NUMERACY

VM 1&2

VCE: VM Units 1&2: From 2023

- Literacy VM 1&2: Coursebook & Applied Vocational Booklet
- Numeracy VM 1&2: Coursebook & Skills Development Portfolio
- Personal Development VM 1&2: Coursebook & Applied Vocational Booklet
- Work Related Skills VM 1&2: Coursebook & Applied Vocational Booklet

VPC Units 1&2: From 2023

- Literacy VPC 1&2 : Coursebook & Applied Vocational Booklet
- Numeracy VPC 1&2: Coursebook & Skills Development Portfolio
- Personal Development VPC 1&2: Coursebook & Applied Vocational Booklet
- Work Related Skills VPC 1&2: Coursebook & Applied Vocational Booklet

VCE: VM Units 3&4: From 2024

- Literacy VM 3&4: Coursebook & Applied Vocational Booklet
- Numeracy VM 3&4: Coursebook & Skills Development Portfolio
- Personal Development VM 3&4: Coursebook & Applied Vocational Booklet
- Work Related Skills VM 3&4: Coursebook & Applied Vocational Booklet

VPC Units 3&4: From 2024

- Literacy VPC 3&4 : Coursebook & Applied Vocational Booklet
- Work Related Skills VPC 3&4: Coursebook & Applied Vocational Booklet

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2023 into 2024 DELIVER Education: Order form for Semester 2 2023. All prices are (GST inc.)

2024 VM & VPC

VCE: Vocational Major

*Note: 3&4 due Nov & Dec '23	Printed Coursebook	Applied Vocational Booklet	Master license PDFs	e-version Master license PDFs	3&4 Interim masters
*Literacy VM: 3&4	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	- Available now
*Numeracy VM: 3&4	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	- Available now
*Personal Development VM: 3&4	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	Available in Oct
*Work Related Skills VM: 3&4	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	- Available now
Literacy VM: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	
Numeracy VM: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	
Personal Development VM: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	
Work Related Skills VM: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	

Vocational Pathways Certificate

*Note: 3&4 due Dec '23 & Jan '24	Printed Coursebook	Applied Vocational Booklet	Master license PDFs	e-version Master license PDFs	3&4 Interim masters
*Literacy VPC: 3&4	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	Available from Nov
*Work Related Skills VPC: 3&4	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	Available from Nov
Literacy VPC: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	
Numeracy VPC: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	
Personal Development VPC: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	
Work Related Skills VPC: 1&2	___ @ $49.50	___ @ $27.50	___ @ $385	or ___ @ $495	

Vocational and Work Education Resources

	Printed Book	e-version Master license PDFs
Work Experience Journal	___ @ $22	or ___ @ $165
Work Placement Journal	___ @ $33	or ___ @ $220
PDS Planner: VPC 1&2	___ @ $33	or ___ @ $220
PDS Planner: VM 1&2	___ @ $33	or ___ @ $220
*PDS Planner: VM 3&4 (exp Jan '24)	___ @ $33	or ___ @ $220
Foundation Numeracy	___ @ $44	na
Senior Numeracy	___ @ $44	na

WACE: Career and Enterprise

Career and Enterprise	Printed Text Coursebook	e-version Master PDFs
CAE: General 11 2ed	___ @ $60	or ___ @ $660
CAE: General 12/ATAR 11 2ed	___ @ $62	or ___ @ $660
CAE: ATAR 12 2ed	___ @ $68	or ___ @ $770
CAE: Foundation 11	___ @ $55	or ___ @ $595
CAE: Foundation 12	___ @ $55	or ___ @ $595

VCE: Industry and Enterprise

New editions were released in 2022

I&E Unit 1: Workplace Participation 5ed - book	___ @ $38
I&E Unit 1: Workplace Participation - e-master	___ @ $550
I&E 1&2: Towards an Enterprising You 6ed - book	___ @ $55
I&E 3&4: Towards an Enterprising Australia 5ed - book	___ @ $68

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Working The Numbers 1

Activities 1: Working The Numbers		p.	Due date	Done	Comment
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1C	**Work it out**	7			
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1I	**Round it out**				
1J	**Mental work**				
1K	**Working together**	17			
1L	**Fractions and decimals**	18			
1M	**Calculating fractions & decimals**	19			
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Comments:

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1.01 Unit 1: Introduction

Unit 1 requirements

In order to successfully complete this unit:

- ✓ for Outcome 1 you must demonstrate key **knowledge** and **skills** in the **4 areas of study** through applied activities related to **3 numeracies**
- ✓ for Outcome 2 you must use and apply the **4-stage Problem-Solving Cycle**
- ✓ for Outcome 3 you must develop, use and apply a **mathematical 'toolkit'**.

4 Areas of Study for Unit 1

1. Number	2. Shape	3. Quantity & Measures	4. Relationships

6 Numeracies for Units 1 & 2

a. Personal Numeracy
Includes travel, transport, organising, planning, commitments, education, life scheduling.

b. Civic Numeracy
Includes data, information, issues, society, economy, government, institutions, media and environment.

c. Financial Numeracy
Includes money, prices, shopping, income, wealth, banking, saving, debt, tax and budgets.

Image: adapted from MAJIVECKA/ Depositphotos.com

d. Health Numeracy
Includes food, nutrition exercise, fitness, data, information, medical, care, systemic measures.

e. Vocational Numeracy
Includes jobs, working, job tasks, pay rates, training, safety, time & travel, and industry-specific skills.

f. Recreational Numeracy
Includes sport, hobbies, games, arts, crafts, life balance, wellbeing, social media and fun.

3 Outcomes for Unit 1

Outcome 1
Use and apply numeracy skills and capabilities across the 6 numeracy foci; and through the 4 Areas of Study.
Unit 1: 4 Areas of Study
Unit 1: 3+ Numeracies

Outcome 2
Use and apply numeracy skills as part of the 4-stage Problem-Solving Cycle.
1. **Identify the Maths**
2. **Act & Use Maths**
3. **Evaluate & Reflect**
4. **Communicate & Report**

Outcome 3
Develop, use and apply mathematical 'toolkit' including analogue and digital numerical tools.

Unit 1: Structure of this coursebook		
Areas of Study	**Numeracy/Numeracies**	**Assessment tasks**
1. Number Section 1	Personal or Recreational (Could be applied to Vocational)	AT1: The Big BBQ pp.26-28
2. Shape Section 2	Personal or Recreational	AT2: Make Me Over pp.50-52
3. Quantity & Measures Sections 3-4	Health or Vocational (Could be applied to Personal) Personal or Vocational (Could be applied to Recreational)	AT3: Measuring Up pp.76-78 AT4: What About Time? pp.98-100
4. Relationships Section 5	Health (Could be applied to Recreational or Personal) Health or Recreational or Personal (Could be applied to Vocational)	AT5a: The Right Proportions pp.120-121 AT5b: The Rhythm of Life pp.122-124

Unit 1 Requirements 1A

Your teacher will inform you of your unit requirements to fill out this table

Areas of Study	Numeracy/Numeracies	Assessment task (s)
1. Number		
2. Shape		
3. Quantity & Measures		
4. Relationships		

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1.03 Introduction

1 4 PS 2 3

Problem-solving cycle

You will need to apply the **4-stage Problem-Solving Cycle** at all times throughout the year, for all activities and tasks you do. In the early part of your studies, your teacher will guide you through the application of the problem-solving cycle. Then as you develop your numeracy skills, you will be expected to start to apply this cycle naturally and independently.

4-Stage Problem-Solving Cycle

1. Identify the maths

Find, identify and interpret the numerical information. Look for:

- ❑ numbers
- ❑ symbols
- ❑ sizes
- ❑ patterns
- ❑ problems
- ❑ words
- ❑ measures
- ❑ directions
- ❑ sequences
- ❑ data
- ❑ images
- ❑ dimensions
- ❑ angles
- ❑ ratios
- ❑ proportions
- ❑ quantities
- ❑ shapes
- ❑ times
- ❑ questions
- ❑ formulae.

2. Act on and use maths

Do the estimates or calculations
actions; and apply suitable
technologies. Such as:

- ❑ estimating
- ❑ measuring
- ❑ calculating
- ❑ comparing
- ❑ analysing
- ❑ solving
- ❑ making
- ❑ sketching & drawing
- ❑ designing
- ❑ rendering
- ❑ constructing
- ❑ building.

4 PS 2 3

4. Communicate & report

Communicate the results and findings using a range of different methods and media. Consider:

- ❑ selecting
- ❑ explaining
- ❑ describing
- ❑ summarising
- ❑ graphing
- ❑ evaluating
- ❑ words
- ❑ numbers
- ❑ format
- ❑ method
- ❑ media
- ❑ technologies.

3. Evaluate and reflect

Check and review to make sure that the right information is being used and that appropriate maths has been performed.

- ❑ Did I perform the appropriate steps?
- ❑ Did I apply the correct tools?
- ❑ Does my answer seem correct?
- ❑ What did I do well?
- ❑ Is the result close to my estimate?
- ❑ What do I need to improve?
- ❑ How can I double-check?

Mathematics Toolkit: Analogue // Digital // Technological

Throughout the year you will develop skills in the use of many mathematics 'tools' and resources, as well as other tools and resources that relate more specifically to your own vocational, health, recreational, financial, civic and personal circumstances.

- ❑ Measuring devices
- ❑ Calculators
- ❑ Timing devices
- ❑ Software
- ❑ Apps
- ❑ Spreadsheets
- ❑ Tables
- ❑ Graphing
- ❑ Mapping
- ❑ Counters
- ❑ Designing
- ❑ Making
- ❑ Inputs
- ❑ Readers
- ❑ Outputs
- ❑ Planners
- ❑ Organisers
- ❑ Rosters
- ❑ Monitoring
- ❑ Sensors
- ❑ Alarms
- ❑ Data
- ❑ Statistics
- ❑ Information
- ❑ Collecting
- ❑ Calculating
- ❑ Analysing
- ❑ Drawing
- ❑ Recording
- ❑ Processors

My maths toolkit 1B

At the start of this year, what do I already bring in my maths toolkit?

Personal maths skills and tools	Work-related maths skills and tools
I can...	I can...
I can...	I can...
I am able to...	I am able to...
I am able to...	I am able to...
I can use...	I can use...
I can use...	I can use...
I can apply...	I can apply...
I can apply...	I can apply...
I...	I...

1.05 Basic Calculations

Numeracy 101

Image: Artem Efimov/iStock/ Thinkstock

You come into contact with numbers all the time. So it is vital that you develop skills to be able to deal with any numerical information and mathematical problems that you encounter.

Although this might sound a bit complicated it doesn't need to be! Put simply, numeracy refers to being able to effectively understand and deal with mathematical issues in order to improve your quality of life.

As a normal part of your day-to-day personal, social and vocational activities, you have to use numeracy skills in a range of situations. You probably don't realise just how much you rely on these skills of numeracy to get by in life.

However, some people will (quite loudly and even proudly) announce that they are innumerate; that is, they don't understand and can't do mathematics. And I'm talking about well-educated professionals as well. They seem to have, what they believe, is an acceptable 'fear' of being effectively numerate.

The funny thing is that these people seem to be very quickly able to use maths and calculate if their pay is too short, or if their superannuation is not adding up.

Population Explosion!

As at Sep 1, 2022 there were estimated to be 26,018,471 people in Australia. You can express this better by saying this as, "about 26 million".

As at Sep 1, 2022, there were 8,650,237,012 (est.) people in the world. You can express this better by saying, "almost 8.7 billion".

Therefore out of all the people in the world, only about 26 out of every 8,650 (est.) were part of the Australian population.

This equals 0.3267% which is about 0.3 out of every 100 people, or 3 out of every 1,000 people.

China's is the world's most populous country with an (est.) population as at Sep 1, 2022 of 1,555,125,169 or about 1.5 billion.

This equals about 19% of the world's population.

Therefore, it was estimated that 1,555 out of every 8,650 people in the world were Chinese.

This equals about 19.02% which is roughly 19 out of every 100 people, or 190 out of every 1,000 people.

Find out current population estimates online at:
www.worldometers.info/world-population
Search for the world, China, Australia and other countries.

Working it out

Image: mikhail malyugin/iStock/ Thinkstock

Numeracy goes well beyond simply adding, subtracting, multiplying and dividing. There are many skills associated with numeracy; and just like any skill, numerical skills can be improved and developed.

By the end of this year you may not end up a mathematical genius, but you will end up improving your ability to work with numbers. This will help make you more confident in your day-to-day lives, and hopefully, more employable.

This resource is focused on you developing the types of numeracy skills that will enable you to work things out for yourself. You will build your mathematical knowledge, learn and apply numerical techniques, learn the language of numeracy and learn how to interpret information.

All throughout this unit, you will use and apply the **4-stage Problem-Solving Cycle**, all the while developing your **numeracy toolkit**.

Work it out 1C

1 4 PS 2 3

1. Solve the following numerical problems by writing your answer in the table.
2. For each write a brief explanation or show your workings to support your answer.

	Question	Answer	Justify/explain your answer
a.	2... 4... 6... 8...		
b.	What do you think would be the average age of the students in your class?		
c.	If your boss says he'll give you a 20% pay rise, and you currently earn $10 per hour, how much will your new hourly rate be?		
d.	How many mobile phones do you reckon are currently in your class room?		
e.	What percentage of these mobile phones do you think are switched on?		
f.	If you see an ad for a new app that will cut your phone bill by 10% a year, and the app costs $60, then is it worth it?		
g.	If Jacob has twice as many brothers than Naser, who has one, then based on this information, how many male children are there in Jacob's immediate family?		

1.07 Basic Calculations

Introduction

Over the course of this year, you will investigate a wide range of numeracy topics and undertake varied skills-development and applied activities and tasks.

Across Units 1 & 2 you will develop and apply numeracy skills in the 6 areas of:

a. **Personal Numeracy**
b. **Civic Numeracy**
c. **Financial Numeracy**
d. **Health Numeracy**
e. **Vocational Numeracy**
f. **Recreational Numeracy**.

"Easy numbers are easy. But what about when the numbers get harder?"

Image: Arman Zhenikeyexv Hemera, Thinkstock

Making a start

In this first section, you will develop the skills to perform a range of numerical calculations. You will build this mathematical knowledge by:

- undertaking some basic mental arithmetic
- learning the correct order to perform arithmetic operations
- applying these mental numerical skills to solve some life problems
- practising how to calculate fractions, decimals and percentages
- learning how to interpret words as numbers
- interpreting numerical information, including spatial information.

This unit culminates in an assessment task that requires you to use a range of numerical skills for an applied situation involving a BBQ.

Image: Wojciech Gajda iStock/Thinkstock

Basic calculations

Basic calculations are those calculations that you should be able to do in your head; or on paper for more complicated calculations.

It is not simply enough to use a calculator to do basic calculations. You have to know if the answer that the calculator gives you is correct. A calculator will only calculate based on the numbers you enter and people can make errors when entering data. So you have to be able to also predict and estimate.

Some of the basic functions that you already are likely to know include addition, subtraction, multiplication and division. You might also be able to calculate percentages and fractions, as well as being able to measure area, volume and distance.

In this section, you will recap some of these skills so that you can develop your own skills that rely on numeracy.

Nearly every occupation requires you to have an immediate understanding of basic calculations.

Addition (plus or sum)

...shown by a '+' sign

Addition involves **combining** two numbers into a sum. e.g.

1 + 1 = 2

4.07 + 191.63 = 195.70

1/2 + 1/3 = 5/6

$1.04 billion + $10 million = $1.05 billion

Addition also involves combining more than two numbers. e.g.

1 + 1 + 2 = 4

17.4 + 19.8 + 12.8 = 50

1/2 + 1/3 + 1/6 = 1

12c + 87c + $1.01 = $2

93 + 126 + 57 + 250 = ?

NUM SUPER SKILLS

Subtraction (take away or minus)

...shown by a '-' sign

Subtraction involves taking one number away from another, which essentially is finding the **difference** between 2 or more numbers. e.g.

2 - 1 = 1

4.15 - 2.85 = 1.30

1/2 - 1/3 = 1/6

$50 - $27.95 = $22.05

2 - 1 - 1 = 0

4.15 - 2.85 - 1.40 = -0.10

1/2 - 1/4 - 1/12 - 1/12 = 1/12

$50 - $25 - $30 = -$5

250 - 70 - 9 - 35 = ?

NUM SUPER SKILLS

Basic calculations 1 1D

1 4 PS 2 3

When making calculations on paper it is good practice to set out your problem in a way that is easy to read and follow. Use the example below, then complete the problems.

e.g. What is the sum of the following numbers?

45 + 567.5 + 2,000 + 16 = ?

- ⇨ Set the problem out clearly.
- ⇨ Numbers should be right justified at the point of any decimal.
- ⇨ Here 'carrying' is included at the bottom. This could also be shown at the top. Your teacher will show you a preferred method.

```
   45
  567.5
2,000
+  16
   11
-------
2,628.5
```

1. So what is the sum of the following numbers?

73 + 256 + 1,500 + 11.5 = ?

What is the sum of the following numbers?

45 - 36 + 158 - 212 = ?

What might be the best way to set out this calculation? Your teacher will advise you.

2. So what is the sum of the following numbers?

100 - 52 + 58.5 - 75 - 80 = ?

1.09 Basic Calculations

Multiplication (times)

...shown by a 'x' or '*' sign)

Multiplication involves repeated addition of the same number to find the **product**. In other words you are adding the same number together for however many times is specified. e.g.

3 x 5 = 15
or (5 + 5 + 5=15)

17 * 16 = 272
(16+16+16+16 and so on...you get the idea!)

Multiplication of more than two numbers involves finding the product of the first 2 numbers, and then multiplying that answer by the next number, and so on. And you can also use brackets to group parts of the calculation together; but move left to right! e.g.

4 x 7 x 6 = (7+7+7+7) x 6
= 28 x 6 = 168

(or another way)
4 x 7 x 6 = (4 x 7) x 6
= (28) x 6 = 168

So... 8 x 12 x 10 = ?

NUM SUPER SKILLS

Division (how many)

...shown by a '÷' or '/' sign)

Division involves finding the **quotient** of 2 (or more) numbers. In other words, how many times one number goes into another. e.g.

10 ÷ 5 = 2
(or how many 5's are there in 10; there's 2)

280 ÷ 2 = 140

1040 ÷ 40 = 26

Sometimes not all numbers are divisible (or go into each other) equally, which leaves a remainder. You might express this as a decimal or as a fraction. e.g.

25 / 2 = 12.5
(remainder expressed as a decimal)

17 ÷ 2 = 8 1/2
(remainder expressed as a fraction)

Division of more than 2 numbers involves finding the **quotient** of the first 2 numbers and then dividing that answer (the quotient) by the next number, and so on. e.g.

140 ÷ 14 ÷ 10 = ?
(140 ÷ 14) ÷ 10 = ?
therefore... 10 ÷ 10 = 1
So... 456 ÷ 4 ÷ 6 = ?

NUM SUPER SKILLS

1E Basic calculations II

Complete the following in your workbooks. Your teacher will show you a preferred method for setting out and solving multiplication and divisions calculations.

a. 12 x 8 =

b. 12 x 13 =

c. 27 x 36 =

d. 10 x 5 x 15 =

e. 36 x 2 x 14 x 3 =

f. 62 x 37 x 15 x 1 =

g. 48 ÷ 8 =

h. 64 ÷ 8 ÷ 4 =

i. 120 ÷ 10 ÷ 2 =

j. 770 ÷ 5 ÷ 4 =

k. 140 ÷ 2 ÷ 10 ÷ 2 =

l. 650 ÷ 25 ÷ 2 ÷ 4 =

Quick quiz 1F

1. First, complete the quiz below just using your powers of mental arithmetic. Estimate your score.
2. Then complete this quiz using a calculator. Estimate your score.
3. After your teacher has given the correct answers, discuss how the class performed on their mental arithmetic, versus the use of a calculator.

(Your teacher might choose to do this quiz with the class as an oral activity.)

1.	27 + 94 =	_____	1. _____
2.	136 + 76 + 39 =	_____	2. _____
3.	271 + 29 + 700 =	_____	3. _____
4.	14 - 9 =	_____	4. _____
5.	117 - 49 =	_____	5. _____
6.	117 + 48 - 64 =	_____	6. _____
7.	14 - 27 =	_____	7. _____
8.	5 x 11 =	_____	8. _____
9.	14 x 13 =	_____	9. _____
10.	27 * 20 =	_____	10. _____
11.	6 x 5 + 5 =	_____	11. _____
12.	6 + 5 x 5 =	_____	12. _____
13.	28 ÷ 4 =	_____	13. _____
14.	195/10 =	_____	14. _____
15.	128 ÷ 4 + 20 =	_____	15. _____
16.	128 + 4 + 20 =	_____	16. _____
17.	10% of 240 =	_____	17. _____
18.	15% of 250 =	_____	18. _____
19.	1/4 + 1/2 + 1/8 =	_____	19. _____
20.	0.5 + 1/2 =	_____	20. _____

Estimated Score: _____ Actual Score: _____ *Estimated: _____ Actual: _____*

1.11 Working Together

Round numbers

At this stage of the unit you are expected to be able to perform these basic calculations in your head; and on paper for the more difficult ones. It is important that you are able to do these calculations in your head because this allows you to **estimate** and **predict** more accurately. This can enable you to make better informed numerical decisions on-the-go in your personal, working and social lives.

To assist with these mental calculations you should use **rounding** to help you make estimates. Then afterwards you can check the estimates on paper or with a calculator. Rounded estimates are very useful when shopping, giving quotes, planning a dinner or a party, comparing deals and many other times. Why so?

Rounding time

Linly is talking with a used car dealer who says that to pay off a car (a 2011 VE II Commodore) he will have to pay $200 a month for 48 months.

This is a pretty straightforward calculation to work out in your head:

48 x $200 = $9,600

Linly can quickly decide if he thinks this deal is good value or not, based on the specifications and purchase price of the car. What do you think?

However, Linly's friend Selma is told by another dealer that she will have to make 42 payments of $229. This is [illegible] to work out mentally because the numbers are not 'round'.

So without doing the maths, who do you think is paying more? Linly or Selma?

Have a quick class vote. Then calculate the answer below. Your teacher will show you how best to set out the calculation on paper.

1G Who's paying more?

1 4 PS 2 3

Use the information in the example above to work out who is paying more.

Linly: Calculation	Selma: Calculation

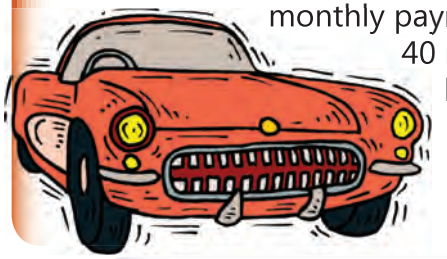
Rounding estimates

To make the calculation easier, Linly estimated that the car he was looking at would cost about $10,000. That is 50 x $200. He rounded the 48 up to 50. This makes it easier for him to do the calculation quickly in his head.

Selma also estimated that the car she was looking at would cost her about $10,000. She rounded 42 down to 40 and $229 up to $250 (just to be safe).

In reality, they are both pretty close and they have both over-estimated. In their case (working out total price of a car) it's a good thing to over-estimate. Why so?

They have a cousin Albrut who likes to use rounding. He was told that a car he was looking at would cost $220 a month for 44 months. Albrut rounded the monthly payment down to $200 and the number of payments to 40 months, and calculated a cost of $8,000. On TikTok he did a victory dance singing how he got a bargain! What has he done wrong? Give your answer and show your calculations below.



Rules for Rounding

- Round to nice and friendly numbers that are more easily calculated in your head. e.g. 5, 10, 20, 50, 200
- Remove all fractions and decimals when rounding. e.g. 1.5 becomes 2, 1.4 becomes 1. (But be careful you don't round down bad things by too much and underestimate.)
- Round up for bad things (e.g. cost, time, quotes, materials, expenses, etc.). This means that you are playing it safe and over-estimating potential costs.
- Round down for good things (e.g. income, revenue, time saved, etc.). This also means that you are playing it safe and under-estimating potential benefits.

NUM SUPER SKILLS

Rounding 1H

1 4 PS 2 3

1. What has Albrut done wrong with his rounding? Show your calculations.
2. What advice would you give him?

1.13 Working Together

1I Round it out

1 4 PS 2 3

1. Use rounding to calculate answers for Ilsa and John.

a. Ilsa reckons that she buys and drinks about three 600ml bottles of Coke a day. Approximately how many millilitres does she drink each week, and each year? How might she be wasting her money?	b. John works out 3 times a week and performs 3 sets of bench presses each of 10 reps, lifting 25kg, 40kg and 50kg respectively. How much weight does he bench press per workout, and per week?

1 4 PS 2 3

2. Problem-solving

a. Katie earns $52 for a [illegible] and she works 3 weekday evening shifts per week. How much does she earn per week and per hour?

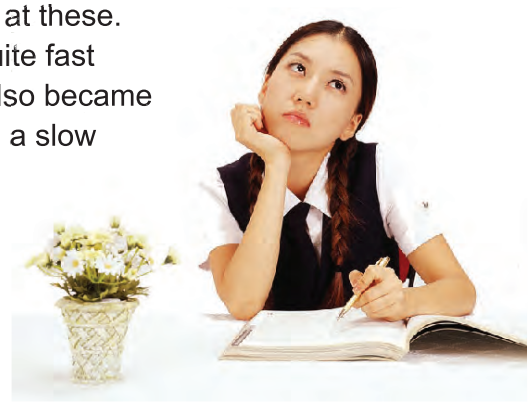
b. Robert earns $96 for an 8-hour shift each Sunday plus 25% penalty rate. How much does he earn per week and per hour?

c. Who has got the better job? List 3-5 reasons, but make your decision carefully. Discuss with the class.

Working together

So as you have experienced, the more you do mental arithmetic the better you get at it. Performing these basic calculations is a skill that you can learn, train and develop. But use it or lose it!

When I was in primary school I was very fast at doing basic calculations in my head. Throughout high school I become slower at these. When I was working as a sales assistant I became quite fast again. When I was studying business at university I also became quite fast at certain calculations. Now I'm just old with a slow brain! What about you?



Many people who work in retail, trades, hospitality, patient care, management, transport, manufacturing and accounting need to be well-skilled at basic arithmetic.

Why so? And where does this leave you?

Mental work 1J

1. Choose 2 of these occupation/industry fields listed above (or your own choices). Briefly describe 3 clear examples of when you would need to use mental arithmetic if you were working in that occupation.
2. Give an example of a mental numerical calculation that you have done, or would need to do, as part of this job.

Industry/Occupation 1:	Industry/Occupation 2:
i.	i.
ii.	ii.
iii.	iii.
Calculation e.g.	Calculation e.g.

1.15 Working Together

Order of operations

In life we naturally follow orders and procedures. Procedures can assist us to accomplish tasks accurately and efficiently. For example:

- if you are changing a tyre you need to follow a sequence of operations to do the task properly,
- if you are fixing a blocked drain you need to follow a sequence of operations to do the task properly, and
- and if you are performing open-heart surgery you also need to follow a sequence of operations to do the task properly!

The same goes with arithmetic calculations. You need to follow an order of operations. The basic rules, in order (and as explained below) are:

1. **First, calculate anything in brackets.**
2. **Move from left to right, and perform any multiplication or division.**
3. **Move from left to right, calculating for any addition and subtraction.**

The tasks and responsibilities associated with occupations require workers to follow a well-planned and systematic order of operations.

Image: George Doyle/ Stockbyte/ Thinkstock

Have you ever heard of BOMDAS?

Order, order!

When performing a calculation, the order of operations is as follows.

Firstly, you must always **evaluate any brackets** before doing anything else:

e.g. 5 + (10 x 6) = 5 + 60 = 65 (and not 90!!!)

Secondly, you **move from left to right** performing any **multiplication or division.** It doesn't matter which of these you do first as long as you move from left to right. Tip: You can show this as a bracket ( ).

e.g. 6 x 5 + 3 x 13 =

(6 x 5) + (3 x 13) =

30 + 39 = 69 (and not 429, 624 or 1,170!!)

Finally, you move from left to right performing any addition or subtraction.

(Once again it doesn't matter which of these you do first as long as you move from left to right.)

For example:	And another:	And one more:
3 + 9 x 7 = ??	6 x 9 - 9 ÷ 3 = ??	17 - (15 ÷ 3) + 5 x 25 = ??
3 + (9 x 7) = ?? do this 1st	(6 * 9) - (9 ÷ 3) = ?? do this 1st do this 2nd	17 - 5 + (5 x 25) = ??
3 + 63 = 66	54 - 3 = 51	12 + 125 = 137

NUM SUPER SKILLS

Working together 1K

1. Perform the following calculations.

a. 3 + 3 + 3 x 3 =	
b. 3 + (3 + 3) + 3 =	
c. (3 + 3) ÷ 3 + 3 =	
d. (3 + 3) * (3 - 3) =	

2. Estimate answers to the following calculations using rounding. Check your answers.

a. 29 x 31 - 28 =	
b. 147 - 52 ÷ 4 =	
c. 998 * 10 ÷ (299 - 47) =	

3. Davey has a $5 note a $2 coin and 3 $1 coins. He has to buy 25 packets of Gooba Noodles which are 52c each. 5-packs of noodles are $1.97 per pack. Which purchase option should he make? Why? (Show your workings below.)

1 4 PS 2 3

1.17 Fractions and Decimals

Fractions

A fraction represents a part or a portion of a whole number. Essentially a fraction divides the top number (**numerator**) by the bottom number (the **denominator**).

For example:

- An orange cut equally in two portions = 1/2 an orange + 1/2 an orange.

  If you eat one of these portions you have eaten 1/2 of an orange. And 1 divided by 2 = 1/2. (Or, "how many 2s go into 1: a half!") Then if you cut the other half equally you have 2 quarters. Eat one of those and you have now consumed 3/4s and have 1/4 left.
- 75 cents = 3 quarters of a dollar or 3/4.
- A pizza sliced in 8 portions = 8 x 1/8. Each slice is 1/8th.

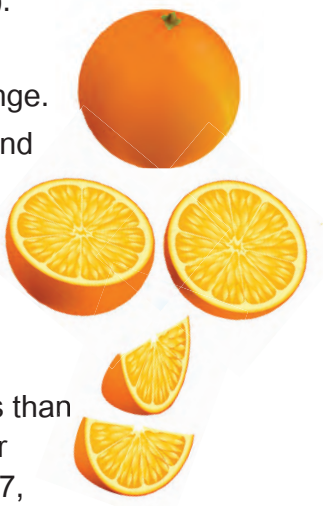


Image: mustahtar/ Depositphotos.com

A **proper fraction** is one where the number on top (**numerator**) is less than the number on the bottom (**denominator**). This means that the number represented by the fraction will be less than 1. e.g. 1/4, 1/2, 3/5, 2/3, 5/7, 7/10, 19/20 and so on. (Except for negative fractions!)

An **improper fraction** is one where the number on top (**numerator**) is more than the number on the bottom (**denominator**). This means that the number represented by the fraction will be more than 1. e.g. 3/2 4/3, 11/2, 11/3 and so on. (Except for negatives!)

Decimals

A decimal is another way of representing a fraction. Decimals are based on our number system which uses the power of 10 (e.g. 1, 10, 100, 1000, 0.1, 0.01, 0.001, 0.0001).

Some numbers include a decimal point to represent a whole number, such as 4, plus a fraction of a whole number, such as .5. When put together this will be 4.5 (or 4 and five tenths). 4.5 can also be written as 4 1/2.

> For example, Jaz ate 4 Big Macs plus another half a burger before he had to stop with a gut ache. In decimal terms, Jaz ate 4.5 Big Macs!

For really accurate numbers such as in medicine, pharmacy and other technical and scientific areas decimals might go up to the hundredth (i.e. 2 numbers after the decimal point; 0.01); or even to the thousandth, (i.e. 3 numbers after the decimal point 0.001).

For this stage of numeracy we can keep decimals to the hundredth, which is two numbers after the decimal point, or 0.01. This is important when dealing with money. When converting measurements you might also require 2 (or more) decimal places. Why so?

1L Fractions and Decimals

Arrange these fractions in order from lowest to highest. Show each as a decimal.

11/3, 1/4, 5/2, 9/10, 1/2, 3/2, 2/3, 4/3, 7/2, 27/4, 3/5, 5/7, 5/4, 7/10, 19/20

Fractions: Addition and subtraction

If the fractions have the same bottom number (**denominator**) then simply add or subtract the top numbers (**numerator**).

e.g. 1 $\frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$ e.g. 2 $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ e.g. 3 $\frac{5}{2} + \frac{4}{2} - \frac{3}{2} = \frac{9}{2} - \frac{3}{2} = \frac{6}{2} = 3$

But, if the fractions have different bottom numbers (**denominators**) then you will have to find the lowest common **denominator** (or lowest common multiple). After this you can then add or subtract the top numbers.

e.g. 1 $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$ e.g. 2 $\frac{3}{2} + \frac{2}{4} - \frac{1}{8} = \frac{6}{4} + \frac{2}{4} - \frac{1}{8}$

$= \frac{12}{8} + \frac{4}{8} - \frac{1}{8}$

$= \frac{15}{8} = 1\ 7/8$ or 1.875

NUM SUPER SKILLS

Fractions: Multiplication and division

Multiplication

1. Multiply the top numbers (numerators).
2. Multiply the bottom numbers (denominators).
3. Then if possible, simply the fraction.

e.g. 1 $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ e.g. 2 $\frac{3}{5} \times \frac{2}{3}$ [illegible] e.g. 3 $\frac{7}{4} \times \frac{3}{2} = \frac{21}{8}$

[illegible] $\frac{21}{8} = 2\frac{5}{8}$

Division

Now this is a bit trickier; [illegible] these steps.

1. Invert all the fractions to the right of the first fraction (or whole number).
2. Then multiply (yes multiply) the top numbers (numerators).
3. Then multiply (again, yes multiply) the bottom numbers (denominators).
4. Then if possible, simply the fraction.

$\frac{3}{5} / \frac{2}{5} = \frac{3}{5} \times \frac{5}{2} = \frac{15}{10} = \frac{3}{2} = 1\frac{1}{2}$

Step 1 | Step 2 & 3 | Step 4

NUM SUPER SKILLS

Calculating fractions & decimals 1M

Complete the following calculations showing your workings.

a. 1/2 + 3/4 + 0.5 =	b. 2/5 + 5/2 =	c. 5/2 x 10/2 =	d. 9/2 - 11/4 x 0.5 =
e. 0.7 + 28.8 - 7/2 =	f. 0.3 + 0.5 x 3/2 =	g. 7.25 - 0.75 x 1/2 =	h. 3/4 ÷ 1/4 =

1.19 Percentages

Percentages

At times people say that they have trouble calculating percentages. But in reality, percentages are one of the most straightforward calculations going around. A percentage simply represents a proportion of a whole! Just look at the orange below.

1 = 100%

1/2 = 50%

1/4 = 25%

1/8 = 12.5%

Percentages

Right now in your class, put up your hand if you feel that you are OK at calculating percentages.

Count the number of people who put up their handS. This is the number of people in your class who are OK at calculating percentages.

Count the number of people in total in your class.

Now you have all you need to calculate a percentage. What's the answer?

Proportion

A percentage represents a smaller proportion of a whole; let's consider these examples.

- 7 out of 10 people prefer Burpee Cola. That's 70%.
- 33 out of 100 people have never been overseas. That's 33%.
- 26 out of 50 people surveyed agreed that *Love Island* contestants were, "a waste of oxygen". That's 52% (52 out of 100).
- Approximately 60% of all adults in Australia are considered 'overweight or obese'. If there are about 15 million adult Australians then that's about 9 million people.

Six out of ten people are red (or 60%).

Image: Adapted from Kamaga/iStock/Thinkstock

Making percentages easier

Percentages are calculated as a proportion of 100. You cannot have a percentage greater than 100% nor can you have a percentage lower than 0%. If you have a cake and slice it in two you have two slices each of 50%. You cannot create more than 100% of the cake.

When calculating percentages the easiest to do are the 10%s. It's not that hard to calculate 10% of any number. Quickly, what's 10% of 270? See it's easy!

If you have to work out 5%, then calculate 10% and then halve the amount. If you have to calculate 20% then calculate 10% and then double the number.

You get the picture! Or should we say, the number.

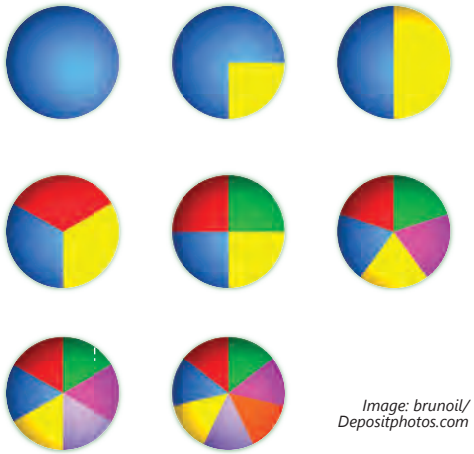
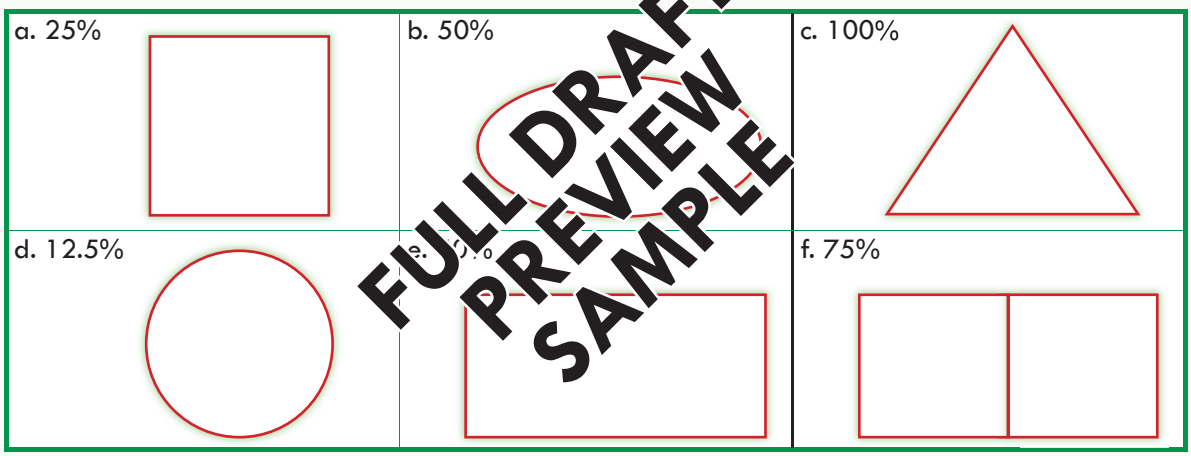


Image: brunoil/ Depositphotos.com

Percentages 1N

1. Colour in the shapes to indicate each percentage.



2. Fill in the table with the correct percentages.

	1%	2.5%	5%	7.5%	10%	20%	25%	33%	40%	50%	60%	66%	75%	80%	100%
100															
50															
1,000															
500															
250															
156															

1.21 Percentages

Calculating percentages

If there are 100 people waiting in a queue for Grand Final tickets, and 80 of these are members of Collingwood, then the percentage of Collingwood members in this queue for Grand Final tickets is 80%. See it's easy in words. It's easy in numbers as well. e.g.

⇨ $\frac{80 \text{ (number of Collingwood members in queue)}}{100 \text{ (total number of people in queue)}} \times \frac{100\%}{1}$

$= 0.8 \times 100\%$

$= 80\%$

So to work out percentages you divide the amount or the portion you are focusing on, by the total amount.

This gives fraction or decimal (such as 8/10 or 0.8).

You then multiply by 100% to express this as a percentage.

So if there are 17 Toyotas in the car park and there are 51 cars in total, what percentage of cars in the car park are Toyotas?

NUM SUPER SKILLS

1O Percentage calculations

1 4 PS 2 3

1. Complete the following percentage situations. Show your workings.

1. What is 20% of 250?	2. What is 25% of 200?
3. When surveyed, 36 people out of 50 replied that they would like an iPhone. What % is this?	4. The 2021 Census found that 7,043,711 of Australia's population were born overseas. The total population was 25,422,728. What % was born overseas?
5. GST is charged at 10% on most goods and services. How much GST applies to a purchase of $550 (GST inc.)?	6. If you get paid $11.50 an hour and you get a pay rise of 4.5%, what will your new hourly rate be?

2. Jonesie buys a pizza and cuts it into 8 equal slices. What percentage of the total pizza does each slice represent?

1
4 PS 2
3

3. He cuts each of these 8 slices in half. What percentage of the total pizza is each slice?

4. If the pizza weighs 500 grams (gm) and Jonesie cuts quite accurately, what is the approximate weight of each slice when cut into 8 slices; and the approximate weight of each slice when cut into 16?

5. What might be the benefit of Jonesie cutting the pizza into 16 slices? What problems can you predict with this type of slicing?

6. Way back in 2009, local 60gm Mars Bars decreased in size by 11.6%. What was the new weight of a Mars bar? Why would Mars do this? What is the weight now?

Have you ever heard of Shrinkflation?

1.23 Interpreting Numbers

Numbers as words

Sometimes you hear or read numbers as words which can create a bit of a problem. When listening to spoken numbers many people start to switch off after hearing three numbers. Most of us are just not skilled enough at mental arithmetic to process more than three numbers at a time. We can get confused.

Sometimes a pushy salesperson can use this confusion to their advantage and try to bamboozle and manipulate you with spoken 'facts' and 'figures'. Some people also don't take this 'spoken number' confusion into account when giving presentations or when explaining complex numerical issues. As a result, they bore and confuse their audience.

It is important to develop the skills to be able to interpret spoken words to find out their true numerical meaning.

1P Numbers as words

1 4 PS 2 3

Partner up. At the end of the task, discuss which method worked better.

1. Have one person read the maths problem aloud. Try to work out the answer.
2. Now write the sentences as numbers and calculations, and then solve each.

e.g. My oldest child is 12, my next youngest is 3 years younger and the next is 2 years older than my 4th who is 5 and my baby is a quarter of the age of the oldest.	How many children do I have? What are each of their ages and what is their combined age? Oldest = 12, 2nd oldest = (12 - 3) = 9, 4th oldest = 5, 3rd eldest therefore = (5 + 2) = 7, and the 'baby' = (12 x 1/4) = 3. a. I have 5 children. b. Their ages are 12, 9, 7, 5 and 3. c. 12 + 9 + 7 + 5 + 3 = 36 years
a. Alo earned $100 a week for half a year. Alo spent $50 a week for the whole year. Alo's uncle gave him $800 for his birthday which he hasn't touched yet. Alo needs to purchase 12 driving lessons @ $60 each.	a. How much money has Alo had? b. How much money has Alo spent? c. How much money will Alo have left after paying for the lessons?
b. In this recipe to serve 12, you will need a kilo of butter, and two eggs for every quarter kilo of butter, and 100 grams of sugar for every egg. You will also need 500 grams of flour per 250 grams of butter.	How much of each ingredient will you need for 24 people? Butter? Eggs? Sugar? Flour?

What are words worth?

Numbers mean very little, if anything, on their own. Instead, it's their interpretation that is important. What does it mean to say that your meal has 30 grams of fat? Is that good or bad? How do you know?

When you interpret the meaning of numbers, you need to be able to **compare** them to **benchmarks**, **norms** and other **standards**.

Advertisers and people who are trying to persuade, often use slippery words to try and alter the meaning of the numbers.

How many grams of fat would you expect to be in this 1 kg serve of fried chips?

Slippery numbers 1Q

1 4 PS 2 3

Are these statements all they're cracked up to be? What else do you need to know? Research online to find out this 'unknown' information and then explain each.

a. "Michael can run 100m in an amazing 15 seconds flat."	b. "Our factory-laid eggs each weigh a whopping 40 grams."
c. "At Scofforamas you get a [illegible] quarter-pound steak for [illegible]."	d. "This simple hack will take years off your mortgage."
e. "Our new 20% lower-fat cheese-flavoured chips have only 18 grams of fat per 50g pack."	f. "Elvira's blood pressure reading is 110 over 70."
g. "With our new BigBoy Booster powder you can get ripped in half the time."	h. (Make up one of your own)

1.25 Assessment

AT1 The Big BBQ
Personal Numeracy // or Recreational

1
4 PS 2
3

For this assessment task, you and a partner are required to use and apply numerical skills and tools to help plan a big BBQ for your friends and families. You have got this estimated shopping list, but you need to check to see if the numbers are realistic.

You have invited about 100 friends and family members, and so far 50 have accepted. You can expect about another 50% to accept. You don't know how many might bring partners, or how many will bring their kids and other friends along. But you don't want to be short of food and drink. And you certainly don't want to spend too much money buying items that might go to waste!

The shopping list:

- ❑ 20kg of sausages
- ❑ 10kg of onions
- ❑ 10kg of beef patties
- ❑ 1kg of vegie patties
- ❑ 1 x 24 pack of bottled water
- ❑ 20 litres of soft drink
- ❑ 5 loaves of white bread
- ❑ 1 loaf of wholemeal bread
- ❑ 4 x 4 litres bottles of sauce

Note: You have 2 BBQs, gas and oil.

Work in pairs and start planning. Complete the following tasks.

1. Predict the most likely amount of guests (adults and kids) that will attend.
2. Estimate and calculate the amounts for sausages, and any others.
3. Identify whether the shopping list is suitable. If required, change the list by adding or subtracting amounts. Then recalculate relevant amounts, proportions and ratios.

Prepare a written report in point form (as well as your workings) to answer questions 1-3 above. Your teacher might ask you to prepare a report to the class.

How many adults ?	How many kids?	How many vegetarians?
How many sausages?	How many sausages each?	Snags: Too few, too many or just right - explain?
How many burger patties?	How many burgers each?	Burgers: Too few, too many or just right - explain?
How many vegie patties?	How many vegie patties each?	Vegie patties: Too few, too many or just right - explain?
How many slices of bread?	How much bread for snags?	Bread: Too little, too much or just right - explain?
	How much bread for burgers?	
How many grams of onions?	How many grams of onions each?	Onions: Too little, too much or just right - explain?
How many litres of sauce?	How many litres of sauce each?	Sauce: Too little, too much or just right - explain?
How many cups of soft drink?	How many cups of soft drink each?	Soft drink: Too little, too much or just right - explain?
How much water?	How many bottles of water each?	Water: Too little, too much or just right - explain?

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS1: Number
Personal or Recreational Numeracy

Tasks - AT1: The Big BBQ	Must do?	Due by	Done	Level
Part 1: Planning and estimating				
Negotiate the task details with my teacher.	✓		○	
i. Predict the amount of guests.	✓		○	
ii. Describe any special food requirements needed.	✓		○	
iii. Estimate the amounts of main food items needed.	✓		○	
iv. Estimate the amounts of drinks needed.	✓		○	
v. Estimate the amounts of other items needed.	✓		○	
vi. Refine the shopping list	✓		○	
Part 2: Calculating and analysing				
i. Calculate the amount of main food items needed	✓		○	
ii. Calculate the amounts of drinks needed.	✓		○	
iii. Calculate the amounts of other items needed	✓		○	
iv. Correctly calculate proportions and ratios	✓		○	
v. Estimate a budget for the BBQ given	○		○	
Part 3: Reporting				
Draft our report and submit for feedback	✓		○	
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	
Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Prepare and submit your final report and calculations.**	✓		○	
Present a report to the class (if required).	○		○	

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

Additional information:

Signed: _____ Date: _____

1.27 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT1 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

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Shapes and Objects 2

Activities 2: Shapes and Objects		p.	Due date	Done	Comment
2A	**Basic shapes**	30			
2B	**3D shapes**	31			
2C	**Describing shapes**	32			
2D	**Recognising shapes**	33			
2E	**Cube net**	34			
2F	**Solid objects**	35			
2G	**Shapes at work**	36-37			
2H	**Scale and ratio**	39			
2I	**Transforming objects**				
2J	**Floorplan**	4[illegible]			
2K	**Working plans**	44			
2L	**Plan symbols**	45			
2M	**Plans**	46			
2N	**Classroom floorplan**	47			
2O	**Organic infographic**	49			
AT2	**Make Me Over**	50-51			
PST	**Problem-Solving Cycle and Maths Toolkit**	52			

Comments:

2.01 Shapes and Design

Design

As part of everyday living you interact with design all the time. The consumer products you use are designed for your needs. Industrial products have been designed for a particular vocational use.

Sometimes design is technical; at other times it is more artistic. People might develop and design systems, processes and procedures to help us do our jobs more efficiently. People might also design graphics, multimedia productions and works of art to improve our leisure and hobby experiences.

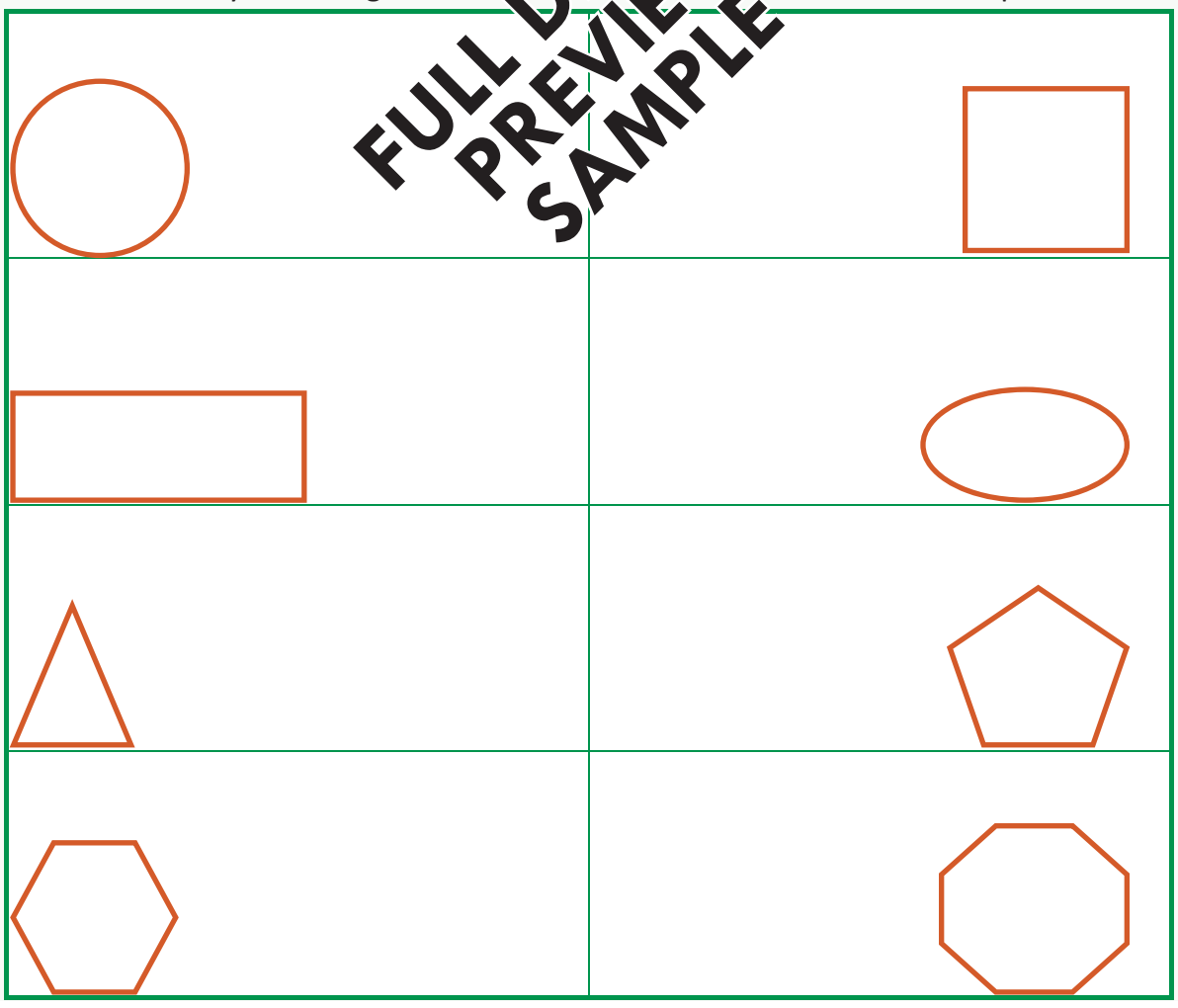
Good design has often been said to be a blend of **form** and **function**, that is; how good something looks versus how good it works. So how good are you at recognising the shapes that surround you in everyday life?

Image: Nik_Merkuloc; iStock/Thinkstock

'Modern' design is constantly evolving. What's next?

2A Basic shapes

1. Name each of the basic shapes shown in the table below.
2. List 3 objects that you come into contact with as part of your everyday life that have been designed using this basic shape.
3. List a naturally occurring situation in nature which resembles this shape.



3-Dimensions

You live in a 3-dimensional (3D) world. The spatial dimensions which interact to create a sense of depth are:

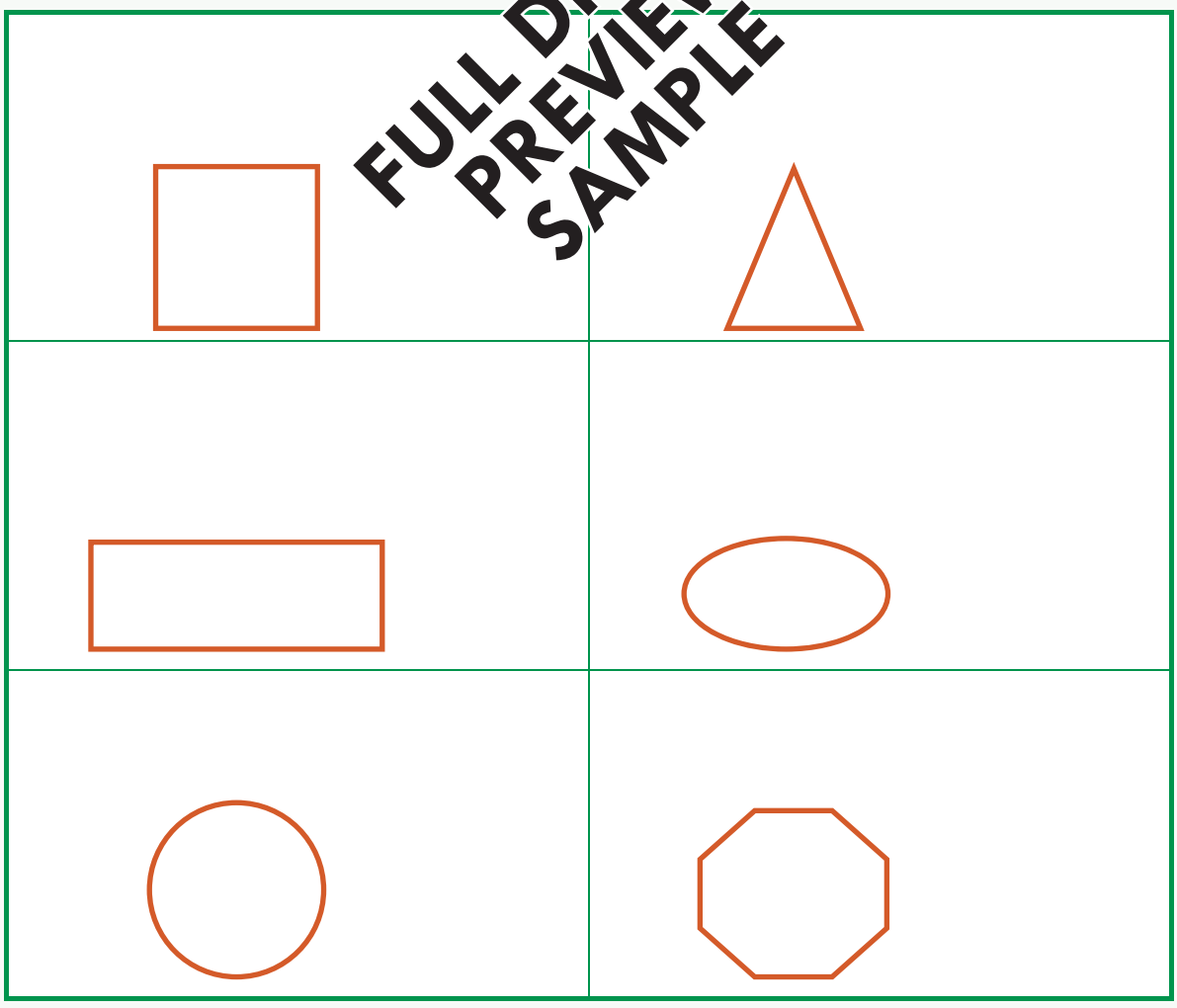
- ⇨ **length**
- ⇨ **width**
- ⇨ **height.**

On paper, you can usually only work in 1 or 2 dimensions. 1D involves lines. 2D involves the flat shapes on these pages. However, talented graphic designers can make 2D shapes seem like 3D objects by creating a sense of depth. You see the world in 3D. This is because you have two eyes which create **binocular** vision.

If you cover one eye you will lose the ability to sense depth accurately. This can be a hazard when performing tasks such as driving.

3D shapes 2B

1. Change the shapes below into their corresponding 3D objects. Name them. (You might need to sketch some drafts in your workbooks to get these right.)
2. For each shape list 3 objects that you come into contact with as part of your everyday life that have this 3D shape.



2.03 Shapes and Design

The shape of our environment

Have a look at the direct world around you now. What types of shapes exist?

Look at your hands, your body, your legs and arms and feet, your clothes, your school materials, the chairs and tables in the room, the fixtures and fittings and all the equipment. Look down at the floor to see the patterns and up at the ceiling to see everything going on there. Look at the other people, their faces, their eyes.

You live in a world of objects and shapes.

Objects with depth are 3-dimensional.

Flat shapes appear 2-dimensional.

Lines are 1-dimensional.

Think about this...sometimes shallow people are described as being 2-dimensional. How about that!

What does shallow mean? Without depth of course!

2C Describing shapes

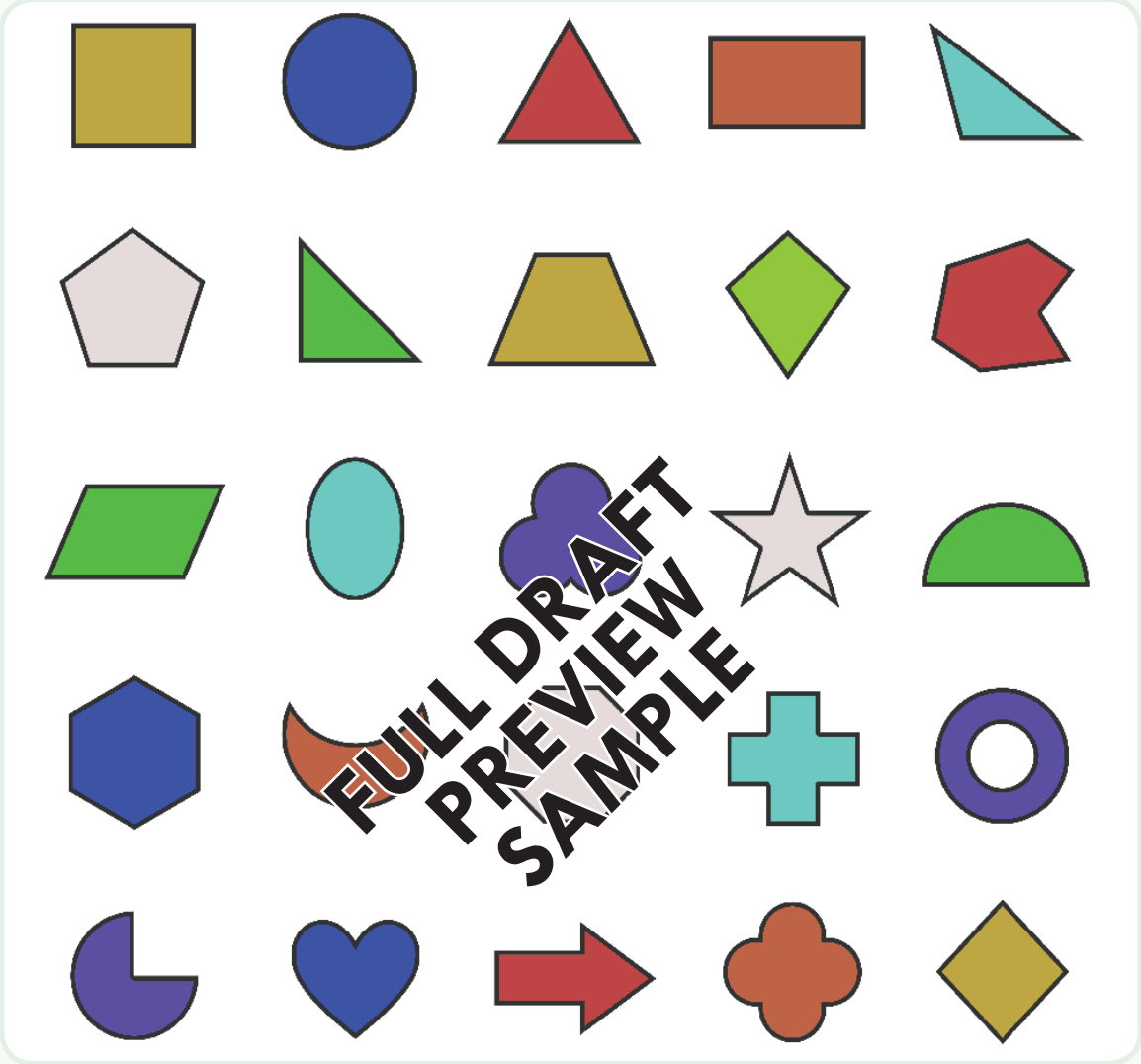
1. List 6 things in this room and describe their shape.
2. Draw 4 body parts and/or items of clothing and describe their relevant shape. e.g. My eyes are quite round and are spherical in depth.

1
4 PS 2
3

Recognising shapes 2D

1. Name or describe the shapes represented in the drawings below.
2. List things from your everyday world that are similar to these objects.

Image: Adapted from Axsimen/Depositphotos.com



3. Choose an item or an object from your everyday life that consists of 2 or more of these shapes. Draw it, or take a photo.
4. Take accurate measurements of the object's dimensions in 3D. Add these to the drawing or image.
5. List the major shapes that are part of that object.

2.05 3D Objects

3D objects

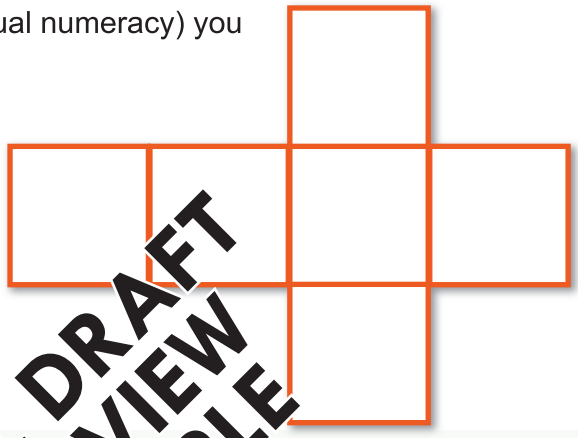
A key part of visual numeracy is the ability to estimate and manipulate objects in three dimensions. One way to work with solid objects is to use **object nets**.

As an example, consider the 3D properties of a cube. A cube is a solid 3-dimensional item and this shape is used for items such as dice, a block of sugar, a stool, a gift box and even sandstone bricks.

But if you were covering a plain cardboard cube with gift wrapping paper how should you lay out and cut your paper for maximum efficiency?

To help you picture this (i.e. to use visual numeracy) you can use an object net.

Image: scanrail/ iStock/Thinkstock



2E Cube net

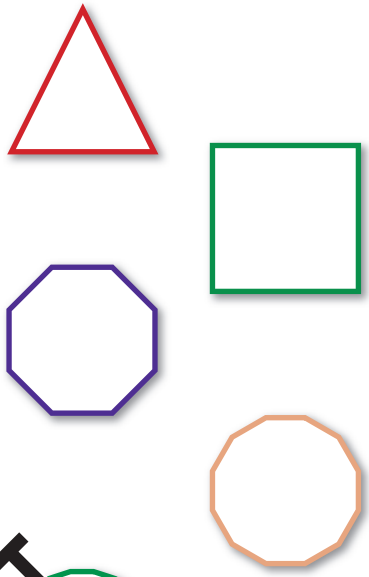
1
4 PS 2
3

1. Measure the cube net shown above and draw it on stiff card or heavy paper.
2. Carefully cut, fold, assemble and form the cube.
3. How did you go? Does your cube look neat?
4. Create a cube net for a cube 3 times the size as the one above.
5. Cover the cube with decorated paper. Use your net to measure the paper. Glue the paper to the cube. Now that you're a craftsperson you might try to sell this on Etsy! Otherwise make a gift of your cube to your favourite teacher!
6. Outline the type of work tasks that object nets might be used for.

Other shapes

Some shapes have all of their sides of equal length and all of their angles of equal length. These are called **regular polygons**. Some of these include:

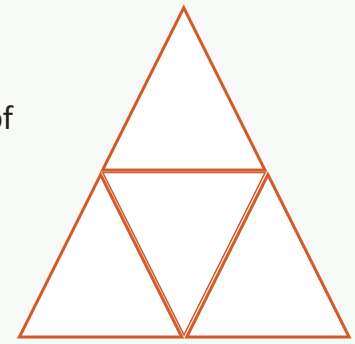
- **Trigon** (needs to be an equilateral triangle) - It has 3 sides which as a solid object can be formed into a tetrahedron with 4 faces
- **Square** (tetragon) - It has 4 sides which as a solid object can be formed into a cube (hexahedron) with 6 faces
- **Octagon** - It has 8 sides which as a solid object can be formed into an octahedron with 8 faces
- **Dodecagon** - It has 12 sides (look in your pocket, you might have one!) which as a solid object can be formed into a dodecahedron with 12 faces
- **Icosagon** - It has 20 sides which as a solid object can be formed into an icosahedron with 20 faces.



Solid objects 2F

1 4 PS 2 3

1. Shown opposite is the net of one of these shapes. Which shape is it?
2. Use stiff card to draw up this net and then assemble 5 of these shapes.
3. As a class combine the shapes you have made into one big object. Comment on how well (or not) these shapes fit together. Discuss whether any of these shapes are used in commerce or industry. Why/why not?
4. Go online and find out about octahedrons, dodecahedrons and icosahedrons. Make a dodecahedron.
5. Create or source an image for each of these. Find out if, and how, each shape is used for products; or if they exist in nature.



octahedron	dodecahedron	icosahedron

2.07 3D Objects

Working with objects

In reality most shapes and objects are irregular and are not uniform. They don't fit together as neatly with each other as do cubes or tetrahedrons.

So in order to function successfully in the world, you need to be able to visualise how these shapes might fit together. For example:

- ⇨ a furniture removalist will have to pack a household full of odd-shaped furniture and other household items, very carefully, into a rectangular van,
- ⇨ a cabinet-maker might combine different-shaped cabinets, cupboards and drawers into a practical kitchen fit-out, and
- ⇨ a visual merchandiser might need to display different shaped and varied size stock items in an attractive and cost-effective manner.

Workers need to be able to use **visual-spatial** numeracy skills to work effectively with irregular shapes.

2G Shapes at work

1. Choose an occupation and investigate the common shapes and objects that are important in the work roles for this job. Consider equipment, tools, materials, buildings, inputs and outputs.

Occupation:		
Objects that this worker commonly has to work with, use or produce.		
2. Find or create 3 images of these objects, and describe their shape and size.		

1
4 PS 2
3

2. Why do removalists try to pack as many things as they can in boxes?

3. Why is it important for removalists to fit as much as they can into their truck? Does this also apply to you if you are hiring a van for the day?

4. What sorts of household items might be packed together to save space? Explain.

5. Retail stores tend to dislike items that come in round or odd-shaped packaging. Why might this be?

Have you ever heard of Hans Rausing?

2.09 Representing Objects

Representing size

When drawing and designing you might often have to represent shapes and objects as different sizes from what they actually are.

You will usually have to show large-sized shapes and objects, as smaller design elements or images.

At other times you might have to do this representation the other way around, and make small shapes and objects bigger.

Two important numerical techniques that you can use for this involve **scale** and **ratio**.

Scale and ratio

A scale is used to represent the relative distance or size of a map, diagram, shape or object compared to itself in real life.

Scales use quantity ratios, e.g. 1:4, 1:20, 1:10,000 or even 2:1, 4:1 etc.!

A map scale of 1:100 (in cm) means that every 1cm on the map represents 100cm in real life. Or, the map is 1/100th the size of real life.

An action figure might be in 1:6 scale. This means that every 1cm of the action figure represents 6cm in real life. So the action figure is 1/6th the size of the character it is representing.

A small object such as a fly might be drawn at 4:1. This means that the drawing is increasing the real life size of the fly by a factor of 4.

NUM SUPER SKILLS

Example: Scale and ratio

Tul draws a 3cm square at a ratio of 1:1.

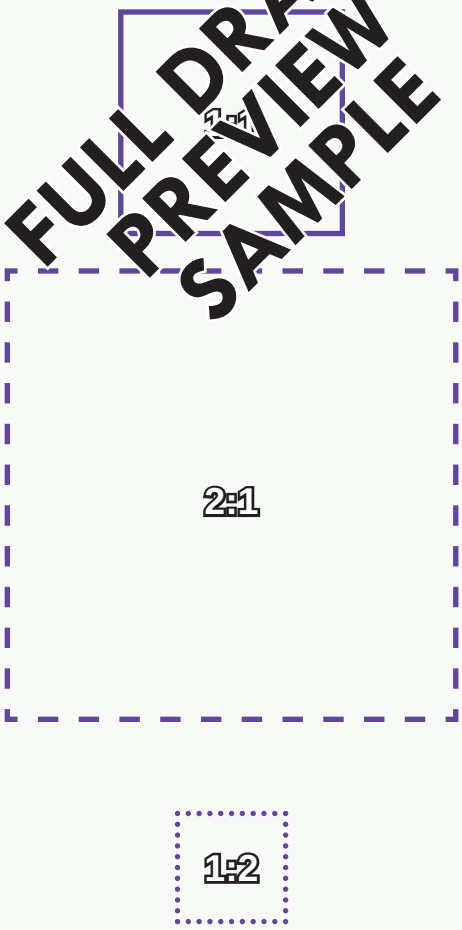
Measure this square to see how well he has done.

Now Tul draws the 3cm square at a ratio of 2:1. He has doubled the size of the square.

Measure this square to see how well he has done.

Finally Tul draws the original 3cm square at a ratio of 1:2. Now he has halved the size of the square.

How well did he do with this drawing?



Consider:

One thing you will notice about these scaled drawings is that the square that has doubled in size (2:1) actually looks a lot bigger than simply being doubled. Do you agree?

And the square that is half the original size (1:2), looks much smaller than simply being halved. And it looks much, much smaller than the 2:1 square.

(The 2:1 square is actually 4 times the size of the smaller 1:2 square but it looks much larger than that!)

The reason for this 'difference' relates to measurements of area.

1 4 PS 2 3

1. First, estimate the dimensions (size) of these icons as shown on the page.
2. Second, measure these icons. How did you go with your estimates?
3. In your workbooks, or using software, convert these icons by:
   - ❑ doubling their size
   - ❑ halving their size.
4. Turn these icons into drawings of 3D objects by adding depth.
5. Check your answers by measuring the new dimensions of your enlarged, reduced and 3D icons. How did you go?
6. Estimate the scale of the drawings of each icon, compared to the object that each represents in real life.

Image: adanv1/iStock/Thinkstock

Image: adanv1/iStock/Thinkstock

Image: greenwatermelon/iStock/Thinkstock

Image: Tantoon/Depositphotos.com

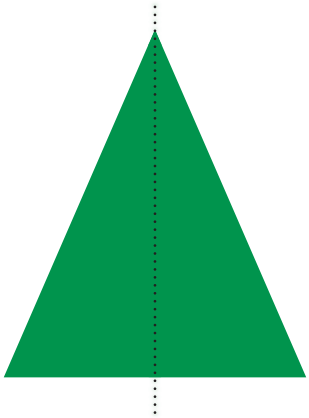
2.11 Representing Objects

Transforming objects

We have to make sense of objects in many different situations in our personal, recreational and working lives. To do this we have to transform or manipulate objects using **visual-spatial** skills in our head, in space, on paper, or by using digital design programs.

Some of the key recognition, drawing and design manipulations include symmetry, reflection and rotation.

Symmetry



Symmetry simply means that a shape or object is exactly the same on each side.

You establish symmetry by drawing an imaginary line down the centre of an object

It is important to realise that nothing that occurs in the natural world is perfectly symmetrical. Nature doesn't work that way.

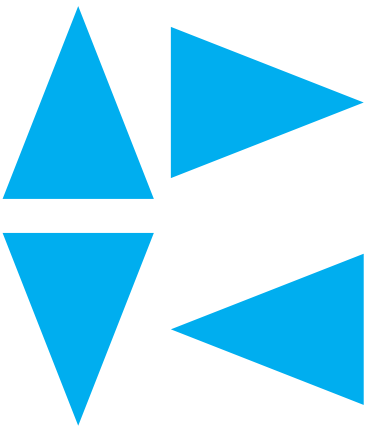
However, many human-made designs, objects and structures aim for symmetry. Humans seem to have a need to place 'order' and 'perfection' on the natural world.

Reflection

Reflection is an important element of shape design and construction. Reflection simply means to 'flip' an object so that the LHS becomes the RHS, and vice versa.

When you look at many Instagram and TikTok influencers, you will see that their pictures and videos are inverted. This is because they are looking at themselves in the camera, rather than looking through the camera. Text in the captures is reversed and make no sense. So if they are advertising MOM 'N' POP on a t-shirt that's ok. Most anything else - not so good!

Rotation



Objects can be rotated by a set amount of degrees. One full rotation is 360 degrees. When rotating a shape or object:

- ⇨ 90^0 is a quarter turn.
- ⇨ 180^0 is a half-turn - and facing the other way.
- ⇨ 270^0 is 3/4 turn.
- ⇨ 360^0 is a full turn - and back to where you started.

Commonly, shapes and objects can be rotated through their centres. However, rotations might also happen at any edge, join or other point, which tends to re-located the shape or object.

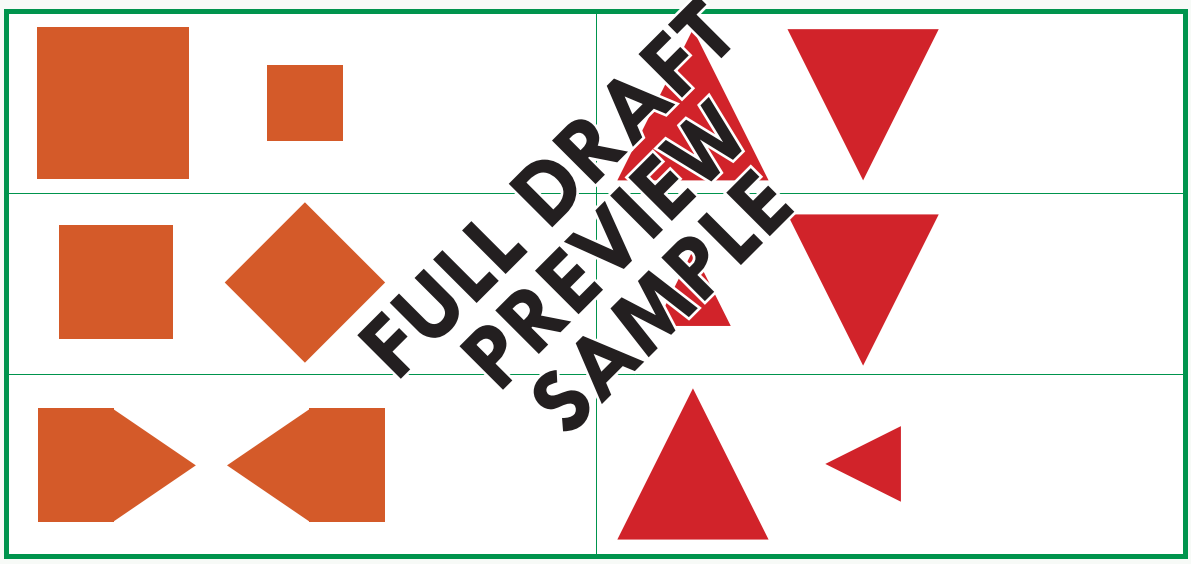
Transforming objects

- Reflection: Flipping an object. The size and shape of the object do not alter.
- Rotation: Change an object by rotating it (or turning it around). The size and shape of the object do not alter.
- Symmetry: Something is symmetrical when it is the same on both sides. A shape has symmetry if a central dividing line (a mirror line) can be drawn on it, to show that both sides of the shape are exactly the same.
- Dilation: Change the size of the object. The shape of the object does not alter.
- Translation: Change the location of an object. The size and shape of the object do not alter.

NUM SUPER SKILLS

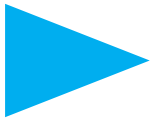
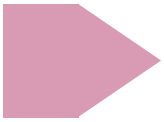
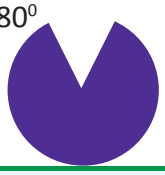
Transforming objects 2I

1. Have a look at these image pairs. What type of transformation has been applied to the object in each image?



2. Transform these shapes and objects using a quick sketch, or software.

1 4 PS 2 3

90^0 left 	Size 2:1 
Flip to RHS 	Reflect 
Size 1:2 	180^0 

2.13 Representing Objects

Representing objects

Designers and illustrators represent real life objects and living creatures as **2D** drawings either by **hand**, by using **computer software**, or through a combination of methods.

One way to represent objects, especially in drawn plans, is by using an **elevation** view. So this means drawing the object from the point of view that looks down from above on the object. This way the object can be easily drawn using simple geometric shapes. The creator of the plan can also use **scale** to ensure that the areas of the plan, and the objects in the areas, are shown at the 'right' **size relative** to each other.

In other situations the creator of a plan will render the drawing in a **3D** style, usually using **CAD software**. This makes the finished illustration resemble a **model**. This means that the designer or illustrator no longer has to stick to a simplified elevation view.

Some plan creators even make **models**, **dioramas** and **maquettes** based on the plans. This is especially so with architects, set designers, product developers and others working with large-scale objects and settings.

Image: AndrewLozovyi/Depositphotos.com

2J Floorplan

1. List the rooms/areas shown on the [illegible] floorplan.
2. Identify the objects represented in each room/area. Does the scale of these objects appear to be accurate? Explain.
3. Add any other objects that you would put in these rooms.
4. Add objects into bedrooms 2&3.

Image: Blankstock/Depositphotos.com

2.15 Plans and Diagrams

Plans

An important numerical skill is the ability to read, interpret and design plans. This skill often requires people to think in a visual-spatial way.

Plans are used in many different occupations and industries and may go under many different names. Common examples include:

- plan
- map
- diagram
- floor-plan
- blueprint
- schematic
- diagram
- circuit diagram
- technical drawing
- sketch.

"If I couldn't read a pl… wouldn't know how to … job properl…

Occupations - plans & diagrams

Here are some key occupations that rely on diagrams and visual plans.

- architects
- electricians
- electro-technology workers
- construction workers
- carpenters
- computer programmers
- engineers (all types)
- designers (all types)
- business equipment technicians
- logistics co-ordinators
- drivers
- geologists
- plumbers
- surveyors
- bricklayers
- miners
- draftspersons
- builders

and many more.

2K Working plans

Choose types of plans from the list above, and explain how these might be used by people working in specific occupations.

i.	ii.
iii.	iv.

Plan symbols

Plans and diagrams use a common set of symbols to represent 3-dimensional items.

Technical symbols on plans and diagrams are usually standardised so that anyone reading the plan can quickly recognise what a shape is meant to be representing.

Using these symbols improves accuracy, efficiency, and also safety.

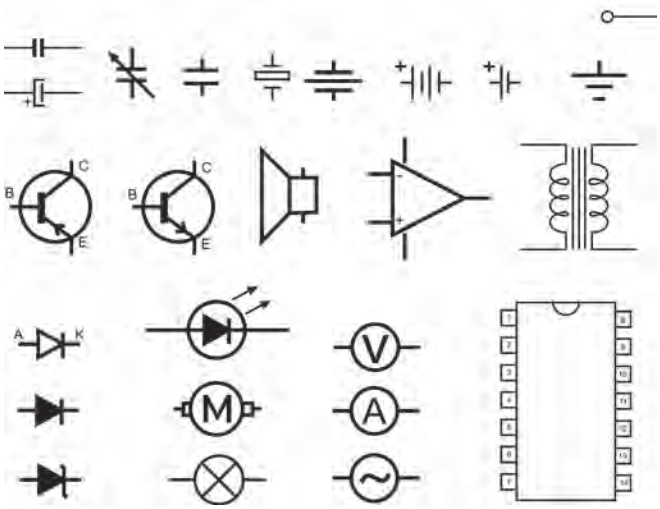


Image: nebojsa78/ Depositphotos.com

Do you know what these symbols are used for? Some of you will recognise these immediately and be able to say what they are and even perhaps know what they represent on a plan, schematic or diagram. Most of you won't - that's no problem - that is why we engage skilled workers who know their stuff!

Plan symbols 2L

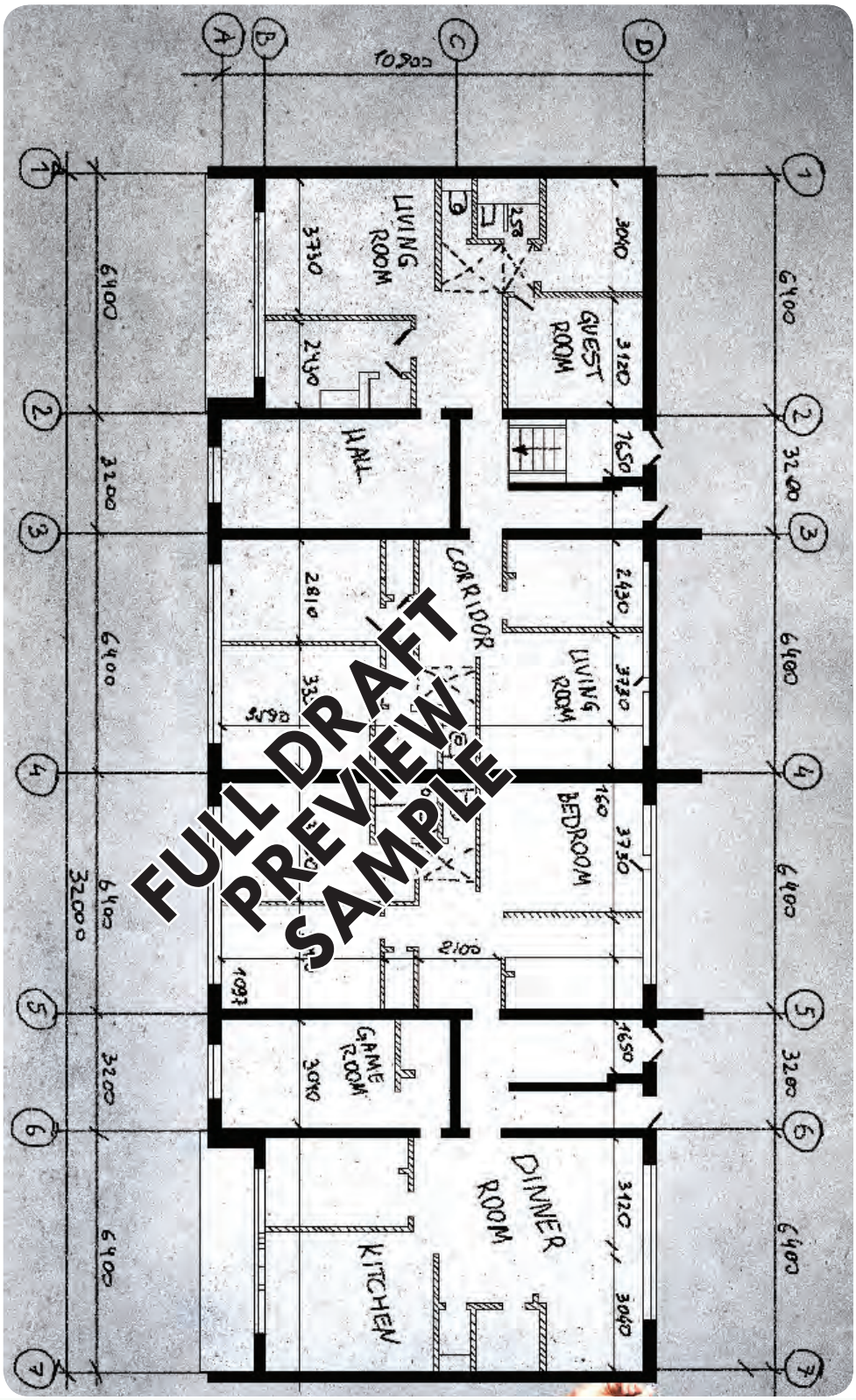
Draw symbols to represent the following fixtures and fittings that might be used for a house plan. Name the common shapes that you use in each drawing.

Tip: Compare to a real estate agent's website for house floorplans.

door	light fitting
toilet	electrical outlet
stairway	wall
window	tree
table	sink
fireplace	couch

2.17 Plans and Diagrams

Image: Khakimullin/ Depositphotos.com



2M Plans

1
4 PS 2
3

Jhak asked the builder, Jheell to send him the plans. Jheel sent this grainy image.

1. List the numerical measuring information shown on the plan, including the size of the rooms. Is this a big, medium or small house? How do you know?
2. What are some problems that can occur when taking quick snaps of complex or important documents?

Classroom floorplan 2N

1 4 PS 2 3

1. Draw a floorplan of this classroom. Start by doing a sketch below.
2. Include all permanent fixtures and fittings and also all furniture items.
3. Make sure that you include relevant dimensions as well.
4. Include all electrical, air-conditioning and plumbing fixtures (if relevant).
5. After your teacher has checked your draft, prepare a larger final floorplan on A3, poster paper or using a multimedia design program.

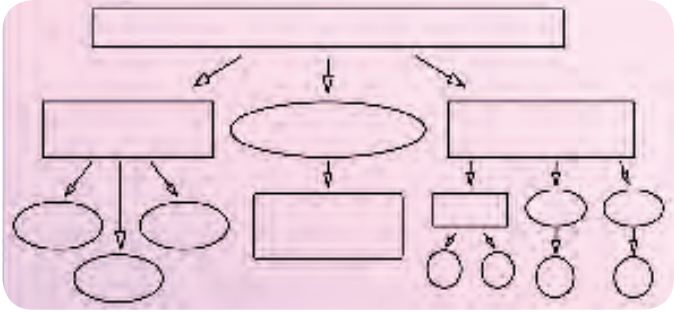
Name: _____ **Floorplan of Classroom:** _____

Orient this page to match your room.

2.19 Plans and Diagrams

Diagrams

A diagram is a visual representation that usually combines numerical, written and visual elements. In a diagram, it's the **visual information** that is usually the key **communication tool**. Diagrams often set information out in a structured way to show the **relationships** between people, decisions, actions, resources, flows of information and other key elements.



Charts, diagrams and mind-maps can be an effective way to summarise and communicate complex ideas, thoughts and information that could take a long time to explain in words.

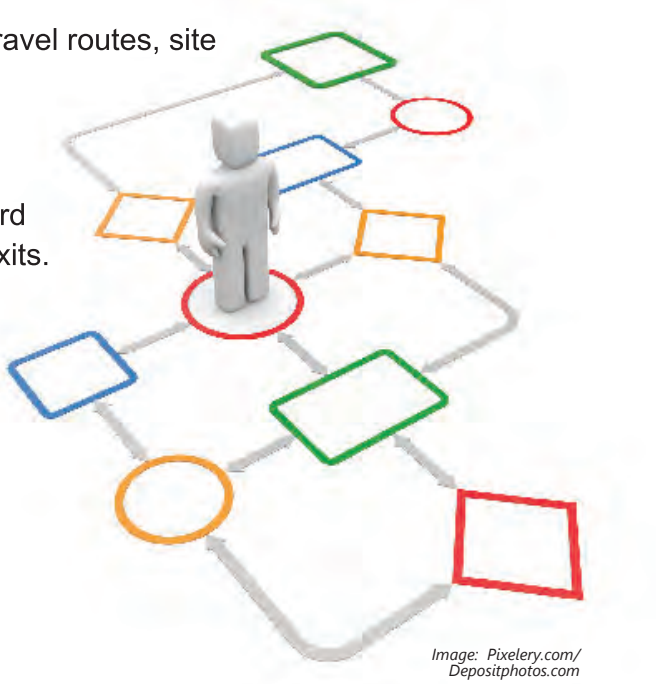
Image: Pixelery.com/Depositphotos.com

Some people will prefer to use a diagram to **communicate information**, **record ideas** or **give instructions**. For example, a tradie will often make a sketch diagram to lay out what a potential client is asking for, such as with a kitchen renovation. A couple about to be married might make a diagram of the seating plan for their reception (single colleagues down the back table of course). And a sports coach might make a diagram of the field positions for players for a set play.

So do you create diagrams, can you 'read' and interpret them, and do you naturally prefer to think in this **visual-spatial** way?

There are many different types of diagrams. Possible common uses and examples include these, as well as many more, including a range of industry-specific technical diagrams.

- Organise ideas and information, e.g. mind-maps, organisational charts.
- Give instructions, e.g. how-to guides, assembly instructions.
- Inform customers, e.g. online menus, stadium seating plans, self-serve instructions.
- Outline a process, e.g. flowchart, instructions, order processing, production plan.
- Aid navigation, e.g. route markers, maps, travel routes, site maps.
- Communicate summary information, e.g. graphs, charts and infographics.
- Communicate safety information, e.g. hazard warnings, safety instructions, emergency exits.



Flowchart diagrams can be very useful for mapping out a process that involves choices between decisions and what actions might then need to be taken.
In fact, many people think in a flowchart type of way when planning and doing tasks, especially when they are developing new skills, such as driving.

Image: Pixelery.com/ Depositphotos.com

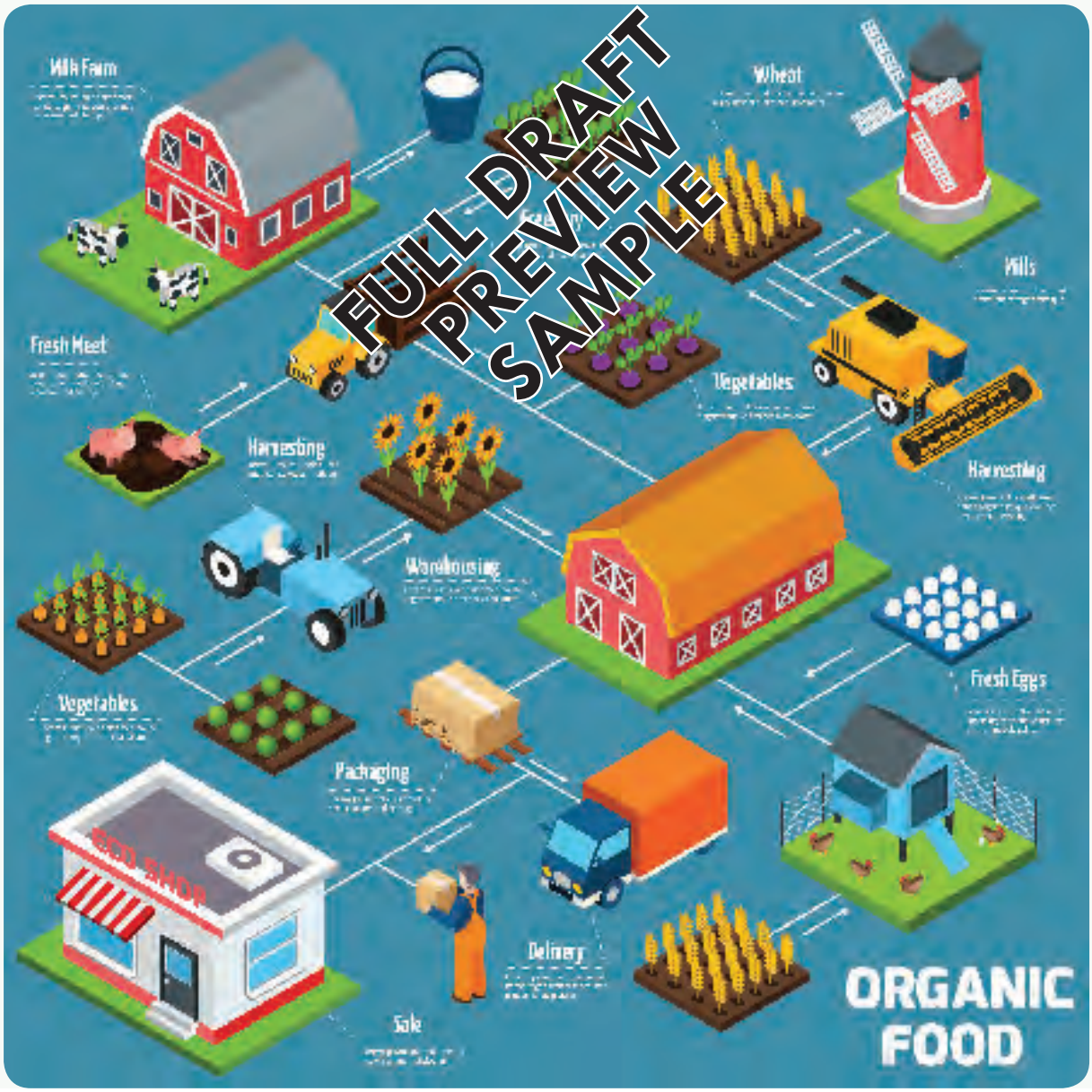
Organic infographic 2O

1
4 PS 2
3

Shown below is a computer-drawn infographic that illustrates the factors of production and steps involved in organic farming. You can see that text is used sparingly. The diagram has used perspective to present objects in more of a 3D style. It also includes directional flow arrows; and it doesn't worry about scale.

1. In your workbooks, identify the key information shown in this organic farming infographic.
2. Evaluate the effectiveness of this infographic. Consider how long it took you to interpret the information. Also consider how effectively the infographic shows different elements in relation to one another. Have you learned about the 'organic farming' process from the infographic?
3. Develop an infographic about something you are quite expert in. This might be a personal situation (e.g. how to build fitness) or a work-related situation.

Image: macrovector/Depositphotos.com



2.21 Assessment

AT2 Make Me Over
Personal Numeracy // or Recreational

1
4 PS 2
3

Your eccentric Uncle Boab has promised you $2,500 for your birthday. However, he will only give you the money if you spend it doing a makeover of your bedroom. He has said that he will pay for items such as:

1. painting and decoration
2. bed and bedding
3. furniture and study equipment
4. electronic, TV, AV systems and equipment and devices
5. (others as negotiated with your teacher). _____

Stage 1: Planning and Design

- ❑ Create a draft using common shapes to sketch your room as it is now, noting key dimensions. Use your workbooks or a digital device.
- ❑ On your sketch identify any **static fixtures**, such as doors, windows, etc..
- ❑ On your sketch lay out the **fittings** and **furniture** that are part of your room.
- ❑ Discuss your sketch and plans with your teacher.

Stage 2: Creating a 2D Representation

- ❑ Outline the **changes** you are going to make as part of your room makeover.
- ❑ List all the **items** that you are going to use and/or buy to makeover your room. Name these correctly. Note the approximate **dimensions**.
- ❑ Prepare a basic **budget** that outlines your expenditure on the items you have chosen. (Tip: Refer to pp.248-249 for a guide.)
- ❑ Create a **precise layout** of your '**new**' **room** noting all static fixtures and their relevant dimensions. Include a **scale**. You might use digital technologies for this.
- ❑ Use stiff card or cardboard, or digital technologies, to make a **2D representation** of all the fittings in your 'new' room.
- ❑ Manipulate and transform objects to test **different layouts**. Take photos of these.
- ❑ Discuss your 2D layout with your teacher.

Stage 3: Building a 3D Model or Digital Representation

- ❑ Use cardboard, timber, plaster or some other medium, or use digital design software or an app; to make **models/representations** of the fittings and furniture you have selected to be part of your room makeover.
- ❑ Use these models/representations to create a **3D diorama**, or a **digital representation** of your room **after the makeover**.
- ❑ Give an oral presentation describing your 'new' room to the class. (Your teacher will inform you whether this is a compulsory task for this activity.)

Name(s):

Key dates:

AOS2: Shape

Personal or Recreational Numeracy

Tasks - AT2: Make Me Over	Must do?	Due by	Done	Level
Part 1: Planning and Design				
Negotiate the task details with my teacher.	✓		○	
i. Create a draft sketch of my room.	✓		○	
ii. Include static fixtures on my sketch.	✓		○	
iii. Include fittings and furniture on my sketch.	✓		○	
iv. Discuss the sketch with my teacher.	✓		○	
v. Finalise my sketch.	✓		○	
	✓		○	
Part 2: Creating a 2D Simulation				
i. Outline planned changes for the makeover.	✓		○	
ii. Prepare a basic budget showing my expenditure.	✓		○	
iii. Create and record 2D representations of the makeover.	✓		○	
iv. Discuss my 2D layout with my teacher.	✓		○	
	○		○	
Part 3: Building a 3D Model/Representation				
⇨ Make a 3D representation of your room makeover.	○		○	
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	
Identify the maths / Act on & use maths / Evaluate & reflect / Communicate & report				
Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Prepare and submit my final designs and models.**	✓		○	
Present a report to the class (if required).	○		○	

Additional information:

Signed: _____ Date: _____

2.23 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT2 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

Measure By Measure 3

Activities 3: Measure By Measure		p.	Due date	Done	Comment
3A	Measuring	55			
3B	Units of measurement	57			
3C	Estimating	59			
3D	Distance	60			
3E	Perimeter - Rectangle	61			
3F	Perimeter - Triangle	62			
3G	Making it work	63			
3H	Short and long	64			
3I	Length in action	65			
3J	Area in action	67			
3K	Volume - Solids	69			
3L	Volume - Fluids	70			
3M	Food and drink	71			
3N	Volume - Fluid units	72-73			
3O	Temperature in action	74-75			
AT3	Measuring Up	76-77			
PST	Problem-Solving Cycle and Maths Toolkit	78			

Comments:

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3.01 Measuring

Measuring

You measure lots of things. Time, cost, distance, weight, depth, area, volume, speed and so on. Measurements use particular **units** that are standard. This makes it easier to do calculations. It also makes it easier for people to communicate more effectively by sharing a common language.

We all use and make measurements in our **personal lives**, especially in the areas of **health** (weights and medicines), **recreation** (distances and times); and of course when travelling and **driving**. When do you make measurements?

The ability to estimate, and/or measure, using both **analogue** and **digital** tools and **measuring devices**, is a key work-related skill for almost all occupations.

Tradespeople, and manual, practical and technical workers rely on **estimating** and measuring skills for most of their day-to-day work tasks.

Some workers need to measure very accurately and may use **precision** tools and instruments. These workers include engineers, draftspersons, architects and pharmacists. Why so?

Other workers can afford to be a little less accurate and use **approximations** because they work in occupations that do not need to be exact, such as chefs, concreters or clothing designers.

As a person becomes more skilled and experienced they are better able to **estimate** measurements. For example:

- ⇨ experienced tradespeople can look at a job and give a pretty accurate estimate of the materials and time needed for completion, or
- ⇨ an experienced hairdresser can assess a client's hair and estimate how much length needs to be removed, or
- ⇨ an experienced teacher can estimate how long it should take for a class to complete an activity.

Image: lovleah; iStock/Thinkstock

Measuring

- Units
- Tools
- Devices
- Analogue
- Digital
- Estimating
- Approximations
- Accuracy
- Precision

Image: Andrey Popov/ Depositphotos.com

1. List some common units of measurement for each of the following.
2. What types of measuring tools and instruments might you commonly use to measure these units?

length	mass (weight)
volume	temperature
distance	time
capacity (volume)	price/cost
speed	other

3. Measuring is a key skill required in many personal and work-related situations. Describe when and why you need to measure for these situations.

Health & Wellbeing	Recreation & Hobbies	Work-Related Situations
What do I/could I measure? ⇨ ⇨ ⇨	What do I/could I measure? ⇨ ⇨ ⇨	What do I/could I measure? ⇨ ⇨ ⇨

Applied: One of the best things about the digital age is that there is a range of tools and apps that make measuring easier and more accurate. These tools and apps also make recording measurements easier.

Find out about a digital tool or app that can be used for digital measuring. Research how it works. Find an image of it. Describe 3 situations when this digital tool or app could make measuring easier, and/or more accurate for you.

3.03 Measuring

Units of measurement

When we measure something we use some type of unit to establish size.

You already know about the **metric system** and how it works in 1s, 10s, 100s, 100s 1,000s and 10,000s. Each metric unit measurement is sized **relative** to another unit. For example 10 mm = 1 cm, 100 cm = 1 metre, 1,000 metres = 1 kilometre.

It is important to be able to **convert** between different units to suit different circumstances. In work-related situations, most trades and practical jobs use millimetres for measuring and not centimetres. But a client might have done the measurements in cm. The tradie will have to convert to mm when ordering the materials.

In other vocational situations, workers need to **convert 'up'**, because they are often dealing with inputs in **bulk** quantities. So if a chef needs 100 millilitres of oil for each meal they are cooking, they will need to bulk order in litres.

It is important to also understand the measures of time. Time is not a metric measure. Time uses seconds, minutes and hours with a relationship based on 60. Days and years are based on the rotation of the Earth on its own axis, and on rotation of the Earth around the sun.

Weighing in at 250,000 grams or 1/4 of a tonne is the great Yokozuna!

Metric Measurement Units

Length		
millimetre	mm	1 mm = 1,000 microns
centimetre	cm	1 cm = 10 mm
metre	m	1 m = 100 cm
kilometre	km	1 km = 1,000 m
hectare	m^2	1 ha = 10,000 m^2

Weight		
milligram	mg	1 mg = 1,000 ug
gram	g	1 g = 1,000 mg
kilogram	kg	1 kg = 1,000 g
tonne	t	1 t = 1,000 kg
kilotonne	mt	1 kt = 1,000,000 t

Fluid Volume		
millilitre	ml	1 ml also = 1 cm^3
litre	l	1 l = 1,000 ml
litre	l	1 l =1,000 cm^3
megalitre	ML	1 ML = 1,000,000 l

Time (time is not metric)		
second	s	1 s = 1,000 ms
minute	min	1 min = 60 s
hour	hr	1 hr = 60 min
day		1 day = 24 hr
week		1 week = 7 days
fortnight		1 fortnight = 14 days
year		1 years = 365 days*
decade		1 decade = 10 years
century		1 century = 100 years
* A leap years is 366 days		

Temperature		
celcius	°C	0 °C freezing point of water 100 °C boiling point of water

Units of measurement 3B

1 4 PS 2 3

1. What units do we most commonly use for these measures? Describe situations.

length	The measure used for building materials is usually millimetres. The measure used for
fluid capacity (volume)	The measure used for a small fluid volume is usually The measure used for
distance	The measure used for close personal distances materials is usually metres. The measure used for a travel distance is usually
height	The measure used for a human's height is usually The measure used for
weight (mass)	The measure used for a human's weight is usually The measure used for
time	The measure used to calculate [illegible] rate is usually an hour. The measure used for
temperature	The measure used for a heat is usually The measure used [illegible]

2. Which of these is correct?

a.	elephant 5 kg or 5 tonne?	b.	[illegible]ndrop 1 ml or 1 litre?	c.	small passenger car 1 kg or 1 tonne?
d.	can of soft drink 375 ml or 375 gm?	e.	olympic swimming pool 2.5 ML or 2.5 ml?	f.	an hour 60 s or 60 min?
g.	cup of coffee 80° or 800°	h.	distance to LA 13,000 m or 13,000 km	i.	AFL men's ruck 2002 cm or 2.02 m

3. Convert these units of measurement.

a.	2.5 kg in grams	b.	375 ml in litres	c.	0.5 km in metres
d.	27.5 cm in mm	e.	0.25 litres in ml	f.	500 metres in km
g.	300 secs in minutes	h.	2 hours in minutes	i.	100°F in Celcius

Have you heard of the Imperial system?

3.05 Estimating

Estimating

Many numerical situations make use of well-developed estimating. Estimates enable a person to start **planning**, drafting, quoting, cooking, crafting, budgeting and so on, by using and applying their experience and knowledge. We also use a lot of **spatial** estimates all the time when physically moving, riding or driving.

When making estimates for measurements, you should make use of **rounding**. Then down the track, you might need to make more accurate measurements using precision methods and tools.

This is especially important with chemicals, medicines, building, construction, engineering and other precision tasks.

And what about hairdressers and barbers? Will they rely on estimates or precise measurements?

What about the haircut rule?

Image: marcinmaslowski/ Depositphotos.com

Rounding: For example

You need 4 timber lengths of 1.3m for skirting. What total length do you need to buy?
You will need about 6 metres ie. 4 x 1.5m just to be safe.
You round up because you can cut extra timber off.

You want people at your party to have about 375ml each of drink each. But you are buying bottles because they are cheaper per litre. Are you overthinking?
How does four 2-litre bottles sound?
375ml round up to 400ml. Times by 20 = 8000ml or 8 litres.

Kitty needs to save $1,500 for a holiday at the end of the year. Kitty usually gets about 10 hours per week in shifts and takes home $25 per hour. Kitty has estimated she spends about $55 a week.
So she rounds her spending down to $50 and says it will take her 15 weeks to save up.
What do you think?

You find out that Kitty actually averages 9.5 hours a week but she upped that to 10 because it's a nice round number! What would you have recommended she do?

Estimates and rounding

Round up: Playing it safe!

Always allow a bit extra just to be safe, especially when working with materials.

Round up: Overestimate costs

If you are spending money then round up. Things often cost more than you expect. If you run out of money then a project or goal could fail.

Round up: Don't fool yourself

Don't underestimate things that are hard, or that require discipline, or which involve a long timeframe or might be subject to other variables and/or unknowns. Instead round them up!

Round down: Don't get cocky

Don't overestimate 'good' things such as income. Always round down money you are expecting to earn or hoping to get - just in case!

NUM SUPER SKILLS

Estimating 3C

1. Estimate each of the following. You choose the measurements and the units.
2. Make or find out measurements to see how accurate you were.

The 'size' of this room.	The length of your hair.
The perimeter of the school grounds.	The area of your bathroom at home.
The weight of your family vehicle.	The time to walk/roll 20 kms.
The volume of a shipping container.	The cost of the timber for a doghouse.

3. Estimating is a key skill required in many personal and work-related situations. Describe when and what you need to estimate for these situations.

Health & Wellbeing	Recreation & Hobbies	Work-Related Situations
What do I/could I estimate?	What do I/could I estimate?	What do I/could I estimate?
⇨	⇨	⇨
⇨	⇨	⇨
⇨	⇨	⇨

Discussion

If you had to give people advice for making estimates, what would this be?

3.07 Measuring Length

Distance

In essence, distance tells us 'how far'. We might measure the distance between one or more places, a distance travelled, distances around the edge of an object (which we usually call **perimeter**, or **circumference** for a circle) or other distances.

Distances are usually measured in mm, cm, m and km.

- ⇨ 1 kilometre = 1,000 metres.
- ⇨ 1 metre = 100 centimetres.
- ⇨ 1 centimetre = 10 millimetres.

3D Distance

Estimate and then calculate each of the following.

1. How many millimetres are in 2.4 metres?	2. How many metres are in 17.3 kilometres?
3. How many centimetres are in 1 metre plus 65 mm?	4. What is the distance from your home to your school?
5. Over what distance is the [illegible] run?	6. What is the distance from your eyes to the bottom of your feet?
7. What is the distance in km and metres of the Olympic Games Marathon?	8. What is the flight distance from Tullamarine Airport to Los Angeles?
9. At footy training Albi does 4 warm-up laps of the 400m oval, 20 x 100m sprints, 20 x 200m sprints, a 2km time trial; and then general training for another half hour at an average pace of 8km/hour. What distance has Albi covered?	10. If you walk 2km each way to school daily, what distance would you cover in a normal school year? Where would that total distance get you to in Australia (from your school)?

1 4 PS 2 3

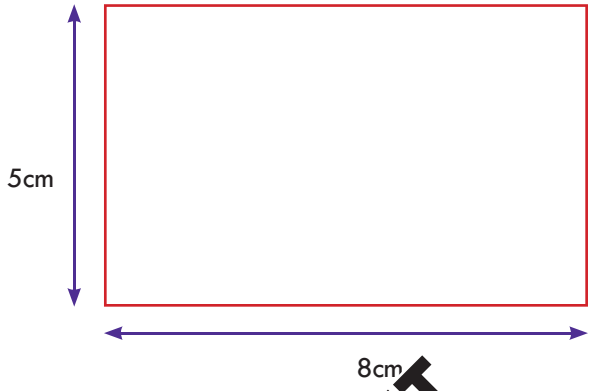
Perimeter: Rectangles

The **perimeter** is the distance around an object. To calculate perimeter we simply add up the length of all sides of an object. For example, the perimeter of the rectangle below is:

⇨ **perimeter = length + width + length + width or (2l + 2w)**

Perimeter: Rectangle

perimeter = l + w + l + w



⇨ perimeter of rectangle = 5cm + 8cm + 5cm + 8cm

⇨ perimeter = 26cm or 260mm (not usually all trades use mm as measurements rather than cm)

NUM SUPER SKILLS

So as you can see, the total length of the edge of the rectangle above is 26cm.

If you were making an object, let's say a picture frame, with these same external dimensions, the total length of timber you would need would be 26cm (or 260mm).

But in reality, you probably should buy a little bit more. Why so?

Image: alanpoulson/ Depositphotos.com

Perimeter - Rectangle 3E

1 4 PS 2 3

Estimate and then calculate the following.

i. What total length of fence would be needed for a yard that measures 5m x 10m?

ii. If each fence pailing measures 100mm with 25mm overlap on each side, what would be the minimum number of palings needed for this job?

iii. What other materials are needed to build a pailing fence? Go online and see if you can find a handy guide to building timber fences.
Work out the materials cost for this job in your workbooks.

3.09 Measuring Length

Perimeter: Triangles

We measure the perimeter of a triangle in the same way as for a rectangle. We simply add up the length of all sides.

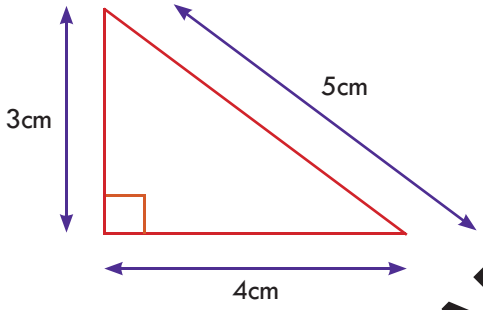
For example, the perimeter of the triangle below is:

⇨ **perimeter = length a + length b + length c**

Image: kavramm / Depositphotos.com

Perimeter: Triangle

perimeter = length side 'a' + length 'b' + length 'c'



⇨ perimeter = 3cm + 4cm + 5cm

⇨ perimeter = 12cm or 120mm or 0.12

NUM SUPER SKILLS

3F Perimeter - Triangle

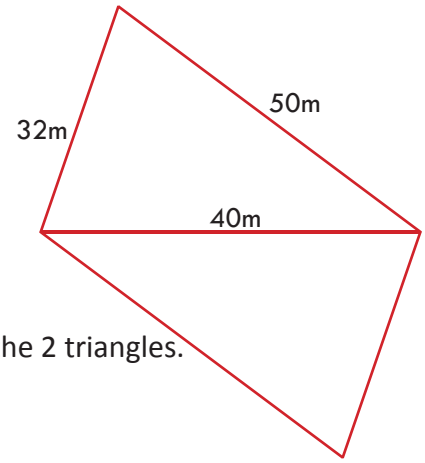
Estimate and then calcula[illegible] each of the following.

i. What is the perimeter of a right-angled triangle with sides of 9cm, 12cm and 15cm?

ii. What is the perimeter of a triangle with sides of 22cm, 12cm and 17cm?

1 4 PS 2 3

iii. Calculate the perimeter of each of the identical triangles shown below



iv. Calculate the total perimeter of the shape made by the 2 triangles.

Perimeters in the workplace

By being able to calculate perimeters we can do a range of important workplace tasks. This is especially relevant in trades. Often a diagram or sketch will really help as well. Some examples are as follows.

- A fencing contractor will need to calculate the perimeter of the land that they have been contracted to fence. They need to calculate materials needed, time to do the job and also to be able to give a quote. They rely on their ability to calculate perimeters.
- A roof plumber will need to calculate lengths of guttering needed for a house that might have regular, as well as odd shapes.
- A builder might need to calculate the length of skirting board and quads needed for different-shaped rooms.
- A dressmaker might need to calculate the length of piping needed for the edges of a dress.
- A greenkeeper might have to work out how long it might take to do the edging on a lawn.
- A pastry chef might need to know how much icing to put around the edge of a huge wedding cake.

Making it work 3G

1. Explain when these workers would need to measure length and distance. Add 2 more of your own choice.
2. What devices and digital tools and apps could help them? Find images.

hairdresser/barber	fitness instructor
caterer	driver
cabinet maker	electrician
retail manager	vet nurse

3.11 Measuring Length

3H Short and long

1 4 PS 2 3

1. Estimate each of the following (add 2 more). You choose the measurements and the units.
2. Make or find out measurements to see how accurate you were.
3. What digital tools and apps can help you?

The length of an infant's bassinet.	The distance people sit next to each other on public transport.
The length of your hair.	The distance people stand from one another in queues.

4. Distance and length are key measures required in many personal and work-related situations. Describe situations where you need to estimate and measure both short, and long, distances and lengths.

Health & Wellbeing	Recreation & Hobbies	Work-Related Situations
When is short distance and length important for me?	When is short distance and length important for me?	When is short distance and length important for me?
⇨	⇨	⇨
⇨	⇨	⇨

Health & Wellbeing	Recreation & Hobbies	Work-Related Situations
When is long distance and length important for me?	When is long distance and length important for me?	When is long distance and length important for me?
⇨	⇨	⇨
⇨	⇨	⇨

Length in action 3I

1. Estimate each of the following (add 2 more.) Make or find out measurements to see how accurate you were. What digital tools and apps can help you?

The dimensions of your front door.	The surface area of your dining room table.
The length of a semi trailer.	The distance you would walk in 2 hours?

1 4 PS 2 3

2. Joe is a concreter who specialises in laying guttering. He has been asked to give a quote on laying the gutters on the edge of a lawn measuring 4m by 4m square.
   a. Draw a diagram in your workbook of Joe's job.
   b. What is the approximate length of guttering Joe needs to lay?

   c. As part of the job Joe has to order exact length timber frames on both the inside and outside of the gutters to hold them until they set.
   d. Start by drawing a diagram and adding the dimensions.
   e. What is the total length of framing Joe needs to cut, assuming the guttering he is laying is 200mm wide?

   f. If Joe usually charges $100 per linear metre (including materials and labour but excluding GST), how much should he quote?

3.13 Measuring Area

Measuring area: Rectangles

Area is a 'how much' sort of calculation. i.e. How much area does that lawn cover? The most basic area calculation is the calculation for the area of a rectangle.

⇨ **Area of rectangle (A) = length x width**

Think of area like a grid of squares. Then count the number of squares (provided they are of the appropriate size). This total should equal the area.

Area: Rectangle

Area of rectangle (A) = length (l) x width (w)

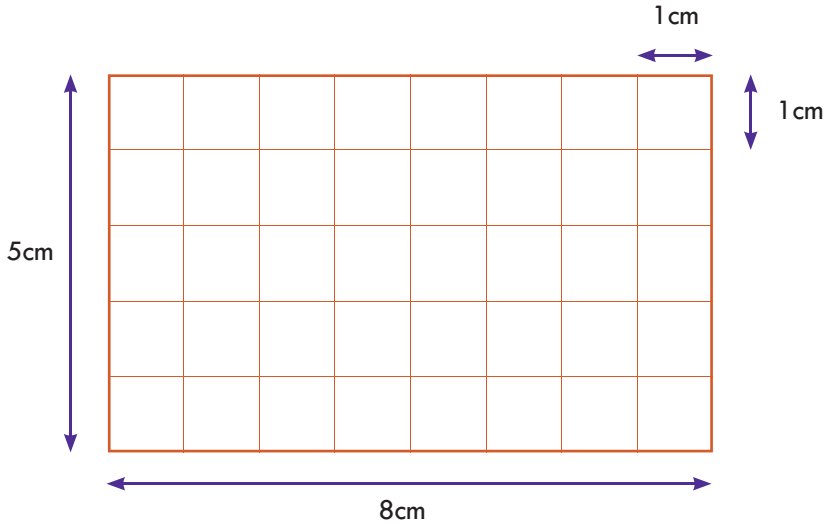
⇨ Area of rectangle = 8cm [illegible]

⇨ A = 40cm^2 (or 4,000[illegible])

Note: Here the unit, cm, is squared (^{2}). That's because cm is multiplied two times in the calculation (i.e. cm x cm). And of course you are working in 2 dimensions with area, hence cm^2!

NUM SUPER SKILLS

Alternatively, we can draw a grid on the object and add up the squares to calculate the area. In the example, each square = 1 cm^2. If you add all of these squares up the total area will equal 40 cm^2.



Measuring area: Triangles

Not every shape or object is simple and easy to measure like a rectangle.

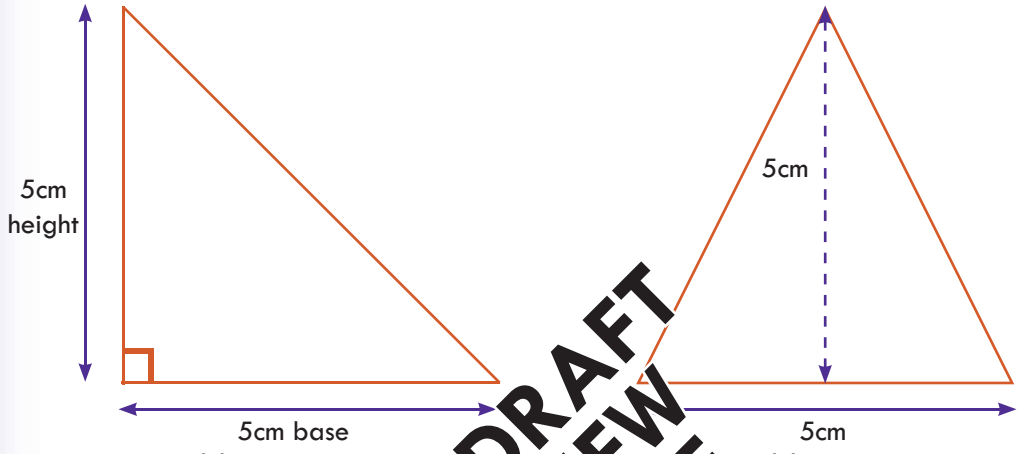
Measuring the area of a triangle is a bit harder but we still use the same basic principles.

For a right-angled triangle, or an equilateral triangle, it is easy to measure the height. So we can easily apply the formula which is:

⇨ **Area of (right-angled) triangle = 1/2 base x height**

Area: Triangle (right-angled)

Area of (right-angled) triangle = 1/2 base x height



⇨ A = 1/2bh

⇨ A = 1/2 x 5cm x 5cm

⇨ A = 1/2 x 25cm^2

⇨ A = 12.5 cm^2 (or 125mm^2)

⇨ A = 1/2bh

⇨ A = 1/2 x 5cm x 5cm

⇨ A = 1/2 25cm^2

⇨ A = 12.5 cm^2 (or 125mm^2)

Now, this formula makes sense because when you think about it, each of these triangles are half a rectangle. So the formula for calculating the area of a right-angled triangle is the same as for calculating a rectangle but halved!

NUM SUPER SKILLS

Area in action 3J

Calculate the area of the following 'shapes'.

A rectangle box: 20 cm x 30 cm.	A block of land 28 m x 12 m.
This classroom (if it is rectangular).	A standard soccer pitch.

3.15 Measuring Volume

Volume

The volume of an object refers to how much space it occupies. When you learned about area you were only working in 2 dimensions, length x width.

Volume is different from area in that it relates to 3 dimensions; length, width and height (or depth).

It might be helpful to think of an object's volume as its **capacity**, or how much it holds. But in theory, volume is measured by how much space an object displaces.

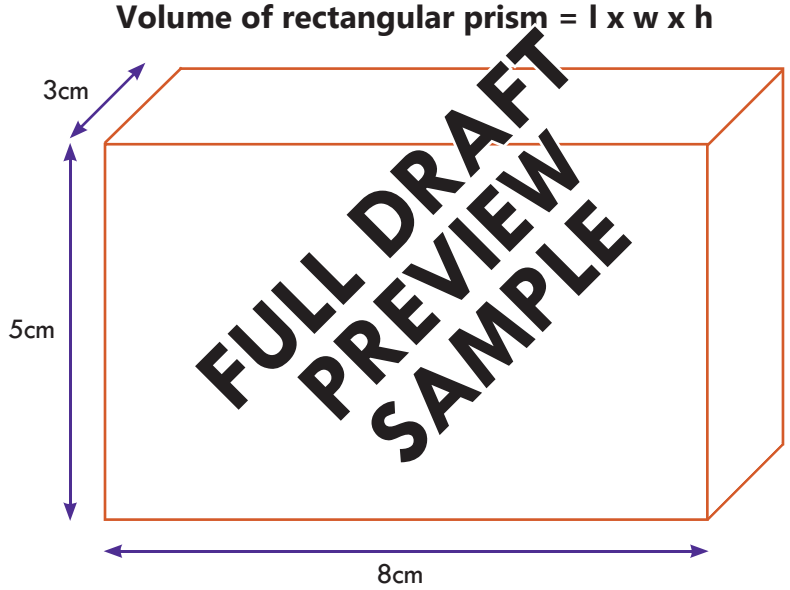
To calculate the volume of a solid rectangle shaped object (a prism) we have to consider the object's properties in all three dimensions; its length, its width and its height (or depth).

To calculate the volume of a rectangular prism we can use the formula:

⇨ **Volume of a rectangular prism (V) = length x width x height**

Volume: Rectangular prism

Volume of rectangular prism = l x w x h



⇨ Volume = 3cm x 8cm x 5cm

⇨ V = 120cm^3 (or 120,000 mm^3 or 0.00012m^3)

Note: Here the unit, cm, is cubed (^{3}). That's because cm is multiplied three times in the calculation (i.e. cm x cm x cm). And of course you are working in 3 dimensions with volume, hence cm^3!

NUM SUPER SKILLS

Image: ilyakalinin/Depositphotos.com

Volume - Solids 3K

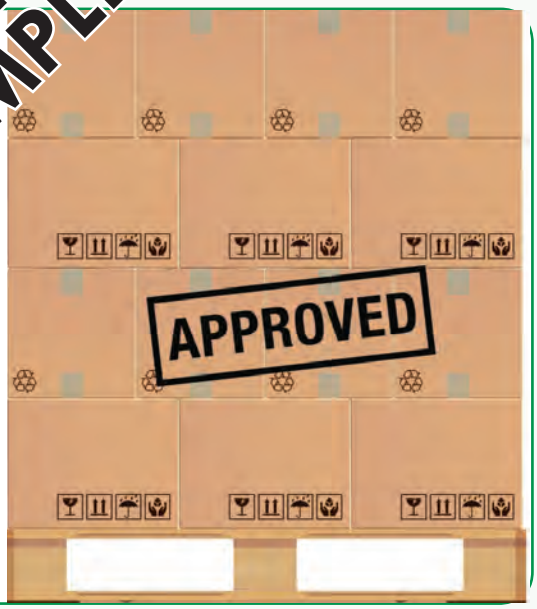
1 4 PS 2 3

1. What is the volume of each of these packing boxes? By what percentage is the volume of each box greater than the volume of the smallest?
   - ⇨ Box 1: 10cm x 8cm x 12cm
   - ⇨ Box 2: 12cm x 10cm x 16cm
   - ⇨ Box 3: 15cm x 20cm x 18cm
   - ⇨ Box 4: 25cm x 22cm x 20cm

Image: zager/Depositphotos.com

2. Estimate and then calculate the total [illegible] boxes stacked on this pallet.
   Each box measures 60 x 45 x 50cm

Image: Elgusser/iStock/Thinkstock



3. List situations where volume measure are important as part of your own personal or working life.

Do you know how to stack a pallet?

NUMERACY 14

3.17 Measuring Volume

Volume - Fluids

Volume measures abound in our everyday lives for cooking, medicine and of course, for fluid containers.

What was the volume of the last bottle of soft drink you consumed? What volume of sauce is in a bottle? This type of volume is called **capacity**. Or in other words, how much something can hold. e.g. How much liquid in a bottle?

Most fluids are measured in **millilitres** or ml. 1,000ml equal 1 **litre**.

A millilitre is the same volume as a **cubic centimetre** (cc). So therefore a cube that has sides of 1cm will have a volume of 1 millilitre. The measure of cubic centimetres is often used in medical settings.

You are likely to use fluid volume measures in your personal lives when it comes to hydration, cooking, gardening and various recreational and hobby pursuits.

People also pay particular attention to one common volume measure expressed as a cost. This is the cost of a litre of petrol. How does $1.70 per litre sound? And if your vehicle's fuel tank has a capacity of 60 litres, then at $1.70 per litre, it will cost just over $100 to fill.

Many work-related tasks require a good working knowledge of fluids. Occupations such as chefs, baristas, gardeners, plumbers, painters, nurses, hairdressers, farmers and others need to have a good working knowledge of fluid volumes.

Fluid volumes are extremely important when working with chemicals and mixing chemical ratios; be that when **diluting** concentrates with water (such as bleach and pesticides) or when mixing more than one chemical. This is also an area of workplace safety concern for some workers.

Nurses and doctors have to administer exact doses of medications, otherwise the results might be life-threatening.

So you should always make sure you are on top of fluid measures, read the product manufacturer's instructions, and be accurate with your measurements.

Image: @ emmeci74/Depositphotos.com

3L Volume - Fluids

In your own words, complete the following questions

1. What is capacity?	2. Which is bigger, a litre or a millilitre?
3. When might diluting be important?	4. When will exact fluid measures be vital?

Cooking

Cooking uses metric measurements for volume, but also uses volume measures based on cooking **utensils**.

These measures might vary in different countries, but in Australia we accept these values to be accurate.

Fluids

- 1 teaspoon = 5ml
- 1 tablespoon = 20ml
- 1 cup = 250ml
- 1 fluid ounce = 28.41ml
- 1 pint = 568.26 ml
- 1 gallon = 4.564 litres

Solids

The weights of solids vary so we should not really use 'utensil' measures.

NUM SUPER SKILLS

Food and drink 3M

1 4 PS 2 3

Find out the prices of 4 different-sized cola containers from the same brand, both in a milk bar, and in a supermarket.

1. Complete the following table; and then discuss the results as a class.
2. What volume of container do you recommend and why? (Think carefully!)

Date:_____ Milk Bar: _____ Supermarket: _____

Size	Milk Bar price	Milk Bar price/litre	Supermarket price	Supermarket price/litre

Applied: Treat or threat?

1 4 PS 2 3

Complete the following tasks in your workbooks

1. If a recipe calls for 4 teaspoons of milk how many ml is this?
2. If a fruit dessert recipe calls for a sauce to be made from 100g of cooking chocolate, 6 tablespoons of cream and 2 tablespoons of icing sugar per person, and you are serving 10 people, what total quantity of cream, in ml, do you need?
3. What weight of both icing sugar (1 tble = 8 gms), and of chocolate, do you need?
4. Find out how much these ingredients might cost.
5. What do you think about this recipe? Discuss this as a class!

3.19 Measuring Volume

3N Volume - Fluid units

1
4 PS 2
3

1. Complete these tasks related to capacity. Some you will have to research.

Note: There are 1,000 millilitres in a litre, and 1 million litres in a megalitre.

a. How many mls of fluid would be in 5 tablespoons?	b. How many mls of fluid would be in 5 teaspoons?
c. How many mls of fluid are in three x 3 litres bottles.	d. How many litres are in 2 megalitres?
e. How much 'bad' fluid do you consume a week? What might be a 'bad' fluid?	f. How much 'good' fluid do you consume in a week? What might be a 'good' fluid?
g. How many litres of water are needed to fill up an average backyard swimming pool?	h. How many litres of water are needed to fill up an Olympic sized swimming pool?
i. How much does bottled water cost per litre?	j. How much does tap water from home cost per litre?
k. What is the capacity of a fuel tank for a motorbike?	l. What is the capacity of a fuel tank for an SUV?
m. When is a 'cup' measure used for fluid volumes?	n. When is 'cc' used for fluid volumes? Find examples.

2. List situations from your own life when it is suitable to estimate fluid volumes.

3. List situations when you must measure fluid volumes exactly. Why so?

4. Health & Wellbeing	Recreation & Hobbies	Work-Related Situations
When is measuring solid volume important for me?	When is measuring solid volume important for me?	When is measuring solid volume important for me?
⇨	⇨	⇨
⇨	⇨	⇨
⇨	⇨	⇨

5. Health & Wellbeing	Recreation & Hobbies	Work-Related Situations
When is measuring fluid volume important for me?	When is measuring fluid volume important for me?	When is measuring fluid volume important for me?
⇨	⇨	⇨
⇨	⇨	⇨
⇨	⇨	⇨

3.21 Measuring Temperature

Temperature

Temperature can be commonly referred to as the intensity of heat of an object, fluid, surface or other substance. The most common unit of measurement for temperature is Celsius which is a comparative scale, based on the freezing point of water 0°C, and the boiling point of water 100°C. However, some slight variations to this definition do exist for scientific purposes. Temperature is usually measured by a scaled mercury-based **thermometer**.

Temperature in action

An awareness of temperature scales, and associated safe temperature ranges, is a vital concept for many personal and work-related situations. Can you think of more?

- Personal health and wellbeing, such as surface air temperature.
- Personal care and safety, such as bathing an infant.
- Household situations such as hot surfaces, heating requirements and clothing needs.
- Health diagnosis and medicine, such as hypothermia, fever and other conditions.
- Food storage and preparation, such as perishables, dairy and meats.
- Employee OH&S such as exposure, heat and cold hazards, and fire risk.
- Cooking, such as temperatures and times to avoid food poisoning.
- Manufacturing, such as engineering, food production and construction.
- Transport, such as refrigerated vans and superheroes.
- Exercise, such as energy burning and safe body temperature zones.
- Electrical goods, such as heating, cooling systems and radiant heat.

Image: Wavebreakmedia Ltd; Wavebreak media, Thinkstock

Correct temperature is important in the beauty industry. Why so?

3O Temperature in action

1 4 PS 2 3

1. Estimate and then find out the temperature for each of the following.

Item	Estimated temp.	Exact temp.	Item	Estimated temp.	Exact temp.
The temperature in this room.			Hottest temperature ever in Australia.		
The temperature in Moscow today.			Coldest temperature ever in Australia.		
A caffè latte.			Car radiator fluid after a long drive.		
A bath suitable for a baby.			A shop fridge for milk.		
Healthy human temperature.			your choice		
A human with a fever.			your choice		

1 4 PS 2 3

2. You are required to undertake an investigation into safe temperature ranges in a variety of personal, social/recreational and work-related situations. Complete the tasks specified in the table by describing relevant activities/items. You might also need to undertake some online research.

	Describe activity/item	Safe range/ hazard control	Potential hazards
Health & wellbeing situations	Cooking of...		
	Temperature of a child...		
	other...		
	other...		
Recreation & hobby situations	A day at the beach...		
	other...		
	other...		
Work-related situations	Working environment...		
	Storage of perishables...		
	other...		
	other...		

3.23 Assessment

AT3 Measuring Up
Health Numeracy // or Vocational Numeracy

1
4 PS 2
3

For this assessment task, you are required to investigate, collect, analyse and report on common quantities and measures related to **health situations**, and/or **vocational work-related situations**.

You will choose the focus area most relevant to you, and identify the most important quantities and measures to investigate.

You will prepare an investigative analysis that explains relevant quantities and measures, why and how to estimate and measure these, the use of measuring devices and tools and techniques, how to ensure accuracy, and why these quantities and measures are important for your chosen focus area.

Health Numeracy:
Quantity and Measures

You might investigate:

- ❑ making recipes healthier by substituting ingredients
- ❑ healthy eating and portion sizes
- ❑ amount of macronutrients, (protein, carbohydrates and fats) in different foods
- ❑ amount of refined sugar in food and beverages
- ❑ general health indicators and measures
- ❑ condition-specific health indicators and measures
- ❑ correct dosages of medications
- ❑ fitness measures
- ❑ amounts of different physical activity needed to balance food intake
- ❑ safe cooking temperatures and times for different foods;

or many other health quantities and measures relevant to you.

Vocational Numeracy:
Quantity and Measures

You might investigate:

- ❑ work-related task times
- ❑ work-related measuring of shapes and objects
- ❑ specific work-related measuring tools and devices
- ❑ work-related temperatures including safe operating ranges
- ❑ work-related estimates and measures of quantities
- ❑ work-related estimates and measures of sizes
- ❑ work-related estimates and measures of volume and capacity
- ❑ work-related estimates and measures of materials, ingredients, resources and inputs
- ❑ work-related mixes, proportions and other measures;

or other relevant work-related and vocational quantities and measures.

As part of your investigation, you must explain the importance of numerical knowledge and skills; and an explanation of the applied use of maths tools.

- ❑ measuring units and devices
- ❑ time measures and importance
- ❑ size and distance measures
- ❑ amounts and quantities
- ❑ temperature measures
- ❑ volume and capacity measures
- ❑ estimations and accuracy.

If relevant, especially for Vocational Numeracy:

- ❑ perimeter and area measures
- ❑ work task time measures
- ❑ work-related object and materials measures.

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS3: Quantity & Measures
Health or Vocational Numeracy

Tasks - AT3: Measuring Up	Must do?	Due by	Done	Level
Focus area:				
⇨ Measuring units.	✓			
⇨ Measuring devices and techniques.	✓			
⇨ Time measures.	✓			
⇨ Size and distance measures.	✓			
⇨ Amounts and quantities.	✓			
⇨ Temperature measures.	✓			
⇨ Estimations and accuracy.	✓			
⇨ Perimeter and area measures.				
⇨ Work task time measures.				
⇨ Work-related object and materials measures.				
⇨ Importance of these measures.	✓			
⇨ Other portfolio tasks to satisfy skills & knowledge for AOS3 that are not part of the applied investigation.				
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			
Identify the maths / Act on & use maths / Evaluate & reflect / Communicate & report				
Develop and apply mathematical tools and techniques.	✓			
⇨ **Prepare and submit my final investigative analysis.**	✓			
Present a report to the class (if required).				

Additional information:

Signed: _____ Date: _____

3.25 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT3 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

What's The Time 4

Activities 4: What's The Time		p.	Due date	Done	Comment
4A	**Different times**	81			
4B	**Telling the time**	82			
4C	**12 v 24**	83			
4D	**You and time**	85			
4E	**Converting time**	87			
4F	**Duration**				
4G	**Elapsed time**				
4H	**My timetable**	9			
4I	**Timetables in action**	93			
4J	**Rosters in action**	95			
4K	**Timesheets in action**	97			
AT4	**What's The Time?**	98-99			
PST	**Problem-Solving Cycle and Maths Toolkit**	100			

Comments:

4.01 Time

Time

Image: Jorge enrique Villalobo espinosa/ Hemera/Thinkstock

Time is the only resource that we all have the same amount of. We each have 24 hours a day, 7 days a week, 52.18 weeks a year and about 82 years a lifetime.

Time is a construct which in Western society is measured in seconds, minutes, hours, days, months, years, etc..

There are many other scientific measures of time as well. Time is also the 4th dimension!

But do you use your time efficiently or are you wasting this valuable resource? So how do you value your time, how much is an hour worth to you?

At work we get paid a wage per hour for our time (and effort and skill); or an annual salary for our time per year (and effort and skill).

So at work we don't really just get paid for our 'time'. Giving up our time is just a small part of working. If all we needed to do was give up our time to get paid then we could get anyone to do any job. We could get your grandma to be your hairstylist, or your little brother to be your teacher.

In reality, we get paid for our effort (**labour**) and our skill level (**competency** at doing the task). This reality is from your employer's point of view. They employ you to perform a task. The most common types of pay models are shown on p.220.

From your own point of view you want to be rewarded for the time you give up and any effort you will need to contribute to complete the task.

So how much would you need to be paid to get you off the couch, or to put down your phone, and give up an hour of your labour? And what could you do?

What About Time

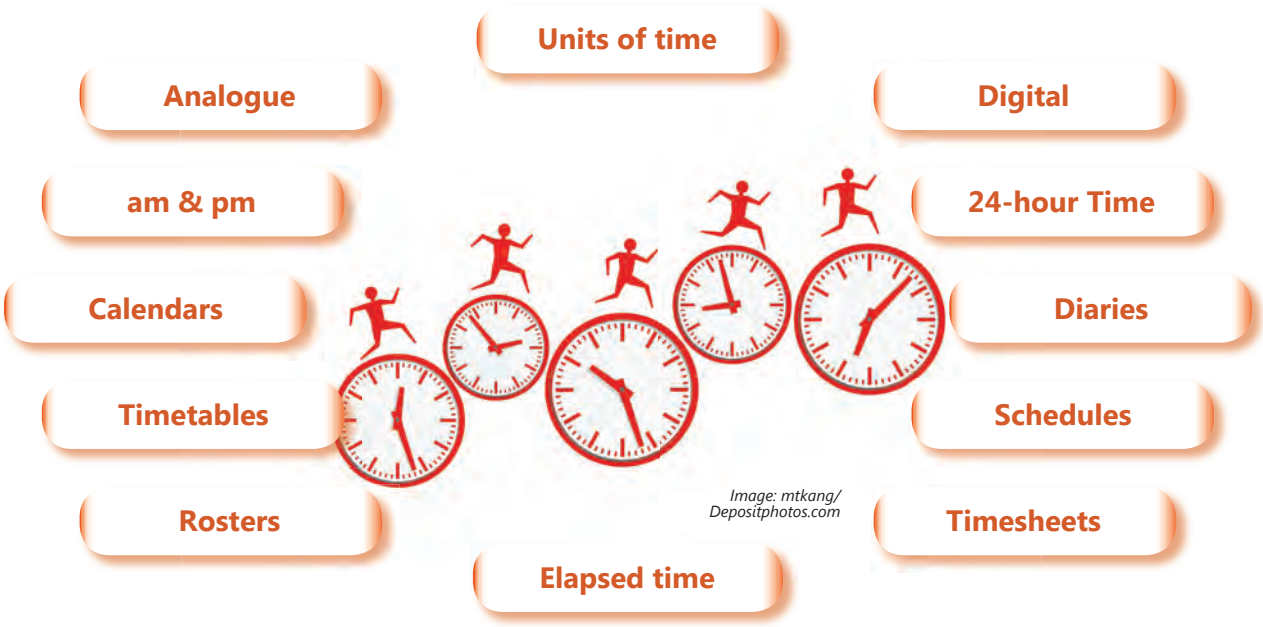


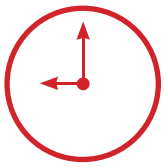
Image: mtkang/ Depositphotos.com

Telling the time

Time can be commonly expressed in analogue terms using hands and numbers on a clockface, or in digital terms using numbers. So let's have a basic refresher of time.

⇨ Analogue time

Analogue time generally refers to the traditional method of 'telling' time as shown on a clock or on a watch. Analogue time uses a 12-hour clockface with an hour hand, a minute hand and sometimes even a second hand.



Many people use analogue timepieces in their professions, including doctors and nurses who may have to count seconds. Some people such as pilots and divers prefer analogue timepieces for their precision.

⇨ Digital time

Digital time is now the most common way of telling time. People use digital devices such as their mobile phones, digital clocks, digital watches and other time devices to read time in a numerical format. Digital devices normally also indicate am or pm.

⇨ 24-hour time

24-hour time treats the day as continuous and counts the hours from 0 to 24 (or 23:59:59). The day starts at 0:00 hours (which is midnight) and goes through to 24:00. (Note: 24:00 is also regarded as midnight). 12:00 hours is midday. 13:00 hours is 1pm and so on. Each pm hour adds 12 to the number 12.

Sometimes 24-hour time is communicated as "1 hundred hours" (i.e. 9pm in Army time!).

Many industries use a 24-hour clock to communicate and record work time for activities associated with rosters, work shifts, transport, automated tasks and many other work-related activities.

⇨ AM and PM

a.m. refers to the time between 12:00pm (midnight) and 12 (noon). **am** stands for ante meridiem (before midday).

p.m. refers to the time between 12:00 noon and 12 midnight. **pm** stands for post meridiem (past midday).

You can write 'a.m'. and 'p.m.' as just am and pm without the full stops.

Different times 4A

1
4 PS 2
3

Larry, Curley and Mo each prefer different time methods. Larry uses analogue, Curley uses digital and Mo uses 24-hour time. This can cause some difficulty when communicating.

In your workbooks, show the following times using the three methods. Draw a clockface, a 12-hour digital readout and 24-hour time.

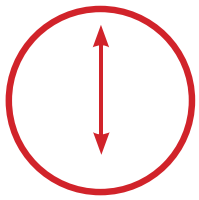
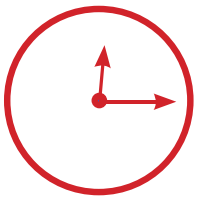
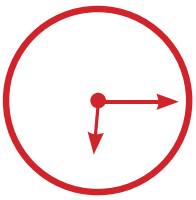
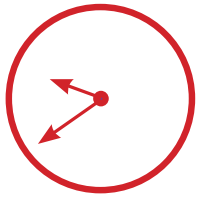
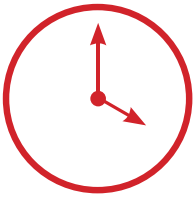
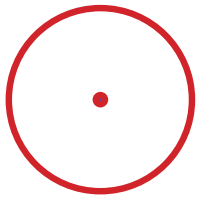
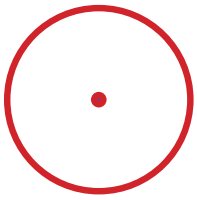
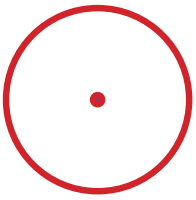
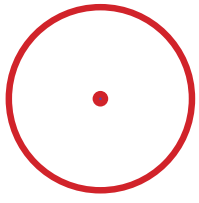
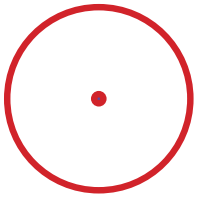
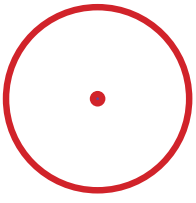
3:30am, 17:27, a quarter to eleven in the morning, midnight, the time you got up this morning, 2 hours after today's sunset, and the current time in London.

4.03 Time

4B Telling the time

1. Interpret these **analogue** clockfaces to estimate the time. (You might want to show key numbers on the clockface to help you.)
2. Show the correct time on the blank **clockfaces**.

   Tip: Remember that the hour hand does move continuously between numbers (but slightly) as the minute hand goes round an hour.

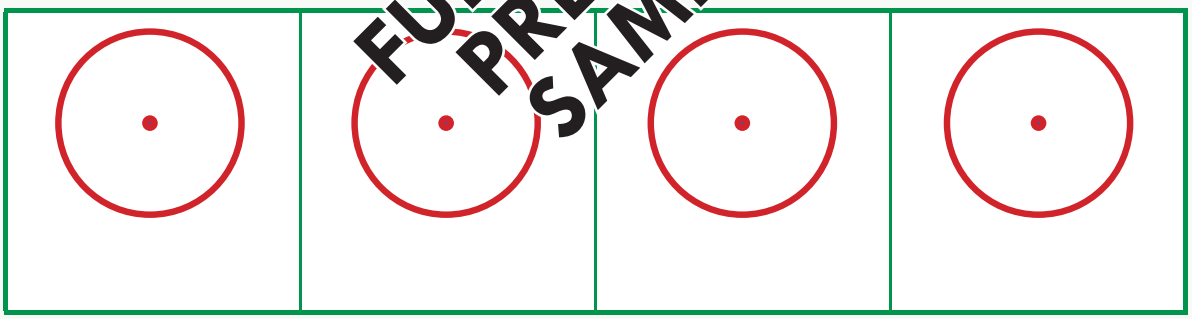
		
		
 7:30	 10:15	 Half past nine
 A quarter to four	 Noon	 The current time

12 v 24 4C

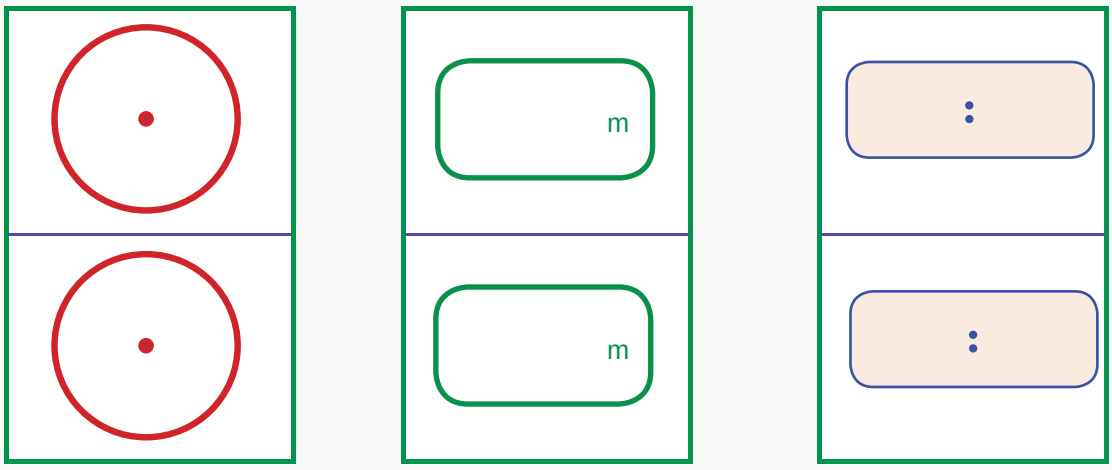
1. Use the signifiers of **am** and **pm** to interpret these 24-hour digital displays as 12-hour time.

15:30	13:45	21:30	23:15
06:00	04:55	09:30	21:45
18:00	00:00	12:00	24:00

2. Choose 4 of these 24-hour examples, and show the correct time on a 12-hour **analogue** clockface. Make sure to also include am or pm.



3. What time do you usually get up and go to bed? Show these times on a 12-hour clockface, as digital time and as 24-hour time.



4.05 Time

Time for play

We live our lives according to time, whether we realise it or not. As living beings, the **passage of time** is a constant reminder in our lives. We sleep, clean, eat, love, care, learn, socialise, exercise, relax, travel, visit, watch, listen and play. And of course - there's the time we spend on our digital lives.

If it wasn't for time we could do anything. But time forces us to make **decisions**, and **prioritise** the tasks in our lives. Some things more important. These **responsibilities** must be met - regardless. As a result, we might have to put off, or give up something else. So what are your priorities when it comes to time?

Time for work

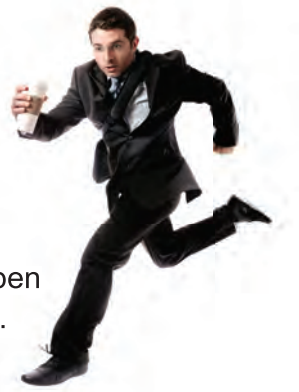
The world of work is governed by time. Most **employees** in Australia, about 75-80%, work for **profit-making businesses**. It's a cliche, but **time is money**. That's how most people get **paid**, according to an hourly **wage**.

Even people who work for **not-for-profits** such as government departments, government agencies, and many schools, hospitals and community services, are also governed by the constraints of time.

There's rosters, schedules, timetables, appointments, production times, delivery times, travel times, ETAs, start times, end times, break times, open hours, after-hours and many other measures of time in the world of work.

Two key terms are **productivity** and **efficiency**. These are the main elements of being a productive and efficient worker. How well you perform your work duties - in relation to time!

Image: focuspocusltd/ Depositphotos.com



Are you good at managing your time, or are you more of a 'last minute' person?

Time and the Numeracies

a. Personal Numeracy
- ❑ Estimating time commitments.
- ❑ Organising personal time.
- ❑ Estimating & planning travel times.
- ❑ Using different timetables.
- ❑ Using diaries and calendars.

b. Civic Numeracy
- ❑ Collecting time-based information.
- ❑ Comparing data and statistics.
- ❑ Allocating time to communities.

c. Financial Numeracy
- ❑ Calculating wages and pay.
- ❑ Filling out timesheets.
- ❑ Planning budgets.
- ❑ Developing savings plans.

d. Health Numeracy
- ❑ Measuring biological health.
- ❑ Maintaining work/life balance
- ❑ Organising healthy routines.

e. Vocational Numeracy
- ❑ Understanding rosters.
- ❑ Meeting work commitments.
- ❑ Organising daily routines.
- ❑ Understanding pay and wages.
- ❑ Completing timesheets.

f. Recreational Numeracy
- ❑ Maintaining work/life balance.
- ❑ Sport and recreation measures.
- ❑ Developing an exercise plan.
- ❑ Organising healthy routines.

1. Which do you think is the best method to use for telling the time in personal, social and in work-related situations? Discuss as a class.

Personal situations	Social situations	Work-related situations

2. Describe examples of when you expect others to be on time, or situations when you need things to be running on time and to schedule.

Situations	Personal	Social	Work-related
When I expect others to be on time.			
When I need things to be running on time and to schedule.			

3. Describe examples of when others expect you to be on time, or situations when others rely on you to ensure that things are running on time or on schedule.

Situations	Personal	Social	Work-related
When others expect me to be on time.			
When others need things to be running on time and to schedule.			

Applied:

What time management strategies do you currently use? What strategies and tools could you apply to improve the management of your own time?

4.07 Converting Time

Converting time

At times we have to convert hours into minutes, minutes into hours or different conversions using other units of time.

Of course, our major units for recording time are hours, minutes and seconds.

But the breakdown for counting time is different from our usual decimal counting method.

With hours, minutes (and seconds) we need to remember that there are 60 seconds in a minute and 60 minutes in an hour. So:

- 1 full hour is 60 minutes
- 1 half of an hour is 30 minutes
- 1 quarter of an hour is 15 minutes
- 3 quarters of an hour is 45 minutes
- 1 full minute = 60 seconds
- 1 half of a minute is 30 seconds (and so on).

Image: jorayoh/ Depo[illegible]photos.com

Calcula[illegible] ti[illegible]

i. Hours to minutes

To convert from hours to minutes we simply **multiply** the number of hours by 60. For example:

- 3 hours = 3 x 60 minutes = 180 minutes.
- 20 hours = 20 x 600 minutes = 1,200 minutes
- 2 and a half hours = ? (So let's do the calculation)

  = 2 x 60 minutes plus another half of an hour

  = 120 minutes + 30 minutes

  = 150 minutes

ii. Minutes to hours

To convert from minutes to hours we perform a **division** calculation.

We divide the total minutes by 60 (which equals 1 full hour).

- 240 minutes = 240 / 60 = 4 hours
- 540 minutes = 540 / 60 = 9 hours
- 900 minutes = 900 / 60 = 15 hours

Minutes [illegible] hours (cont.)

With [illegible] time conversions we are like[illegible] get a **remainder**, because few ta[illegible] take 'exact' hours to complete. For example:

- 150 minutes = 150 / 60

  = 2 hours 30 minutes (or 2 1/2 hrs).

iii. Adding time

To add time we add the hours first and then we add the minutes. e.g.

- 1 hr 30 mins + 1 hr 15 mins = 2 hrs 45 mins

If the total minutes part of the answer is greater than 60, then this is another whole hour. So we have to take 60 away from this 'minutes' total and add it back as 1 hour to the 'hours' part of the calculation.

- 1 hr 30 mins + 1 hr 45 mins

  = 2 hrs and 75 mins

  = 2 hrs and (75 - 60 mins)

  = (2 + 1 hrs) and 15 mins

  = 3 hours and 15 minutes

NUM SUPER SKILLS

Converting time 4E

1. Calculate the time for the following situations.

a. 1 hour in minutes	b. 2 hours in minutes	c. 1 hour 15 minutes in minutes	d. 4 and a half hours in minutes
e. 4 hours in minutes	f. 20 hours in minutes	g. 2 1/4 hours in minutes	h. 1 day in minutes
i. 120 minutes in hours	j. 180 minutes in hours	k. 330 minutes in hours	l. 495 minutes in hours
m. 600 minute in hours	n. 960 minutes in hours	o. 90 minutes in hours	p. 15 minutes in hours

2. Calculate the total time in hours and minutes for the following situations.

a. 1 hour + 2 hours	b. 1 hour 30 min + 2 hours 15 min	c. 3 hours + 30 min + 45 min
d. 2 hrs 45 min + 3 hrs 30 min	e. 30 min + 3 hrs 15 min + 1 hr 15 min	f. 45 min + 75 min + 120 min
g. 3 hourly appointments less 10 mins waiting each time.	h. 4 journeys of 1 and 1/2 hours each.	i. 80% game time in an AFL, or in an AFLW match.

1 4 PS 2 3

4.09 Counting Time

Elapsed time (duration)

Elapsed time, which is also called **duration**, indicates how much time has passed between one time and another.

For example, the elapsed time in 1 hour = 1 hour (or 60 minutes!). That's pretty straightforward! So therefore the elapsed time between 3pm and 4:00pm is 1 hour. Or the elapsed time between 6:45am and 7:45am is 60 minutes. There you go!

Elapsed time or duration is used to calculate how 'long' something takes. This might include travel times, work times, task times or even leisure times. If we don't know how long travel takes, then we are likely to be very late, or possibly very early for important appointments and responsibilities.

Sporting activities rely heavily on elapsed time such as with AFL, soccer, netball and rugby. The game time dictates how long the play goes for. Other sporting activities use duration (or how long) to record achievement such as the 100m sprint, the 1,500m freestyle, the marathon and the 200km cycling road time trial. Fastest wins!

We also need to pay attention to elapsed time when cooking, when performing work tasks, in medical situations and in many other personal and work activities.

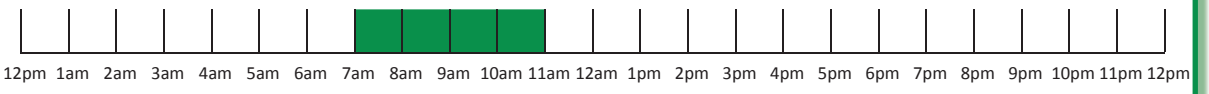
Image: tumunyan/ Depositphotos.com

You will need to know how to work out duration when you get your work roster or fill out a timesheet at work.

One method to work out duration or elapsed times is by using a **timeline.** You simply use the timeline to count the number of hours (and minutes as fractions of hours). You may also break each hour into 15-minute intervals.

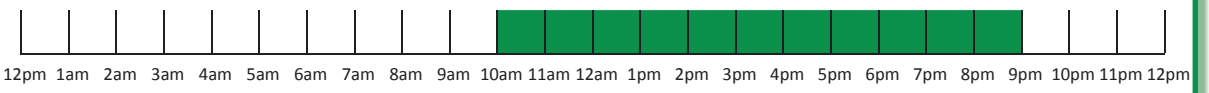
Duration: Using a time line

How much time from 7am to 11am?



Answer = 4 hours

How much time from 10am to 9pm?



Answer = 11 hours

So, how much time from 8:30am to 4pm?

Answer =

1. Calculate how much elapsed time (duration) is represented by the clocks.

   Write a timespan that would match this elapsed time (e.g. 30 minutes = 1:00pm to 1:30pm).

   Suggest a personal task that you estimate would take this amount of time.

   Describe a work-related task that you estimate would take this amount of time.

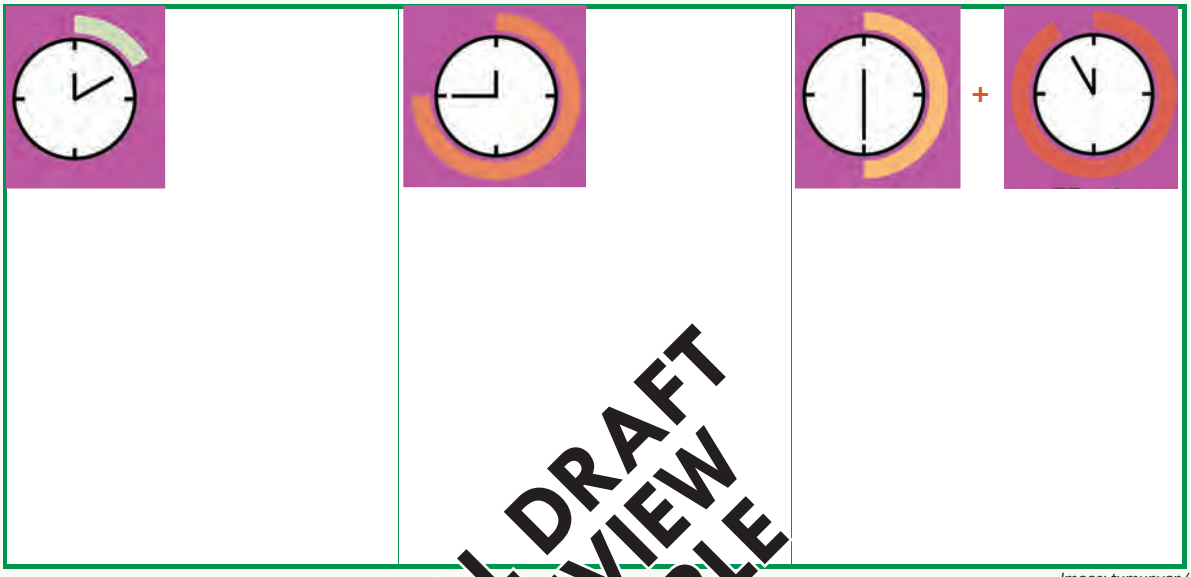
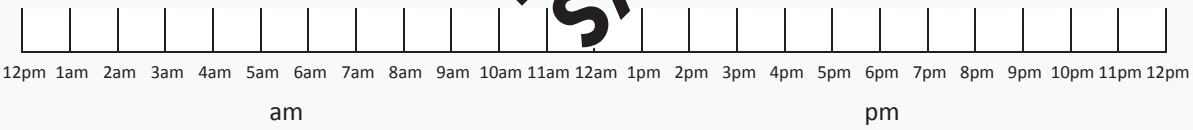


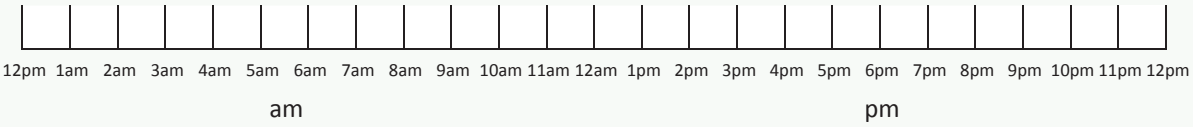
Image: tumunyan/ masha_tace.com

2. Use number lines to calculate the total duration for the following.

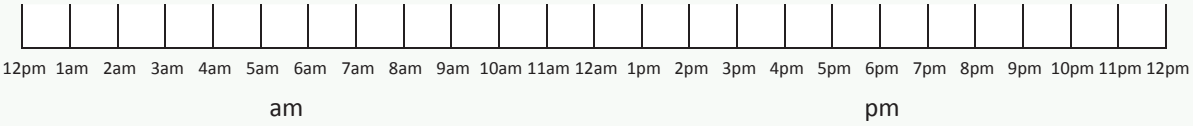
a. 6am to 11am Answer: _____



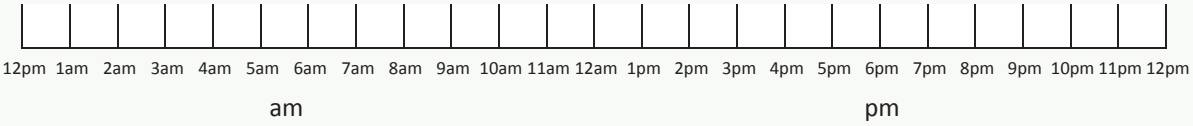
b. 9:30am to 2pm Answer: _____



c. 11:30am to 10pm Answer: _____



d. 9am to 4:45pm Answer: _____



4.11 Counting Time

Elapsed time (duration)

To count total **duration** in hours and minutes we need to see how much time has passed (or elapsed) between one period of time and another.

Some calculations are easy. e.g.

3pm to 4pm = 1 hour (or 60 minutes).

7:45pm to 8:30pm = 45 mins (15 mins to the end of the hour, plus another 30 mins).

11:30pm to 2:30am = 3 hours (or 180 mins).

But some calculations are a bit harder. To calculate elapsed time we use 3 steps.

i. e.g. 5:15am to 7:50am **(later time minutes > than earlier time minutes)**

1. First you subtract the hours (later minus earlier).
   = 7 - 5 (hours) = 2 hours
2. Then subtract the minutes (later minus earlier)
   = 50 - 15 (mins) = 35 minutes
3. In this case (because the later minutes are higher (>) than the earlier minutes) you combine the answers as an addition.
   = 2 hours plus 35 minutes

Note: If the earlier time starts as a '12' e.g. 12:30am treat the 12 as a '0'.

ii. e.g. 7:45pm to 8:30pm **(later time minutes < than earlier time minutes)**

1. First you subtract the hours (later minus earlier).
   = 8 - 7 (hours) = 1 hour
2. Then subtract the minutes (later minus earlier).
   = 30 - 45 (mins) = -15 minutes
3. In this case (because the later minutes are smaller (<) than the earlier minutes) you combine the answers as a subtraction.
   = 1 hour minus 15 minutes
   = 45 minutes

Note: If the earlier time starts as a '12' e.g. 12:30am treat the 12 as a '0'.

iii. e.g. 8:30am to 4:30pm **(later time crosses over am or pm)**

For times that cross over into am or pm you do 3 steps.

1. Subtract earlier time from the next 12.
   = 12:00am - 8:30am
   = (12 - 8) hours 00 - 30 (minutes)
   = 4 hours - 30 minutes
   = 3 hours 30 mins
2. Add the time that has elapsed after the 12 (am or pm).
   (This means that you are treating the 12 as '0'.)
   = 4 hours 30 minutes
3. Add these 2 times together.
   = 3 hours 30 mins plus 4 hours 30 mins
   = 7 hours 60 mins
   = 8 hours

Note: If the earlier time starts as a '12' e.g. 12:30am treat the 12 as a '0'.

NUM SUPER SKILLS

Elapsed time 4G

1. Calculate the elapsed time for the following situations.

a. 7:30am to 11:30am	b. 8:30am to 11:45am	c. 2:30pm to 7:45pm
d. 5:45am to 7:15pm	e. 9:45am to 11:15pm	f. 1:30am to 8:15pm

1 4 PS 2 3

2. Calculate the total daily opening hours, and the weekly opening hours, for these shops based on this information.
3. Discuss what type of retailers might have these hours. What do your answers show about retail working hours?

Opening hours

Mon-Fri: 6:30am to 9:30pm
Sat: 6:30am to 9:00pm
Sun: 7:30am to 8:30pm

Trading hours

Weekdays: 10 - 6pm
Saturday: 10 - 5pm
Closed Sunday

Calculations:

Calculations:

4.13 Timetables, Schedules & Rosters

Timetables, Schedules & Rosters

Three important time management tools for personal, educational and work situations are **timetables**, **schedules** and **rosters**.

A **timetable** is a plan or schedule that sets out various times and durations for a particular activity. The most common timetables that you use include:

- your school subject timetable
- your VET timetable
- public transport timetables
- work timetables (rosters)
- services appointment timetables such as for a doctor or dentist, hairdresser or barber, and many others
- government services timetables such as 'Centrelink';
- and any other activity that uses set times and time durations.

Image: anze.bizjan/ Depositphotos.com

Airline timetables are non-negotiable. The plane won't wait for you!

One person's timetable is designed to fit in with all the other timetables that are part of the same activity, network or system. This means that timetables must be designed to meet very rigid time schedules.

e.g. Your school timetabler has to balance the needs of students, teachers, classrooms, facilities (such as prac or computer rooms) and many other variables to construct a suitable timetable. Of course, we have to follow that timetable.

And then on your VET or work day you may have to deal with your TAFE timetable, your employer's work roster, transport timetables, your personal or family commitments (such as looking after younger siblings or doing domestic chores) and perhaps even your own personal casual work roster. So it can get quite complex!

4H My timetable

1 4 PS 2 3

So how 'good' is your school timetable?

1. In your workbooks (or using software) reconstruct your timetable based on your preferred times and days for classes.

   You must keep the same classes you are doing now, and the same lesson or period duration - but other than that - redraft your timetable to suit you.

Times	Monday	Tuesday	Wednesday	Thursday	Friday
e.g. Period 1 8:30-9:20am	Numeracy	PDS	Literacy	Work Related Skills	VET

2. See if you can find another classmate who created the same timetable as yours, or one that is close. How many matches did you get? Were there any classmates with totally different timetables from you? Why so? As a class discuss how hard it would be to please everyone; and why compromises need to be made.

Timetables in action 4I

1 4 PS 2 3

One of the key types of timetables you might use regularly is public transport timetables. Some people have access to well-developed public transport systems. But those of you in the outer metro, regional or rural areas might find public transport to be quite scarce.

Go online to research information to complete the following tasks. Are there any apps that can help you? Find information for 1 more trip of your own choosing.

a. What time do you need to leave home to get to school? What public transport options are available and what are the associated times and travel durations?	b. What time would you need to catch a train (or bus) to get to the CBD by 9am? What time would you need to leave home?
c. You need to get to Geelong for a [illegible]day on Sunday at 12:30pm. Is this trip possible or practical if you [illegible] public transport? If so, what will be your travel times and trip duration?	
d. You are leaving for a holiday at the Gold Coast tomorrow. The plane takes off at 09:30am. What time do you need to get to the airport? If you used public transport to get to the airport what mode(s) would you use, what time(s) would they leave and how long would the trip(s) take? When would you need to leave home?	
e.	

4.15 Timetables, Schedules & Rosters

Schedules & Rosters

A **schedule** is the general term used to describe planning, organising and doing all the tasks and meeting all the responsibilities and time commitments, of an individual, a team, or some other entity. e.g. “You free for a coffee today.” “Let me check my schedule.”

Some people organise their **schedules** using **diaries**, **e-calendars** and **to-do** lists.

What ‘tools’ do you use to plan and organise your daily or weekly schedule?

Rosters

A roster is a planning and organising tool that sets out the labour (worker) needs of an organisation.

Rosters are used to make sure the appropriate number of staff is available to complete the work roles and responsibilities needed for effective operating.

Rosters set out and communicate employees’ scheduled work hours. This includes workers with specific skills to do particular job roles, as well as supervisory and management staff.

- Rosters need to be planned well in advance.
- Rosters are often drawn up using 24-hour time.
- Rosters need to be communicated to all employees involved.
- Rosters should ensure that an appropriate balance of skills, training and authority is covered by the workers.
- Rosters must be fair, and must not be used to favour or punish particular workers.

Gra[illegible] Weekly Roster						
Monday May 1[illegible] - Sunday May 25, 2023						
Times	**8-10am**	**10am-12pm**	**12-2pm**	**2-4pm**	**4-6pm**	**6-8pm**
Monday 20/5	Edwina F.	Edwina F.	Edwina F.	Edwina F.		
	Reg. G.	Reg G.				
Tuesday 21/5		Edwina F.	Edwina F.	Edwina F.	Edwina F.	
	Reg. G.	Reg G.				
Wednesday 22/5		Adut N.	Adut N.	Adut N.	Adut N.	
	Edwina F.	Edwina F.	Edwina F.	Edwina F.		
Thursday 23/5			Edwina F.	Edwina F.	Edwina F.	
	Reg. G.	Reg G.				
Friday 24/5		Adut N.	Adut N.	Adut N.	Adut N.	Adut N.
	Edwina F.	Edwina F.	Edwina F.	Jo P.	Jo P.	
Saturday 25/5	Jo P.	Jo P.	Jo P.	Aloysius Z.	Aloysius Z.	Aloysius Z.
	Reg. G.	Reg G.	Frankie F.	Frankie F.	Frankie F.	
Sunday 19/5	Jo P.	Jo P.	Jo P.			
		Edwina F.	Edwina F.	Edwina F.	Edwina F.	

Rosters in action 4J

1 4 PS 2 3

Jack Fromage works at Hungry Macs serving customers on the register, and sometimes helping out on one of the kitchen stations. The boss has just texted Jack with the roster for next week.

Jack always thinks it's better to show information visually and he is also going to enter the roster in his e-calender. He'll also print this out and put it on his fridge as a reminder.

1. Use the information below to show Jack's roster for the upcoming week. How many hours will Jack work for the week?

   Monday: 7am to 5pm, Tuesday: 11am to 7pm, Wednesday: On standby, Thursday: Day off, Friday: 12pm to 9pm, Saturday: 10am to 2pm then 6pm to 10pm, Sunday: 12pm to 4pm.

Name:					Dates:	to	
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7:00							
8:00							
9:00							
10:00							
11:00							
12:00							
13:00							
14:00							
15:00							
16:00							
17:00							
18:00							
19:00							
20:00							
21:00							
22:00							

2. Use the roster on p.94 for Gramble Newsagency to tally the weekly hours for each worker. How many hours do staff work in total? When is the newsagency less busy? How do you know? Which shifts would you prefer? Why so?

4.17 Timesheets

Timesheet

A timesheet is a numerical tool that shows work times and how many hours a worker has worked for a week. Timesheets are used to work out your pay.

Some timesheets are **digital** and some are **hard copy**. Timesheets often use a **24-hour clock**. Many **casual** workers, which is a lot of young people, have to complete timesheets at work.

You may also have to complete a timesheet for any **work experience** or **work placements** that you undertake - including as part of a **diary/journal** record for school or **VET**.

Timesheets are used to record:

- ⇨ **days and dates of work**
- ⇨ **work start and end times**
- ⇨ **break times**
- ⇨ **daily hours worked**
- ⇨ **rates of pay**
- ⇨ **weekly hours worked**
- ⇨ as well as other information relevant to the particular work setting and employee.

It's your responsibility to make sure your timesheet is correct and complete.

Image: monkeybusiness/Depositphotos.com

Completing a weekly timesheet is often y[illegible] **responsibility** as a worker. So it is vital t[illegible] you can fill-out your own timesheet co[illegible]

If your supervisor or **manager** do[illegible] you need to **check** that it is correct. Otherwise, you mi[illegible] **paid** the correct amount for the week.

So that's why it is so important to be ab[illegible] count or calculate **elapsed time** or **duration**.

Crazy Cracka's Discount p/l: Weekly Timesheet

Name: Robbi Grenoble **Work period:** April 19 - April 25, 2023

Employee number: 3875698 **Classification:** Retail Worker Level 2 **Age:** 17

	Date	Start	Finish	Break	Hours Worked	Rate	Total
Sunday	19/4	10:00	17:30	na	7.5	$24	$180
Monday	20/4	10:00	19:00	12:30-13:30	8	$12	$96
Tuesday	21/4	____	____	____	____	____	____
Wednesday	22/4	10:00	19:00	13:30-14:00	8.5	$12	$102
Thursday	23/4	10:30	20:00	13:00-14:00	8.5	$12	$102
Friday	24/4	12:00	19:30	16:00-17:00	6.5	$12	$78
Saturday	25/4	12:30	19:00	15:30-16:00	6	$18	$108
Totals					45		$666

Timesheets in action 4K

1. Why is it important to be able to check, or fill-out, your own timesheet?

2. Complete this sample timesheet with the correct calculations for an adult retail employee working a standard, 38 hour week, Monday to Friday.
   - ⇨ Sign-on is 8:15 am.
   - ⇨ Unpaid lunch break is from 1:00 to 1:45.
   - ⇨ The employee is paid $23.38 per hour (as per the General Retail Industry Award 2020, as at Nov. 2022).

	Date	Start	Finish	Break	Hours Worked	Rate	Total
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
Sunday							
Totals							

3. What other information do you think is missing from this timesheet?

4. Find an example of a timesheet for an occupation or industry you are interested in. Use it to complete questions 2&3.

4.19 Assessment

AT4 What About Time? Personal Numeracy // or Vocational Numeracy

1 4 PS 2 3

For this assessment task you are required to identify and analyse how well you are using your time in **personal situations**, and/or in **vocational situations**. You will then create an **action plan** to apply your time more effectively.

Part A: Estimate my personal time

1. Identify the different main activities you do every week.
2. Estimate the proportion of time you spend on each activity in a normal week.
3. List and rank these, showing your estimated hours and percentages. You could use a bar graph or pie chart.
4. Estimate what these proportions might be like when you are 30 years old.

Remember, that how you use your time on the weekend will be different than weekdays.

Part A: Estimate my work time

1. Identify the different main work tasks you do in a day of work.
2. Estimate the proportion of time you spend on each different work task in a normal work week.
3. List and rank these work tasks, showing your estimated hours and percentages. You could use a bar graph or pie chart.
4. Estimate what these proportions of work tasks might be like when you are 30 years old.

Remember that how you use your work time might change depending on your job duties for that day.

Part B: My actual personal time

1. Calculate the actual proportion of time you spend on each activity in a normal week.
2. List and rank these, showing your actual hours and percentages. Use a bar graph or pie chart.
3. Estimate what these proportions might be like when you are 30 years old.

Part B: My actual work time

1. Calculate the actual proportion of time you spend on specific work tasks in a normal week.
2. List and rank these, showing your actual hours and percentages. You could use a bar graph or pie chart.
3. Estimate what these proportions of work tasks might be like when you are 30 years old.

Part C: Improving my time use

1. Explain how 'wisely' you are using your time. Why is that?
2. What changes could you make to use your time better? Why so?
3. Describe tools & apps that could help you better use your time.

Part C: Improving my work time use

1. Explain how 'efficiently' you are using your time at work. How so?
2. What changes could you make to better use your work time? Why so?
3. Describe tools & apps that could help you better use your work time.

Name:

Key dates:

AOS3: Quantity & Measures
Personal or Vocational Numeracy

Tasks - AT4: What About Time?		Must do?	Due by	Done	Level
Part A: Estimate my personal and/or my work time					
PERSONAL	Identify the main personal activities I do every week.	○		○	
	Estimate proportion of time spent on personal activities.	○		○	
	Calculate, rank and show these personal estimates.	○		○	
	Predict how my personal activities & times might change.	○		○	
WORK	Identify the main work tasks I do in a day.	○		○	
	Estimate time spent on work tasks for a week.	○		○	
	Calculate, rank and show these work task estimates.	○		○	
	Predict how my work tasks and times might change.	○		○	
Part B: Calculate my personal and/or my work time					
PERSONAL	Calculate my actual proportion of time on each act…	○		○	
	Rank and show my actual times for personal activ…	○		○	
	Predict how my actual activities & times m…	○		○	
WORK	Calculate my actual weekly time on work t…ks.	○		○	
	Rank and show these actual work…	○		○	
	Predict how my actual work… …ange.	○		○	
Part C: Improving my personal and/or my work time					
PERSONAL	Explain how 'wisely' I am using my personal time.	○		○	
	Describe improvements and actions I could take.	○		○	
	Describe tools and apps I could use to help me.	○		○	
WORK	Explain how 'efficiently' I am using my work time.	○		○	
	Describe improvements and actions I could take.	○		○	
	Describe tools and apps I could use to help me.	○		○	
Task completion					
1 4 PS 2 3	**Describe applied use of the problem-solving cycle.**	✓		○	

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Prepare and submit your final report and calculations.**	✓		○	
Present a report to the class (if required).	○		○	

4.21 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT4 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

Relationships 5

Activities 5: Relationships		p.	Due date	Done	Comment
5A	**Relationships**	103			
5B	**Proportions**	105			
5C	**Ratios**	107			
5D	**Rates**	109			
5E	**Working the numbers**	111			
5F	**Common formulae**	113			
5G	**Relationship formulae**	115			
5H	**Visual change**	117			
5I	**Visualisations**	118-119			
AT5a	**The Right Proportions**	120-121			
AT5b	**The Rhythm of Life**	122-123			
PST	**Problem-Solving Cycle and Maths Toolkit**	124			

Comments:

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5.01 Relationships

Relationships

For the purposes of your Numeracy studies, a **relationship** can be defined as a **situation** where **two** or more **quantities** or **measures** are connected or **linked** in some way. Therefore, if **change** occurs in one of these quantities or measures, then the **outcome** of the relationship will also change. Some of the most common relationships are:

- ⇨ **proportions** (I want half the pizza, you two can share the other half)
- ⇨ **ratios** (he doubled the milk in the cake and it was too soggy)
- ⇨ **rates of change** (he sped off doing at least 100 km per hour).

Even though you may not be specifically assessed on proportions and ratios, those types of relationships occur in many work-related tasks for just about all employees.

Percentages are a vital estimation and calculation skill for workers. And time and money relationships govern wage rates and cost inputs. Also, just about all workers who do manual, practical, technical, design and other hands-on work naturally apply ratios and proportions.

In our personal lives we use ratios and proportions for cooking, when budgeting, in sport and recreation activities and in many other day-to-day situations. So it is important that you develop the ability to apply these skills in different numerical situations.

Good recipes are all about relationships.

Image: marish/Depositphotos.com

Relationships

- Proportions
- Fractions
- Rates
- Measures
- Size
- Comparisons
- Formulae

Graphs and charts can represent relationships in an easier to understand visual form.

- Percentages
- Ratios
- Variables
- Quantities
- Change
- Contrasts
- Variables

- Per

Image: vectordreamsmachine/ Depositphotos.com

Relationships 5A

Your teacher will explain some common examples of proportions, ratios and rates with the class.

1. Pair up and describe how proportions, ratios and rates relate to these varied situations. Add 4 more situations.

cooking	serving meals	reading maps	exercising
travelling	bicycling	driving	shopping
drawing	using medicines	designing	building

1 4 PS 2 3

2. Now pair up with someone who you wouldn't usually work with, or someone who has totally different vocational interests from you. Complete the table again. Have you got new or different responses this time?

cooking	serving meals	reading maps	exercising
travelling	bicycling	driving	shopping
drawing	using medicines	designing	building

3. Choose an occupation and describe 4 examples where an understanding of ratios, and/or proportions, and/or rates is an important applied skill.

5.03 Proportions and Ratios

Proportions

A proportion refers to an amount of something, as compared to the total amount. Proportions are often measured in percentages, decimals or fractions.

Proportions show portions or percentages of a whole. Proportions can also indicate one or more quantities, or amounts as compared to others.

We can often estimate or indicate proportions visually by comparing size, or by representing relative proportions using images or graphics.

Pie charts are good for showing proportions.

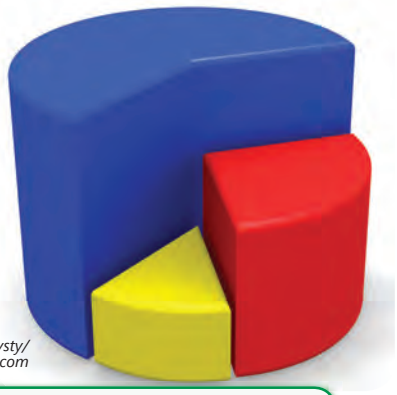


Image: Perysty/ Depositphotos.com

For example: Proportions

What proportion of the cake did Rennie eat? He ate 9 out of 12 slices, which is 3/4 or 75% or 0.75. That Rennie sure ate a large portion!

What proportion of students in the class have brown hair? Count them. Let's say it's 16 out of 20 students. That's 80%. The proportion of students in the class with brown hair is 80%. The proportion of students in the class who don't have brown hair is 20%.

The total weekly earnings of 10 students in your class might be $1,000. So that's an average of $100 each, which is 0.1 or 10% of the total. This average is a **mean** which only shows, as the word itself says, an average. But Jimbo worked 40 hours last week and earned $800. So Jimbo earned 80% of the $1,000.

Jimbo's earnings account for the majority proportion of total weekly earnings for the 10 students. The other 9 students earned $200 between them. That's a much smaller portion to share, and each student worker's proportion might be quite low, or even zero! But that's not Jimbo's fault, now is it?

The proportion of teenagers who might say that the government needs to do more to tackle climate change might be 70%. That's 7 out of every 10 teenagers! The proportion of people aged 65+ who might say that the government needs to do more to tackle climate change might be 40%. That's 4 out of every 10 people aged 65+.

But wait a second, that's 11 out of 10 people! How can that be? Because these two proportions are derived from different samples. They are based on two different measures, teenagers and people aged 65+. You can't add them together. Do you remember something about not adding apples and oranges?

What proportion of people in Australia are vegan? Estimates say about 3-5%. That's only a small proportion. But what proportion of people aged under 30 might be vegan? Do you think this would be a larger or a smaller proportion?

Image: ra3rn_/Depositphotos.com

95% of students in your class now think that proportions are quite straightforward to understand. Do you agree? Let's try to make it 100%. Can someone wake up Rennie, he ate too much cake!

Proportions 5B

1. Express the proportions as a **decimal** and also as a **percentage**.

a. 7 out of ten	b. one in four	c. 3 for every 5	d. 9 times out of 10

2. Express these decimals in words as a proportion.

a. 0.5	b. 0.25	c. 0.10	d. 0.01

3. Express these percentages in words as a proportion.

a. 75%	b. 33%	c. 10%	d. 2.9%

4. Estimate these proportions as percentages from the image.

Yellow:

Red:

Blue:

Green:

Purple:

Image: DmitryRukhlenko/Depositphotos.com

Applied

The 3 macro-nutrients are carbohydrates, protein and fat. Our bodies need to source energy from each of these from the food and drinks we consume.

a. What is a healthy balance of these in our diet (and it's not 33% + 33% + 33%)?

b. How can you ensure that you are getting a healthy balance of these?

c. Are there any variations in these proportions based on age, gender or other factors?

5.05 Proportions and Ratios

Ratios

A ratio shows one quantity as expressed in relation to another. It is another way of showing proportions. Ratios are used for comparison and are expressed in this form 2:1, 1:2; or communicated as “two to one”, “one to two”.

1:2 means that for every 1, you need 2. So this ratio indicates increasing size or amount or quantity. For every person you need 2 eggs.

2:1 means that for every 2, you only need 1. So this ratio indicates decreasing size or amount or quantity. For every 2 people you only need 1 egg.

e.g. For the cake I am baking I have to use 0.25 kg of sugar for every kilogram of flour. So the weight ratio of sugar to flour 1:4; and the weight ratio of flour to sugar is 4:1.

Ratios are often used in scale drawings and models. A map might indicate a scale of 1:10,000cm (reduction of 10,000). A model for an action figure might be expressed as 1:6 (reduction of 1/6th). A drawing of a very small component might need to be at 4:1 (enlargement by 4).

And of course, our devices use specific screen ratios to best display digital content.

One of the most common ratios people deal with every day, without even thinking about it, is 4:5.

Any ideas pop up instantly in your mind about t… ?
What if we add a pixel resolution ratio of 10… by 1350 px? Has that influenced your answ… we also add the term portrait or vertical, is an … forming in your head right now?

Image: Vladru/Depositphotos.com

Proportion and ratios

Proportion and ratios are important for … ements, and for dealing with physical quantities. They are also used to express st…istics in simple sentences.

People doing practical, manual, design and technical tasks in their work situations and personal life often work with and apply proportions and ratios. They estimate these using their own experience, expertise and understanding of practical numeracy. For example:

- chefs estimate, measure and apply ratios of ingredients; and ratios for cooking times based on weight
- farm workers estimate, measure and apply ratios of fluids, stockfeed and chemicals
- hairdressers apply ratios of chemicals for dyes and colouring
- welders use ratios of air to gas, and ratios of metals for welds
- nutritionists, fitness advisers and sportspeople analyse and apply ratios of nutrients to improve diet for better performance
- coaches might calculate ratios to measure outcomes such as scoring from inside 50s in AFL and AFLW
- all businesses had to apply density ratios during the COVID-19 pandemic.

Image: kataklinger/Depositphotos.com

As a class, you can come up with many more examples relevant to you.

1. Which ratio is **bigger**, and which is **smaller**?

a. 1:2 or 2:1	b. 3 to 4 or 4 to 3	c. 3/5 or 5/3	d. 2.5:1 or 1:2.5

2. Ratios are often expressed as fractions. In fact, fractions are ratios. Express these ratios as a fraction. Then calculate the answer as a decimal and as a %.

a. 1:2	b. 1:4	c. 1:5	d. 7:8
e. 2:1	f. 4:1	g. 16:9	h. 4:3

3. Describe some of the coffee ratios from the image. Do these ratios apply in Australia, or are the ingredients and ratios different?

Image: depositphotostas/Depositphotos.com

5.07 Rates

Rates

A rate is a type of ratio. A rate is special because it allows us to combine 2 items or amounts expressed in different units.

Rates show how much of one quantity is needed or consumed in relation to another. i.e. Something **per** something else. Got it?

The most common rates you experience use distance and time. Many rates are also used in financial situations. For example:

- 60 km per hour (60 km/hr). Got it now?
- Petrol consumption - How about 7 litres per 100 km? See!
- What about a shower? 10 litres of water per minute.
- Dinner cost? $20 per kg of beef.

When we combine different quantities and measurements (i.e. **variables**) we calculate a **rate of change**.

On a speedo, the rate of change is represented by how much distance is being covered in a set unit of time. That's two measures. The change measure is moving from point A to point B. The comparison measure is time - one hour. The rate is expressed in km/hr.

On the fuel gauge, the rate of change is represented by how much liquid (petrol) is being consumed over a set distance. Again that's two measures. The change measure is the quantity of petrol being burned. The comparison measure is distance. The rate is expressed in litres/km.

Image: mouse_md/Depositphotos.com

Rates

Rate of speed

Rate of cost

Rate of power

Economy rate

Wage rate

Birth rate

Taxation rate

Interest rate

Consumption rate

Image: mouse_md/Depositphotos.com

Rate of use

Heart rate

Breathing rate

Strike rate

Scoring rate

Inflation rate

Exchange rate

Unemployment rate

Rate of time

1. What are the 2 **measures** used in these **rates**? What might these rates represent?

a. km/hr	b. litres/km	c. litres/min	d. $/hour

2. What might move at these speeds?

a. 10 km/hr	b. 100 km/hr	c. 1000 km/hr	d. 1 km/hr

3. Which vehicle is more fuel efficient?

a. 5 l/km or 10 l/km	b. 7.3 l/km or 7.3 l/m	c. A car or a motorbike?

4. Calculate these rates. (Refer to p.110)

a. 60 km in one hour	b. 120 l... 2 h...	c. 400 km in 30 mins
d. $100 in 5 hours	e. $500 in 5 days	f. $52k for a year
g. 15 litres for 100 km (do the answer per 100km)	h. 20 litres for 200 km (do the answer per 100km)	i. 40 litres for 500 km (do the answer per 100km)

Applied

Investigate some efficiency rates such as the fuel efficiency of your family car, the water flow of the shower head, and how much electricity your family consumes per month.

Research ways to improve efficiency, save money and help the environment.

1
4 PS 2
3

5.09 Rates

For example: Calculating rates 1

The speed limit on major roads might be expressed as 60 kilometres per hour.

The relationship describes how far a vehicle travels within a specified period of time.

The two numerical measures are distance (measured in kilometres) and time (measured in hours).

Together, the distance and time combine to give a rate.

The new outcome of this combination is a **rate of speed** i.e. 60km/hr.

⇨ speed = $\frac{\text{distance}}{\text{time}}$

⇨ speed = $\frac{60\text{km}}{1\text{ hour}}$ (We divide the numbers. We also combine the units.)

⇨ speed = 60 km/hr

For example: Calculating rates 2

A dressmaker might need to buy a particular type of expensive fabric. They have estimated that they will need 5 metres of fabric. The fabric store charges $100 for the fabric.

The two numerical measures are length (measured in metres) and price (measured in dollars).

Together, the length and the price combine to give a rate.

The new outcome of this combination is a **rate of cost** i.e. $/m.

⇨ cost = $\frac{\text{price}}{\text{length}}$

⇨ cost = $\frac{\$100}{5\text{ m}}$

⇨ cost = $20/m

For example: Calculating rates 3

Fangio drives 20 km across town in 20 minutes. What was his average rate of speed?

Speed (s) = $\frac{\text{distance (d)}}{\text{time (t)}}$

Speed = $\frac{20\text{ km}}{20\text{ min}}$

Speed = 1 km per minute

Sounds a bit odd, we don't normally say it like that!

How about...

Speed = $\frac{\text{distance}}{\text{time (in hours)}}$

Speed = $\frac{20\text{ km}}{0.33\text{ hr}}$

Speed = 60 km per hour (approx)

Now that sounds more like it!

But... 20 kms at 60km/hr, town driving?

Could Fangio achieve this rate - legally? What do you think? And who was Fangio?

Working the numbers 5E

1 4 PS 2 3

Solve the following problems. Show your workings. Add 2 more situations related to your own personal or work life.

Numerical situation	This is an example of...	Workings
e.g. At my job I get paid an extra 50% for working on Saturdays.	- Calculating percentages - Calculating wage rates	I get paid $10 an hour normally. Saturday = $10 + 50% = $10 + $5 Saturday pay = $15 per hour
a. Alfie is cooking for a dinner party. His carbonara recipe serves 4, but 6 people are coming. So he has to adjust his portions of 500g pasta, 4 eggs, 500ml milk, 500g cheese, 250ml cream, 2 onions and 3 garlic cloves.	- Using ratios - Estimating amounts - Measuring amounts	
b. Stav has a big Valiant car and it really drinks the fuel. Normally it takes about 70 litres to fill the tank and that lasts for about 245kms. How many litres/km, and how much to fill the tank at today's prices?	- Estimating and calculating fuel consumption rates - Estimating fuel costs	
c. The speed limit on most of the roads near Li is 50 or 60kmh. But she reckons she travels closer to an average of 30khm for a whole trip. Li needs to make a 45 minute trip, so how many kms?	- Using rates and/or ratios - Estimating speed and travel time	
d.		
e.		

5.11 Relationships and Rates

Formulae

Hands up who loves working out formulae using algebra? Really, anyone? How does it make you feel just hearing those numerical terms?

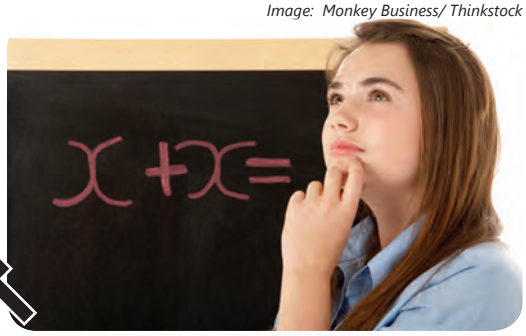
Now before you go running for the hills and screaming that you don't know how to use formulae, it is important to reflect on the fact that just about every numerical problem that you have solved in your past Numeracy studies is based on the use of formulae.

You have successfully completed these tasks using formulaic principles and numerical skills that you have developed over time. You have also applied other numerical skills that you naturally possess. It's just that you did this without even realising your strengths in these areas.

We naturally use formulaic principles when we cook, budget, measure objects, run our vehicles, build things, analyse sporting performances, and many other tasks.

The Super Skills below will give you an insight into formulae and how you are going to apply these principles.

Image: Monkey Business/ Thinkstock



Formula for Success

- Formula = one (singular)
- Formulae (or formulas) = more than one (plural).
- A formula expresses a mathematical problem or a relationship.
- A formula might use algebraic expressions (symbols, such as X) in place of words or variables.
- Symbols can confuse and confound but really all they represent is a short way of ...ing the variables. e.g. 'Amount of fuel needed to get to Geelong' could be just written as 'F'; for fuel (and not Freddie!).
- In computing, such as when using a spreadsheet, formulae can do all the adding, subtracting, averaging and other more complex work for us.
- When following recipes for cooking, or mixing chemicals, or brewing beverages we naturally use formula to apply ideal ratios of ingredients or inputs.

NUM SUPER SKILLS

For example: Bill splitting

Need to split a bill? Well you'd do that using addition for the bill total and then division to calculate how much each diner has to pay.

The POS system has done the adding for you. That's technology there in action!

Bill = $200 Diners = 8. What's the answer?

Well to calculate this you actually use a formula.

S = T / D. What do you think the S, T and D stand for?

S = Split. T = Total. D = Diners.

S is the unknown you are working out. But you know that T = $200 and that D = 8.

So S will be: $200/8.

S = $25 i.e. Each patron owes $25 for their share of the split bill.

See. It really is that easy! Formulae and algebra in action!

Common formulae 5F

1 4 PS 2 3

1. Find out the formulae to calculate each of these. Some might surprise you.
2. Use appropriate formulae to undertake a calculation for each situation. You supply the variables based on realistic situations.

Situation	Formula	Apply the formula
Simple interest rate		
GST to add to a price		
GST already in a price		
Male shoe size based on foot length		
Female shoe size based on foot length		
Fuel economy of a vehicle - general		
BMI - Normal person		
BMI - Muscular athlete		
Cat years in 'equivalent' human years		
Dog years in 'equivalent' human years		
Unemployment rate		
Your choice		

5.13 Relationships and Rates

Establishing a relationship

Formulae are useful because they allow you to express relationships that show ideal ratios. Once developed, you can apply this formula over and over again!

For example: Recipes

A recipe requires 3 eggs, 1kg of sugar for every 3 eggs, and 500 grams of butter for every 1 kilo of sugar. So we could express this as follows.

Recipe = 3 eggs + 1kg sugar + 500g butter (in plain English)

or R = 3E + 1S + 0.5B (in simple notation)

or A = 3X + 1Y + 0.5Z (in algebraic expressions).

Which of these notations do you better understand?

(Note: It is important that the person following the recipe knows that the whole numbers for sugar and butter represent 1 kilo!)

Image: /Thinkstock

So again, what was 'E'? What was 'S'? And what was 'B'?

Pretty straightforward really!

And just as a matter of interest what do you think about a recipe that uses 3 eggs, 1k[illegible] sugar and half a kilo of butter? Yum c[illegible]? What other ingredients might be need[illegible]?

Other rates

Rates are often expressed pe[illegible]ime, [illegible]as [illegible] km per hour; or per dollar, such as 0.2kg per $. There are also very important biological health rates, such as 70bpm for a heart rate. (What does the bpm stand f[illegible]?)

Rates are also used in percentage calculations to show proportions of a whole, such as a discount rate (25% of the total), an interest rate (10% of the principal) and even the unemployment rate (5% of the labour force).

Percentage change

Percentage change is a way of more easily comparing performance for one outcome, or time period, with another. It involves looking at growth (or decline), then calculating this as a proportion of the original. For example:

If you earned $1,000 in year 1, then $1,500 in year 2 what is the % change?

$$\frac{\text{amount in year 2 - amount in year 1}}{\text{amount in year 1}} \times \frac{100\%}{1}$$

$$= \frac{\$1{,}500 - \$1{,}000}{\$1{,}000} \times \frac{100\%}{1}$$

$$= \frac{\$500}{\$1000} \times \frac{100\%}{1}$$

= 50% (That's a lot of growth!)

What would be the % change if year 2 was $3,000; or if Year 2 was $500?

NUM SUPER SKILLS

Relationship formulae 5G

1 4 PS 2 3

1. Calculate using the following formulae. For each one, try and suggest what the variables might represent.

i. X + Y X = 2, Y = 4		
II. 2X + 3Y X = 2, Y = 4		
iii. 6X + 6Y + 5Z X = 5, Y = 12, Z = 20		
iv. 10X + 4Y - 5Z X = 10, Y = 20, Z = 25		

2. Develop relationship formulae for the following situations.

a.	3 eggs, 1kg flour, 1 tbl salt, 300 ml milk.	
b.	4 parts bleach to 1 part water.	
c.	2 cups water for 1st cup of rice, 1.5 cups for each cup of rice thereafter.	
d.	4 screws, 2 brackets, 1 strut for every timber length. Required 20 lengths.	

3. Develop appropriate formulae for the following recipes.

a. 1 litre fruit smoothie.	b. 1 litre protein shake.	c. Fruit salad for 4 people.

4. Calculate the following rates.

a. Travelled 30km in half an hour.	b. Took 60 minutes to drive 90 kms.

NUMERACY 15

5.15 Visual Rates

Seeing the change

We can often see when change happens numerically in our personal lives and our work-related lives by looking at **data** and **tables**, and visual representations such as charts and graphs.

Your household electricity bill should show your energy consumption over different periods of time. It could do this in a table, but it is usually in the form of a **bar graph**. Why is that?

You could use a **line graph** to represent the change in the price of petrol over an extended period of time. You might also use a line graph to represent and compare personal activities on a weekly basis, such as time spent online vs time spent exercising.

Pie charts are good for showing a relative proportion of a quantity. Just think of cutting a pizza or a cake into slices. Those are like the segments of a pie chart.

So one way to analyse change is by comparing 2 or more different variables, data sets, tables, charts or graphs, or images over time.

Line graphs are a good way of representing change, but without a heading and labels, we have no idea what the graph is showing.

Image: atibody/Depositphotos.com

For example: Pie charts

In the first pie chart the red segment represents 50% of the total. The other 50% is shared unequally between 4 other segments. Yellow is the next biggest, a little less than a quarter, perhaps 20%. How much is shared by the other 3 segments?

Images: everythingposs/Depositphotos.com

In the second pie chart the red segment has grown and represents 75% of the total. The other 25% is shared unequally between 3 other segments. Yellow is still the next biggest, but now looks to be about 1/8th, or 12.5%. The white segment is gone. How much is shared by the other 2 segments?

Let's assume that pie charts are showing the brand of mobile phones used by students in your class.

The first pie chart might be from a year ago. 5 different segments are represented. Perhaps the blue segment, the smallest, represented 'Other'? What brands might the 4 bigger segments represent?

The second pie chart might be from now. 4 different segments are represented. Maybe a brand has disappeared from the market. The blue segment, now the equal smallest, might still be 'Other'. What brands might the 3 bigger segments represent?

It is important to remember that unless the pie chart has headings and labels we won't know what it is representing. What we have done here is made an assumption. The assumption might be accurate or it might be well off. Perhaps the 2 pie charts are measuring the time spent at home on different activities, for 2 different people?

1 4 PS 2 3

1. Work with the assumption that the 2 pie charts are measuring mobile phone brands in your class from a year ago, and from now. Complete this table based only on the pie charts, and what you think might be the brands.

Mobile phone brands of my class - 1 year ago		
Colour	**%**	**Brand**
Red		
Yellow		
White		
Green		
Blue		

Mobile phone brands of my class - Now		
Colour	**%**	**Brand**
Red		
Yellow		
Green		
Blue		

2. What do you think? Do these pie charts represent mobile phone brands from your class 1 year ago, and now? Why or why not? How would you find out?

3. As a class do a survey to answer those 2 questions. 'Mobile phone brands a year ago', and 'mobile phone brands now'.
4. Create data tables to record the data.
5. Create 2 properly labelled pie charts to visually represent the data. You might need an 'other' category.
6. Compare and comment on the results.
7. Which method of visual representation do you think is better for this information, data tables or pie charts? Explain.

Applied

Record the amount of time you spend each day on 3 different tasks over the next 2 weeks. Consider a digital activity (e.g. time online), a physical activity (e.g. exercising), and a commitment activity (e.g. doing chores).

Construct a properly labelled line graph to plot all 3 sets of data over the 14 days.

5.17 Visual Rates

Visualisation

In the contemporary world, we now view a lot of rates that are communicated in **visual** form.

Picture in your mind **power bars** on devices or in gaming, **graphic equalisers** in audio and music recording, **colour**-based **warnings** such as overheating and fire danger, **heat maps** in sports performance analysis, **health indicators** and measures, and many other situations.

At times these visualisations are combined with **numbers**, such as on a speedo, a temperature gauge, or even a **graph** or **chart** that displays goal progress on a fitness app.

So when do you look for rates communicated visually? And how are these usually **calibrated** and **displayed**

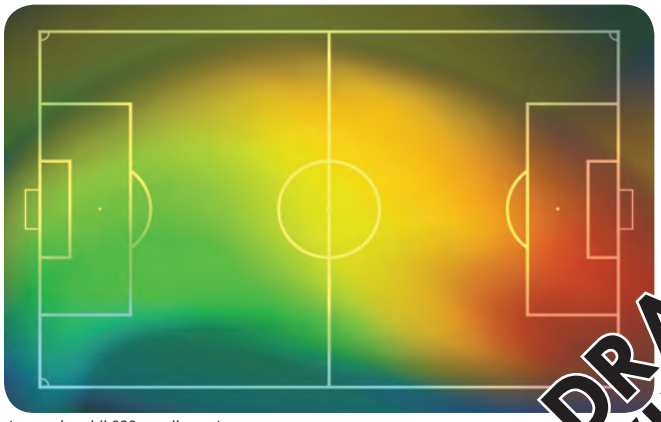


Image: kovshik028.gmail.com/ Depositphotos.com

Images: JonnyDrake/ Depositphotos.com

Sometimes it easier, faster and better ... a visual form.

5I Visualisations

1 4 PS 2 3

1. Find or create images that show rates (or relationships) in the situations below
2. Explain what the image is showing and measuring.
3. Describe how each visualisation communicates numerical information more effectively and/or efficiently.
4. What tools and/or technologies might have been used to create these visualisations?

Sport, recreation or gaming

Vehicles/driving

Health

Your choice

5.19 Assessment

AT5a The Right Proportions
Health Numeracy // or Personal Numeracy

1
4 PS 2
3

Context

In our lives we hear a lot about how to live a healthier and happy life. We get bombarded by messages about health and wellbeing and what we should do to look after ourselves better. These messages are amplified through social media by people acting as health and wellbeing gurus. But you know, it really comes down to you to make healthier life decisions. And the use of relationships, rates and proportions can help guide you.

Required

This assessment task is a free-form activity whereby you investigate how you can apply your numeracy skills to develop a better 'formula for life'. To do this you will complete an annotated report which investigates the following.

1. **Food and nutrition: Images - Ratios, proportions, formulae**.
2. **Time: Tables - percentages and forumlae**.
3. **Physical activity: Relationships and rates**.

Your teacher will discuss the suitability of these potential approaches.

1. Food and nutrition: Images - Ratios, proportions, formulae

Create an image that shows recommended ratios of food and drink for health and wellbeing. You can research the Australian Guide to Healthy Eating as a starting point. Develop a formula to show the ratios suggested in the guide.

Then you might analyse your own consumption patterns, and make a diagram or infographic that illustrates your current consumption patterns.

You can then suggest strategies to make better diet and nutrition choices.

2. Time: Tables - percentages and forumlae

The management of time is an important way to achieve health and wellbeing.

Develop a series of formulae to show how you spend each day doing different activities.

e.g. 8z + 2x + 4s + 7e + 1t + 2o.

(z =sleep, x = exercise, s = screentime, e = education, t = travel, o = other).

Use variables to suit your own life, and develop different formula for varied 'types' of days, e.g. School day, VET day, work day, weekends. You could also create pie charts.

Analyse your use of time and suggest strategies to help you make better use of your time.

3. Physical activity: Relationships and rates

Contemporary life has meant that, in general, we are moving far less than ever before.

Analyse your daily movement according to sleeping, sitting, strolling, walking (rolling), household chores, and higher-intensity movement such as biking, skating and exercising.

Calculate how much time you spend in these physical states, on an hourly or daily basis. Show these over the course of a usual week.

When you move, what rates of speeds and intensity levels are you achieving?

Find out how much physical activity is recommended for your age and ability. Compare this to your own physical activity. Analyse your movement intensity.

Suggest strategies that will help you to reach healthy physical activity guidelines.

Name(s):

Key dates:

AOS4: Relationships

Health or Personal Numeracy

Tasks - AT5a: The Right Proportions	Must do?	Due by	Done	Level
Negotiate the task details with my teacher.	✓			
1. Food and nutrition				
a. Source and analyse healthy ratios/proportions.	✓			
b. Develop suitable formulae.	✓			
c. Create image of your own ratios/proportions.	✓			
d. Apply numerical skills for improvement strategies.	✓			
2. Time				
a. Calculate your time spent on activities.	✓			
b. Create tables showing your use of time.	✓			
c. Develop suitable formulae.	✓			
d. Apply numerical skills for improvement strategies.	✓			
3. Physical activity				
a. Record your patterns of movement.	✓			
b. Calculate your daily/weekly proportions.	✓			
c. Calculate your movement rates and intensity.	✓			
d. Apply numerical skills for improvement strategies.	✓			
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			
Identify the maths / Act on & use maths / Evaluate & reflect / Communicate & report				
Develop and apply mathematical tools and techniques.	✓			
⇨ **Prepare and submit final annotated report**	✓			
Present a report to the class (if required).				

5.21 Assessment

AT5b The Rhythm of Life
Health Numeracy // or Personal // or Recreational

1
4 PS 2
3

Context

In life, there are many rates and relationships that govern how we do various tasks and activities.

From beat and rhythm in music and dance through to health measures such as heart rate, blood pressure, respiration and blood glucose levels.

There are also relationships related to food and beverage intake, health and nutrition, cooking, drawing, arts and crafts, hobbies, pet-care, gaming, exercising, sports performance and even safe driving.

For this assessment task, you are required to explore a range of relationships that exist in health situations, and/or in personal situations, and/or in recreational situations.

You will negotiate the type of relationships you will investigate with your teacher. Then you will prepare an annotated or multimedia report on your findings.

Report: The Rhythm of Life

1. Describe your focus area and its importance.
2. Identify and explain the key relationships that exist.
3. Use formulae to express these relationships.
4. Use maths tools and techniques to measure the variables.
5. Explain what might happen to cause changes in the variables, or changes in the outcome of the relationship.
6. Collect visual evidence of relationships and/or change in action.
7. Create a table, chart, or graph to show a key relationship.
8. Summarise how being able to understand and measure these relationships can improve health, or personal, or recreational outcomes.

Ren is going to track the evolution of dance rhythms by comparing the Charleston, the Jive and Hip Hop.	Cam is going to develop recipe guides to help turn their special meal creations into dinner party-sized amounts.	Lai is going to investigate the vital life measures in different domestic animals and make comparison charts.
Al and Bo are going to analyse and share how many hits and strikes are needed to beat level bosses in popular games.	Tam is going to investigate optimum heart rate and other measures to achieve safe high-intensity athletic training.	Jay wants to create a range of exotic mocktails so they can help their friends choose to stay alcohol-free.
Jen will compare biking, motor scooter, car and train options, to work out the best way for her to get to work.	Mo is going to create a word meter guide so that he can get the lyrics in his raps to fit better and pop with varied beats.	Lil is analysing which foods might be the best source of essential nutrients for a healthy vegan lifestyle.

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS4: Relationships

Health or Personal or Recreational Numeracy

Tasks - AT5b: The Rhythm of Life	Must do?	Due by	Done	Level
Negotiate the task details with my teacher.	✓		○	
My focus is:				
Investigation stage				
1. Establish focus area and its importance.	✓		○	
2. Identify the relationships that exist.	✓		○	
3. Source or create formulae for these relationships.	✓		○	
4. Use maths tools and techniques to measure variables.	✓		○	
5. Propose what might happen to cause change.	✓		○	
6. Source/create visual evidence of relationships or change.	✓		○	
7. Draft a table, chart, or graph of a relationship.	✓		○	
8. Predict how understanding might improve outcomes.	✓		○	
Annotated report				
1. Describe focus area and its importance.	✓		○	
2. Explain the relationships that exist.	✓		○	
3. Use of formulae to express these relationships.	✓		○	
4. Use of maths tools and techniques to measure variables.	✓		○	
5. Explain what can happen to cause change.	✓		○	
6. Describe visual evidence of relationships or change	✓		○	
7. Create a table, chart, or graph a relationship.	✓		○	
8. Summarise how understanding can improve outcomes.	✓		○	
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	
Identify the maths / Act on & use maths / Evaluate & reflect / Communicate & report				
Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Prepare and submit final annotated report**	✓		○	
Present a report to the class (if required).	○		○	

5.23 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT5 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

Data and Systematics 6

Activities 6: Data and Systematics		p.	Due date	Done	Comment
6A	**Unit 2 Requirements**	127			
6B	**Me and data**	128			
6C	**Data and tables**	129			
6D	**Interest comparison**	131			
6E	**Bar graphs**	133			
6F	**Pie charts**	135			
6G	**Line graphs**	137			
6H	**Mean**	138			
6I	**Range**	139			
6J	**Systematics**	141			
6K	**Collecting data**	143			
6L	**Organising data**	145			
6M	**Analysing data**	147			
6N	**Let's get physical**	149			
AT1a	**Analysing and Reporting on an Issue**	150-151			
AT1b	**Ins and Outs of Data and Information**	152-153			
PST	**Problem-Solving & Toolkit**	154			

Comments:

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6.01 Unit 2: Introduction

Unit 2 requirements

In order to successfully complete this unit:

- ✓ for Outcome 1 you must demonstrate key **knowledge** and **skills** in the **4 areas of study** through applied activities related to **3 numeracies**
- ✓ for Outcome 2 you must use and apply the **4-stage Problem-Solving Cycle**
- ✓ for Outcome 3 you must develop, use and apply a **mathematical 'toolkit'**.

4 Areas of Study for Unit 2

5. Dimension & Direction | **6. Data** | **7. Uncertainty** | **8. Systematics**

6 Numeracies for Units 1 & 2

a. Personal Numeracy
Includes travel, transport, organising, planning, commitments, education, life scheduling.

b. Civic Numeracy
Includes data, information, issues, society, economy, government, institutions, media and environment.

c. Financial Numeracy
Includes money, prices, shopping, income, wealth, banking, saving, debt, tax and budgets.

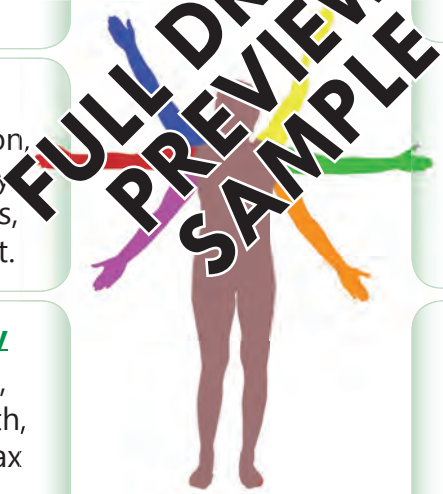

Image: adapted from MAJIVECKA/ Depositphotos.com

d. Health Numeracy
Includes food, nutrition exercise, fitness, data, information, medical, care, systemic measures.

e. Vocational Numeracy
Includes jobs, working, job tasks, pay rates, training, safety, time & travel, and industry-specific skills.

f. Recreational Numeracy
Includes sport, hobbies, games, arts, crafts, life balance, wellbeing, social media and fun.

3 Outcomes for Unit 2

Outcome 1
Use and apply numeracy skills and capabilities across the 6 numeracy foci; and through the 4 Areas of Study.
Unit 2: 4 Areas of Study
Unit 2: 3+ Numeracies

Outcome 2
Use and apply numeracy skills as part of the 4-stage Problem-Solving Cycle.
1. **Identify the Maths**
2. **Act & Use Maths**
3. **Evaluate & Reflect**
4. **Communicate & Report**

Outcome 3
Develop, use and apply mathematical 'toolkit' including analogue and digital numerical tools.

Unit 2: Structure of this Coursebook		
Areas of Study	**Numeracy/Numeracies**	**Assessment tasks**
5. Dimension & Direction Section 7	Recreational or Personal Recreational or Vocational	AT2a: Old School vs New School p.179 AT2b: Lay it Out pp.180-182
6. Data Section 6	Civic Recreational (in Section 8)	AT1a: Analysing and Reporting on an Issue pp.150-141 AT3a - AT3c from Section 8
7. Uncertainty (& AOS6 Data) Section 8	Recreational Recreational Recreational	AT3a: On a Roll pp.194-195 AT3b: Sports and Games pp.196-197 AT3c: I Like the Red Ones pp.198-200
8. Systematics Section 6	Vocational or Recreational (Could be applied to Health or to Personal)	AT1b: Ins and Outs of Data and Information pp.152-153
Section 9: Money AOS8: Systematics AOS6: Data (or) AOS1: Number AOS4: Relationships	Financial or Vocational (Could be applied to Personal)	AT4: Working with Money pp.216-218
Section 10: Income and Pay AOS6: Data	Financial or Vocational (Could be applied to Personal)	AT5: Researching Wage Rates pp.232-234
Section 11: Managing Money AOS6: Data AOS8: Systematics	Financial or Personal	AT6: Saving for a Vehicle pp.262-264
Section 12: How Does it Work? Applied to AOS as relevant	Could be applied to any (relevant)	AT7: Learning to Learn pp.278-280

Unit 2 Requirements 6A

Your teacher will inform you of your unit requirements to fill out this table

Areas of Study	Numeracy/Numeracies	Assessment task (s)
5. Dimension & Direction		
6. Data		
7. Uncertainty		
8. Systematics		

6.03 Data and Tables

Data makes the world go around

Your life is driven by data. **Data** is all the measurements, records, facts, recordings and other information that can be expressed in numerical and/or written form.

In our contemporary digital world, data is collected, collated, analysed and communicated by varied means and media such as mobile phone usage data and billing, banking and financial information, internet and digital media usage, GPS location tracking, as well as personal data such as personal identity details (**biodata**), location and movement, purchasing histories, income levels, taxation and government information.

Data can be used to create **tables**, **graphs**, **statistics**, **infographics** and **reports** that enable bulk information to be understood, analysed and acted upon. Businesses, governments and diverse organisations and agencies compile data to inform their production, pricing and distribution of various goods and services. Schools use data to track attendance and report on student achievement. Sporting teams use data to monitor players and to plan, develop and implement better performance strategies.

However, not all data is 'digital'. Straightforward uses of data might involve measuring a room to determine the amount of tiles needed for flooring, listening to the sound of an animal's breathing to pick up possible ailments, and calculating how much time and money you might need when planning a personal holiday. Although, in reality, there are digital devices to help you do all these tasks.

So data is really just a set of numbers or a set of words, or a set of words and numbers. It's the interpretation of data that makes it useful.

Data is often easier to read and interpret when organised in tables, graphs and other visual forms. So it is vital that you can develop these skills for personal and work-related numerical situations.

Image: royalty/ Depositphotos.com

6B Me and data

Complete the table by giving brief descriptions of the types of data and information you might need to use in your personal life, and for vocational responsibilities.

Personal examples		Vocational examples	
i.	ii.	i.	ii.
iii.	iv.	iii.	iv.
v.	vi.	v.	vi.

Data and tables 6C

Consider the data listed in this table. You will need to calculate:

- ⇨ the total amounts per month (rows)
- ⇨ the total amounts per student (columns)
- ⇨ relevant averages (calculate the mean or simple average).

Monthly wage earnings by student: 2023						
Month	**Lu**	**Adot**	**Fran**	**Grace**	**Mark**	**Total**
Jan	$70	$0	$800	$180	$40	
Feb	$90	$0	$600	$180	$80	
March	$120	$70	$200	$180	$120	
April	$45	$110	$150	$180	$160	
May	$180	$140	$0	$160	$200	
June	$120	$140	$400	$180	$240	
Total						
Average						

1. What data is being shown in the table?

2. Which data is shown in the rows, and which is in columns?

3. The numbers are right-justified. Why is t[illegible] important?

4. Use the data as evidence to answer the following questions.

a. Who earned the most?	b. Who earned the least?	c. Who has the most even income pattern?
d. Who has the most uneven income pattern?	e. Who got a job in March?	f. Who is likely to have worked more over the summer holidays?
g. Who seems to be getting an extra shift each month?	h. In which month was the average wage earned the highest?	i. What was the average earnings per student for the 6 months?

Extension

As a class create a table that shows monthly wage earnings for each student. Calculate relevant averages. Comment on what the results show about the working patterns and income earnings of your class as a whole.

6.05 Data and Tables

Spreadsheets

One of the best tools to use with tables is spreadsheets. Spreadsheets help you to collate, organise and calculate using data.

In an Excel spreadsheet, you use an "=" to denote a formula or calculation.

For example:

=5*10 will perform the calculation and yield the answer of 50

=A3 + 26 will perform the calculation of adding 26 to whatever is in the cell "A3".

Have a look at these 2 spreadsheet examples.

The first spreadsheet shows the formulae to calculate compounding interest on an annual basis. The second spreadsheet shows the result of the calculations for compound interest.

NUM SUPER SKILLS

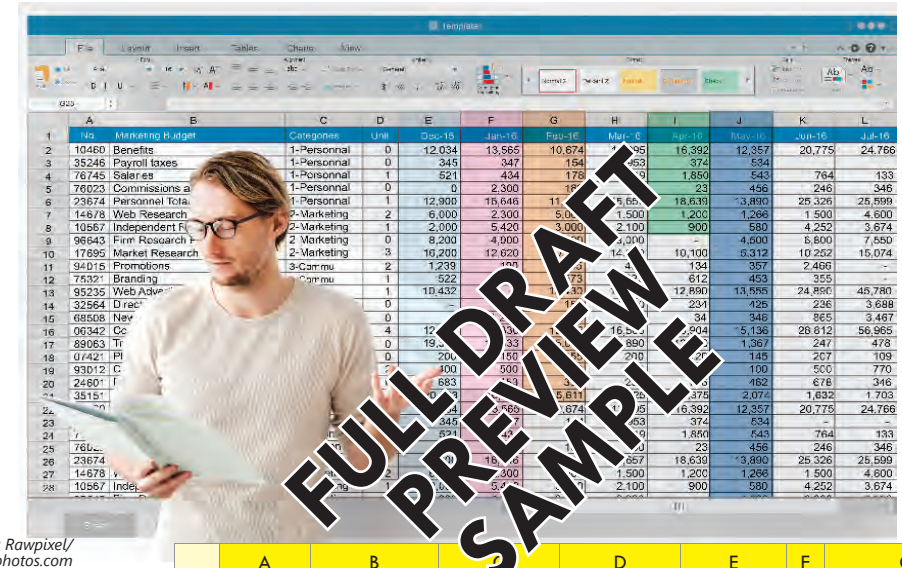

Image: Rawpixel/ Depositphotos.com

	A	B	C	D	E	F	G	H
1	**COMPOUND INTEREST CALCULATOR**							
2	**Year**	**Principal**	**Int. Rate**	**Interest**	**Total**		**Amount =**	$1,000
3	*1*	*=H2*	*=H3*	*=B3*C3*	*=B3+D3*		**Interest Rate =**	5%
4	*=A3+1*	*=E3*	*=H3*	*=B4*C4*	*=B4+D4*			
5	*=A4+1*	*=E4*	*=H3*	*=B5*C5*	*=B5+D5*			
6	*=A5+1*	*=E5*	*=H3*	*=B6*C6*	*=B6+D6*			
7	*=A6+1*	*=E6*	*=H3*	*=B7*C7*	*=B7+D7*			
8	*=A7+1*	*=E7*	*=H3*	*=B8*C8*	*=B8+D8*			
9	*=A8+1*	*=E8*	*=H3*	*=B9*C9*	*=B9+D9*			
10	*=A9+1*	*=E9*	*=H3*	*=B10*C10*	*=B10+D10*			
11	*=A10+1*	*=E10*	*=H3*	*=B11*C11*	*=B11+D11*			
12	*=A11+1*	*=E11*	*=H3*	*=B12*C12*	*=B12+D12*			
13	*=A12+1*	*=E12*	*=H3*	*=B13*C13*	*=B13+D13*			
14	*=A13+1*	*=E13*	*=H3*	*=B14*C14*	*=B14+D14*			
15	*=A14+1*	*=E14*	*=H3*	*=B15*C15*	*=B15+D15*			
16	*=A15+1*	*=E15*	*=H3*	*=B16*C16*	*=B16+D16*			
17	*=A16+1*	*=E16*	*=H3*	*=B17*C17*	*=B17+D17*			

	A	B	C	D	E	F	G	H
1	COMPOUND INTEREST CALCULATOR							
2	**Year**	**Principal**	**Int. Rate**	**Interest**	**Total**		**Amount =**	$1,000
3	**1**	$1,000	5%	$50.00	$1,050		**Interest Rate =**	5%
4	**2**	$1,050	5%	$52.50	$1,103			
5	**3**	$1,103	5%	$55.13	$1,158			
6	**4**	$1,158	5%	$57.88	$1,216			
7	**5**	$1,216	5%	$60.78	$1,276			
8	**6**	$1,276	5%	$63.81	$1,340			
9	**7**	$1,340	5%	$67.00	$1,407			
10	**8**	$1,407	5%	$70.36	$1,477			
11	**9**	$1,477	5%	$73.87	$1,551			
12	**10**	$1,551	5%	$77.57	$1,629			
13	**11**	$1,629	5%	$81.44	$1,710			
14	**12**	$1,710	5%	$85.52	$1,796			
15	**13**	$1,796	5%	$89.79	$1,886			
16	**14**	$1,886	5%	$94.28	$1,980			
17	**15**	$1,980	5%	$99.00	$2,0			

Interest comparison 6D

1 4 PS 2 3

Part A: Spreadsheets

1. Set up the spreadsheet shown on p.130 exactly as it appears. If you are correct then you should get the results in the spreadsheet above. Save this when you are correct. Your teacher can help you with your spreadsheet.
2. Manipulate the values in cells in H2 and H3. See what happens!
3. Try adding more years and see what happens.

Part B: Interest rate comparison

1. Find out the current interest rate on 3 deposit accounts.
2. Use the spreadsheet to input these interest rates so as to calculate potential savings differences.
3. Show your findings based on the 3 different interest rates in a table. Do this for 2 years, 5 years, 10 years, 20 years and for 30 years.

Part C: It's all about time

1. What is the relationship between time and compound interest?
2. Knowing this, what should you do?

6.07 Graphs and Charts

Bar graphs

A bar graph is a good way to show numerical information in a visual form. This means that the user can easily look at the size of the bars in order to interpret some information. We look at what each bar represents (the label) and the height of each bar (the scale) in comparison to the other bars.

And as always, we need to look at the heading to know what the information on the bar graph is representing.

Each bar represents a particular category such as:

- a person (spending per month)
- a time period (monthly phone usage)
- a survey preference (favourite food).

The height of the bars usually represents 'how much' a particular bar is measuring. For example:

- total spending in $ (for each person)
- total number of texts (for that billing period, i.e. 1 month)
- % of people surveyed whose favourite food is fish (14%).

Image: rottenman/ Depositphotos.com

Comparisons can be made by interpreting and analysing the data shown on the graph.

Numerical terms that might be used include; "more", "larger" or "greater than", "less" (or "fewer"), "smaller" or "less than". We can also use comparison descriptors such as "twice as much", "half as much", "almost the same", "slightly more", "much more" (or "less") and so on. This will help the user to make key points and to interpret and express the visual graph in words.

Bar graphs

- A bar graph shows a comparison between the data of various categories.
- A more complex bar graph can also be used to compare different variables on the same chart by using more than one 'set' of bars.
- The components of a bar graph are:
  - **Horizontal (bottom) axis** (x): Plots the categories along the bottom, usually with spaces between the bars.
  - **Vertical (side) axis** (y): Plots the amount along the side, which is usually a number, a count, a percentage, or a $ amount, shown as an even scale.
  - **Heading** and **data labels**: These tell the reader what is indicated by the graph so you know what the graph is showing.
  - **Bars**: The height indicates the amount being graphed. The bars can be drawn using the same colour, or different colours, depending on what is represented on the graph.

NUM SUPER SKILLS

Bar graphs 6E

1 4 PS 2 3

This table shows the average number of text messages sent daily by 6 teenagers.

Person	Texts/day
Rip	60
Chuck	98
Biff	33
Peg	45
Chase	80
Juice	15

1. In your workbooks prepare a properly labelled bar graph that shows this information.
2. Use comparative words and phrases to describe 3 main points about this data.

3. Use a computer or tablet to plot the graph, add visual effects, and print this out. Which graph was easier to construct, and which format was better? Why?

4. This image shows the number of $ spent by people on different types of drinks at a school canteen on a particular day. Each coin represents $2 (assume each drink is the same price - which is $2 of course).
   a. Add a heading.
   b. Label the 'bars' with what might be a suitable type or brand of drink.
   c. Interpret the bars to work out the $ amount spent. Draw a scale on the vertical axis to suit this.
   d. Use comparative words to describe the main points shown by the data.

Image: infocuss/ Depositphotos.com

NUMERACY 18

6.09 Graphs and Charts

Pie charts

Pie charts are another effective way of showing numerical information visually. Pie charts show data and numerical information to represent relative proportions or amounts of a whole. So pie charts are good for showing relative percentages.

The pie represents the whole of the data (100%). Each segment or slice of the pie represents a part (or a %) of that pie.

Segments will usually be different sizes, unless the data is exact for each proportion.

The size of the segment will correspond to the proportion (the % of the total).

Segments will also be coloured which helps the viewer to easily identify each segment.

Pie charts are useful to show survey information based on closed questions and preferential ranking questions, such as 'very high', 'high', etc..

Pie charts might be used together with bar graphs. The bar graph shows the incidence, i.e. how many, whereas the pie segments indicate the relative proportion. Both visuals might suit different users.

Image: Albachiaraa/ Depositphotos.com

Pie charts are commonly used to represent data and information such as:

- proportional spending patterns, such as different categories of a budget
- sources of income or sales categories, such as hot food, sandwiches, drinks, confectionery, and so on
- allocation of time between various tasks, such as sleeping, school, travel, work, sport, and so on
- personal preferences, or likes or dislikes, for a group of people, such as a favourite type of music
- demographic information such, as country of birth, or type of residence/dwelling.

Pie charts

- A pie chart shows the relative size of different amounts shown by pie segments of a proportional size.
- On a pie chart we can easily see the difference between variables shown by the size (or area) of the pie segments.
- The chart should include the segments, a legend, data values (or %) and a heading.
- When constructing a pie chart it is important not to have too many segments, otherwise it will be hard to make sense of the data. This might mean you will need an 'other' category to 'catch' all the smaller or less frequent amounts.

NUM SUPER SKILLS

Pie charts 6F

1 4 PS 2 3

This table shows how Rip uses his mobile on a normal Sunday. Rip has carefully logged each interaction.

Rip	Per day	%
Texts	60	24%
Phone	10	4%
Social media	48	19%
Web pages	10	4%
Music	25	10%
Games	15	6%
Apps	35	14%
Other	47	19%
Total	250	100%

1. In your workbooks prepare a properly labelled pie chart that shows this information.
2. Use comparative words and phrases to describe 3 main points about this data.

3. Use a computer or tablet to plot the graph, add visual effects, and print this out. Which graph was easier to construct? Which format was better? Why?

4. This image shows a representation of a 'Healthy Eating Pyramid' as a pie chart.
   a. Add a heading.
   b. Label the chart to describe each segment, and estimate the % of each segment.
   c. Use comparative words to describe the main points shown by the chart.
   d. How do you stack up compared to this healthy eating chart? Discuss with the class.
   e. Does the image show the recommended portions by Australian health information guidelines?

Image: ifong/Depositphotos.com

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6.11 Graphs and Charts

Line graphs

One of the most common ways of representing connected data and numerical information in a visual form is to use a line graph.

Line graphs are generally used to display data that is connected over a particular period of time. Spacing the data along the horizontal axis using a scale establishes the duration of each data point. It also indicates the total **time series** that is being measured.

Plotting the data on the vertical axis using dot points establishes the height of the various measures. This indicates how much was recorded at that point in time.

Joining the dots gives us an easy to read lineal representation of the data.

Line graphs are commonly used to represent:

- natural phenomena such as weather temperatures
- business sales, revenue, expenses and profit amounts over time
- personal records of achievements such as fitness data, weight gain or loss, strength increases, and other associated measures
- patterns in income, savings and wealth levels
- comparisons of different data sets (by using more than one line on a graph).

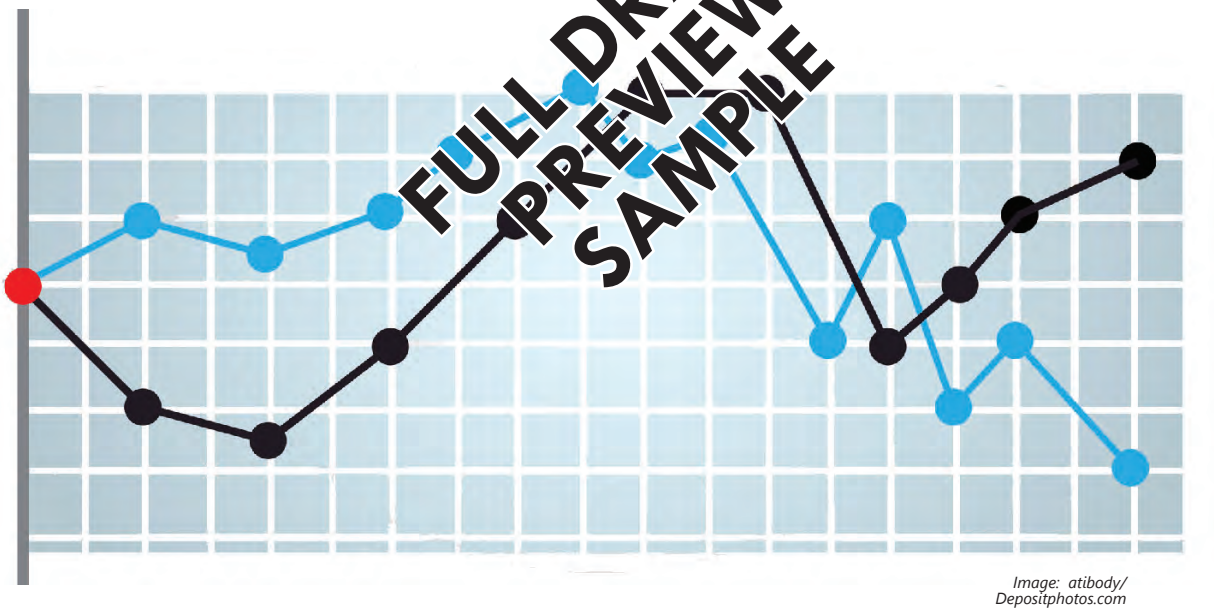


Image: atibody/ Depositphotos.com

Line graphs

A line graph represents a variable over an extended period of time (a time series). It allows for a visual representation of data and can also be used to compare different variables on the same chart. The components of a line graph are:

Horizontal axis (x): Plots the time series

Vertical axis (y): Plots the variable over time

Heading and **data labels**: Tells the reader what is indicated by the graph

Data line: Shows the data in visual or graph form.

NUM SUPER SKILLS

Line graphs 6G

1 4 PS 2 3

Twins Jay and Jilbert are helping their family get on top of the household bills by calculating each week's grocery shopping bill, and also by sourcing specials and alternative sellers to try and cut down the bill in the longer term. To support this, they are collecting and graphing the shopping expenses over a 3-month period.

Month/Week	Shopping $
March W1	$275
March W2	$290
March W3	$284
March W4	$240
April W1	$220
April W2	$190
April W3	$170
April W4	$175
May W1	$150
May W2	$150
May W3	$165
May W4	$140
May W5	$140

1. In your workbooks prepare a properly labelled line graph that shows this information.
2. Use comparative words to describe the pattern of the line (and/or the trend) of the graph. How well did the twins do?

3. Use a computer or tablet to plot the graph, add visual effects, and print this out. Which graph was easier to construct? Which format was better? Why?

4. This image shows a human representation of a line graph, perhaps for business sales or profit or some other outcome.

Image: SergeyNivens/ Depositphotos.com

   a. What do you think this graph could measure or show?

   b. As a class come up with ways that you could use people to represent certain data and information in a line or bar graph. Have a try but don't stand on someone's shoulders - that's Photoshopped!

6.13 Interpreting Data

Mean - Simple average

If I ask you to calculate an average, most of you will simply add up the total and divide by the number of items that you add up. For example, calculate the average price of these shopping items: $10, $8, $6, $4, $2.

- ⇨ Total price = $30 (sum of all prices)
- ⇨ Total number of items = 5.
- ⇨ Average = $30/5 = $6.

Well done! See it's simple isn't it! This calculation is sometimes called the **simple average** or arithmetic **mean**. The mean is the total of all values divided by the number of all values.

Calculating averages is important for activities as diverse as weekly retail sales amounts, health information, safety and even sporting achievements.

Averages allow you to interpret data to provide information that will help your decision-making. Averages can be used to interpret data in tables, often using spreadsheets. So find out the spreadsheet calculation for average.

For example: Mean

- ⇨ A football coach looks at Wobbie Rilliams' stats and sees that in the last 4 games they had 6 possessions, 7 possessions, 8 possessions and 5 possessions. That's an average of just 6.5 per game.

  What would you recommend the coach do?
- ⇨ Sandy is trying to clock up hours for her 'L'. In the first 10 weeks she has averaged only 2 hours per week.

  At this rate, how long is going to take her to accumulate her hours?

  What do you recommend she should do?

Image: Route55/ Depositphotos.com

6H Mean

1. Calculate the average (mean) for each of these data sets.

	Johnny	Jackie	Vinnie	Vonnie	Dot	Mean
weight kg	76	65	94	45	80	
height cm	184	166	196	152	175	
wage $	12.50	14	15.75	18.90	9.50	
mark out of 100	96	66	82	57	74	
driving hours	0	97	62	35	145	

2. What do you think might be the mean height of students in your class? Make an estimate. Now as a class, come up with a way of finding out this mean height.

Range

Sometimes calculating a simple average might not give a complete story of data. Another tool to use is range. **Range** is the difference between the **lowest** data **value** and the **highest** data **value**.

Range indicates the extent to which data is **spread**. It is important to know range because one or two very high, or very low, data samples could **skew** the data.

Data that is skewed - with a large range - might not really paint a true picture, if we just look at the simple average.

Image: adapted from artisticco/Depositphotos.com

For example: Range

- The average height of the starting five of the Year 7 boy's basketball team = 162cm. Which is pretty impressive.

  The players' heights are: Sammy = 146cm, Simi = 155cm, Stevie = 155cm, Suley = 164cm. The final player, Shorty McGhee, towers in at 195cm due to an early and huge growth spurt. So Shorty has skewed the average height somewhat.

  The range of these values is 195cm (tallest) less 146cm (shortest) which = 49cm. That's a pretty big difference there!

- The boys go out to lunch to celebrate a victory. Sammy has $5, Simi has $5, Stevie has $4 and Shorty has just $1. Suley's got $20 so he'll shout Shorty and spot Stevie a $1!

  The average $ across the five boys is $4. But the range is $19 ($20 less $1).

Range 6I

1. Calculate the range for each of the data sets on p.138. Is there any skewing going on there?

weight kg	height cm	wage $	mark out of 100	driving hours

2. Another measure of average is **median**. The median of the basketball boys' height is 155cm. The median lunch $ amount for the boys is $5. So how do you think that a median average is calculated? And might this be a better measure?

1 4 PS 2 3

6.15 Systematics

Data

Throughout history there has always been data. And in the past, before the computing age, data was generally recorded manually using analogue processes.

Many businesses were staffed with rooms of workers who dealt with data. These clerks collected data, recorded data, organised data, analysed data and reported on the data. Most of this data was recorded on paper, or in ledger books. Storage of this analogue information took up significant space with rows and rows of filing cabinets, or large compactus.

There's so much data being generated and collected in the world these days. Most of this data is collected digitally and stored digitally - often up there in the cloud somewhere!

A lot of this data is collected automatically whenever a person uses a digital device. Let's say you are researching **shrinkflation** for a Numeracy assessment.

Image: belchonock/ Depositphotos.com

"Hey Siri. How big is a Mars Bar?"

"In Australia a standard Mars Bar weighs 47 grams."

And then somehow for the next week you get ads for Mars Bars across all your notifications, feeds and online searches. You might even see a 'news article' or two pop up about Mars Bars. You might even be directed to pics and videos of a chocolate bar influencer, but for a different brand! Anyone feel like a Mars Bar right now?

So we need better systems to make sense of all this data in the world. Because after all, data is of no value if we can't use the information to do things in some productive way. And that's where systematics comes in.

Systematics

Systematics involves how we can make best use of technology, including devices and apps, to help us plan and organise our personal lives, our educational lives, our social and recreational lives, our vocational lives and other activities in our life.

Systematics deals with **data** and **information**. Think of your school **timetable**, a work **roster**, and a public transport timetable; lots of important data and information in those. How about a power **bill**, your mobile **plan** and sports **statistics**? Also a lot of data!

Data and information involves **inputs** and **outputs**. When using a Sat Nav you input information - your location and destination - and you get outputs - a travel route and estimated time. That is systematics at work.

Sometimes we see financial and civic numerical data in **tables**, **graphs** and **charts**. This type of systematic representation helps us to keep on top of our money situation, and to better understand what is going on in broader society.

So don't be put off if you have never heard the term before. We use systematics every day in most of the tasks we do. The challenge is to get better at managing and understanding our data inputs and outputs.

Planning your holiday flights. That's applied systematics in action!

Image: anze.bizjan/Depositphotos.com

Systematics 6J

1. In your own words, what is systematics?

2. Consider each of these applied situations. Identify the inputs and outputs of data that might be involved. What analogue and digital devices might be used as part of systematics in each of these situations?

a. Larry is a plasterer and measures the internal dimensions of a room.	b. Lucee is a soccer player and wants to keep track of the kms she runs at each training session.
c. Lanny is a gamer and needs to find out how many hits he needs to level-up.	d. Lucki is a chef and needs to measure the internal temperature of meat.
e. Laurie is saving for a scoot[illegible] cut down their spendi[illegible]	[illegible]ee grows vegetables at home and w[illegible]s to know the ideal seasonal variations to optimism growth.
g. Leni is planning a week away in Bali and needs to spend no more than $1,500.	g. Laddy has type 1 diabetes and needs to monitor his blood glucose levels.
h. Loni is going vegetarian and wants to find substitute sources of protein.	i. Leslie is a running a micro business and needs to find out profit margins on each cake sold.

Applied

When do you use data and systematics in recreational situations, health situations, financial situations and vocational situations? Make lists in your workbooks and then discuss in small groups. Add to your lists based on what your group members also say.

6.17 Data Collection

Primary data

Primary data is data you collect yourself. For example a painter might need to measure the external dimensions of a house. A caterer will register the number of guests coming to the wedding. A fitness trainer might record time trials for athletes they are working with.

Primary data can be collected via measuring, counting, observing, surveying, interviewing; and even experimenting, such as confectioner developing a new chocolate dessert recipe.

Secondary data

Secondary data is data collected by another person or agency. For example, the painter might ask a paint salesperson to estimate how much of a particular brand might be needed. A chef will need to plan and order ingredients based on the caterer's information. A head coach could apply the information recorded by the fitness trainer to determine a player's most suitable position or role.

Reliable secondary data can be accessed in government reports, industry technical guides, investigative studies and research, scientific, statistical and other information from various experts and agencies, health and medical reports and studies, product information, financial data and many other sources. (But generally not personal social media posts!)

Anecdotal data

Anecdotal data is when a person reports based on their own, or a very limited set of experiences. This can also be labelled as 'inconclusive conclusions'.

Although sometimes a person may be reporting truthfully and accurately, they may not be representative of a bigger sample. e.g. "Fast food doesn't make you fat. I eat a Big Mac every day and I'm skinny!"

Or they might draw a false conclusion based on an inaccurate premise. e.g. "We just had our coldest winter for 20 years. How can those so-called experts say global warming is happening?"

Collecting and Organising Data

- Collecting
  - Asking
  - Watching
  - Counting
  - Tabulating
  - Averaging
  - Graphing
- Organising
  - Surveying
  - Recording
  - Sorting
  - Totalling
  - Ranking
  - Charting

Image: agsandrew/Depositphotos.com

Collecting data 6K

1 4 PS 2 3

1. Joanie wants to be a personal trainer and is researching teenage health and activity measures. What primary data could Joanie collect? What secondary data could she access and use? What tools and devices can she use to help her?

2. Complete the table about varied work-related, health, and recreational situations when you might need to collect and organise data.

Collecting and organising	Work-Related situations	Health information	Recreational activities
What data might I need to collect?			
How would I collect this data?			
How will I record this data?			
How will I sort this data?			
How will I present this data visually?			

Applied

One 'ing' that is not included on p.142 is 'capturing'. How is data captured? Who captures data? Why would they want to capture data?

Does this impact on you in any way?

It seems that data is so easily captured in the digital age. But is data just as easily 'freed'?

6.19 Working With Data

Organising data

You already know about some of the more preferred ways to organise data. **Tables** are used as the basis for collating and organising all kinds of data. Systematic devices can collect some data digitally. **Spreadsheets** can be set up to automatically do the calculations in tables

Databases can then be created by using information in tables, cross-matching based on selected variables (such as a customer record number), and compiling and combining as a huge **dataset** about a person, organisation, event or issue.

AFL Ladder 2022

Team	G	W	L	D	PF	PA	%	Pts
1 Geelong	22	18	4	0	2146	1488	144.2	72
2 Melbourne	22	16	6	0	1936	1483	130.5	64
3 Sydney	22	16	6	0	2067	1616	127.9	64
4 Collingwood	22	16	6	0	1839	1763	104.3	64
5 Fremantle	22	15	6	1	1739	1486	117	62
6 Brisbane Lions	22	15	7	0	2147	1799	119.3	60
7 Richmond	22	13	8	1	2165	1780	[illegible]	54
8 Western Bulldogs	22	12	10	0	1973	1812	[illegible]	48
9 Carlton	22	12	10	0	1857	171[illegible]	[illegible]	48
10 St Kilda	22	11	11	0	1703	[illegible]	[illegible]	[illegible]
11 Port Adelaide	22	10	12	0	[illegible]	[illegible]	[illegible]	[illegible]
12 Gold Coast	22	10	12	0	187[illegible]	[illegible]	[illegible]	[illegible]
13 Hawthorn	22	8	14	0	[illegible]	[illegible]	[illegible]	[illegible]
14 Adelaide	22	8	14	[illegible]	[illegible]	[illegible]	[illegible]	32
15 Essendon	22	[illegible]	[illegible]	[illegible]	[illegible]	2087	83.2	28
16 Greater Western Sydney	22	6	16	0	1631	[illegible]	84.6	24
17 West Coast	22	2	20	0	1425	2389	59.8	8
18 North Melbourne	22	2	20	0	1337	2397	55.8	8

Average temperatures Melbourne, Victoria // Victoria, BC

	Average Celsius ^{0}			
	Melb. VIC		Vic. BC	
Month	Min	Max	Min	Max
January	16	27	3	7
February	16	27	4	9
March	15	25	5	11
April	12	21	6	13
May	10	18	8	16
June	8	15	10	18
July	8	15	11	20
August	8	16	12	20
September	10	18	11	19
October	11	21	8	17
November	13	23	5	9
December	14	25	3	7

Sources: BOM Australia, Meteorological Service of Canada

Cheeky's Chunky Chickens: Volume of Ingredients Used — **June: 21st to 27th**

		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
	Unit	Amount	Weight	Amount	Weight	Amount	Weight	Amount	Weight	Amount	Weight	Amount	Weight	Amount	Weight
Chickens	kg	30	105	40	56	50	70	75	105	90	126	150	210	120	168
Chicken pieces	kg	150	60	130	45	110	39	250	33	275	75	290	82.5	150	87
Chips	kg	8	24	16	48	12	36	9	27	22	66	24	72	17	51
Patties	kg	24	4.8	30	6	17	3.4	22	4.4	29	5.8	36	7.2	51	10.2
Buns	kg	24	2.4	30	3	17	1.7	22	2.2	29	2.9	36	3.6	51	5.1
Nuggets	kg	72	36	48	24	90	45	112	56	150	75	275	137.5	115	57.5
Onions	kg	8	1	12	1.5	7	0.87	6	0.75	8	1	20	2.5	19	2.37
Lettuce	kg	3	0.75	4	1	3	0.75	5	1.25	7	1.75	8	2	6	1.5
Tomatoes	kg	12	3	15	3.75	11	2.75	19	4.70	26	6.5	27	6.75	21	5.25
Cheese	kg	48	1.2	26	0.65	24	0.6	29	0.73	24	0.6	34	0.85	50	1.25
Sauce	litres	4	4	4	4	5	5	6	6	9	9	12	12	7	7
Special sauce	litres	2	2	2	2	4	4	3	3	4	4	6	6	8	8
Oil	litres	2	8	3	12	3	12	3	12	6	24	6	24	5	20
		238.15 kg		188.9kg		200.1 kg		235.1 kg		360.55 kg		524.9 kg		389.2 kg	
		14 litres		18 litres		21 litres		21 litres		37 litres		42 litres		35 litres	

Organising data 6L

1 4 PS 2 3

1. Remember Joanie? Here is her clients' week 1 'step' data. How should she organise this data? Go ahead and organise it for her. What tools will you use?

Millie M: 2458 T: 7145 W: 10256 Th: 11256 F: 1220 Sa: 11250 Su: 759
Villie M: 2546 T: 5845 W: 1258 Th: 5892 F: 10258 Sa: 2587 Su: 1985
Willy M: 10256 T: 14568 W: 19560 Th: 1758 F: 14568 Sa: 2890 Su: 11258
Tilly M: 9899 T: 9745 W: 10125 Th: 4568 F: 5689 Sa: 4520 Su: 6458
Jillee M: 11002 T: 5625 W: 9998 Th: 4521 F: 5689 Sa: 17850 Su: 16529
Zylie M: 2500 T: W: 3500 Th: 4500 F: 5500 Sa: 1250 Su: 6500
Sav M: 11196 T: 6696 W: 14251 Th: 2170 F: 4499 Sa: 44250 Su: 8260

2. Have a look at the tables on p.145. What type of activities is the data reporting? What information is it communicating?

3. How 'easy' is it to interpret the data and information? Is all of the data useful?

4. What formulae would have been used to set up the spreadsheets?

5. What types of visual representations would you recommend to communicate the information more successfully?

6. In your workbooks, create summary statements using descriptive information and numbers to develop clear, concise statements to communicate the main points from the spreadsheet tables.

6.21 Working With Data

Data in society

We rely on the government at all three levels, as well as government departments and government agencies to collect, organise, analyse and report data and information about the economy, society, health and medical, the environment and other 'civic' issues.

These departments and agencies use complex systematic processes to gather and communicate data and information. Just have a think about the scope of the Census and the enormity of that data management task.

The key data agency is the Australian Bureau of Statistics. On their site, you will find a whole range of accurate and trusted information and data. **www.abs.gov.au** There are also many other trusted data sources from other government agencies.

Sources of Australian Energy Generation

As at the end of 2020, the Australian electricity generation industry sourced 75.6%[2] of its power from fossil fuels (91.3% in 2009/10)[1] and 24.4%[1] from renewables (8.7% in 2009/10)[1].

At that time, coal-fired energy accounted for around 55% of Australia's electricity generation and gas accounted for 21%.[2]

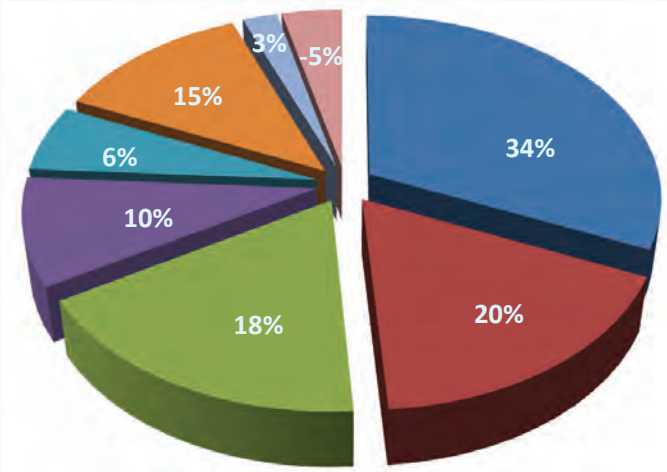
In 2020, of the 54.9% coal-fired energy, black coal accounted for 42.2%, and brown coal accounted for 12.7%. This change reflected a long-term trend in a shift away from coal as a major source of fuel for electricity generation.[2]

As at the end of 2020, it was estimated that 14.4% of total energy production was sourced from renewable energy sources (up from 15.7% in 2016/17) with coal down to 55%.[2] The main renewable energy sources were:

- photovoltaic (solar) 8% of total (57% of renewables)
- wind 8.5% of total (35% of renewables)
- hydro 5.9% of total (23% of renewables)
- bioenergy 1.3% of total (5% of renewables). [2]

[1] *Source: Securing a Clean Energy Future, Commonwealth of Australia.*
[2] *Australian Energy Statistics 2021. Commonwealth of Australia 2021, available through:* **www.energy.gov.au**

Sources of Australia's Carbon Pollution, Dec 2020 [3]



- Energy - Electricity: 33.6%
- Energy - Stationary energy excluding electricity: 20.4%
- Energy - Transport: 17.6%
- Energy - Fugitive emissions: 10.0%
- Industrial processes and product use: 6.2%
- Agriculture: 14.6%
- Waste: 2.7%

(Note: Land Use, Land Use Change and Forestry: -4.9%)

[3] *Source: Department of Environment and Energy, Quarterly Update of Australia's National Greenhouse Gas Inventory: December 2020.*

Part A

In small groups or pairs, discuss the 2020 data about the Sources of Australian Energy Generation and the Sources of Australia's Carbon Pollution.

1. Find out the current data for Australia's:
   - ❑ sources of energy generation
   - ❑ proportion of renewables and types of renewables
   - ❑ proportion of coal - black and brown
   - ❑ sources of Australia's emissions.

Note: There will be a time-lag in the data.

2. Create a table and suitable charts or graphs to show this information more clearly.
3. Compare the data to the 2020 data.
4. What changes have happened?
5. Why have these changes occurred?
6. How might these changes be a positive for our society?

Research Australia's current performance on emission reductions.

Part B

1. Revisit the data you organised for Joanie.
   a. Calculate the most useful averages.
   b. It seems that there might be an error in the data. What might that be? What should Joanie do?
   c. It also seems that someone might have 'fudged' their data. Who might that be? What should Joanie do?
   d. Describe some of the key patterns that the data reveals. What do you think are the reasons for these patterns?
   e. Present this data in a visual form. What type of chart or table would you use? What tools would you use?
   f. How do the results that Joanie collected compare to recommended healthy guidelines? Are these guidelines based on science, or just a nice round number?

Applied 1

How about doing a similar study for people your age? You could split the class into pairs or groups and look at different variables such as students who walk to school, students who play sports, students who work, students who do structured exercise, and so on! Also, research how phone apps actually 'count' steps.

Applied 2

Go to the ABS website. **www.abs.gov.au** Look at the Latest releases menu. Discuss the type of data and information that may be of interest to you as part of Civic Numeracy.

6.23 Working With Data

Health and wellbeing data

Another area of our lives where data and information play a hugely important role is in the achievement of personal health and wellbeing.

We rely on doctors and medical professionals to check our heart rate, blood pressure, breathing rates, temperature and other indicative measures. These are assessed against health guidelines developed by experts in government health agencies.

We can monitor our physical activity using analogue measures such as a watch, manually counting steps or reps, and 'estimating' distance. Increasingly we are using digital tools such as pedometers, apps, fitbits and SatNavs. These digital helpers are very good at doing the systematic analysis for us by giving us readouts and easy-to-read visual graphs and charts of our progress. They are also happy to give us a 'level' of fitness achieved, just like in a video game.

And what about that other pillar of health and wellbeing - diet and nutrition? There are so many digital ways to measure the kilojoule intake and health benefits of what we are consuming, that it can all get a bit too confusing. But remember, many of these diet hacks and digital meal 'tools' are products aimed at getting us to part with our money, and then feel bad about ourselves when we scoff down a box of Magnums in one sitting!

But all we really need to do is to be aware of the recommended healthy dietary guidelines, check product labels and packaging, and then not lie to ourselves about how much (or how little) we are putting in our mouths. Perhaps one Magnum might have been enough!

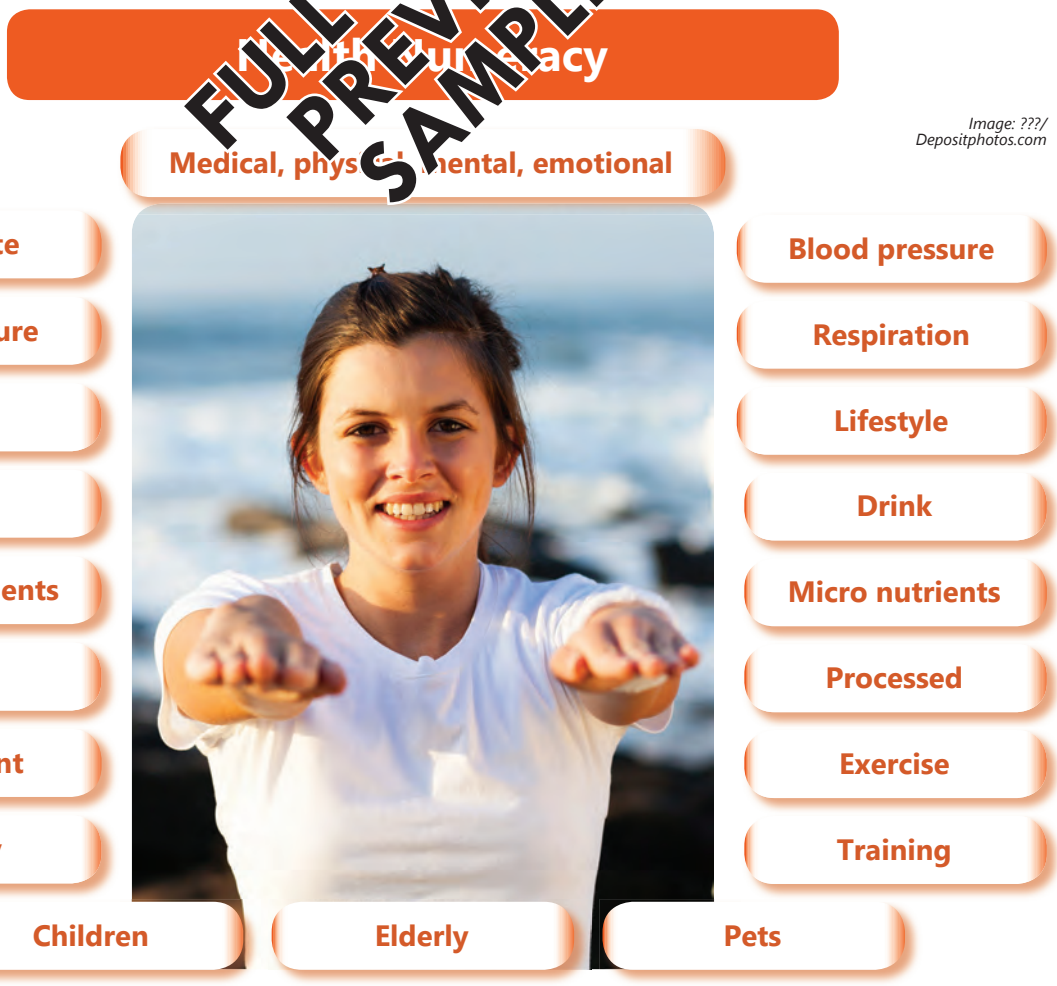


Image: ???/ Depositphotos.com

Let's get physical 6N

Physical activity guidelines [1]

It is recommended that young people aged 15-17 years complete at least 60 minutes of moderate to vigorous intensity physical activity every day.

The guidelines also recommend that young people include strength or toning activities on at least three days per week.

It is recommended that people aged 18-64 years should be active on most days of the week (i.e. 5). People aged 18-64 years should undertake either 150-300 minutes of moderate-intensity physical activity, or 75-150 minutes of vigorous-intensity physical activity, or an equivalent combination of both, per week.

The guidelines also recommend that people aged 18-64 years include strength or toning on at least 2 days per week.

[1] Department of Health, 'Physical Activity and exercise guidelines for all Australians', 02/03/2022. **www.health.gov.au/health-topics/physical-activity-and-exercise**

ABS: Physical activity survey [2]

In March 2022, The Australian Bureau of Statistics released The National Health Survey 2020-21. One focus area was on physical activity.

www.abs.gov.au/statistics/health/health-conditions-and-risks/physical-activity/2020-21

The types of physical activity measured were:

- Walking for fitness, recreation or sport
- Walking for transport
- Moderate activity
- Vigorous activity
- Strength or toning exercises.

The differences between activity types are as follows:

Moderate activity is activity that causes a moderate increase in heart rate or breathing (e.g. a brisk walk, strength or toning exercises, lifting small boxes and sweeping).

Vigorous activity causes a large increase in a person's heart rate or breathing (e.g. playing basketball, running and lifting heavy boxes).

Strength or toning exercise includes lifting weights, resistance training, yoga and Pilates. This measure does not include workplace physical activity in this survey.

1 4 PS 2 3

1. Estimate your own level of non-work physical activity.
2. Calculate your own level of non-work physical activity. Are you meeting the guidelines?
3. Predict the survey results for people aged 15-17, and people aged 18-65.
4. Go to the ABS website and find the data. How well did you predict?
5. How do you compare to the survey data?
6. What did the survey report about workplace physical activity? Does this match what you do, or would do, in your future career?
7. There is lots of other data. Have a read through and list points of information that you find informative or interesting.

6.25 Assessment

AT1a Analysing and Reporting on an Issue
Civic Numeracy

1
4 PS 2
3

For this assessment task you are required to collect, organise, analyse and report to the class on data and information about social issues and civic situations.

The issue might be something you feel strongly about, or of local concern, or related to your Personal Development Skills, Literacy or Work Related Skills studies.

Record key planning and task completion information below as you apply the problem-solving cycle and maths toolkit. Your teacher might get you to work in pairs.

1. Choose an issue to investigate.

2. Design and use a survey.

Decide on the respondents, type of questions, format, and other matters.

3. Collate, tabulate and organise the results.

Organise your data and information in a meaningful way.

4. Create visual representations of the results.

Represent the data in a more user-friendly visual format.

5. Source existing reputable data, information and/or reports about the same issue.

Evaluate potential sources of suitable data and information.

6. Compare your results to the existing data and information.

Analyse both sets of data and information to find similarities and differences.

7. Report recommendations or suggestions using both sets of data and information.

Name(s):

Key dates:

AOS6: Data
AOS8: Systematics
Civic Numeracy

Tasks - AT1a: Analysing and Reporting on an Issue	Must do?	Due by	Done	Level
Negotiate the task details with my teacher.	✓			
1. Issue:	✓			
2. Design and use a survey.	✓			
3. Collate, tabulate and organise the results.	✓			
4. Create visual representations of the results.	✓			
5. Source existing data and information.	✓			
6. Compare results to existing [illegible]	✓			
7. Make recommendations and suggestions.	✓			
Apply and use tools of systematics.	✓			
Draft my report and submit for feedback.	✓			

Task completion

1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

Develop and apply mathematical tools and techniques.	✓			
⇨ **Prepare and submit your final report.**	✓			
Present a report to the class.	✓			

6.27 Assessment

AT1b Ins and Outs of Data and Information
Vocational Numeracy // or Recreational Numeracy

1
4 PS 2
3

For this assessment task you are required to collect, organise, analyse and report on data and information, and the use of systematics, in **vocational or recreational** situations.

You should create an **annotated visual report** using some, or all, of: text, numbers, tables, images, diagrams, graphs, charts, flowcharts and video.

You will be required to submit working **drafts** to your teacher for feedback.

You will make a **presentation** to the class about your investigation into systematics, using evidence as examples.

Vocational Numeracy: Data and Systematics

You are required to investigate the use of **systematics** in a **workplace** that you are working, or a workplace that you might be interested in working in.

For that workplace outline:

- ❑ the goods or services that the workplace produces or provides
- ❑ the main job roles and tasks that workers regularly perform
- ❑ the systems and processes used to manage inputs, processing and outputs related to these job roles and tasks
- ❑ the ICT devices, apps and other tools and techniques that are used to collect, organise, analyse data and information
- ❑ the methods used to communicate and report data and information
- ❑ the skills needed by workers to deal with data and information using systematics
- ❑ your own current skill-level at being able to deal with data and information using systematics.

Recreation Numeracy: Data and Systematics

You are required to investigate the applied use of **systematics** in a **recreational pursuit** that you enjoy doing.

For that recreational pursuit outline:

- ❑ the nature, focus and scope of that recreational pursuit
- ❑ the main activities and tasks that people do as part of that recreational pursuit
- ❑ the systems and processes used to manage inputs, processing and outputs in that recreational pursuit
- ❑ the ICT devices, apps and other tools and techniques that are used to collect, organise, analyse data and information in that recreational pursuit
- ❑ the methods used to communicate and report data and information for that recreational pursuit
- ❑ the skills needed by the participants to deal with data and information using systematics
- ❑ your own current skill-level at being able to deal with data and information using systematics.

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS6: Data
AOS8: Systematics
Vocational or Recreation Numeracy

Tasks - AT1b: Ins and Outs of Data and Information	Must do?	Due by	Done	Level
Workplace/Occupation:				
VOCATIONAL: Goods or services the workplace produces or provides.	○		○	
Main job roles and tasks of workers.	○		○	
Systems and processes used by workers.	○		○	
ICT devices, apps and other tools and techniques used.	○		○	
- How data and information is collected.	○		○	
- How data and information is organised.	○		○	
- How data and information is analysed.	○		○	
How data and information is communicated.	○		○	
Systematic skills needed by workers.	○		○	
Evaluation of my current skill-levels.	○		○	
Recreational pursuit:				
RECREATIONAL: The nature, focus and scope of the recreational pursuit.	○		○	
Main activities and tasks participants undertake in this pursuit.	○		○	
Systems and processes used by participants.	○		○	
ICT devices, apps and other tools and techniques used.	○		○	
- How data and information is collected.	○		○	
- How data and information is organised.	○		○	
- How data and information is analysed.	○		○	
How data and information is communicated.	○		○	
Systematic skills needed by participants.	○		○	
Evaluation of my current skill-levels.	○		○	
Task completion				
Applied use of systematics skills.	✓		○	
Submission of draft annotated report for feedback.	✓		○	
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Prepare and submit annotated report and visuals.**	✓		○	
Make a presentation to the class.	✓		○	

6.29 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT1 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: Level:	Choose maths tools	Done: Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: Level:	Check processes	Done: Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: Level:	Oral processes	Done: Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

Location and Direction 7

Activities 7: Location and Direction		p.	Due date	Done	Comment
7A	Compass directions	156			
7B	Angles and dimensions	159			
7C	Language of location	160-161			
7D	Preferred directions	162			
7E	The road less travelled	163			
7F	Maps: Pathways	164			
7G	Maps: Landmarks & scale	165			
7H	Getting around	167			
7I	Whereabouts?	168-[illegible]			
7J	Check out da 'hood	17[illegible]			
7K	School map grid	170-171			
7L	Get me here!	172-173			
7M	Training time	174-176			
7N	Word up	177			
7O	Maps vs apps	178			
AT2b	Old school vs new school	179			
AT2b	Lay it Out	180-181			
PST	Problem-Solving & Toolkit	182			

Comments:

7.01 Describing Location

The language of directions

When giving and following oral directions we often use, and listen for, certain language to describe 'where' and 'how' about location and directions. We also often combine oral directions with physical gestures such as pointing.

Compass directions use terms such as north, south, east and west, or north-east, south-west and so on. But most of us usually don't use this more formal way of speaking, and many times we don't even know which direction is which, unless we have a map, or have prior knowledge of an area.

So instead we often use **directional** words that are relevant to our position. These can include words such as "left" or "right", "up" or "down", "over there", "behind", "in front", "beside", "here", or even "up the street and around the corner"! We can say that these types of descriptions describe **relative position**.

We also use **descriptors** that give an indication of how far, such as "pretty soon", "3-blocks", "half-a-kilometre", "in 5 minutes" or simply even, "go just up the street and you'll find it"!

So what about you? What type of language do you use to describe location and how to get around?

In the movies, the only place more dangerous than under the bed is behind the closet door!

Image: iStock/Thinkstock

7A Compass directions

1. Label the compass pointers with the appropriate directions.

2. The face of a compass is made up of 360^0. (It is a circle after all.)

   If north is 0^0, label all the compass points with their correct degrees.

3. Get hold of a compass. Place this page flat on the desk in front of you. Use the compass to draw an arrow showing north on this page.

Location

It is important that you develop a vocabulary of location. Doing this will help you to better describe the relative position of people, features and objects with one another. Correct terminology assists when following and giving directions. For example:

- ⇨ when helping people deal with spatial issues
- ⇨ in sport and recreation for movement
- ⇨ in work-related situations such as helping co-workers to use equipment, or to position themselves around work stations, and
- ⇨ also when guiding people to find different items in a store.

At times it is important to consider your own perspective. If you are facing someone then your left is the opposite of who you are facing. This means that left for you is right for them. To overcome this people sometimes face the same way when giving directions.

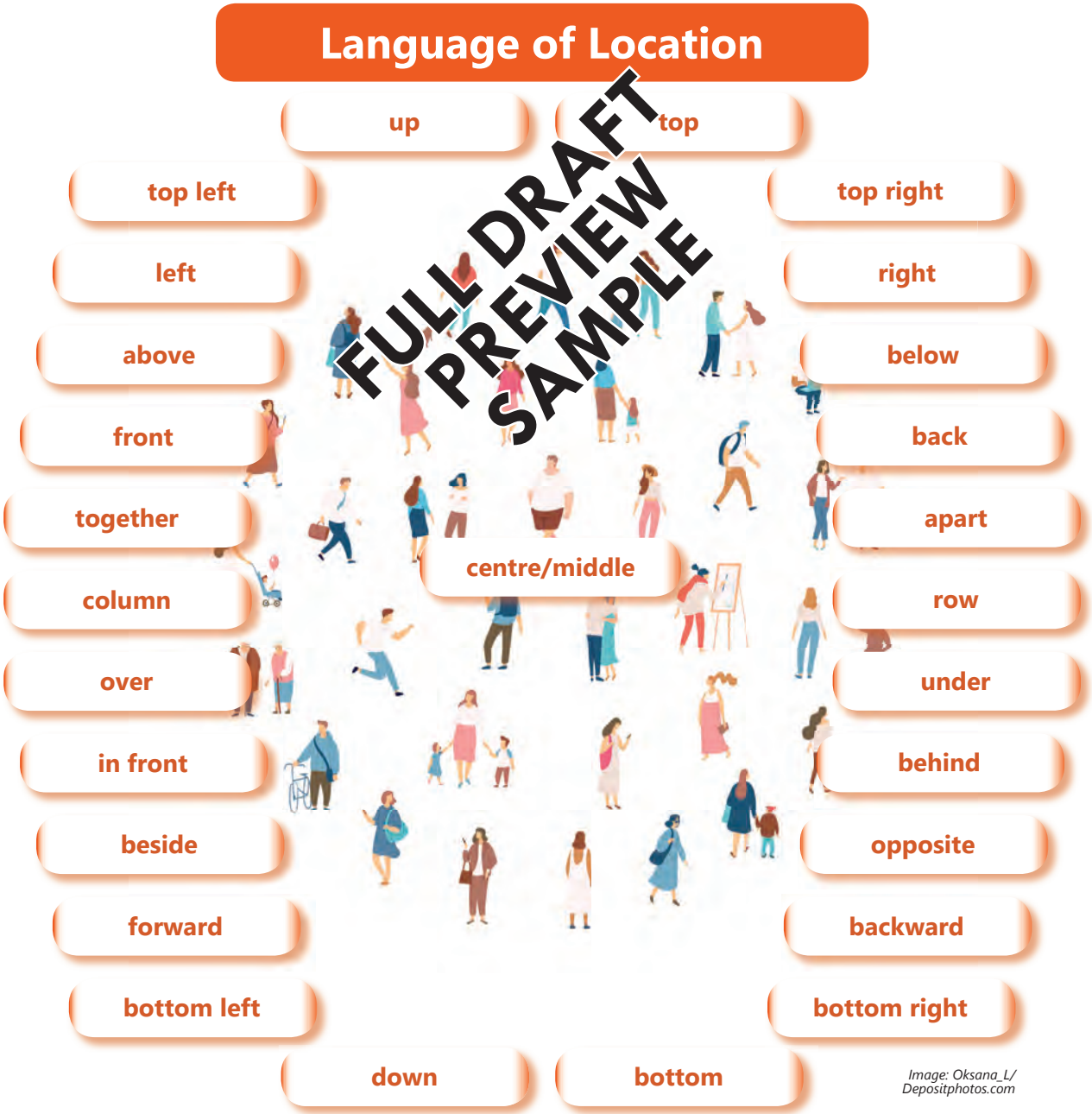


Image: Oksana_L/ Depositphotos.com

7.03 Describing Location

Dimension

When we describe location it is important that we have a visual-spatial understanding of dimension. You looked at dimension in your work on quantity and measures, and now you just need to apply the same principles to location.

When we are describing location we are doing so within the framework of a **3-dimensional** world. However, when we are using and creating maps and diagrams we do this within 2 dimensions only. This is why some people have trouble working out from a map where they are in the real world.

Another issue is that maps usually run **vertically** within a rectangle frame, with the user looking at a top and bottom, and a left and right.

But when we are moving within the world, we move mainly through a **horizontal plane** because gravity keeps us fixed to the ground.

So when you describe location you will need to take into account **relative location** based on **length** (distance), **width** (size) and **depth**.

This is a skill some people really master when parallel parking.

Whereas others are better off just letting the car do the parking for them.

Image: Depositphotos.com

Angles

An angle measures the 'distance' between 2 **rays**. When drawn these rays might be represented by lines. In the real world the 'rays' might actually represent the edges of physical objects or components of an object.

For example, a carpenter and joiner building the roof for a pergola might have to affix 2 lengths of timber (the 'rays') with the edges at an angle of 90º.

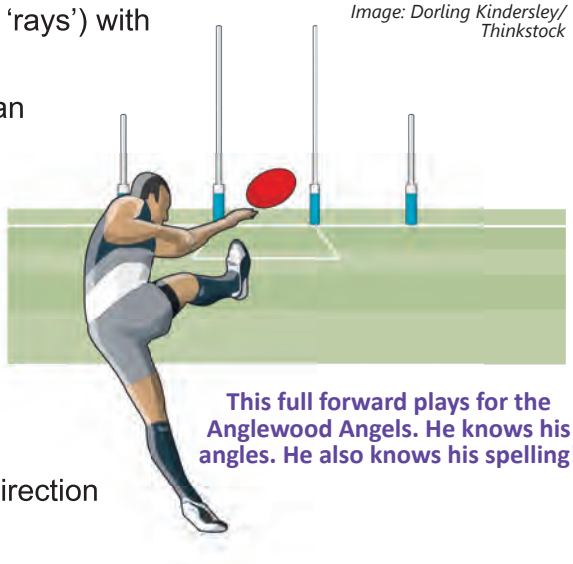
An angle is measured in degrees. One full turn of an angle equals 360º.

Therefore a 1/4 turn represents 90º. This is called a **quadrant**. Therefore, four quadrants make up an entire 'turn'.

Just like if you face north and turn 90º to face west, turn another 90º to face south, turn 90º again to be facing east, and then 90º once more; you're back facing north.

That's 360º in total. And you're back to the same direction you were in the beginning.

Image: Dorling Kindersley/ Thinkstock



This full forward plays for the Anglewood Angels. He knows his angles. He also knows his spelling!

Types of angles

Acute: An acute angle is less than 90°.

Looking down: Opening a door.

Right: A right angle is exactly 90°.

Looking front-on: Wall meeting a floor.

Obtuse: An obtuse angle is more than 90° but less than 180°.

Looking side-on: A reclining chair.

Straight: A straight angle is exactly 180°.

Looking side-on: Laying down flat.

Reflex: A reflex angle is greater than 180°.

Looking side-on: Doing a hyper-extension on a bench.

Full: A full angle is 360°.

Looking down: Performing a pirouette!

NUM SUPER SKILLS

Angles and dimension 7B

1. Draw or represent these common angles

a.	45^0	b.	90^0	c.	180^0
d.	270^0	e.	360^0	f.	540^0

2. Describe how an understanding of angles is important in personal situations, in recreational situations and in vocational situations.

Applied

An understanding of dimension is important in maintaining personal space, which was a very important element in stopping the spread of COVID-19.
'Acceptable' personal space changes depending on the 'closeness' of our relationships with the other people with whom we share physical space.
As a class, suggest suitable personal space distances for different situations. Go online and look up how personal space can vary in different situations and cultures.

1 4 PS 2 3

7.05 Describing Location

7C Language of location

1. For each of these situations use appropriate language to describe the relative location of the people, objects and equipment shown. e.g. Left, right, behind, next to, and so on! You choose the language that suits.

Image: Thomas Northcut/ DigitalVision/Thinkstock

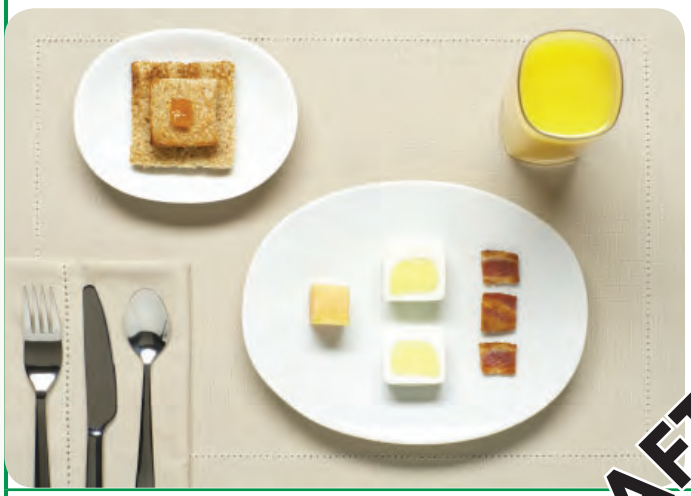


Image: ???/ Depositphotos.com

Image: Pavlo61/ iStock/Thinkstock

2. Use the language of location to describe where these tools are placed.
   Some tools are in an absolute position, (e.g. “top left”). Whereas others might be better described relative to another tool or tools. (e.g. “opposite”).

Image: emojoez/ Depositphotos.com

Location	Description
top left	
top right	
bottom left	
bottom right	
top	
bottom	
centre	
left	
right	

Location	Description
above	
below	
over	
under	
beside	
opposite	

7.07 Getting Around

Directions

A very important set of personal numerical skills includes the ability to be able to both give and follow directions to **navigate** around the physical environment. Directions may be in the following forms.

- **Oral:** Verbally, such as asking someone the way to the nearest train station.
- **Written:** By following a sequence of directions from a starting point to a destination.
- **Visual:** Using a print or digital map to find your way around a location, such as using a store layout map when in IKEA.
- **Digital:** Using GPS in a car, or a maps feature, or an app on your phone, to find key landmarks while on holiday in an unfamiliar city.
- **Physical:** Showing, pointing or leading someone so as to 'act out' appropriate directions.

When we both give and receive instructions we usually use a combination of these methods. However, people have different communication styles; and also different preferred learning styles for understanding information.

Some people like to be shown, some like to be told, some like to follow a map; while others simply just like 'being lost' and stumbling upon something new!

So what type of method of 'directions' do you prefer to use when you are trying to get around?

7D Preferred directions

Comment on each of these methods (for and/or against) to describe your preferences. Describe an example to show how you use this method.

Method	Explanation for me	Example
e.g. Digital	I like to use a map on my phone because I can set my location and see the directions on my screen.	When I travelled to my appointment for work experience in the city I put the address in my phone and followed its directions very easily.
Oral		
Written		
Visual		
Digital		
Physical		

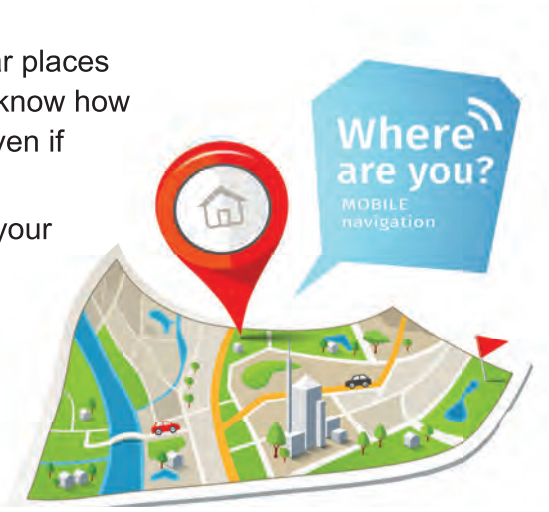
There to here and back again

Sometimes we know how to navigate around familiar places because we have done it before. For example, you know how to get from your home to school, and back again. Even if these two trips use different routes.

But think back to the first time you had to **navigate** your **journey**. How did you work out your travel **route**?

A map? An app? Did someone show you? Did someone take you?

So, now that you are experienced, how would you 'show' someone how to get from there to here, and back again?



The road less travelled 7E

1 4 PS 2 3

1. Sketch a map that shows your usual journey from your home to school.
2. What types of information should you show on your map?
3. On your map, show a different travel journey that you can use to get home.
4. Why might people travel one route to get to a destination, and then a travel different route to get back again? Discuss examples as a class.

Start to plan your map and journeys below.
Then create your map using paper, or multimedia.

7.09 Getting Around

Using maps

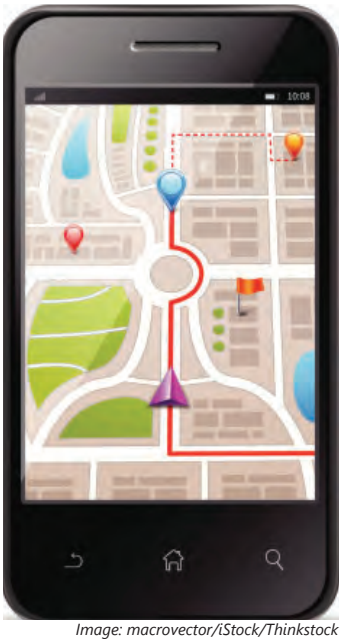


Image: macrovector/iStock/Thinkstock

Whether you are using maps to get around, or you are drawing a map to help others, you have to make the map functional so that it can be effective.

This means that the map must guide the person as to how to get from their origin to their destination.

The map should also be efficient.

This means that the map needs to enable the person to quickly and easily work out how to get from their origin to their destination.

Three key mapping features that make a map more usable (i.e. both more effective and more efficient) are **pathways**, **landmarks** and **scale**.

Pathways

When using or making a map, you are likely to trace a travel route (or a pathway). A pathway is the **route** that includes the ways to go from 'point A' to 'point B'.

A person might mark the route on the map they are going to follow. Or they may trace it with their finger to commit this into memory.

GPS, street directories and map pathway routes might include roads, streets, highways, freeways and other methods of travel.

Many GPS and e-devices will bring up a pathway route when you enter in your destination. These devices might also communicate the route aloud. In fact many people follow these verbal instructions when travelling.

Pathways are also important as escape routes for emergency evacuation procedures. Have you noticed any of these, usually as green arrows, around your school?

Pathways might also include public transport routes, bike paths, pedestrian traffic areas, waterways, terminals and exchanges (e.g. airports) and so on.

7F Maps: Pathways

What is a map 'pathway'?	Why is a map pathway important?

Features and landmarks

Image: tovovan/ iStock/ Thinkstock

Most maps will include common or key features or landmarks.

These **landmark** features might include places of interest, government buildings and services, emergency facilities, green areas, schools, signs, landmarks and other distinguishing and useful features.

Landmarks might be located in the correct spot on the map, but may not be drawn to scale.

Map features help people by getting them to look out for key landmarks that they might notice on their journey. For example:

- ⇨ "If you reach the canteen then you've gone too far."
- ⇨ "Turn left at the traffic lights."
- ⇨ "When you come to the double-storey house keep going, because mine is three doors down."

Scale

Most maps are usually drawn to scale. This means that the distance shown on the map corresponds with a distance in real life.

Scale allows the user of a map to make a fairly accurate estimate of travel distance and time. Therefore it helps us to get our bearings. However, not all maps are drawn to scale, nor do they need to be.

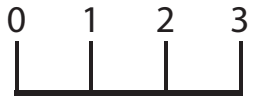
So when you are using a map see if it is to scale or close to scale. Also, if you are constructing a map, then try to make it close to scale so that people can estimate approximate distance and time. Your teacher will help you with this.

If the map is for a short distance then the scale will be quite generous, e.g. 1cm = 1m (i.e. a school or shop map).

If the map is for a large distance the scale will be quite economical, e.g. 1cm = 1km (a street or town map).

Scale = 1:100

1 cm = 1 m



Maps: Landmarks & scale 7G

What are map 'landmarks'? How are map landmarks useful?	What is a map scale? How does a scale help a map user?

7.11 Getting Around

Which way do I go?

Ever been lost? Of course you have. Well a good map would've come in handy.

The growing use of apps, satellite navigation systems and GPS demonstrates that people have trouble reading maps. They would rather be told where to go by a smooth, but insistent voice. Our use of contemporary digital maps is one of the most common ways that we use **systematics**. So how reliant are you on your digital guide?

"Take High Street for another kilometre Marcel. Turn right at 200 metres Marcel. You missed your turn Marcel. Where are you going Marcel? You're not going to Hungry Jacks again are you Marcel? You know that you are trying to lose weight Marcel. Why have you taken your hand of the steering wheel Marcel? Why did you throw me out the window Marcel?" "I am now lying on Ballarat Road. Do a U-turn and..."

Distance

As you already know, distance is a 'how far' sort of measure.

"How far is it to the Melbourne CBD?"

For some of you, not very far (especially if you live locally in one of the city's nearby inner suburbs!

What about people in Melbourne's expanding outer west? And those living east, west, south, outer east, or north, or north east or south east? What about those in Bendigo, Wangaratta, Benalla, Yarram or Bairnsdale? How about those in Mallacoota, Mildura, Wodonga or Swan Hill? And let's not forget about those of you in another state.

So what do you reckon? How far - from where you are sitting right now - to the city? How will you know?

Travelling: How long?

- Distance of journey from origin to destination.
- Day of week e.g. work day vs weekend.
- Time of day e.g. peak hour vs off peak.
- Mode of transport e.g. public vs private transport.
- Familiarity with journey.
- Weather conditions.

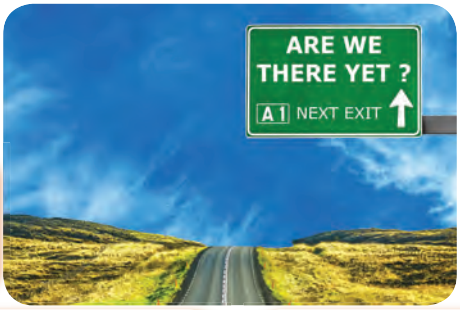


Image: Alexis84/ Depositphotos.com

Time

When we are travelling, knowing the distance of our total journey from our **origin** to our **destination** is only one part of the equation. The more important number that we need to work out, is the **time** it might take to travel that distance.

Sometimes we don't even need to worry about the distance. If you are catching a train to the city for a job interview you don't really worry about how far you have to travel. What you are likely to be more concerned with is how long it takes you to complete the journey.

If you are travelling by public transport you will check **timetables** (using **systematics**).

If you are travelling by car you will rely on someone else's expertise to advise you. They are likely to be able to estimate travel time based on their own **knowledge** and **experience** of travelling at this time of the day.

However, if you are getting there under your own power, such as by cycling, then you will need to know the distance. You will factor in how **fast** you usually cycle - let's say an average of 20km per hour. Then there's the **distance** - let's say 20km. So that's 20km/20kmh which actually equals 1 hour! (You did this in **Relationships**).

You will need to add more time for traffic conditions, traffic lights, getting lost in the city, parking and locking your bike, freshening up, changing clothes, finding the building, getting to the right place in the building and so on.

So what time is the appointment? Better give it another 30 minutes at least to do those other things. Also better hope it doesn't rain and you don't want a puncture. That's lots of things to consider. Especially if you are giving directions to someone else!

Getting around 7H

1. Estimate the distance to each of these destinations. How much time do you think it will take to travel to these destinations using these transport methods?

Journey	Estimated distance	Journey time: by car	Journey time: by public transport	Journey time: by your choice
a. Your school to your home.				
b. Your home to the nearest train station.				
c. Your home to the CBD.				
d. Your home to the airport.				
e. Your home to your workplace.				

2. Research these distances and times using maps, GPS or other resources. Set up another table in your workbooks. How well did you estimate?

1 4 PS 2 3

7.13 Putting it Together

7I Whereabouts?

Use the map below to identify the location of the features and landmarks and other information in the table on p.169.

- ⇨ The map is not exactly to scale, but it is pretty close.
- ⇨ Of course the size of people, vehicles and other features may not be that large - especially the duck - ducks don't come that big!
- ⇨ You could do this working in pairs, but each of you should fill in your own table. If you need more space, enlarge the table, or use your workbooks.

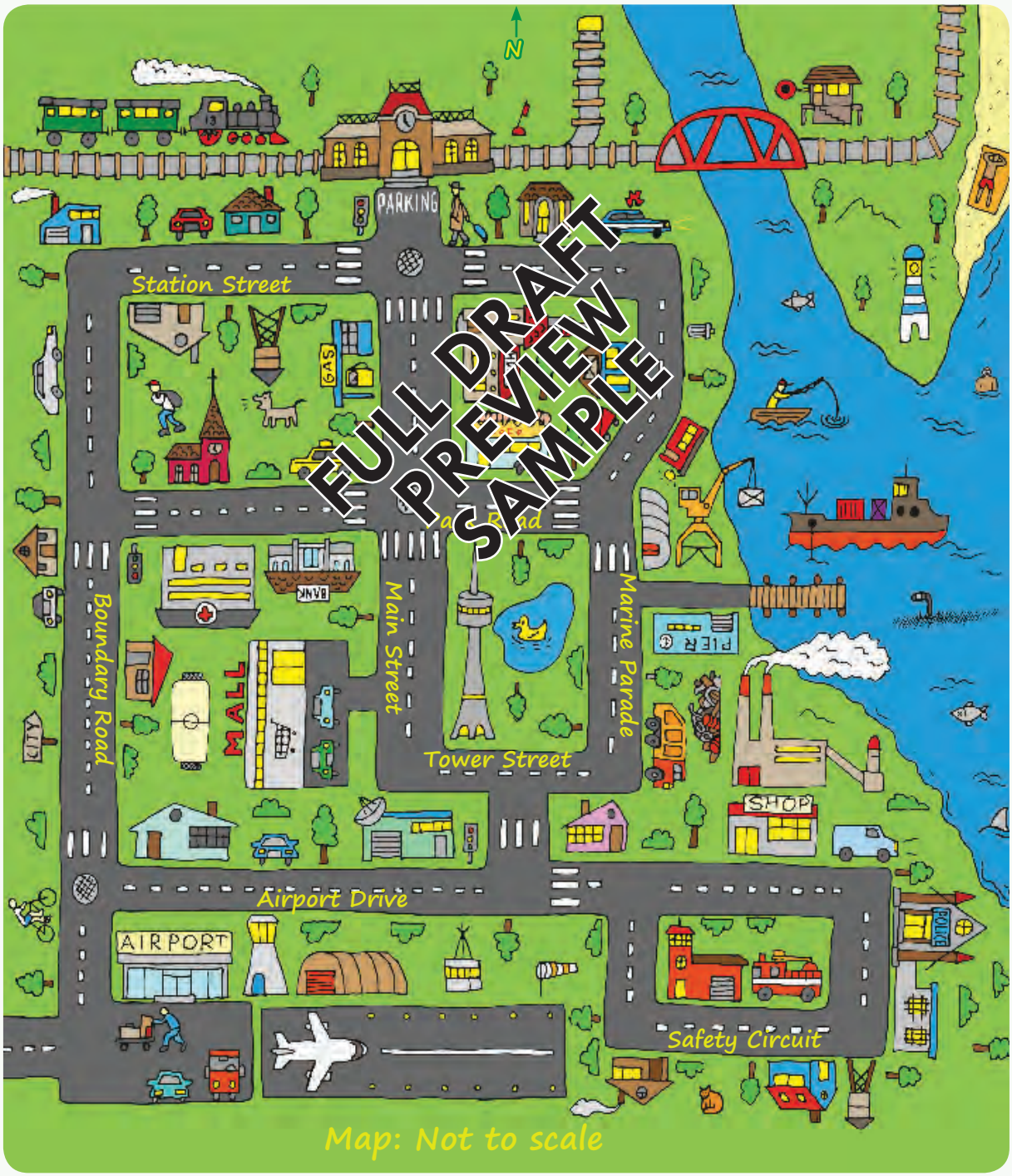


Image: WINS86/Depositphotos.com

On which 'roadway' is the train station?	On which 'roadway' is the fire station?	On which 'roadway' is the pier?
On which 'roadway' is the airport?	On which 'roadway' is the shopping mall?	On which 'roadway' is the hospital?
On which 'roadway' is the petrol (gas) station?	On which 'roadway' is the garbage tip?	On which 'roadway' is the city edge?
On which 'roadway' is the church?	On which 'roadway' is the police station?	On which 'roadway' is the viewing tower?
What is the nearest intersection to the hotdog van?	What is the nearest intersection to the church?	What is the nearest intersection to the duck pond park?
What is the nearest intersection to the railway bridge?	What is the nearest intersection to the bank?	What is the nearest intersection to the taxi rank?
Which 'roadways' run north-south?	Which 'roadways' run east-west?	On which side of town is the water?
On which side of town is the boundary?	At which end of town would you enter and leave via roadway?	The train only runs in one direction. From which direction does it enter town?
What is the direction of the police station relative to the hospital?	What is the direction of the airport relative to the train station?	What is the direction of the shipping port relative to the airport?

Give directions for someone walking from the mall to the police station.	Give directions for someone driving from the airport to the hotel.
Assume Boundary Road is 1km long. How long might it take to walk, cycle and drive?	Assume Park Road is 0.5km long. How long might it take to walk from the hospital to the tip?
Where is the no-though road? Why?	Is there any vehicle access allowed between Tower Street and Airport Drive? Explain?
Where's the beach? How could you get to it?	Where should you avoid swimming? Why?

7.15 Putting it Together

7J Check out da 'hood

Get hold of a street directory or print a map of your local area. Make a copy for educational purposes. On the map locate and highlight the following features.

a. Your home.

b. The homes of 2 other members of the class or other local people that you know.

_____

_____

c. The major arterial roads.

d. Public transport routes.

e. 4 landmarks or places of interest.

_____ _____

_____ _____

f. In your workbooks use the scale to calculate the following.

   i. Distance from your home to each of these 2 people both 'as the crow flies' and by road.

   ii. Length and breadth of the map covered.

   iii. The time it would take you to walk the length and breadth of the area covered by the map.

7K School map grid

When drawing maps it is best to use a grid. The grid should correspond to a scale.

1. Use the grid opposite to draw a map of your school.
2. If your school is too big then draw a map of one level of your school. Your teacher might instruct class members to each map a different section of the school. You could do this task working in pairs. You need to have suitable measuring devices and tools.
3. Work out your scale and orient your page before you start.
4. Make copies of the grid opposite before you start; or design your own grid.
5. Do rough sketches and plans first. Perhaps use multimedia for your final map.
6. On the map include the key features below:
   - ⇨ rooms, exits, fire extinguishers, stairs, toilets, windows, heating ducts or vents or air-conditioning vents (plus others of your own).

Name(s): _____

Map of: _____ **Date:** _____ **Scale: 10mm:** _____

7.17 Using Maps

Drawings maps

When someone asks you to draw a map for them you are taking responsibility for them arriving at their destination safely and quickly. You have to design the map with the following practical features in mind.

- The traveller needs to be able to read the map quickly and easily.
- All key roads, turns and landmarks need to be clearly marked and easily identified.
- You might need two maps, a long-distance map showing the suggested major route, and then a short-distance map with exact directions that show how to get to a specific destination.
- Directions need to be clear e.g. N, S, E, W, etc., or turning left or right.
- Long-distance maps should either be close to scale and show this scale; or they should have estimated distances and travel times.
- Short-distance maps should be to scale and should show the scale.
- A contact phone number can be included on the map to help the traveller.

7L Get me here!

I'm not very good at following directi[illegible] on how to get to your school. Where am I? I am at Flinders Street St[illegible]ot in Victoria, then I am at your main CBD railway station.)

1. I need to know how to ge[illegible]sport. Draw me a map.
   a. What modes of public transport should I take? Do I need to take any interconnecting services?
   b. Where do I catch these? How often do they leave?
   c. What 'tickets' will I need to buy, where can I buy them from, and how much will they cost me?
   d. How long will my journey take?
   e. When I get near your school am I going to have to walk much at all?
   f. Don't forget to include directions, street names and major landmarks.
2. Maybe I will drive my car to get to your school. Draw me a road map(s).
   a. What roads should I take? In which direction am I heading while on these roads?
   b. What major landmarks should I look out for?
   c. Are there any tricks and turns I might miss? Help me out.
   d. How long should my journey take?
   e. Calculate the approximate petrol cost for the journey.
   f. What about catching a taxi or an Uber? Do you think that this is a good idea? Why/why not?

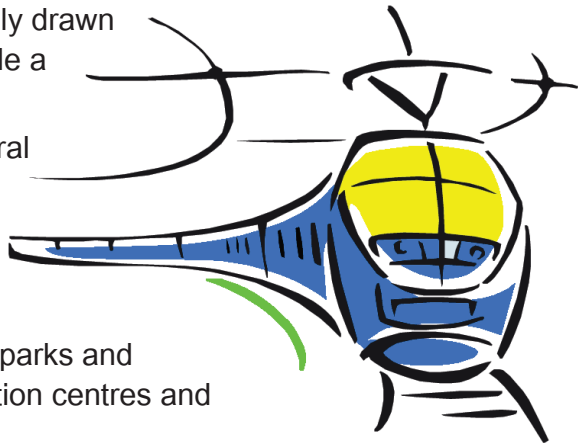
Name(s): _____

Map of: _____ **Date:** _____ **Scale: 10mm:** _____

7.19 Using Maps

Using Maps

Maps do not need to be to scale or even accurately drawn to be useful. Some maps are abstracts and provide a diagrammatic overview of a feature or facility.



The idea of these types of maps is to give a general guide to the user. They usually represent the information in an easy-to-read diagrammatic form. This makes them very user-friendly.

These types of maps are often used for public transport systems, shopping centre maps, theme parks and attractions, tourist guides, building maps, information centres and other related situations.

7M Training time

Shown on p.176 is a map of the Melbourne metropolitan train network. The map is not to scale. But in most cases the length of the lines do reflect the number of stations.

- ⇨ Listed on the map are the different train lines with the final station of each line.
- ⇨ Also shown are some V-Line services indicated by - - - - - - and diesel services shown by ~~~~~.

Working in pairs you are required to choose a section of the system either:

- ❑ North: Upfield, South Morang and Hurstbridge
- ❑ South: Sandringham, Frankston, Cranbourne and Pakenham
- ❑ East: Lilydale, Belgrave, Alamein and Glen Waverley
- ❑ West: Craigieburn, Sunbury, Melton, Werribee and Williamstown.

1. For each train line in your section complete the following.
   a. The names of each station.
   b. The distances of each station from the CBD.
   c. The cost of a trip to the station from the CBD.
   d. Indicate these on the map. (Enlarge the map to A3, or use multimedia.)

Draft/workings/other information

2. For each train line in your section complete the following.
   a. Find out the travel times to each station from the CBD.
   b. Find out the travel times from each station to the CBD.
   c. Find out the peak and off-peak travel frequencies.

Draft/workings/other information

3. Calculate the following travel times and distances.
   a. It's 07:30 hours on a weekday. If you set out from Pakenham station when will you arrive at Watergardens?

   b. It's 14:35 on a weekday. If you set out from Hurstbridge when will you arrive at Werribee?

   c. It's 17:55 on a weekday. If you are at Frankston, when will you get to Craigieburn?

   d. It's 18:55 on Sunday. You need to go from Nunawading to pick up a friend in Oak Park and then back to the city to go out. Do you need to make this whole trip?

7.21 Using Maps

Word up 7N

1
4 PS 2
3

Sometimes we have to give people verbal instructions and directions which can result in a range of communication difficulties. Discuss these case studies and then provide verbal directions for each person. Why not model these scenarios?

Dimi needs directions to walk from your nearest railway station to your home. He texts you saying his phone is about to die, but he reckons he has 15 seconds of time left. Plan and then communicate your 15-second message to Dimi.

Paola is vision-impaired and uses a guide dog. She is to visit your school and needs directions from the town centre. She needs clear and explicit directions in one phone message, including time estimates.

Cousin Tor is visiting from overseas. His English is very limited. The cab has dropped him in the next suburb (or town). He doesn't have enough money for another cab but could afford public transport (if it exists). Direct him to meet you at an identifiable local landmark.

7.23 Maps and Apps

Maps v apps

One of the most interesting outcomes of modern technology is watching people walking around streets while using their devices to find out where they are going. Perhaps they should just look up?

However, there is no doubt that mapping **apps**, **GPS** and other technological locators can provide enormous benefit for travellers. And they are very useful when one is lost!

On the downside, screens can be too small to show a large physical environment, the GPS often suggests routes that ignore local knowledge (which can increase travel time), and users may dumb down and become technologically dependent.

Old-style **paper maps** and **street directories** can also be extremely useful in the right circumstances.

Users can see a larger area, instantly recognise features, and orient the map in the direction they are travelling.

However, they can be too large, can date quickly and are a distraction when driving.

Image: Sergey Nivens, iStock/Thinkstock

7O Maps vs apps

List the advantages and disadvantages associated with using 'printed maps' such as a street directory, as opposed to electronic maps such as GPS or a phone app.

Advantages		Disadvantages	
Printed maps	**GPS & apps**	**Printed maps**	**GPS & apps**

Old School vs New School
Recreational Numeracy // or Personal

AT2a

1 4 PS 2 3

Jorgen, is an exchange student who has just arrived from Denmark. As yet, he has no access to mobile technology. He wants instructions on how to get from your school to the CBD (or major regional town centre) using public transport. He is then going to hire a car for the weekend. He wants instructions on where to hire a car. Jorgen is then planning to drive to visit a zoo (or animal sanctuary), a beach (or lake or river), a BBQ/recreation area in a national park and an Indigenous activity or cultural centre. He would also like to know where to stay overnight as part of his adventure.

Split into 4 groups for this challenge. You are going to use 4 different methods to plan and communicate travel directions, instructions and advice. Each group will choose 1 method, or your team will allocate the methods to different members.

- ❑ motor vehicle GPS system
- ❑ app on a mobile phone
- ❑ maps function on a desktop or laptop
- ❑ a street directory or paper maps

Complete the following tasks

1. Research and prepare travel instructions, costs and travel times for Jorgen.
2. Produce and prepare any relevant hard-copy maps and instructions.
3. Does Jorgen need to use any mobile mapping technology to find his way around? Explain.
4. List any advantages associated with your particular mapping method.
5. List any disadvantages associated with your particular mapping method.
6. Prepare a group report to the class to communicate your advice and instructions.
7. As a class conclude on the strengths and weaknesses of each method.

Name(s):

Key dates:

AOS5: Dimension & Direction

Recreational or Personal Numeracy

Tasks - AT2a: Old School vs New School	Must do?	Due by	Done	Level
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	
Identify the maths / Act on & use maths / Evaluate & reflect / Communicate & report				
Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Apply and compare mapping options.**	✓		○	
Present a report to the class	✓		○	

7.25 Assessment

AT2b Lay it Out
Recreational Numeracy // or Vocational Numeracy

1
4 PS 2
3

For this assessment task, you are required to create an annotated **map**, **sketch** or **diagram**, or an annotated series of **images**, to describe dimensions and direction in an applied situation. As part of this, you need to include key angles.

You can apply your focus to either a **recreational situation** or a **vocational situation**, depending on advice from your teacher.

Recreational Numeracy: Dimension and Direction

Choose a physical space or area you are familiar with, or make use of. It might be a workspace for an art, craft or hobby, or a sporting or playing area, or even a gaming set-up.

1. You need to create a close-to-scale diagram of the 'area'.
2. Describe how the area or field of play; or the workspace, or the immediate area is set out.

Include the following (if they apply) and add other relevant features to your applied recreational situation.

- ❑ size and dimensions
- ❑ location of people
- ❑ importance of angles
- ❑ movement requirements
- ❑ movement patterns
- ❑ static and fixed features
- ❑ mobile or modular features
- ❑ placement of any equipment, tools, electricals and other required items as relevant
- ❑ safety zones or boundaries
- ❑ accessibility features
- ❑ other (as relevant):

3. Evaluate the effectiveness of the layout of the area.
4. Suggest, show and explain possible improvements.

Vocational Numeracy: Dimension and Direction

Choose a workspace you are familiar with. It might be from your workplace, or a work environment for an occupation you are interested in.

1. You need to create a close-to-scale diagram of the workspace.
2. Describe how the workspace or immediate work environment is set out.

Include the following, and add other features as relevant to your applied vocational situation.

- ❑ overall layout
- ❑ fixtures and fittings
- ❑ importance of angles
- ❑ static equipment
- ❑ mobile equipment
- ❑ ICT, tools, utensils, etc.
- ❑ inputs and consumables
- ❑ stock and work-in-progress
- ❑ location of people
- ❑ worker and customer flows
- ❑ lighting
- ❑ electrical outlets
- ❑ safety equipment
- ❑ emergency exists.

3. Evaluate the effectiveness of the layout of the workspace.
4. Suggest, show and explain possible improvements.

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS5: Dimension & Direction

Recreational or Numeracy

Tasks - AT2b: Lay it Out	Must do?	Due by	Done	Level
My applied focus is:				
Negotiate the task details with my teacher.	✓		○	
1. Create diagram of the workspace, or area.	✓		○	
Include dimensions and other physical features.	✓		○	
2. Describe how the workspace, or area is set out.	✓		○	
Indicate relative location of key features.	✓		○	
Use correct language of dimensions and direction.	✓		○	
Source or create suitable images or symbols.	✓		○	
Provide appropriate description of key angles.	✓		○	
Evaluation				
3. Evaluate the effectiveness of the layout	✓		○	
Use descriptive evidence for the evaluation	✓		○	
4. Suggest possible improvements to the layout.	✓		○	
Apply descriptive evidence to the improvements.	✓		○	
Part 3: Reporting				
Draft my annotation and submit for feedback.	✓		○	
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	
Develop and apply mathematical tools and techniques.	✓		○	
Prepare and submit final annotation & descriptions.	✓		○	
Present a report to the class (if required).	○		○	

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

Additional information:

Signed: _____ Date: _____

7.27 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT2 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit

Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

What's the Chances 8

Activities 8: What's the Chances		p.	Due date	Done	Comment
8A	**What are the chances?**	185			
8B	**Uncertainty and likelihood**	187			
8C	**Coincidence**	189			
8D	**Luck**	191			
8E	**Not likely**	19			
AT3a	**On a Roll - Investigating Chance**	19 195			
AT3b	**Sports and Games**	196- 197			
AT3c	**I Like the Red Ones**	198- 201			
PST	**Problem-Solving & Toolkit**	202			

Comments:

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8.01 Uncertainty and Likelihood

Good luck

Are you lucky? How do you know? Just what is luck? Perhaps fortunate is a better term to use. So how fortunate are you? Are you likely to lead a fortunate life and build a fortune? Or are you hoping to get lucky and strike it rich through a win on Powerball, or through some long-lost, rich relative making you their sole heir?

When highly-successful people (who are often very wealthy, although this doesn't need to be a measure of success) are interviewed about their success, they normally cite these factors:

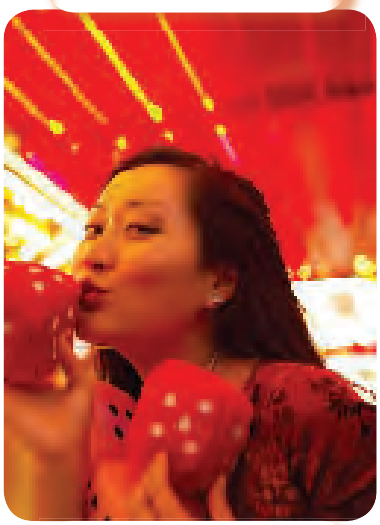
- hard work
- good planning and goal-setting
- good communication and people skills
- effective teamwork
- high-level knowledge and expertise in the field
- appropriate timing
- passion
- persistence, and
- surrounding themselves with highly-skilled and motivated people.

Image: dizanna/ Depositphotos.com

They rarely, if ever, say that luck was a reason for their success, apart from sometimes saying that they were in the right place at the right time, which really is a measure of good planning rather than luck).

So where does this leave you?

What Chance Do I Have?



Likelihood

Probability

Odds

Luck

Chance

Probable

Unlikely

Coincidence

Random

Conditional

Unconditional

Cause

Effect

Apophenia

Good luck with that!

Probability is often expressed using different language. Consider these examples. Some are about making a choice, or about playing a game, which can be about having a bit of fun.

But many of these examples are based on gambling - which by its very nature - is precisely calculated, to ensure that almost every person participating will lose their money.

- Coin toss = 50/50 (which is an even chance).
- Drawing a heart card = 25% or 1/4.
- Die Roll = 1 in 6.
- American Roulette spinning a single number = 37 to 1.
- Saturday Lotto = One in 8,145,060 chance.
- PowerBall Australia = Almost 135 million to 1.

What are the chances? 8A

1. Your teacher will show you how to calculate probability based on chance (if you don't already know). Complete the table below based on what you learn.

Coin Chance of tossing a head? Chance = 1 out of 2 Probability = 50%	**Coin** Chance of tossing a tail?	**2 Coins** Chance of tossing 2 heads?
Die Chance of rolling a 6? Chance = 1 out of 6 Probability = 16.7%	**Die** Chance of rolling a 1?	**2 Dice** Chance of rolling a 12?
Rain Chance it will rain tomorrow?	**Roulette** Chance of ball landing on red?	**Toast** Chance that dropped toast will fall butter side down!

2. Respond to this statement.
"If gambling was about winning, then we'd all be rich. And we're not. So what is gambling really about then?"

8.03 Uncertainty and Likelihood

Uncertainty

If there's one thing that is certain in life it is that nothing is certain. We live our personal, educational, social and vocational lives through a series of actions and events.

Our actions help determine outcomes. You might have already learned about **locus of control** in respect to planning your career and developing your personal health and wellbeing. So an important part of your actions is recognising, and dealing with, uncertainty.

One strategy to help you do this is by having more **information** at your disposal. The more information you have, then the more likely you are to make better **decisions**.

A second strategy is to develop an understanding about **risk**, and then implement ways to **minimise risk**. Risk is a normal part of life. All actions have an element of risk. From driving a car to flying in a plane. From starting a job, to opening a business, to starting a new relationship. It's how we understand and deal with risk that is important.

Another strategy is to understand about **likelihood** and **probability**. This involves understanding chance, randomness, and cause and effect. This doesn't involve luck, guessing or 'carnival tricks' such as consulting a psychic.

For example: Likelihood

In simple terms, likelihood refers to the chance of something occurring.

If you toss a coin, then there is a 50% chance of it coming up heads, and a 50% chance of it landing as tails.

So if someone is hoping for a certain outcome, such as the Australian cricket captain wanting to bat first, then they have as much chance of getting their preferred option as does the captain of the English team, Eoin Morgan (Steve Smith).

The same principle applies to rolling a die. There is a one in six chance of rolling a '5'. That's the same likelihood as rolling a '1', a '2', a '3', a '4', or a '6'. That's not very good odds at all: 16.7%.

You wouldn't want to risk something substantial on that roll of the die as you have an 83.3% chance of losing! So you could say that the most likely outcome is losing and the least likely outcome is winning!

And of course people like playing card games.

If you are asked by a magician to choose a suit, and you select Hearts, then there's a 1 in 4 chance of you randomly picking a card that is a Heart (13/52).

If the magician instead told you to pick a face value, and you selected 'Ace' then there's only a 1 in 13 chance of you randomly selecting an 'Ace' (4/52).

If the magician now asked you to pick one card, and you choose the Ace of Hearts, then there's only a 1 in 52 chance of you selecting that card.

So the likelihood of you being lucky is getting smaller, and smaller and smaller, because the specificity of the selection is becoming more precise.

However, if the magician asked you to choose a card, in your head, but not tell them, then what chance do you think the magician would have of pulling that card from the deck? Well, if they're good at their craft probably close to 100%. Why is that?

Image: VitalikRadko/ Depositphotos.com

Probability

Randomness

- Randomness refers to the absence of a noticeable or measurable pattern or sequence to events.
- e.g. Rolling a fair die. The number that is rolled is random and could be anything from 1 to 6.
- On the next roll, the outcome again is random. And so on.

Unconditional probability

- Unconditional probability is an outcome that is not affected by any previous or future events.
- e.g. Tossing a coin. The coin doesn't 'know' what happened before. The probability resets to 50% each time.
- Unconditional probability measures randomness. It doesn't predict an outcome, it only gives the likelihood of an outcome.

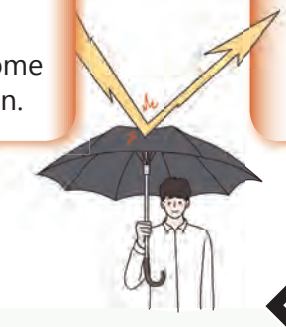


Image: Elada/ Depositphotos.com

Uncertainty and likelihood 8B

In your own words explain the meaning of r[illegible]ness and the meaning of likelihood. Explain how each of these m[illegible] play a part in your personal life, and in your vocational life. Report back to t[illegible]

	In my personal life	In my vocational life
Randomness is...		
Likelihood is...		

Applied

What's the weather going to be tomorrow? Fine? Rainy? Windy? How do you know? How do 'they' know? How do meteorologists apply uncertainty and likelihood to weather forecasting?

View

Penn and Teller are recognised as the two greatest magicians of the contemporary era. Watch some episodes of Penn and Teller: Fool Us.
How do magicians create 'tricks' that make the extremely unlikely, happen?

8.05 Coincidence and Luck

Coincidence

As humans we need to assign 'order' to the world around us. One way that we do this is by noticing **coincidence**.

Coincidence occurs when we connect two or more unrelated events to each other. As part of coincidence we make a connection that isn't really there. Instead, we infer a connection by linking random events together.

Coincidence isn't reality. But it feels like it. Especially if there is a strong emotional connection between people, or if the outcome is important (either positively or negatively), or the event has significant meaning such as a special date or anniversary.

Image: Fo[illegible]elin/ Deposit[illegible]om

So have you got any strange or freaky coincidences to share with the class?

For example, do any of your classmates share the same birthday?

For example: Coincidence

Manny was thinking about an old crush he had at work in school. He rejoins the present, checks his Facebook notifications and one of his friends has commented on a school reunion post by his old flame Marjorie tagging Manny. Manny is not connected with his past 'love' at all. Mysterious Manny!

Teonie has bought a dress for the formal. She keeps it a tight secret. On the big night she arrives in style steps out the limo to pose for the photos, and her bff appears wearing the same dress. Traumatising Teonie.

Seren had a particularly vivid dream that they were changing into a butterfly. On the way to school, a beautiful multi-coloured butterfly landed on Seren's shoulder. Serendipity Seren!

Surhan is playing his first game of cricket. In a rush to get dressed he puts on odd socks. Surhan makes a century on debut. He puts it down to the socks! From then on, Surhan always wears odd socks when batting. But he doesn't always make a century - in fact far from it. Superstitious Surhan!

Mo is calling a football game. The big forward lines up for a set shot from 30m out, directly in front. Mo proclaims that this is a simple shot and it will go through for a goal. But, the forward shanks the kick and Mo laments the commentator's curse. Mozzing Mo!

Laki likes to go to the casino with his best mate Ulbo. When they play roulette Laki gets Ulbo to bet first. Whatever colour Ulbo chooses, Laki bets on the opposite colour. Ulbo always seems to lose and gives up after two bets. Unlucky Ulbo! Lucky Laki!

Sam has lost his keys again. He posts online and his friend Psi says "Have you looked in the front door lock?" Sure enough, the keys are still hanging there! Psychic Psi!

Coincidence 8C

1. In your own words, explain what was happening to each of the guys on p.188. Are their inferences 'correct'?

Manny	Teonie	Seren
Surhan	**Mo**	**Laki**
Lucky	**Sam**	**Psi**

2. Find out about 'Apophenia '. Why do we as humans look for coincidences and patterns that don't really exist? Have you? Should we allow this tendency to influence our decision-making? Explain and discuss using examples.

Applied

Are you psychic? Is anyone? What would be the chances of that?

A useful 'test' of clairvoyance is the Zener card test, as seen in the movie, Ghostbusters (the good one!). The test involves you predicting which of the 5 symbols matches the card. Each time you have a 1 in 5 chance. Go online a find a test. But don't use any site that wants you to create an account to get your results.

Remember, this is just about fun, not reality! **https://psychicscience.org/esp3**

8.07 Coincidence and Luck

Luck

People love to believe in luck. Luck can a real thing. An event happens and you either benefit from it (winning Lotto), or avoid harm from it (surviving a lightning strike). That's good luck.

But it could just as easily have gone the other way. If so, that would be bad luck!

In your personal life, good luck is when you drop your toast and it lands butter side up. Bank it and move on. But don't think it will happen like that next time.

Or you get out of bed quickly and catch the earlier bus. And then you see them. Your heart skips a beat. Your eyes meet, and it's happily ever after. That's good luck. Some call this **destiny**.

Some cultures have strong beliefs in luck. Lucky and unlucky numbers. Lucky and unlucky words. Lucky and unlucky colours. Lucky and unlucky charms. Lucky and unlucky signs and symbols. Lucky and unlucky rituals. How do you think these beliefs evolved over time?

The thing about luck is it's just that - luck! If you start to apply patterns to luck them you're in for a big shock. Luck is not about you. It's about **randomness** and **likelihood**; or even more relevant, unlikelihood.

So are you lucky? Why is that?

Being Lucky vs being fortunate

People often say "I'm lucky because I ha[illegible] or "I'm lucky that I have good health". Sometimes you even get told, "Yo[illegible] you have a roof over your head", or "You're lucky because you a[illegible] But these things don't happen by accident; and certainly not by luck.

It is better to say that we are **fortunate**. Fortunate to have a secure job that brings a steady income into the home. Fortunate to enjoy good health and to not have any chronic illnesses or debilitating conditions. Fortunate to have a stable home; or fortunate to have good genetics or self-discipline.

You might know of people in life who have much more than you, yet they still want more. They might not realise just how fortunate they are.

They try and chase luck and make luck work for them. Sure a few dollars a week on lotto might not do much harm. But dreaming of a better life 'when' they get their big win, because 'they' deserve it - well that's not a very healthy approach to life at all.

We can make our own luck. We can do this by planning, organising, skilling ourselves and taking action.

So how can using the **problem-solving cycle** help you create your own luck? The hint is in its name.

Image: Pazhyna/ Depositphotos.com

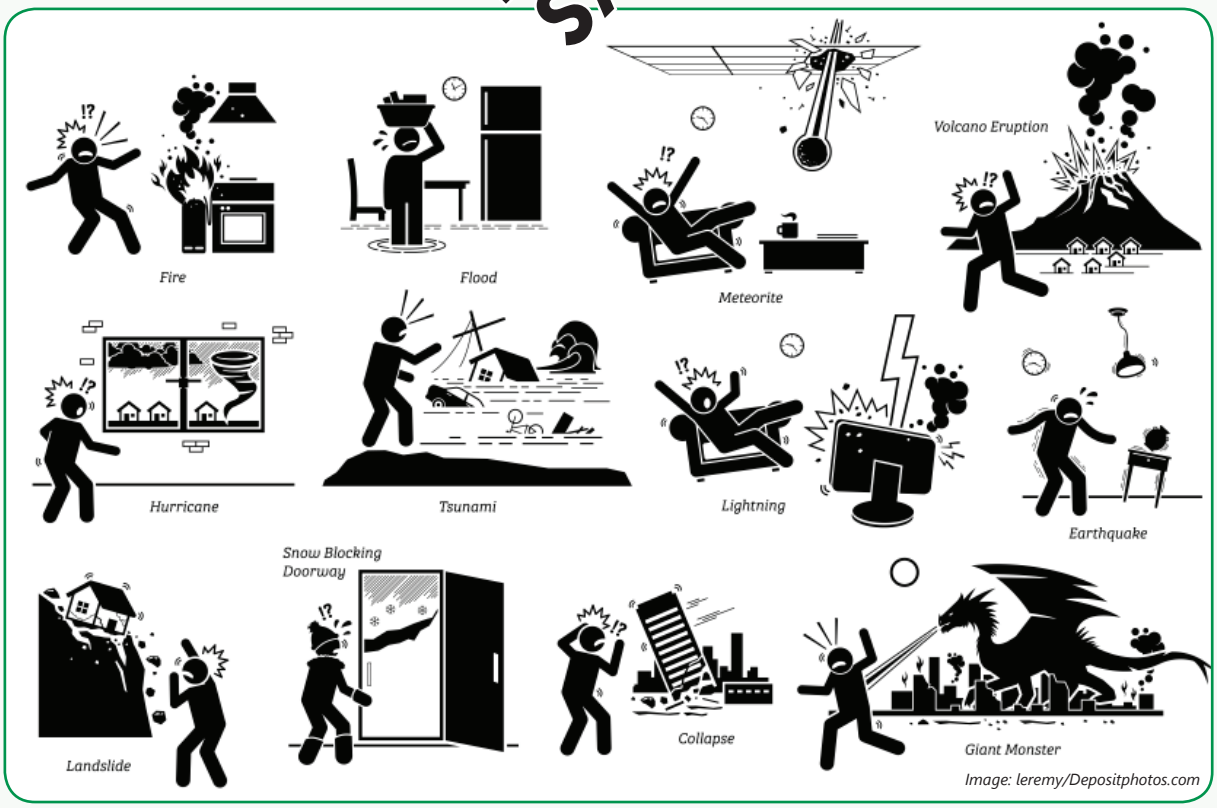
Part A

Why do people want to believe in luck? Find out about the different 'beliefs' about luck held by different cultures. Some of these might be strongly held in your own family circles. Share with the class and learn from each other.

Part B

Meet unlucky Phil. Each time something bad happens to Phil he moves to a new place. But bad luck just seems to follow him. Unlucky Phil also does not believe in climate change. He says he has a right to an opinion on that. Do you agree?

Research the likelihood of each of these events happening in Australia. Are there certain locations in Australia where these are more likely to happen? What about in other places in the world? What sources did you use? Report back to the class.



8.09 Sample Spaces

Compound probability

A compound probability refers to the likelihood of two or more independent outcomes occurring.

Using coins as an example, what is the probability of spinning 2 heads in a row?

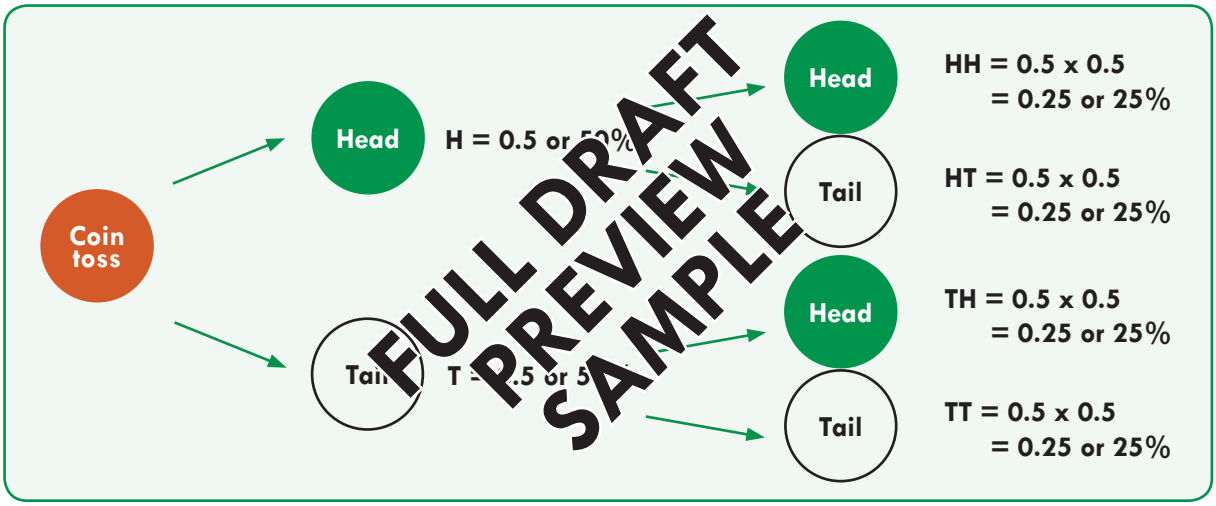
The probability of this is 1/2 times 1/2 which equals 1/4 (or 25%).

We can say that over 2 spins there are 4 possible outcomes.

- Head then head, or
- head then tail, or
- tail then tail, or
- tail then head.

Each of these 4 outcomes has a 25% chance of occurring. And the 4 probabilities add up to 100% (which they must)! So as you can see, the probability of 2 heads in a row is 1 in 4 (or 25%), which is what we calculated right at the beginning.

We can show compound probability on a sample space (a tree diagram).



Tree diagram

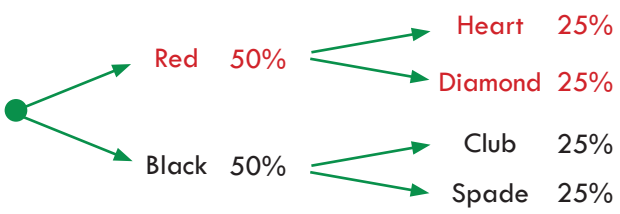
A tree diagram is a visual tool to display all the possible outcomes of an event.

You can use the tree diagram to calculate the probability of all the possible outcomes, because each branch in the tree diagram represents a possible outcome.

In a tree diagram all the possibilities must add up to 100% - naturally! But of course some outcomes may have a lower probability of occurring, whereas some might have a higher probability.

For example, the chance of drawing a red card from a standard 52-card deck is 1 in 2, or 50%. The chance of drawing a heart is 1 in 4, or 25%. The chance of drawing an Ace is 1 in 13, or 7.7%, and the chance of drawing the Ace of Hearts is 1 in 52 or 1.9%!

e.g. Probability of drawing a particular suit from a deck of playing cards.



NUM SUPER SKILLS

Not likely 8E

1 4 PS 2 3

1. What is luck? Give an example. Are you lucky?

Your uncle Tomot is a hard-headed man who believes in luck. Last week he walked into the casino and saw that the previous 8 spins on the roulette wheel were black, black, black, black, black, black, black, black. He immediately bet all his money, $100, on red and won.

2. How much did Uncle T win? Why did he win?

Tomorrow, Lucky Tomot is going back to the casino. He is going to play the same system as last time. He has taken his savings, $2,643, and family members have also given him some of their own money to bet. He will be taking over $5,000.

3. Will you give him any of your own money? Why/why not?

4. How is this story likely to end? Discuss this as a class.

Extension

1 4 PS 2 3

a. Play some roulette in class using toy wheels. Give each student a 'pretend' $100.
b. Before you start, have a class discussion about what is likely to happen.
c. How do you think you will go personally? Have you got a strategy you can use?
d. Carefully record all bets and winnings.
e. Who are the winners/losers? Why so?

Note: You don't have to participate directly if gambling is prohibited in your religion, or against your values. But pay attention to how the players behave during the task and report back to the class.

NUMERACY 19

8.11 Assessment

AT3a On a Roll - Investigating Chance
Recreational Numeracy

1
4 PS 2
3

For this assessment task, you are required to record and analyse the chance outcomes associated with rolling a die. Steps:

- ⇨ Get a standard 6-sided die.
- ⇨ Form together into pairs (one rolls, one records), or trios (roller, caller, recorder).
- ⇨ Each person is to pick a different 'lucky' number from 1 to 6.
- ⇨ Develop a record table with at least 60 or 120 spaces on it. Make multiple copies.

1. One cycle (6)

a. Predict the count outcome for each number. What should be the average total?
b. Roll the die 6 times and record the results.
c. Compare the results to your predictions. Do the outcomes surprise you?

2. Ten cycles (60)

a. Predict the count outcome for each number. What should be the average total?
b. Roll the die 60 (54 more) times and record the results.
c. Compare the results to your predictions. Do the outcomes surprise you?

3. Fifty cycles (300)

a. Predict the count outcome for each number. What should be the average total?
b. Roll the die 300 times (240 more) and record the results.
c. Compare the results to your predictions. Do the outcomes surprise you?

4. A hundred cycles (600)

a. Predict the count outcome for each number. What should be the average total?
b. Roll the die 600 times (300 more) and record the results.
c. Compare the results to your predictions. Do the outcomes surprise you?

5. Analysis and Report

a. Show the key averages in a table, and in a visual form (pie or bar).
b. Were there any patterns in the outcomes? Explain.
c. How did your lucky number perform? How does that make you feel?
d. Did luck play any role in the outcomes? Explain carefully.
e. Combine the results for the whole class and re-do your analysis.
f. Have the overall results changed significantly?

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS7: Uncertainty
AOS6: Data
Recreational Numeracy

Tasks - AT3: On a Roll - Investigating Chance	Must do?	Due by	Done	Level
Rolling and recording				
1a Predict the count and average.	✓			
1b Roll and record 6 times.	✓			
1c Compare results to predictions; and make comment.	✓			
2a Predict the count and average.	✓			
2b Roll and record 60 times.	✓			
2c Compare results to predictions; and make comment.	✓			
3a Predict the count and average.	✓			
3b Roll and record 300 times.	✓			
3c Compare results to predictions; and make comment.	✓			
4a Predict the count and average.				
4b Roll and record 600 times.				
4c Compare results to predictions; and make comment.				
Analysis and report				
a. Show averages in a table, and in visual for	✓			
b. Explain any patterns in the outcomes.	✓			
c. How did my lucky number do? How do I feel ?	✓			
d. Did luck play any role in the outcomes?	✓			
e. Combine class results; re-do the analysis.	✓			
f. Explain the overall results and any changes.	✓			
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			
Develop and apply mathematical tools and techniques.	✓			
Prepare and submit your final report and analysis.	✓			
Present a report to the class (if required).				

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

8.13 Assessment

AT3b Sports and Games
Recreational Numeracy

1 4 PS 2 3

Even Steven the Maths Master says: **"When two opposing teams line up against each other, the probability of each winning, and each losing, must be 50%"**.

Do you agree with Moderate Mike? Or are there other 'measurable' factors that can influence the likelihood, and the probability of winning (or losing)?

For this assessment task, you are required to record and analyse key likelihood and probability outcomes, and the role of chance, luck and other factors, associated with sports or games.

A. Prepare a pre-report based on your understanding right now.

B. Undertake an investigation into likelihood, probability and other factors.

C. Communicate a set of conclusions based on your findings.

Recreation Numeracy: Likelihood in Games

Many games we play for fun involve estimates of likelihood, probability, skill and even a little bit of luck.

You are required to prepare an investigative report into how these measures of uncertainty apply to a game you like playing. Consider:

- ❑ **chance**
- ❑ **likelihood** and **probability**
- ❑ **skill** vs **randomness**
- ❑ **information** and **knowledge**
- ❑ **luck**.

For example, you might investigate a card game, a board game, a dice game, a role-playing or strategy game, or a video game.

Many games rely on dealing with uncertainty such as:

- ⇨ a dice roll or being dealt a good hand
- ⇨ skills such as noticing what other players are doing or discarding
- ⇨ the likelihood of what might happen next, and even
- ⇨ probabilities such as 'fighting' opponents with varied 'power' ratings.

Recreation Numeracy: Likelihood in Sports

Sports participation, supporting a team and watching sports is enjoyed by millions of Australians across many different sports.

You are required to prepare an investigative report into how these measures of uncertainty apply to a sport you enjoy playing or viewing. Consider:

- ❑ **chance**
- ❑ **likelihood** and **probability**
- ❑ **skill** vs **randomness**
- ❑ **information** and **knowledge**
- ❑ **luck**.

For example, you might investigate your favourite sport, team or players; or even your own involvement.

Many sport statistics are expressed in a way that suggests likelihood such as:

- ⇨ scoring a goal or making a 'target'
- ⇨ tactics or set plays
- ⇨ possessions/involvements
- ⇨ application of specific skill-sets
- ⇨ player characteristics, and
- ⇨ even home ground/court/pitch advantage.

You've probably already got some ideas going. So get to work and have fun!

Name(s):

Key dates:

AOS7: Uncertainty
AOS6: Data
Recreational Numeracy

Tasks - AT3b: Sports and Games	Must do?	Due by	Done	Level
A. Pre-report - I am investigating:				
a. How does chance apply?	✓			
b. How does likelihood and probability apply?	✓			
c. How does skill vs randomness apply?	✓			
d. How does information and knowledge apply?	✓			
e. How can luck apply?	✓			
B. My investigation				
a. Measures of chance.	✓			
b. Measures of likelihood and probability.	✓			
c. Understanding of skill vs randomness.	✓			
d. Benefits of information and knowledge	✓			
e. Observations and examples of luck.	✓			
C. Communicate conclusions				
a. Conclusions and evidence of chance.	✓			
b. Conclusions and evidence of likelihood and probability.	✓			
c. Conclusions and evidence of skill vs randomness.	✓			
d. Conclusions and evidence of information and knowledge.	✓			
e. Conclusions and examples of luck.	✓			
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			
Develop and apply mathematical tools and techniques.	✓			
⇨ **Prepare and submit your final report and analysis.**	✓			
Present a report to the class (if required).				

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

8.15 Assessment

AT3c I Like the Red Ones
Recreational Numeracy

1
4 PS 2
3

Overview

Do you like M&Ms? What about Smarties? How about Beanies, or even those generic coloured chocolate buttons? What's your favourite colour? Well, you are going to find out.

You are going to form a pair to investigate the weight, colours and associated averages of these tasty little treats.

To do this investigation properly within your class there must be at least 2 pairs independently investigating each particular brand of treat.

ALLERGEN ALERT: DO NOT USE TREATS WITH NUTS IN THEM.

CAUTION: ALL CONFECTIONARY MAY HAVE BEEN MANUFACTURED USING MACHINERY THAT HAS BEEN EXPOSED TO NUT PRODUCTS.

IF YOU ARE ALLERGIC TO ANY OF THE PRODUCTS OR INGREDIENTS NOTIFY YOUR TEACHER BEFOREHAND. YOU WILL NOT HANDLE THE TREATS UNDER ANY CIRCUMSTANCES. YOU CAN INSTEAD BE THE RECORDER OF INFORMATION.

ALL OTHER STUDENTS MUST USE DISPOSABLE BARRIER GLOVES TO HANDLE THE TREATS, AND THEY MUST BE HANDLED IN A HYGIENIC MANNER.

Stage 1: Estimating

Consider a bag of treats that has individual fun-size serves, e.g. M&Ms and Smarties. You are going to need to set up tables to record this information.

- ❑ a. Find out the colours that are available.
- ❑ b. Estimate the number of each colour in each fun-size serve.
- ❑ c. Estimate the total number of each colour in a bag.
- ❑ d. Estimate the total weight of the treats.
- ❑ e. Estimate the weight of each fun-size serve.
- ❑ f. Estimate the number of treats in each fun-size serve.
- ❑ g. Estimate the total number of treats in each bag.
- ❑ h. Estimate the probability of randomly selecting a particular colour.

⇨ **Task/process/maths tools and information:**

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Stage 2: Investigating and recording

Undertake the following tasks. Record your information in an organised format. Use tables to record your data where appropriate.

- ❑ a. Weigh each fun-size serve.
- ❑ b. Calculate the total weight of treats in the whole bag.
- ❑ c. Count the number of treats in each fun-size serve.
- ❑ d. Calculate the total number of treats in the whole bag.
- ❑ e. Count the colours in each fun-size serve.
- ❑ f. Calculate the total colours in the whole bag.
- ❑ g. Calculate the probability of randomly selecting a particular colour from a fun-size serve, and from the whole bag.

⇨ **Task/process/ maths tools and information:**

Stage 3: Co[illegible]ng and an[illegible]g - Your results

You will need to set out your information clearly in a table. Then you will create relevant graphs/charts.

- ❑ a. Calculate the mean average of each colour per fun-size serve.
- ❑ b. Calculate the median average of each colour per fun-size serve.
- ❑ c. Calculate the mean average of each colour for the whole bag.
- ❑ d. Calculate the median average of each colour for the whole bag.
- ❑ e. Compare the different averages. Explain which average you think is most useful for this type of analysis.
- ❑ f. Create a pie chart that shows the average number or proportion of the different colours of treats per whole bag. Which average method will you use and why?

⇨ **Task/process/maths tools and information:**

8.17 Assessment

Stage 4: Comparing and analysing - Class results

As a class collate the data for each pair's investigation to come up with total figures. Then you will create relevant graphs/charts.

- ❑ a. Calculate the mean average of each colour per fun-size serve for the entire class.
- ❑ b. Calculate the median average of each colour per fun-size serve for the entire class.
- ❑ c. Calculate the mean average of each colour for the whole bag for the entire class.
- ❑ d. Calculate the median average of each colour for the whole bag for the entire class.
- ❑ e. Compare the entire-class averages with your own specific averages. Discuss variations in the results. Which is a more useful measure, and why?
- ❑ f. Create a pie chart that shows the average number (or proportion) of colours of treats per whole bag. Which average method will you use and why?
- ❑ g. Go online and find out the average colours per serve from M & M. How do both your own investigations, and the entire cl[illegible]es' investigations compare?
- ❑ h. Recalculate the probability of randomly se[illegible]ting a particular colour from the whole bag.

⇨ **Task/process/maths tools and inform[illegible]:**

Stage 5: Extension - The milk chocolate melts in your mouth and not in your hand

- ❑ a. Chocolate melts quite easily. At what temperature does this start to happen?
- ❑ b. Did you experience any melting during your investigations? Why/why not?
- ❑ c. Find out and describe why M & Ms were invented. Was this a good idea?
- ❑ d. Is there any difference in the taste of the different colours? What do people prefer? You could work out relevant averages for these preferences.
- ❑ e. Why do you think they make different colours for these treats?

⇨ **Task/process/maths tools and information:**

Name(s):

Key dates:

AOS7: Uncertainty
AOS6: Data
Recreational Numeracy

Tasks - AT3c: I Like the Red Ones	Must do?	Due by	Done	Level
Stage 1: Estimating				
abc Colours in a fun-size serve and in the whole bag.	✓		○	
d e Weight of a fun-size serve and the whole bag.	✓		○	
f g Number in a fun-size serve and in the whole bag.	✓		○	
h Probability of selecting a colour.	✓		○	
Stage 2: Investigating and recording				
a b Weight in a fun-size serve and whole bag.	✓		○	
c d Number in a fun-size serve and whole bag.	✓		○	
e f Colours in a fun-size serve and whole bag.	✓		○	
g Calculate probabilities of selecting a colour.	✓		○	
Stage 3: Comparing and analysing				
a b Mean and median of fun-size serve.	✓		○	
c d Mean and median of whole bag.	✓		○	
e Comparison of averages.	✓		○	
f Pie chart showing colours.	✓		○	
Stage 4: Comparing and analysing				
ab Mean and median of fun-size for class.	✓		○	
c d Mean and median of whole bag for class.	✓		○	
e Comparison of your's and class averages.	✓		○	
f Pie chart showing colours for whole class.	✓		○	
g Online research of colours.	✓		○	
h Calculate probabilities of selecting colours.	✓		○	
Stage 5: Extension	○		○	
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	
Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Prepare and submit your final calculations and report.**	✓		○	
Present a report to the class (if required).	○		○	

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

8.19 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT1 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

Money 9

Activities 9: Money		p.	Due date	Done	Comment
9A	**Money basics**	205			
9B	**Money calculations**	206			
9C	**Notes and coins**	207			
9D	**Making change**	209			
9E	**It's all in your head**	2			
9F	**Calculating money**				
9G	**Percentages**	212-213			
9H	**Change in prices**	215			
AT4	**Working with Money**	216-217			
PST	**Problem-Solving & Toolkit**	218			

Comments:

9.01 Money

Money

When you hear the term money, what does it mean to you?

Money is used as the key tool to make purchase transactions, to pay wages, to accumulate wealth from investments, and for a variety of other purposes.

Money is a **medium of exchange** that uses a recognisable **currency unit** (i.e. notes and coins).

Money might exist in **cash** form, or as **cheques** (mainly in business but becoming less common), and increasingly as **digital** credit values that utilise **eCommerce** payment methods.

Now in the 2020s, more than 50% of all **retail transactions** are made using digital payment methods. And this 'digital' proportion is growing every year.

A huge growth in digital transactions occurred as a result of the COVID-19 pandemic. This event saw people turn more to online shopping. At the same time, there was also a move away from the use of cash in retail and hospitality outlets.

Some people prefer digital 'money' because it's quicker, portable and in some cases safer.

Others prefer cash 'money' because it's quicker, portable and in some cases safer.

So go figure! They're both important to focus on.

What about you? Are you mainly a cash buyer, a digital shopper, or an even mix of both - and why?

And raise your hand if you feel you have enough money. Anyone?

Why do think this is the case?

Estimating & Calculating Money to...

- Add up totals
- Estimate change
- Make change
- Manage your personal finances
- Plan and manage a household budget
- Complete workplace transactions
- Manage business income and expenses
- Pay your bills
- Check your pay
- Plan and save for your future

Image: selensergen/Depositphotos.com

Decimal currency

In Australia we use a **decimal currency**. This means that $1 is made of up 100 cents. People then tend to count money in 10s, 100s, 1,000s, 10,000s and so on.

We use a combination of **coins** and **notes** as money. These coins and notes allow us to carry out everyday transactions. Most people also use **e-transactions** which **debit** (subtract) and **credit** (add) money from and to their bank accounts. Digital amounts are still calculated using these currency units. Many people are now switching to using **digital wallets** on their smart devices instead of carrying cash.

Small items we purchase are usually expressed in dollars and cents, such as $2.50 for a Mars Bar. Large items are usually expressed in dollars, such as $19,990 for a new Hyundai Accent.

Wages are paid as dollars and cents, such as $12.50 per hour for a 16 year-old working in a take-away shop.

People in professional jobs are usually paid a salary expressed only in dollars, such as $65,000 per year.

How much currency do you estimate is in this picture? Now calculate this. How close were you?

Image: robynmac / iStock/Thinkstock

Money basics 9A

1. What is money?

2. What is currency?

3. What is a digital wallet?

4. Which do you prefer, cash or digital? Why so?

9.03 Money

Money

Image: JupiterImages/ Polka Dot/Thinkstock

Do you want some; or do you want more? Money that is! Well, what have you got to **trade**?

We get paid in money (**currency** or **digital**). Currency and digital values are very useful because we can easily break these down into smaller units, either in cash form, or in digital form.

We swap these monetary units, these notes and coins and digital amounts, for goods and services. We earn these notes and coins and digital amounts by exchanging our labour and our skills for **income**, or by earning income on our investments (capital). We might also receive welfare benefits.

We use these notes and coins and digital amounts to buy goods and services, i.e. **expenditure**; to satisfy our needs (food, water, shelter, clothing, warmth) and our wants (Big Mac, Evian, Toorak mansion, Prada and LG.) Life is good isn't it!

Money in itself is not a resource. We cannot eat, drink or live in money. Money is important in that it represents the value of the goods and services that we can buy. Money gives us purchasing power as consumers. And if we haven't got enough money, then there's always credit!

Although the use of **e-transactions** is growing rapidly, cash is still a preferred form of currency in some industries and businesses, especially for smaller transactions. So you need to be able to work out the right currency units for different amounts of money.

Even though the shift to digital and e-payments is becoming more pronounced, you might think this means that you don't need to develop cash-based estimating and calculating skills. But in reality, as people get used to using digital tools, they have to do even more training to manage cash effectively.

9B Money calculations

Complete the following transactions. Calculate the amounts and list the notes and coins you would provide. (Don't forget about rounding!)

a. Purchase of 3 cans of Blurpto Beans @ 76c. Handed a $10 note.	b. Order of 2 pieces of flake, 3 potato cakes, 2 steamed dim sims, minimum chips and a 1.25 litre bottle of Pepsi Max. What's left from a $50?	c. Purchase of jeans @ $59.99, top @ $35, shoes @ $79.99 and a belt @ $15. (Belt is free with sales over $175). Handed a $100 and 2 $50s.

Indicate the correct combination of notes and coins needed to make change for each of these transactions. Try to use the least number of currency units.

a. Processing a $65 sale. Given $100.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ $2 x ___ $1 x ___ 50c x ___ 20c x ___ 10c x ___ 5c
b. Purchase of 3 items at $25.50 each. Given a $50 a $20 and a $10.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ $2 x ___ $1 x ___ 50c x ___ 20c x ___ 10c x ___ 5c
c. Purchase 2 for $75 and a different item at $44.99. Given 2 x $100 notes.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ $2 x ___ $1 x ___ 50c x ___ 20c x ___ 10c x ___ 5c
d. Total sales = $73.11. Given a $50, 2 x $10 and 2 x $2.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ $2 x ___ $1 x ___ 50c x ___ 20c x ___ 10c x ___ 5c
e. Purchase of 8 @ $1.20 and 10 @ $2. Given a $100.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ $2 x ___ $1 x ___ 50c x ___ 20c x ___ 10c x ___ 5c
f. Purchase of 3 x $2.20, 2 x $4.75 and 2 x $5.00. Given a $20 a $10 and a 10c.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ $2 x ___ $1 x ___ 50c x ___ 20c x ___ 10c x ___ 5c
g. Purchase of $49.95 and $54.95. Given 5 x $20s.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ $2 x ___ $1 x ___ 50c x ___ 20c x ___ 10c x ___ 5c

9.05 Making Change

Making change

When you are buying things using **cash** the **transaction** will often involve **change**. The **change amount** is the difference between the **purchase price** and the **money tendered**.

If you are the **customer** it is important to know that you are being given the correct amount of change. This prevents you from being **short-change**d.

If you are the **worker** then you must be able to calculate change accurately. Even if you use an **electronic point-of-sale register** that tells you how much change to give, you will have to manually 'make' the correct change using notes and coins.

A physical counting method involves **counting up** from the purchase amount, using the currency units to move to round numbers - making sure you say each step and amount aloud. This involves placing the change in the customer's hand, or down on the counter for contactless service.

As more and more everyday purchases are transacted using **eCommerce,** the skill of making change actually becomes more important rather than less important. Why do you think this might be the case?

Change process

Making change might involve 2 or 3 of the 4 basic calculation functions.

Money tendered is the amount that a customer hands over for payment.

Image: pawelhelbik1985/ Depositphotos.com

- Addition: Calculating total purchases.
- Multiplication: Calculating total purchases for multiple items.
- Subtraction: Calculating the change by taking away the purchase amount from the amount given (tendered) by the customer.
- Division might also be needed, such as when calculating bill splitting.

Making change

One step is used when:

- it is a single purchase, or
- the total is calculated using a cash register, POS terminal or some other means.

The correct process is:

'money tendered' less 'purchase price' equals 'change'.

e.g. Purchase $75. Given $100
= $100 - $75 = $25

Two (or more) steps are used when:

- there are multiple purchases, and/or
- you have to work out the totals manually.

The correct process is:

Step 1: Calculate total purchase price using addition and/or multiplication.

Step 2: 'Money tendered' less 'total purchase price' = 'change'.

e.g. Purchases of $50 and $35. Given $100

Step 1: Total purchases
= $50 + $35 = **$85**

Step 2: $100 - **$85** = $15

e.g. Purchases of 5 items @ $12. Given $100

Step 1: Total purchases
= 5 x $12 = **$60**

Step 2: $100 - **$60** = $40

NUM SUPER SKILLS

Making change 9D

Work out the change for each of these purchases and amounts tendered. Then count out the currency notes and/or coins to make the change.

Purchase	Amount	Change	Currency
e.g. $7.50	$10	$2.50	$2 + 20c + 20c +10c
$5.75	$10		
$3.15	$10		
$9.45	$10		
$7.80	$10		
$2.20	$10		
$4.80	$10		
$1.45	$10		
$6.60	$10		
$0.75	$10		
$5.99	$10		

Purchase	Amount	Change	Currency
e.g. $16.30	$20	$3.70	$2 + $1 + 50c + 20c
$9.25	$20		
$17.50	$20		
$15.00	$20		
$3.75	$20		
$19.40	$20		
$1[illegible]5	$20		
$[illegible].95	$20		
$1[illegible]	$20		
$7.[illegible]	$20		
$[illegible]5	$20		

Purchase	Amount	Change	Currency
e.g. $26.50	$50	$23.50	$20 + $2 + $1 + 50c
$11.80	$50		
$2.75	$50		
$29.95	$50		
$48.50	$50		
$49.75	$50		
$17.50	$50		
$22.00	$50		
$0.95	$50		
$32.50	$50		
$15.25	$50		

Purchase	Amount	Change	Currency
e.g. $38.75	$100	$61.25	$50 + $10 + $1 + 20c + 5c
$62.50	$100		
$28.75	$100		
$75.50	$100		
$92.00	$100		
$82.25	$100		
$16.75	$100		
$9.60	$100		
$33.50	$100		
$54.15	$100		
$41.75	$100		

9.07 Calculating Money

In your head

We often do money calculations in our head. It's a skill that many people develop over their lives. So let's explain how to do this in words using an example.

For example: Money calculations

The best way to do this for **addition** is to add the dollar amounts first. Then keep that number in your head:

$5.30 + $3.80 = $8 (i.e. $5 + $3)

Then add the cents amounts:

30c + 80c = 110c

If the added cents equal more than 100, then you need to add an extra dollar to your dollar calculation, plus the remaining cents:

$8 + 110c = $8 + $1 + 10c = $9.10

Otherwise, you just add the cents to your dollar amount.

If **subtracting** use the same steps, but by 'taking away':

$5.30 - $3.80 = $2 (i.e. $5 - $3)

Then subtract the cents amounts.

30c - 80c = -50c

If your subtracted cents amount is less than 0 then you need to take away a dollar from your dollar calculation and then add the remaining cents:

$2 - $1 = $1 then add 50c = $1 + 50c = $1.50.

Otherwise, you just add the cents to your subtracted dollar amount.

Now, what if I tell you that you can do this quite easily in your head as long as you have a basic grasp how to add and subtract numbers? Do you believe me? Have a go!

In your head add: $6.50 + $3.80 = ?

Now do a subtraction: $7.95 - $2.60 = ?

Now another subtraction: $6.70 - $3.90 = ?

See it's much easier to do this in your head rather than following the correct, but complex, instructions above. It's a natural numeracy skill you have developed, or can develop, through your life experiences. That's why these types of numeracy skills are about applied learning. (And if the calculation gets too complex then just set it out on paper.)

9E It's all in your head

Complete the calculations based on money, 'in your head'. Check your answer on paper or using a calculator.

a. 75 cents + $1.50 =	b. $10 + $4.40 =	c. $125 + $59.99 =
d. $11.95 - $5.50 =	e. $7.50 + $0.75 - $4 =	f. $1,000 - $100 + $500 =

Calculating with money

When adding and subtracting with money the rules are the same as you learned in Section 1.

1. Do your additions first.

2. And then if needed do your subtraction from that answer.

However, you might be dealing with two different currency units, i.e. dollars and cents, especially if you are working with items that have a small value or cost (such as in a supermarket).

So when working with money it is important to use correct place value to line up your calculation, because a dollar amount has 2 decimals.

e.g. $1 = $1.00 = 100 cents or $27.50 = $27 and 50 cents = 2,750 cents.

This means right justifying when you set up your sum to keep all the correct units (and their values) in the appropriate place.

e.g. $1.57 + $3.60 + 72 cents = ?

$ 1.57
$ 3.60
+ $ 0.72
$ 5.89

e.g. $2.50 + $5.45 - $1.80 = ?

$ 2.50
+ $ 5.45
$7.
-
$6.

e.g. $5.99 + $117 - $12.30 = ?

$ 5.99
+ $ 117.00
$122.99
- $ 12.30
$110.69

NUM SUPER SKILLS

Calculating money 9F

Complete the calculations based on money. These are a bit more complex so you might have to work on paper. Use a calculator to check your answers.

a. $962 + $745 add $27.50 =	b. $17.95 + $11.44 + $27.95 + 5.95 + $49.45 minus $20 =	c. $1500 - $695 add $50 + another $50 twice =
d. $27,500 - $12,900 add $1,450 - $22,500 =	e. $1,500,000 + $150,000 + $15,000 - $1,500 - $150 + $15 + $1.50 =	f. Add the price of a Pepsi, a salad roll, an apple and a doughnut. Take away a $5 discount coupon.

9.09 Calculating Money

Percentages

As you learned in Section 1, a percentage simply refers to a proportion. It is also another way of representing a fraction. But fractions can be messy when dealing with money so instead we use percentages. Percentages are important for calculating amounts for many personal and work-related situations including:

- sales discounts
- volume discounts
- bulk purchases
- GST
- price mark-ups
- fees and costs
- overtime and penalty rates.

Image: marinini/ Depositphotos.com

For example: Percentages

A store is having an end of financial year clearance sale and all stock is to be discounted by 20%; or by 25% if customers buy two or more items. You have your eye on two items. How do you do these calculations?

	20% off	25% off for 2 or more
Normal price	= $50	= $50 and $30
Discount	= $50 x 20% = $10	($50 + $30) x 25% = $20
New price	= $50 - $10 = $40	$80 x 25% = $20
		= $80 - $20 = $60

Example 2

You are paid $10 an hour normal time, 25% more for overtime, and time and a half (50%) for working on Saturday. What is the hourly rate for each?

What if you work 20 hours normal, 4 hours overtime and 6 hours on Saturday? How much in total?

Normal rate	= $10			
Overtime rate	= $10 + 25%	= $10 + ($10 x 25%)	= $10 + ($2.50)	= $12.50
Penalty rate	= $10 + 50%	= $10 + ($10 x 50%)	= $10 + ($5.00)	= $15.00

Total pay

Rates	= $10 x 20 hours	+ $12.50 x 4 hours	+ $15 x 6 hours
	= $200	+ $50	+ $90
	= $340		

Example 3

GST is calculated at 10% of the price for eligible goods and services.

	GST exc to inc		GST inc to exc
Normal price	= $90 (GST exc)	Price	= $99 GST inc
GST	= (10% of $90)	GST	= $99/11
GST	= $9	GST	= $9
GST inc price	= $99 (i.e. $90 + $9)	GST exc price	= $90 (i.e. $99 - $9)

Percentages 9G

1. Calculate these fraction amounts as money. First, convert the fraction into a percentage. Then calculate the % money amount.

a. 1/2 of $100 =	b. 1/4 of $150 =	c. 2/3 of $300 =
d. 4/5 of $2,000 =	e. 3/8 of $1,000 =	f. 3/4 of $25 =
g. 9/10 of $50,000 =	h. 1/5 of $99.95 =	i. 15/20 of $1,000,000 =

2. Calculate these percentage amounts as money.

a. 40% of $90 =	b. 30% of $200 =	c. 65% of $1,500 =
d. 15% of $3,000 =	e. 37.5% of $1.5m =	f. 10% of $12.95 =
g. 20% of $90 + 25% of $500 =	h. 15% of $500 + 30% of $150 =	i. 10% of $9.95 + 15% of $100 - 5% of $50 =

3. In your workbooks, write these as numerical expressions. Calculate the answers.

a. Abe has to calculate the GST for a customer's order. The order involves ten items at five dollars, 20 items at 10 dollars and 50 items @ $20. All these prices are GST exc.	b. Baal has to calculate the GST already included in a supplier's invoice. The order involves five items at $7.70 dollars, ten items at $16.50 and 20 items at $49.50. All these prices are GST inc.	c. Carin buys three items from an online seller. The items are fifty dollars, 125 dollars and $75. As a special she gets ten per cent discount from the least expensive item. All these prices are GST inc.

1 4 PS 2 3

9.11 Calculating Money

Changes over time

One of the most useful ways that you can apply your numeracy skills is to monitor and calculate changes in prices over time, or in economic terms, **inflation**.

This skill is important to help manage a household or personal budget because people can keep an eye on their spending, and perhaps source less expensive purchasing options.

This skill is also important for business enterprises because a key to commercial success is to minimise costs, especially over an extended period of time.

Many people think that all prices go up over time, but this is not necessarily true. For a variety of reasons there are many goods, and some services, that have reduced in price or cost over time. Price drops have occurred due to higher levels of **supply**, improved **efficiency** and ongoing technological **innovation**.

This can be seen with the prices of many personal items (such as clothing) and household items (such as electrical products); and some services such as personal private transport (due to new competitors such as Uber).

However, many services have increased in price over time, especially electricity, gas and water charges, health and medical services, and home repairs and construction.

The price of many **staple goods**, such as most food and beverage products usuall increases over time.

Some food items experience **price sw** due to **seasonal** factors, such as fresh fruit.

And of course who can really know which direction petrol prices are likely to be heading at any one time! But they do **trend** upwards!

Image: ginasanders/Depositphotos.com

Petrol is one good that shows price volatility over time. The key is to manage when you fill up so as to avoid price peaks. But how can you do that?

Basket of goods

One way to monitor price changes over time is to select a basket of **staple goods** that your household regularly purchases, and record the prices of these goods over time.

Using the data you collect, you can set up a **table** and calculate the **percentage change** in the price of particular goods. You can also do this for the entire **basket** of goods over time.

Have a look at these shopping baskets.
Which of these goods would be a staple part of your household's weekly shopping?

Percentage change

Percentage change is a way comparing performance for one outcome, or time period, with another. It involves looking at growth (or decline), then calculating this as a proportion of the original. For example:

If you earned $1,000 in year 1, then $1,500 in year 2 what is the % change?

$$\frac{\text{amount in year 2 - amount in year 1}}{\text{amount in year 1}} \times \frac{100\%}{1}$$

$$= \frac{\$1{,}500 - \$1{,}000}{\$1{,}000} \times \frac{100\%}{1}$$

$$= \frac{\$500}{\$1000} \times \frac{100\%}{1}$$

$$= 50\% \text{ (That's a lot of growth!)}$$

What would be the % change if year 2 was $3,000; or if Year 2 was $500?

NUM SUPER SKILLS

Change in prices 9H

1 4 PS 2 3

1. Choose a basket of goods that your household usually buys (or needs) each week. Choose one retail outlet and monitor the price of these goods over 6 weeks. Record your findings in a table using the rows and column headings.

Item	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	% change
loaf of bread							
Milk							
1kg bananas							
etc.							

2. Construct line graphs to show the price of each item over time. Note: If you plot too many items on the same set of axis then the graph will get very busy.
3. Calculate the total price of the basket each week. You'll have to take into account the quantity of each item that is purchased weekly.
4. Calculate the percentage change in the price of each item over this period of time.
5. Calculate the percentage change in the total price of the entire basket over this period of time.
6. Comment on your findings; i.e. price rises or falls, or price stability or volatility.
7. Make recommendations based on your findings.

9.13 Assessment

AT4 Working with Money
Financial Numeracy // or Vocational

1
4 PS 2
3

For this assessment task, you are required to complete a number of tasks related to money and prices. You will present your evidence in a portfolio report.

Part A: Calculating money and making change

Complete a range of tasks to demonstrate that you can **calculate money amounts** and **make change**. You could use training currency.

Your teacher will advise you of the specific tasks relevant to you that you will need to complete.

Resources, tools and websites to use:

Part B: Calculating percentage discounts

Complete a range of tasks to demonstrate that you can calculate **percentage discounts** on the price of items.

Your teacher will advise you of the specific tasks relevant to you that you will need to complete.

Resources, tools and websites to use:

Part C: Calculating price changes over time

1. What is **inflation**?
2. How might inflation affect your family's household budget?
3. Create a line graph that shows the change in the price of a product (or products) over a 6-week period, or over time by researching past prices.
4. What changes might you have to make to deal with inflation?

Resources, tools and websites to use:

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS8: Systematics AOS6: Data or **AOS1: Number AOS4: Relationships**

Financial or Vocational Numeracy

Tasks - AT4: Working with Money	Must do?	Due by	Done	Level
Part A: Calculating money and making change				
1. Calculate money amounts.	✓			
2. Calculate change.	✓			
3. Make change.	✓			
Part B: Calculating percentage discounts				
1. Identify discounts.	✓			
2. Calculate discounts.	✓			
3. Apply discounts to calculate final amounts.	✓			
Part C: Calculating price changes over time				
1. Explain inflation.	✓			
2. Describe potential impact of inflation.	✓			
3. Create a line graph to show price changes.	✓			
4. Describe potential changes needed.	✓			
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			
Develop and apply mathematical tools and techniques.	✓			
⇨ **Prepare and submit final portfolio of activities.**	✓			
Present a report to the class (if required).				

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

Signed: _____ Date: _____

9.15 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT1 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: Level:	Choose maths tools	Done: Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and [illegible]					
Check Estimations	Done: ○ Level:	Compare results	Done: Level:	Check processes	Done: Level:
Review actions	Done: ○ Level:	Check [illegible]	[illegible]: [illegible]:	Assess conclusions	Done: ○ Level:
[illegible] and report					
Written processes	Done: ○ Level:	Written [illegible]	Done: Level:	Oral processes	Done: Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

Income and Pay 10

Activities 10: Income and Pay	p.	Due date	Done	Comment
10A **Types of income**	221			
10B **Pay up**	222-223			
10C **Different agreements**	225			
10D **Traineeship pay rates**	227			
10E **Pay slips**	229			
10F **Pay slips in action**	230-231			
AT5 Researching Wage Rates	232-233			
PST **Problem-Solving & Toolkit**	234			

Comments:

10.01 Income and Pay

Income

Image: Simon Valentine, iStock/Thinkstock

Income is money that you earn from various sources. The most common form of income is from **wages** and **salaries**.

Some people earn **profits** as a result of them owning and operating businesses.

Other people receive **transfer income** from the government through various **welfare** payments.

Many people also earn **investment income** in the form of:

- interest from savings
- dividends from owning shares
- capital gains from selling assets (shares, property, etc.)
- rent from investment properties.

These various sources of income allow us to enjoy a **standard of living** whereby we can purchase the goods and services that we need and want to maintain our chosen lifestyle.

Types of Pay

Wages

- Wages are income amounts paid for an employee's labour.
- They are determined on an hourly basis.
- Wages normally apply in most trades, and for millions of semi and lower-skilled employees.

Salaries

- Salaries are income amounts that are usually paid to professional staff and high-level employees such as some managers
- Salaries are calculated (but not paid) on a yearly (annual) basis.

Commission/Retainer

- A commission is an incentive payment usually based on a proportion of sales, fees or revenue. These are often used for people in sales roles.
- A retainer is a base level of payment made in conjunction with a commission.

Payment in kind

- Payment in kind refers to non-monetary payments given in return for labour.
- For example, a caretaker who is employed at an isolated island resort might receive payment in kind of accommodation and food, in addition to their wages.

Piece rate

- A piece rate refers to a type of payment made when a person (often a sub-contractor) is paid depending on the amount of items (or units) they produce.
- For example, someone sewing garments might receive $2 per garment; or someone delivering pamphlets might receive $20 per 1,000.

Types of income 10A

1. Match the types of pay from p.220 with the correct description. Complete the numerical calculation (of the example related to this) in your workbooks.

Description	Type of pay	Example & calculation
When a worker gets non-monetary payments given in return for their labour.		Kaytelynne is working as a live-in nanny. On top of her 'pay' of $400 she receives free board and food worth $400. Calculate %'s and weekly 'pay'?
Pay set down for a professional role and calculated as an annual amount.		Regina is paid $67,500 as a manager. So, how much per week?
An amount given as an incentive for making sales or generating revenue.		Lorelei works in a high fashion store and has registered $260,000 in sales this year. She got 20% of that as an extra payment. S extra pay 'per week'?
A pay amount based on a designated job classification - 'earned' on an hourly basis.		Bob earns $22.50. H full-time 38-hour week, and how uch annually?
A payment amount given per item of production often using sub-contracted labour.		Dash s paid $3 for each delivery for Gr un. He can usually do 3-4 deliveries per hour. Ho y rate; and how much for a 5-hour shift?
A lower base rate paid to a worker (usually in sales jobs) 'topped up' by commissions.		Yusuf works as a car salesperson. He gets a base payment of $200 per week plus his commission. He normally earns $100K per year in total. Calculate %'s and weekly amounts.

2. How much are people in your class being paid for working? List names, jobs and hourly wages. Use your workbooks if you need more space. Discuss as a class.

10.03 Income and Pay

10B Pay up

1. Find out the current full-time median earnings for the 10 occupations listed in the first table. (You could also calculate weekly earnings and approximate hourly amounts based on a 38-hour week).
2. Choose 10 occupations and find the most recent amounts for full-time median earnings. (Note: As at late '22 the current amounts were still based on 2021.)

Use: **https://labourmarketinsights.gov.au** search on an Occupation and then find Weekly Earnings. You can scroll down for more information; and find out 'when'.

Occupation Full-time weekly earnings	Median earnings 2015	Median earnings '2021'	Median earnings 20__
Accountant	$1,400	$1,756	
Plumber	$1,142	$1,419	
Chef	$1,050	$1,250	
Police officer	$1,600	$2,188	
Primary school teacher	$1,350	$1,984	
Civil engineer	$1,916	$2,[illegible]	
Sales assistant - General	$850	$1,055	
GP	$1,8[illegible]0	$2[illegible]5	
Cleaner - commercial	$8[illegible]6	$[illegible].013	
Hairdresser	$800	$1,038	
Average all occupations	**$1,230**	**$1,593**	

Source: ABS, Survey of Employee Earnings and Hours, May 2021. ABS EEBTUM survey August 2015 cat. no. 6310.0.

Occupation Full-time weekly earnings	Median earnings 20__
Average all occupations	

Source:

3. Calculate how much each of the following people earn for their week's work. What jobs might these people be working in?

a. Nermi works 22 hours and is paid $11.85/hour.	b. Abe works 17 hours and is paid $15 for 12 hours; with 5 hours overtime with an extra 25% loading.

c. Vesna works two 4-hour casual shifts. The standard rate is $15 per hour and the casual loading is 25%.	d. Herriot works a standard full-time week with an hourly wage rate of $22.50.
e. Ngoc is 15 and works a standard full-time week in a job with an hourly rate of $22.50. Juniors are paid 40% of the adult rate.	f. Tahir is a 2nd year apprentice earning $12 per hour. Next year his wage will increase by 20%.
g. Barrie works a public holiday [illegible] receives [illegible] time and a half for his 8-hour [illegible] paid at $20/hour.	[illegible]ude is in a supervisory role and [illegible]s 53 hours. She is paid at $26.25/hour.
i. Stacee, 22 is not covered by an award or agreement and is paid at the lowest allowable pay rate for her 38 hours work.	j. Adot is paid a salary of $88,000 per year. He doesn't get paid overtime. He works an average of 50 hours per week.

10.05 Pay Rates

Pay

Being paid is one of the most important reasons for working, and every worker deserves to be paid fairly for their labour. And if you are fortunate to secure an apprenticeship or traineeship, it will be good to have some knowledge of the pay you are likely to receive

Most workers are paid either according to a **wage** (per hour) or a **salary** (per year). Note: Refer to pp.220 for other information about other pay entitlements.

Employees in most entry-level jobs such as **Australian Apprenticeships** will be paid a wage based on the number of hours worked. The wage rate is set down in an **award**, or a **registered agreement** or as part of the **National Wage Case**.

Some awards and registered agreements provide extra payments **called penalty rates**. These might apply when working shiftwork, odd hours, on weekends, during public holidays or for overtime.

Workers under 21 are normally paid a percentage of an adult rate based on their age. For example, most retail employees aged 16 usually receive 50-55% of the adult rate. **Apprentices** and **trainees** will be paid a proportional rate according to their job, stage of completion, and/or age.

These rates, and the relevant proportions of an adult rate, will be set down in the relevant award, or the relevant registered agreement under which the apprentice or trainee is employed.

Casual workers are normally paid extra (usually 20-25%). However, in return they forego non-monetary conditions such as annual leave, personal and carers' leave.

Awards

Most employees in Australia are paid according to either a rate set down in an **award** (modern award), or according to a **registered agreement**.

Most awards are **national awards** and apply across an **industry** or industry **sub-sector** Australia-wide. Awards set down **minimum** rates of **pay** and other **conditions** for employees depending on their job **classification**. Apprentices and juniors will be paid a proportion of the adult rate.

Awards will also specify information about penalty rates, overtime, allowances and other pay-related issues. (Note: WA will have some employees covered under WA state awards).

For example, many retail workers are covered under the General Retail Industry Award (2020), which of course has its rates updated annually. Many hospitality workers will be covered under the Hospitality Industry (General) Award 2020) which also has been updated. And many child-care workers are covered under the Children's Services Award (2010) - and yes, it too is updated annually, because 2010 was a very long time ago!

Image: pogonici/Depositphotos.com

Registered agreements

Many workers, including Australian Apprentices, are employed under a registered agreement. **Registered agreements** (sometimes still referred to as Enterprise Bargaining Agreements or **EBAs**) are usually negotiated between employers and unions (on behalf of workers) for similar enterprises in the same industry; or even for one specific enterprise (usually a larger enterprise).

What this means is that workers in the one business, or in a particular geographic location or operation of a business, or in a group of similar businesses from the 'same' industry, are all covered by the one specific registered agreement.

Registered agreements must have **minimum conditions** that are at least as **favourable** as **awards**. As a result, many registered agreements do tend to have more favourable wages and conditions than awards.

For example, in retail there is the Woolworths Supermarkets Enterprise Agreement 2020, the Priceline Retail Employees Enterprise Agreement 2021, and many more.

Image: photography33/ Depositphotos.com

Different agreements 10C

1 4 PS 2 3

Given below are rough approximations of what non-adult apprentices might earn at different stages of their training. Calculate how much each would earn per hour, per week (38 hours) and per year, based on the 'adult' wage rates.

Note: These %s are only a general guide and are not relevant to all jobs and industries, nor do these include allowances, penalty rates and other conditions.

'Adult' wage	1st year 55%	2nd year 70%	3rd year 80%	4th year 95%
$20	Pay: $11/hour	Pay:	Pay:	Pay:
	Week: $418	Week:	Week:	Week:
	Year: $21,736	Year:	Year:	Year:
$25	Pay:	Pay: $15/hour	Pay:	Pay:
	Week:	Week:	Week:	Week:
	Year:	Year:	Year:	Year:
$30	Pay:	Pay:	Pay: $24/hour	Pay:
	Week:	Week:	Week:	Week: $1,083
	Year:	Year:	Year:	Year:

Investigation

In small groups discuss the difference between awards and registered agreements. Find examples of each of these for occupations and industries. What is the National Wage Case? Which workers are covered under the National Wage Case? Report back to the class. **https://calculate.fairwork.gov.au/findyouraward**

10.07 Pay Rates

Traineeships

Nearly all trainees are paid according to a pre-determined rate known as **The National Training Wage**. The **Fair Work Commission** has set down this rate in the Miscellaneous Award 2020.

This information is then used for all awards throughout other industries (except for nine specific modern awards). So nearly all awards will refer employers and employees to the National Training Wage rates and other conditions contained in **Schedule E** in the **Miscellaneous Award 2020**.

It is important to note that trainees will get their other entitlements such as **penalty rate** % loadings, **overtime** % loadings as well as specific job-related or industry-related **allowances** from the industry or occupation award that covers them.

There will still be some trainees who will have their wages and other conditions set down in a specific registered agreement.

And once again, the National Training Wage rates, just like all other minimum rates, are updated annually.

Different National Training Wage rates apply for **Wage Level A**, **Wage Level B** and **Wage Level C** trainees. This Wage Level classification varies according to industry type (and therefore job type) and also the qualification's certificate level.

There are varied National Training Wage pay rates based on the number of years out of school (up until when a trainee becomes an adult).

There are also **part-time** rates, rates related to **disability classification** and rates for **Australian School-based Apprentices**.

So that's a lot of information! But the maths is straightforward - just multiplication and division - and the rates themselves are based on percentages.

Nearly all trainees are paid according to the National Training Wage set down in Schedule E in the Miscellaneous Award 2020.

Image: photography33/ Depositphotos.com

Fair Work Infoline

- The easiest way to get help about pay and conditions and to find out information about this complex area is by calling **Fair Work Infoline** on:

  13 13 94 between 8:00am to 5:30pm, Mon to Fri.

- You should do this before starting a new job.
- Fair Work also has an online Pay Calculator tool called **PACT**. But you'll need to know some key information to use this correctly. But have a go; what you have learned so far might help you find out some information. Your teacher can guide you through the PACT tool.

https://calculate.fairwork.gov.au

NUM SUPER SKILLS

Traineeship pay rates 10D

1 4 PS 2 3

Given below are National Training Wage rates for a **non-adult** trainee as applicable for 2022/23, based on school level and years out of school.

1. Calculate how much a trainee would earn per hour and annually.

To calculate wage per hour you will need to divide the weekly wage by 30.4 (and not 38) as a traineeship has a shorter 'working' week - 4 days instead of 5).

National Training Wage Pay Rates: 2022/23 According to the Miscellaneous Award 2020, Schedule E (Wage Level A)			
School Leaver Wage Level A	...and has completed Year 10	...and has completed Year 11	...and has completed Year 12
Just left school	Week: $363.40	Week: $400.10	Week: $475.90
	Hour: $11.95	Hour:	Hour:
	Year: $18,896.80	Year:	Year:
Plus 1 year out of school	Week: $400.10	Week: [illegible]5.90	Week: $553.90
	Hour:	Ho[illegible]5.65	Hour:
	Year:	[illegible]46.80	Year:
Plus 2 years out of school	Week: $475.90	[illegible]	Week: $644.50
	Hour:	[illegible]	Hour: $21.20
	Year:	[illegible]	Year: $33,514

2. Find out the current rates for this year. Complete the same type of table.

National Training Wage Pay Rates: 20__ / __ According to the Miscellaneous Award 20____, Schedule E			
School Leaver Wage Level A	...and has completed Year 10	...and has completed Year 11	...and has completed Year 12
Just left school	Week:	Week:	Week:
	Hour:	Hour:	Hour:
	Year:	Year:	Year:
Plus 1 year out of school	Week:	Week:	Week:
	Hour:	Hour:	Hour:
	Year:	Year:	Year:
Plus 2 years out of school	Week:	Week:	Week:
	Hour:	Hour:	Hour:
	Year:	Year:	Year:

10.09 Pay Slips

Pay slip

A pay slip is a hard copy or digital document that must be issued by law for each pay period. Pay slips should include the following.

"Which day do all workers like most - pay day of course!"

Image: kritchanut/ Depositphotos.com

Basic information:

- employer's name and ABN
- employee's name.

Pay information:

- the pay period and date of payment
- amounts for gross and net pay.

Pay rate information:

- If the employee is paid an hourly rate (i.e. a wage):
  - the ordinary hourly rate
  - the number of hours worked at that rate during the pay period
  - the total dollar amount of pay at that rate for the pay period.
- Or if the employee is paid a salary - the annual gross salary amount.
- A pay slip usually will also include:
  - loadings, allowances, bonuses, incentives, penalty rates, other entitlements, leave balances, etc., and other information.

Deduction information:

- amount and description of each deduction (such as income tax and employee superannuation contributions), as well as total deductions made
- any superannuation contributions made by the employer for the employee
- details of the superannuation fund to which contributions have been made.

Summary information:

- The total gross and net payments made for the pay period.

P&Q Enterprises	**ABN: 45 214 4875**		**Date:**	**June 16, 2023**
Employee: Glonsork Elver			**Period:**	**June 9-13, 2023**
Entitlements			Deductions	
Ordinary hourly rate:	*Total*	*Total*		
$21.38	38	$812.44		
Overtime hourly rate:				
$32.07	4	$128.28		
Gross entitlement		**$940.72**	Tax deducted:	$188.14
Net entitlement		**$752.58**		
Paid into bank account: 016 534360 BSB 023 145				
Year to date		$1505.16	Year to date	$376.28
Employer superannuation contribution				
RESFund		$98.77	Year to date	$197.54

Pay slips 10E

1. Use the information from the pay slip opposite to complete this table.

Employer details	
Employee & bank account details	
Pay date/ pay period	
Ordinary hourly rate	
Ordinary hours worked	
Overtime/penalty rate(s)	
Hours worked	
Gross entitlement (pay)	
Tax deducted	
Net entitlement (pay)	
Net pay amount this year	
Employee's super fund	
Amount paid into fund this pay	
Amount paid into fund this year	
Other:	
Other:	
Other:	

2. Do the same for a pay slip of your own, or one supplied by your teacher, or for a pay slip from a worker you know.

10.11 Pay Slips

10F Pay slips in action

1 4 PS 2 3

1. Using the model pay slip on p.228 as a guide, or an example from a real employer, complete a pay slip for you based on the following information. (No need to show your true bank account number, just list your bank.)

Employer: Mc Jacks Food Truck	Other information:
ABN: 21 256 253 56	You have been working 3 weeks
Pay period: Sunday-Saturday last week	Week 1: Same ordinary hours, no overtime.
Pay date: This Thursday	Week 2: Identical as week 3 just gone.
Hourly rate: $12.50	Tax deducted: 12.5% each week
Hours worked: 16 in total	(Note: No superannuation contributions required, as the worker is under the 30 hour cut-off for an employee less than 18 years of age.)
Overtime rate: +25%	
Overtime hours: 8	
Tax deducted: 12.5%	
Super deducted: na	

	ABN:		**Date:**	
Employee:			**Period:**	
Entitlements			Deductions	
Ordinary hourly rate:	*Total*	*Total*		
		$		
Overtime hourly rate:				
		$		
Gross entitlement		**$**	Tax deducted:	$
Net entitlement		**$**		
Paid into bank account:		*BSB:*		
Year to date		$	Year to date	$
		$	Year to date	$

1 4 PS 2 3

2. Complete the 5 missing $ figures in the following pay slip.
3. Calculate the **average tax rate** used for deductions from Siri's pay.
4. Since she has been working, Siri has worked exactly the same hours and overtime hours each week, at the rates of pay shown in the pay slip. She hasn't been working long. Use the pay slip to calculate **how many hours she has worked** and also **how many weeks** she has worked.

M&S Enterprises	**ABN: 80 215 2569**		**Date:**	**Mar 16th, 2023**
Employee: Siri Alexa			**Period:**	**Mar 9-13, 2023**
Entitlements			Deductions	
Ordinary hourly rate:	*Total hours*	*Total $*		
$15	20	$		
Overtime hourly rate (20%):				
$	4	$		
Gross entitlement		**$**	Tax deducted:	$74.40
Net entitlement		**$**		
Paid into bank account:	017 12322361	BSB 081 2		
Year to date		$2,4	Year to date	$297.60
Employer superannuation contribution				
RESFund		$3	Year to date	$150.00

4.

Application

a. Find out the pay rates for a job you are interested in.

1 4 PS 2 3

b. Use these rates to prepare a pay slip based on you working 20 hours part-time (on a regular basis). Assume this is your 5th week of work.

c. Use these rates to prepare a pay slip based on you working 38 hours full-time (on a regular basis). Assume this is your 10th week of work.

Note: You are going to need to make some assumptions. One of these is the tax rate for income tax deductions. Take off 10% for the part-time work example, and 20% for the full-time work example.

So what other numerical assumptions might/will you need to make? Your teacher will guide you in this.

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10.13 Assessment

AT5 Researching Wage Rates
Financial Numeracy // or Vocational

1
4 PS 2
3

For this assessment task you are required to complete a number of tasks related to pay and income. You will present your findings in a summary report.

Part A: Apprenticeship wage

1. Find out the current adult minimum pay rate.
2. Estimate the apprenticeship wage for 1st, 2nd, 3rd and 4th year.

Choose an Australian Apprenticeship that you might be interested in.

3. Find out the exact pay rates for that Apprenticeship.
4. Calculate the weekly and annual wage.
5. Find out about penalty rates, allowances and other pay data.

Resources and websites to use:

Part B: Traineeship wage

1. Estimate the current National Training Wage.

Choose a traineeship that you might be interested in.

2. Find out the exact pay rates for that traineeship.
3. Calculate the weekly and annual wage.
4. Find out about penalty rates, allowances and other pay data.

Resources and websites to use:

Part C: Casual employment wages

Choose 2 different employers that young people commonly work for such as supermarkets, retailers, take-away food, hospitality, etc..

1. Estimate the current hourly wage rates for each (based on your age).
2. Find out the exact pay rates for each employer.
3. Calculate a weekly and annual wage (based on a 'normal' casual week).
4. Find out about penalty rates, allowances and other pay data.

Resources and websites to use:

Part D: Graphing

Create a line graph that shows the changes in apprenticeship, traineeship and casual wage rates over time; and compared to an adult full-time wage rate.

Note: In the final column, your teacher might also include an achievement level to indicate your level of performance for each part of the task.

Name(s):

Key dates:

AOS6: Data
Financial or Vocational Numeracy

Tasks - AT5: Researching Wage Rates	Must do?	Due by	Done	Level
Part A: Apprenticeship wage				
1. Current adult minimum pay rate.	✓		○	
2. Estimate the apprenticeship wage.	✓		○	
3. Exact pay rates for that apprenticeship.	✓		○	
4. Calculate the weekly and annual wage.	✓		○	
5. Penalty rates, allowances and other pay data.	✓		○	
Part B: Traineeship wage				
1. Estimate the current National Training wage.	✓		○	
2. Exact pay rates for that traineeship.	✓		○	
3. Calculate the weekly and annual wage.	✓		○	
4. Penalty rates, allowances and other pay data.	✓		○	
Part C: Casual employment wages				
1. Estimate current hourly wage rates for ea…	✓		○	
2. Find out the exact pay rates for each emp…	✓		○	
3. Calculate a weekly and annual wage for e…	✓		○	
4. Penalty rates, allowances and other pay data.	✓		○	
Appropriate use of online resources and tools.	✓		○	
Part D: Graphing				
⇨ Create comparative line graph.	✓		○	
Task completion				
Submit draft for feedback.	✓		○	
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓		○	
Develop and apply mathematical tools and techniques.	✓		○	
⇨ **Prepare and submit your final report.**	✓		○	
Present a report to the class (if required).	○		○	

Identify the maths	Act on & use maths	Evaluate & reflect	Communicate & report

10.15 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT1 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: Level:	Choose maths tools	Done: Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: Level:	Check processes	Done: Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: Level:	Oral processes	Done: Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

Managing Money 11

Activities 11: Managing Money	p.	Due date	Done	Comment
11A **Managing money**	237			
11B **Attitudes to money**	239			
11C **Income**	241			
11D **Expenses**	243			
11E **Bills**	244			
11F **Electricity bill**	245			
11G **Surplus or deficit?**	247			
11H **My budget**	248-			
11I **Banking - Deposit accounts**	2			
11J **Bank statement**	253			
11K **Digital Wallets**	255			
11L **Mortgages and loans**	256-257			
11M **'Easy' money, hard debt**	259			
11N **Comparing credit**	260-261			
AT6 Saving for a Vehicle	262-263			
PST **Problem-Solving & Toolkit**	264			

Comments:

www.delivereducation.com.au michael@delivereducation.com.au

11.01 Managing Money

Money matters

Yes it does! Although money may not be the key to a happy life, financial stress can certainly be a quick road to an unhappy life.

A person with good **financial numeracy** is able to develop, use and apply numerical skills to better manage their money and financial obligations.

Consider your own financial position at the moment. Do you work? If so how much **income** do you earn? Is this regular? If you don't work, then from where do you get your money?

What is your **wealth** (i.e. your assets)? As a young person still at school, probably not very much at all!

Do you have **debt**? How much, and why so? Are you going to have to go into debt in the near future to pay for study, for a car, for personal and/or work purposes, or to move away from home to gain employment?

Managing money

Understanding how to manage money is actually quite easy. Just like maintaining a healthy weight.

With weight the equation is: Energy (kj) in should equal energy (kj) out.

Too much in or too little out; you get heavier. Less in or more out; you get leaner.

When managing money the equation is: Money out should ≤ money in.

☹ Too much out (spending) or not enough in (income): you go into debt.

☺ Less money out or more money in: you start building savings (wealth).

Although it's true that the money management equation is easy (just like the weight/energy equation) **managing your money is actually quite hard.**

The theory is simple, the actuality is harder to achieve.

Contemporary life is expensive and young people, even if they do have a job, generally don't earn much at all! And many things cost so much!

It is important to realise that one side of the financial equation is easier to manage than the other.

You can't do much about the money-in side (**income**) except to try and get a job and build a future career. That takes time, skills, training, experience, commitment and patience!

However, the money-out side (**expenditure**) is the part of the equation you have direct responsibility for. Unfortunately, that takes discipline.

And **financial discipline** is hard.

It is very useful to apply the **4-stage Problem-Solving Cycle** for managing your money. And you will need a lot of good reliable tools in your mathematical toolkit including some digital tools and apps.

Image: selensergen/ Depositphotos.com

One real positive about using cash is that it makes it easier to keep track of your spending - and helps you avoid debt!

Managing money 11A

1. What do these money management words and terms mean to you?

Income	Expenditure
Wealth	Debt

2. What is the money management equation?

3. Why is financial discipline hard to achieve?

4. What types of day-to-day money management tasks would a person commonly need to do at each stage of the problem-solving cycle?

1. Identify the maths	2. Act on and use maths
3. Evaluate and reflect	4. Communicate and report

1
4 PS 2
3

11.03 Managing Money

Digital payments

In 2020, Australia recorded a financial milestone when for the first time in history the proportion of **digital**, **non-cash transactions** exceeded the number of **cash-based transactions**.

This change was partially caused by changes in **purchasing habits** brought about by the acute phases of the COVID-19 pandemic. The shift towards **online** shopping, **contactless** trade and other **e-commerce** methods, meant that people increasingly turned to digital payment **apps** to make the majority of their day-to-day purchases.

The ongoing evolution in one-touch app-based services such as Uber Eats, as well as the huge switch to online retail portals, combined with the growth in the use of digital wallets among young people, has seen many people rely on their smart devices, smart watches, fitbits and other purchasing apps to digitally pay for even the most minor of purchases.

And this trend will continue, as you, the **digital natives**, continue to make use of these evolving shopping and money management apps.

Cash used to be 'king'. But has cash now had the 'jack'?

Financial discipline

Digital shopping methods and e-payment apps are usually easier, quicker and more convenient for consumers to conduct purchase transactions.

But in reality, any digital tool that makes it easier, quicker and more convenient for you to spend your money can lead to immediate, and very real, money management problems.

Therefore, it is becoming harder to achieve financial discipline. This is happening because people are increasingly using quick and easy **digital payment platforms** when out shopping or when paying for purchases. Consumers are also over-using one-touch **apps** and **digital wallets** when shopping online. And unfortunately, young people are racking up a lot of debt using **buy-now pay-later** digital payment platforms such as AfterPay.

Throughout history, many people have struggled to maintain financial discipline. But now you can spend all of your money - tap, tap and tap - in just a few quick transactions, without even leaving the couch! But if you run out of digital 'credit', then don't worry, just AfterPay it!

Some very real problems associated with these contemporary changes in behaviour mean that people:

- ☹ buy too much because the purchase transaction is easier, and is often faceless
- ☹ lose track of how much they're spending on a day-to-day basis
- ☹ spend all their own money quickly because they are making lots of smaller transactions that accumulate quickly into a larger amount
- ☹ overuse credit, especially through digital 'credit' platforms
- ☹ start each 'week' from a position of debt.

Financial management is about making sacrifices now, so as to create a better longer-term **standard of living**. Can you do that?

Well we think you're up for the challenge.

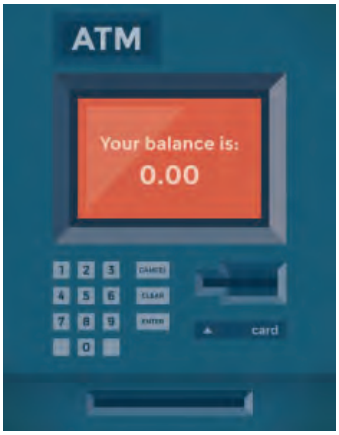

Image: HannaTolak/ Depositphotos.com

Attitudes to money 11B

Do you agree with each of these statements? In your workbooks explain why or why not? Discuss these as a class.

Image: blueringmedia/ Depositphotos.com

Investigation

Go to the Australian Government's key money management advice site operated by ASIC at: **www.moneysmart.gov.au**

List the 5 key topics listed on the home page that you can get advice about.

11.05 Income

Income

So how's your income situation? Income is money that you earn from various sources. A lot of people commonly refer to this as their '**pay**'.

The most common form of income is from **wages** and **salaries** earned from being an **employee**. In Australia, about 13.5 million people are 'employed' - with most workers being paid a wage or a salary.

However, some workers might instead receive a commission and/or a retainer (such as real estate agents and sales representatives).

Of those 13.5 million people, about 2 million are working to try to earn **profits** as a result of owning and operating their own businesses.

Other people might receive **transfer income** from the government through various **welfare payments** (such as aged pensions and the **JobSeeker** allowance).

Many people also earn **investment income** in the form of **interest** from savings, **dividends** from owning shares, **capital gains** from selling assets (shares, property, etc.) and **rent** from investment properties.

Income and young people

When you are younger you are totally reliant on others for your money. This might come in the form of a weekly **allowance**, a **gift**, or even **payments** for doing chores (which are often factored into an allowance).

Sometimes young people can make a bit of extra money **selling** things such as the toys they no longer want, a bike they grew out of, unwanted clothes or other personal possessions.

Some very **enterprising** young people might run a **micro business**. This is more common in regional areas where the children of farmers might manage a small amount of livestock, or a mini-crop of their own, such as eggs from chickens, or an annual yield of tomatoes, or herbs from the greenhouse.

But young people might also cut the lawns of neighbours, wash cars, walk dogs, do babysitting, do tech-installs and repairs, and even make and sell baked goods. Some might even be employed to deliver newspapers, catalogues or pharmacy goods.

A select talented few might earn income from acting, in advertising, dancing, performing, modelling (doesn't have to be fashion modelling) and other similar pursuits.

Some young people might work in **family businesses** or on family farms - sometimes they get 'paid' for doing this - in many cases they don't!

Young people who work for their money are often said to "learn the value of a dollar". This is because they can see how many hours it takes to earn a Big Mac, a new pair of Jordans or even how long it takes to 'pay off' a new iPhone.

And for those of you who are working, you already know that you are paid a junior wage based on your age. This means that bosses like to get juniors to work on weekends when penalty rates apply.

Why is that?

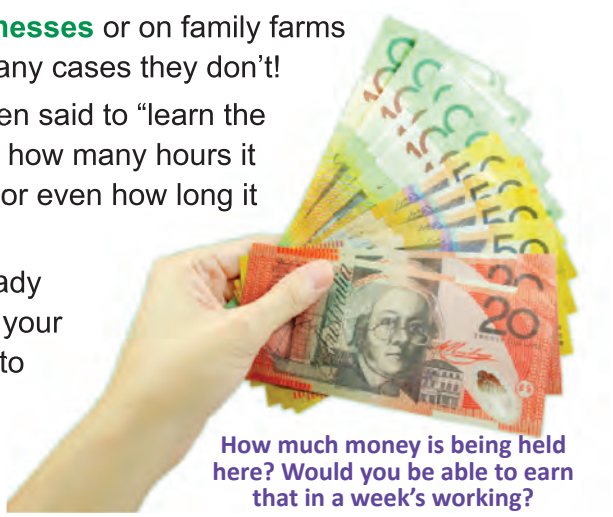

Image: p_saranya/ iStock/Thinkstock

How much money is being held here? Would you be able to earn that in a week's working?

Income 11C

1 4 PS 2 3

1. From where do you get your 'income'?

2. Is this enough for you? Why/why not?

3. How can young people earn more, or even a[illegible] income? What are the most common jobs, industries and employers of young people?

4. If you started earning $1[illegible]0 a week, ho[illegible]any hours would you likely have to work? What would you do with the money?

5. Working in pairs, estimate how much income you will earn in your lifetime. How did you estimate this? Go online and see if there is any information to use as a guide. Report back to the class.

11.07 Expenditure

Expenses

Well you all know it. Living your life costs money. And the lifestyle you might **want** to live can be really expensive. And at times, leading even just a basic life can be full of day-to-day, week-to-week, month-to-month and year-to-year expenses just to meet your **needs**.

For **personal** situations expenses might include mortgage repayments or rent, groceries, utilities, motor vehicle costs, bills, personal items, health and medical bills, education costs, entertainment and other outlays.

Expenses refer to the costs incurred in **business** such as wages, materials, utilities, stock, inputs, equipment and many other payments.

Sometimes expenses might simply be called **costs** or **outgoings**.

Expenses and you

Your most common and costly expenses at this stage of your life will be quite different from when you were 10-11 back in primary school.

In 2-3 years' time - as a young adult - you will also find your pattern of expenditure will be different from now.

And of course, when you are living independently, you will also have to take on responsibility for a whole new range of adult expenses.

And should we mention the expenses associated with being a parent sometime in the future? Well that's a whole new ballgame!

The diagram shows some of the main expenses typical for young people, your age, attending school. How closely do these match your life? Add two more expenses that are more relevant to you.

Main Expenses Now...

- Snacks & treats
- Social outings
- Public transport fares
- Phone & data
- Digital downloads
- Hobbies & interests
- Digital subscriptions
- Clothing & footwear
- Gifts & presents
- Personal & beauty
- Electronic items
- Sport & recreation

Image: iofoto/ Depositphotos.com

Expenses 11D

1 4 PS 2 3

1. Without calculations, rank these 12 major expense items (and add 2 more) in order from 1, highest to 10, lowest, for you at this stage of your life.

- ☐ clothing & footwear
- ☐ digital downloads
- ☐ digital subscriptions
- ☐ electronic items
- ☐ gifts & presents
- ☐ hobbies & interests
- ☐ personal & beauty
- ☐ phone & data
- ☐ public transport fares
- ☐ snacks & treats
- ☐ social outings
- ☐ sport & recreation
- ☐
- ☐

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2. Estimate and calculate how much your expenses are per week/or per 4 weeks in your top 10 categories. Calculate their proportions as a percentage.

1.	2.
2.	4.
5.	6.
7.	8.
9.	10.

3. In your workbooks, or using a computer, construct a properly labelled pie chart to show the relative proportions for each expense category.
4. Think ahead to 2-3 years' time.

   Estimate how much your expenses might be per week/or per 4 weeks, across 10 major categories. Calculate the proportions as a proportion.
5. In your workbooks, or using a computer, construct a properly labelled pie chart to show the estimated relative proportions for each expense category.
6. Comment on why these two sets of figures are similar or different.
7. What might have to change in your life to cover these expenses?
8. Who actually pays for your expenses now? Is it you who covers the costs? Or is it your parents, your siblings, or someone else? Why is that?
9. How might this change in the future? Will you bear responsibility for some, most, or all of your expenses then? Or will you need to get help?

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11.09 Expenditure

Bills

People commonly refer to the amount they have to pay for electricity, gas, water, internet, phone, medical and other services as their 'bills'.

Bills are usually issued after a service has been provided and are often sent or emailed, e.g. an electricity or gas bill. Some bills might be presented as soon as the service has been completed, e.g. a car repair or a restaurant meal. As examples, the dentist doesn't make you pay up front - you pay after they have done their work. Your mobile provider will bill you after you have accumulated call and service charges so they can calculate if you have to pay more than your plan.

A bill is essentially an account usage or service summary, together with an account statement. The bill is issued to the customer, outlining details such as the:

- ✓ issuer name, address, contact details, etc.
- ✓ service provided and/or the type of plan contract
- ✓ date of issue or period of time for the account
- ✓ usage summary details or list of service items provided
- ✓ itemised full usage information and details
- ✓ cost (i.e. the price) and charges related to the usage
- ✓ other charges and fees including late fee
- ✓ account balance (the amount due)
- ✓ due date
- ✓ payment method information

Image: volgariver/ Depositphotos.com

11E Bills

Ask at home to find out the type of bills your family usually has to deal with. Make sure you use the word 'bills' (or other language equivalent for this word).
Ask them to rank which are the most important, the highest, or even the 'worst'!

ENERGY OZ

Get in touch
Enquiries: 13 11 11 1 Faults: 13 11 11 2
Internet: www.energyoz.com.au

Robyn Citizen
21 Main Road
Sunscray Vic 3999

Service address:
21 Main Road Sunscray Vic 3999

Your electricity bill

ACCOUNT DETAILS	DUE DATE	AMOUNT DUE
Account Number 111 111 111 Tax invoice 21 23 56 78 Issue date: 17 Apr 23 Total amount due: See Account summary	**17 May 23** **Direct debit: 17 May 23**	**$360.06**

ADJUSTMENT	USAGE STATEMENT		
Direct debit discount (2%)	Average cost per day	$3.91	**16% increase** in usage since last year
	Average daily usage	13.4 kWh	
	Same time last year	12.7 kWh	
	Indicative greenhou[illegible]s emissions	1.6 tonnes	
	Same time las[illegible]	1.3 tonnes	
	Saved wi[illegible]	n/a	

HOW TO PAY

DIRECT DEBIT
Details specific to the biller and the account

CREDIT CARD
Details specific to the biller and the account

IN PERSON & MAIL
Details specific to the biller and the account

TELEPHONE & BPAY
Details specific to the biller and the account

Electricity bill 11F

This sample electricity bill shows the main information that is commonly shown on the first page of a bill. However, the bill will have other pages that communicate more specific information about an account such as: recent payments, usage amounts, charges for peak and off-peak usage, supply charges, as well as some numerical information (graphs and charts) that shows comparative usage levels.

Sections might be called *Account Summary*, *Payments Received*, *Total Electricity Charges*, *Usage Breakdown*; or something similar to these titles.

1. Create a table with key headings that match the section headings, and/or key information, on your own bill.
2. Locate the key information from your bill and organise this under the appropriate headings. Check the meaning of anything you don't understand.
3. Develop 5-8 short sentences that explain the usage costs and patterns shown by the information on the bill. Use numbers in support.
4. Research ways to reduce electricity consumption. Make 3-5 key recommendations about how to achieve these. Estimate potential energy and money savings.

11.11 Budgeting

Personal budgets

Being able to create and manage a personal budget is an essential skill for your life, especially as you transition beyond school and into your adult lives!

It is vital that you manage your expenditure and minimise the use of credit; especially seemingly easy sources of credit such as buy-now pay-later, credit cards, 'payday' or instant loans, and interest-free purchase contracts. You also need to explore income sources such as wages and salaries, interest income and government benefits and assistance.

Additionally, you need to balance your expenditure with your income to manage your day-to-day financial obligations, to provide for longer-term spending requirements, to save for assets such as a car, and to save for your future.

Budgeting

A budget is a financial management planning tool that lists all of your forecasted revenue and expenses over a period of time. A budget allows you to see if you expect to have more money coming in (**surplus**) or more money going out (**deficit**). A budget can help you plan your spending more responsibly and allow you to take control of your finances. Financial control is about striking a balance between your **needs** (i.e. necessities) and your **wants** (i.e. non-essential and luxury items).

When you are budgeting it is important to be as accurate as possible by listing all of the expenditure items that you are likely to encounter. You should also budget for 'other' expenses; some of these unknowns are likely to crop up unexpectedly.

You need to prepare different budgets depending on your personal circumstances and your goals. This means that your budget will be different when you are still at school, compared to when you might be studying in post-secondary education, and also when working.

An important part of budgeting is to compare your forecasted amounts with the actual amounts to see how much **variation** has occurred. This will help you plan more accurately in the future.

Image: Violka08/ iStock/Thinkstock

Potential expenditure categories and income sources

Expenses

- mortgage or rent
- home insurance
- contents insurance
- rates
- electricity/gas
- water
- repairs/ maintenance
- car loan/interest
- petrol
- insurance
- registration
- service and tuning
- maintenance/ repairs
- public transport
- parking
- fines and charges
- sporting/club fees
- health insurance
- gym memberships
- pharmacy, dental, physio, optical, vet and other medicals
- phone
- internet
- video/TV subscriptions
- music purchases
- cinema
- entertainment
- clubs
- groceries
- toiletries, beauty & health
- household products
- lunches and coffee
- take-away, deliveries & meals out
- haircuts/grooming
- clothing - personal
- clothing - work
- shoes and footwear
- union fees
- computing
- electrical
- child-care
- school and education fees, books, etc.
- books, magazines, subscriptions
- holidays
- gifts and presents
- donations
- special treats
- credit card repayments
- personal loan repayments
- others, others - lots of others!

Income

- wages & salaries
- government benefits
- business income (profit)
- interest income
- investment income

Revenue

- For personal income revenue might include wages, salaries, interest earned, dividends, gifts, government benefits and other monies coming in.
- Revenue can refer to business income from sales, fees, commissions, service provision and any other business income sources such as royalties or interest.
- Sometimes revenue might simply be called income or incomings.

Expenses

- For personal situations expenses might include mortgage repayments or rent, groceries, utilities, motor vehicle costs, bills, personal items, entertainment and other outlays.
- Expenses can refer to the costs incurred by an enterprise such as wages, materials, utilities, stock, inputs, equipment and many other expenses.
- Sometimes expenses might simply be called costs or outgoings.

Surplus or Deficit

- A surplus exists when anticipated revenues are higher than anticipated expenses. A surplus can lead to savings.
- A deficit exists when anticipated expenses are higher than anticipated revenue. A deficit can lead to debt.

Surplus or deficit? 11G

Calculate the anticipated budget result (surplus or deficit) for each of these.

a. Revenue = $475 Expenses = $526	b. Revenue = $87,000 Expenses = $6,500 x 12	c. Revenue = $1,500 + $2,350 Expenses = $1,000 + $757 + $2,134
d. Curly expects to earn $150/week for 20 weeks and $300/week for 30 weeks. His expenses are likely to average $225/week over the year.	e. Mo runs a business that has average revenue of $5,000 per month in autumn and winter but 20% more in spring and summer. Mo's expenses average $950 per week.	

11.13 Budgeting

11H My budget

1
4 PS 2
3

1. Take a close look at the list of expenditure categories shown on p.246.
   a. Identify expense categories that are part of your spending patterns. Show these below. Add other expenses not on the list that are relevant for you.
   b. Estimate how much you spend on each of these categories either on a weekly, or a monthly, or an annual basis (this will depend on how often you actually pay for the item). Complete the table for each of these time periods.
   (Note: There is an average of 4.4 weeks for each of the 12 months of a year.)
   c. Why do you think it is a sensible thing for expenses to be multiplied by 5 weeks, rather than by 4 weeks, so as to equate to a month?
   d. Include an 'other' category. How much should you allocate to this? Why so?

Personal Budget per	week		month		year
Expenses	$		$		$
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
		x 5		x 12	
other expenses		x 5		x 12	
Total		x 5		x 12	

2. Use the planner to forecast a monthly budget for yourself based on your current financial situation. You might have to convert some expenses from weeks into months. You will also need to include any repayment obligations that will fall due such as buy-now pay-later debts. Will you be in surplus or deficit?

Cash Budget/Financial Planner

Name: _____

Situation: _____ Date(s): _____

Revenue items	$ W1 Forecast	$ W1 Actual	$ W2 Forecast	$ W2 Actual	$ W3 Forecast	$ W3 Actual	$ W4 Forecast	$ W4 Actual	$ W5 Forecast	$ W5 Actual	Total $ Forecast	Total $ Actual
Revenue totals:												

Expenditure items	$ W1 Forecast	$ W1 Actual	$ W2 Forecast	$ W2 Actual	$ W3 Forecast	$ W3 Actual	$ W4 Forecast	$ W4 Actual	$ W5 Forecast	$ W5 Actual	Total $ Forecast	Total $ Actual
Other:												
Expenditure totals:												

Repayments Due	$ W1 Forecast	$ W1 Actual	$ W2 Forecast	$ W2 Actual	$ W3 Forecast	$ W3 Actual	$ W4 Forecast	$ W4 Actual	$ W5 Forecast	$ W5 Actual	Total $ Forecast	Total $ Actual
Repayment totals:												

Total Revenue	Forecast:	Actual:
Total Expenditure	Forecast:	Actual:
Total Repayments	Forecast:	Actual:
Budget Result	**Forecast:**	**Actual:**

11.15 Banking

Deposit accounts

Banks, financial institutions and credit unions are a key part of the economy and play a major role throughout our lives.

People use various banking products to make **transactions** and to **save** for the future through **deposit accounts**.

People also **borrow** money from banks through **credit cards** and various **loan products**.

Nearly all workers will have their wages or salaries paid (or **deposited**) into a bank account.

We use **transaction accounts** to pay for goods and services using cards, EFTPOS, PayWave, online banking and an increasing range of digital wallets and apps.

People also withdraw cash from their bank accounts. However, the use of cash is declining in this digital age.

What do you use?

Image: AntonioFrancois/ Depositphotos.com

Transaction accounts

Transaction accounts are the main type of everyday banking accounts. These are the types of accounts that workers get their pay paid into. Wages and any government payments will also be credited to these types of accounts.

Transaction accounts are convenient for managing your day-to-day life. These accounts often have low, or no fees, for young people under 18 (with some limits).

Managing your transaction accounts requires you to apply the 4-stage **Problem-Solving Cycle** on an ongoing basis. You will continually have to identify and use the right maths and **evaluate** the results through honest reflection about your actions. You also need to constantly **communicate** and report to yourself - again honestly - about how well you are **managing** your money. So make sure you use the best **tools** to help you.

People use transaction types of accounts to:

- ☺ withdraw cash for day-to-day living
- ☺ link up their digital wallets
- ☺ make EFTPOS, PayPass and PayWave purchases
- ☺ make online and mobile payments; and
- ☺ to set up ongoing regular direct debits, such as for electricity bills.

Beware:

- ☹ You will need to watch out for high transaction fees if you make too many transactions.
- ☹ A lot of little purchases can add up very quickly.
- ☹ You will need to be careful of overspending, especially using e-payment methods, as your bank balance can run down very quickly.
- ☹ You can be hit with large fees for being overdrawn.
- ☹ Don't expect much, if any, interest on these accounts.
- ☹ The fees for just a few ATM withdrawals (from unsupported machines) can be higher than any interest you might ever earn on this account!

Savings accounts

As people start to earn more than they spend, they usually choose to open a savings account with a bank or financial institution. This is a safe way of storing accumulated money - much better than under the mattress.

A savings account usually pays a **higher interest rate**. This can help you to save for a long-term goal such as a bike, a phone or even a car!

The savings account might require a **minimum deposit** amount to get started, as well as a minimum amount that needs to be deposited regularly (e.g. monthly).

People use savings accounts to separate their money. They hold some money in transaction accounts to pay for their day-to-day lives, and put their left over money in their savings accounts.

A **term deposit** is a special kind of savings account where you 'lock your money' away for a period of time (e.g. six months) in return for higher interest. This imposes financial discipline, as you can't waste your money on things you don't need!

Banking - Deposit accounts 11I

1. What is the difference between a transaction account and a savings account?

2. What type of account is your bank account? Why so?

3. How often do you use your bank account, and for what purposes?

4. What interest rates, and fees and charges, apply to your account?

11.17 Banking

Bank statement

A bank statement is a key financial document that is issued periodically, i.e. every month. A bank statement provides summary details of your **debit transactions** (money out) and **credit transactions** (money in) for your bank account. The balance column also includes a **running total** of your balance. In other words, how much money you have!

It is important that you print out or check a hard copy of your digital bank statement regularly to ensure that you are being credited with the correct amounts, such as your pay, and other **deposits**, including government payments.

It is also important that you check the debit transactions (**withdrawals**) on your account to make sure that you are not being over-billed, double-billed or even billed for transactions that you didn't make.

And of course, the running **balance** total actually informs you of how much money you have in your account at any particular point in time.

However, more and more people, especially younger people, are using **mobile devices**, **apps** and **online portals** to make purchases from their bank accounts. This means that they could lose control over their financial position by spending too much, making too many transactions and not being aware of their current bank balance. As a result, they can very quickly spend all their money, and/or rack up big bills through credit cards and buy-now pay-later schemes - the result becomes **debt**!

However, there has emerged a new generation of mobile banking apps and user interfaces, such as **digital wallets**. These sometimes offer easier and more timely information for users, including a current balance. They might also 'tell you' what you should already know, such as when you getting close to your pre-set **spending limit**. But if you need an app to 'tell' you how much you've spent then really - your financial numeracy is at risk!

Branch	**Account Details**		**Statement Summary**	
St Lanbans	Mr Joe D. Mirto		Opening balance	$2173.52
Account descriptor	**Branch no**	013 238	Total deposits	$1154.00
Savings booster	**Account no**	1265-12345	Total withdrawals	$1579.76
			Closing balance	**$1763.52**
			Statement starts	22/9/2023
			Statement ends	21/10/2023
			Statement number	43

Date	**Transaction Details**	**Withdrawals ($) DR**	**Deposits ($) CR**	**Balance ($)**
22 SEP	**OPENING BALANCE**			**2173.52**
29 SEP	SALARY - TROCKS TRUCKING		**1154.00**	**3327.52**
30 SEP	ANZ ATM - SUNSCRAY	**152.50**		**3175.02**
3 OCT	BPAY - GRINE COUNCIL	**256.12**		**2918.90**
10 OCT	NAB ATM - DEER VILLE	**500.00**		**2418.90**
13 OCT	TRANSFER - RUSTY BROOKS	**275.00**		**2143.90**
15 OCT	MASTERCARD DEBIT - COLES ST LANBANS	**317.14**		**1826.76**
19 OCT	MASTERCARD DEBIT - BP SUNSCRAY	**64.00**		**1762.76**
22 OCT	**ACCOUNT SERVICE FEE**	**15.00**		**1747.76**
	TOTAL AT END OF PAGE	**$1579.76**	**$1154.00**	$1747.76
	TOTALS AT END OF PERIOD	**$1579.76**	**$1154.00**	$1747.76
This statement includes Bank Charges				*$15.00*

Bank statement 11J

1 4 PS 2 3

Part A: Bank statements

1. Use the sample bank statement on p.252 to complete the following information.
2. Investigate how this statement is similar to, or different from, your own statement.

Account holder	Branch & Account no.	Statement period
Opening balance	Fortnightly salary amount	Closing balance
Number of withdrawals & total $	Number of deposits & total $	Impact on his budget?
Other:	Other:	Other:

Part B: Old school v New skul

1. Which method; a full account statement, or app-based details of transactions, do you think is more useful to you for your own banking now, and in the future? Why so?

2. Use these transactions to complete a bank statement for the time period. Include a running balance. Use the format on p.252. (Consider creating a spreadsheet)

Sep 1	Opening balance	85.00	Sep 10	MC EFTPOS - Lunch Blitz	14.00
	Deposits		Sep 10	MC EFTPOS - IGA Dandetown	27.80
Sep 3	Northpoint News - Wages	250.00	Sep 14	MC EFTPOS - Burger Treat	15.50
Sep 10	Northpoint News - Wages	250.00	Sep 16	MC EFTPOS - McJacks	9.50
Sep 14	Deposit	75.00	Sep 18	MC EFTPOS - Romonos	17.50
Sep 17	Northpoint News - Wages	450.00	Sep 19	MC EFTPOS - Lunch Blitz	10.00
Sep 24	Northpoint News - Wages	250.00	Sep 20	DD 2175268 - Netstan	20.00
			Sep 22	MC EFTPOS - Yum Truck	22.00
	Withdrawals		Sep 23	Big Gully - NAB - ATM	120.00
Sep 1	MC EFTPOS - Coles Springwood	61.50	Sep 26	MC EFTPOS - Burger Treat	15.50
Sep 3	MC EFTPOS - El Munchos	14.50	Sep 28	MC EFTPOS - Muscle Mode	45.95
Sep 6	DD 34546764 - HiTunes	30.00	Sep 29	Non-bank ATM 212-456	90.00
Sep 8	MC EFTPOS - Lunch Blitz	10.00	Sep 29	Non-bank ATM fee	3.00
Sep 9	Springwood - ANZ - ATM	200.00			

11.19 Digital Wallets

Digital wallets

In essence, a digital wallet is a mobile application that enables a person to:

- ⇨ make payments from their existing account balance (like a digital debit card), or
- ⇨ to make payments using credit from the app provider such as a bank (like a digital credit card); or
- ⇨ a combination of both debit and credit transactions.

Most digital wallets are operated through a **smart phone**, or **smart watch**, or **smart device**.

Digital wallets can also store loyalty cards, discount coupons and other similar digital shopping add-ons.

So in the digitised world of the 2020s, digital wallets are quickly becoming a replacement for cash-based transactions.

As long as the user transfers money into their debit account, it's just like having cash in their wallet.

This can help a person more easily manage their budget or weekly spending limit. As they can't spend what is **not** in their digital wallet.

Digital wallets. The way of the future - or just for convenience? What do you think?

Image: Mikos/ Depositphotos.com

Many of the apps have push notifications to keep the user up-to-date on their balance and other information.

However, if the e-wallet is also tied into a credit card', or a similar type of credit feature, then it is very easy for a user to lose control of their spending, especially given the comparative ease of online and digital shopping.

Digital wallets can also be set up to easily and regularly transfer funds from an existing debit balance.

Image: VectorStory/ Depositphotos.com

And of course, many small businesses, such as hospitality, service providers and speciality retailers have gone cashless - sometimes for security reasons.

Properly using a digital wallet again involves applying the 4-stage Problem-Solving cycle. And because digital wallets are so easy, quick and convenient to use, you have to stay on top of any potential problems - including **digital security** issues.

So in this age of all the smart apps and devices managing your life for you, it is even more important for you to 'check your digits'.

So what does your class reckon about these? Yea or nay!

Digital wallets 11K

1. List the major examples (i.e. brands or providers) of digital wallets in Australia.

2. What are the advantages and disadvantages of a digital wallet?

3. Do you use a digital wallet or do you use cash? Or both? Why so?

4. Think ahead to 2 year's time. Do you think you'll mainly be a cash user or will you be more likely to use a digital wallet? Why so?

Research

1. Form into a team and find out the main types of digital wallets available to use in Australia, such as those from banks, from global tech giants, and other providers. Your teacher might allocate specific examples to your team.
2. Summarise the key features, costs and security measures associated with each.
3. Report to the class about which ones you would recommend and why; as well as which ones you'd steer clear of (hint: credit/loan types of digital wallets).

1 4 PS 2 3

11.21 Credit

Credit

In life we can't always afford what we want to buy right away. So we use credit to buy things. Credit is easy money. Yeah right! Read on! There are six main types of personal credit finance available in Australia.

1. **Mortgages for housing loans**
2. **Personal loans**
3. **Buy-now pay-later**
4. **Credit cards**
5. **Interest-free purchases**
6. **Payday (instant) loans**

Image: Siong Fong Chua, iStock/Thinkstock

1. Mortgages

- People can take out a long-term credit contract called a mortgage or housing loan to buy a house (and land).
- The term mortgage refers to the right of the lender to take possession of the property in the case of default. (Some people say that the 'bank' still 'owns' their home until the entire loan is paid off.)
- Home loan mortgages are normally taken out over 25-30 years. Mortgages are a pretty good use of credit because the value of the house and land will usually go up in the long term.
- So borrowers are actually gaining utility (by living in the house) while building an investment (the value of the house and land increasing).

2. Personal loans

- People often use shorter-term credit contracts such as personal loans.
- Personal loans are often used to pay for cars, household items, holidays, weddings and big-ticket items. The loan is repaid with regular repayments, including interest, over a period of perhaps 3-5 years.
- However, it can be a mistake to use personal loans to buy luxuries that are consumed immediately such as holidays; and for electricals, that date quickly. e.g. A holiday can = 2 weeks of enjoyment but paid for over 5 years!
- It is better to save up for a holiday! (We won't mention about borrowing to buy engagement rings!)

11L Mortgages and loans

1 4 PS 2 3

After class discussion and online research answer the following.

1. Why is a mortgage generally a 'good' type of credit?

2. How much is the average mortgage in Australia, and in your state?

3. By how much has this grown in the last 10 years?

4. Use a mortgage calculator to calculate monthly repayments on an average mortgage, and how much interest (at today's rate) would be paid over 25 years.

5. List mortgage traps that borrowers should avoid.

6. For which type of purchases would you recommend a personal loan? Why?

7. For which type of purchases would you not recommend a personal loan? Why?

8. Use a personal loan calculator to calculate fortnightly repayments on a 5-year, $10,000 loan for a car. How much in interest (at today's rate) would be paid over the 5 years?

9. Discuss the following case study as a class.

   Larry has steady employment and gets approval for a $5,000 loan for a used car through a finance company. He chose this loan because he didn't have to get comprehensive insurance, but he does pay higher fees.

   Unfortunately, on the way home from the car yard, he lost control of the car in the wet, fishtailed, slammed into a power pole on the passenger side and wrote his car off. What happens next?

3. By-now pay-later

- This is one of the fastest growing sources of 'credit' for consumers in Australia.
- This 'pay in 4' type of credit is becoming the most easily accessible credit for young people
- Key providers include Afterpay, Zip Pay and others.
- Technically this is not a form of credit; it is an agreement to pay off an item over a number of instalments. i.e. 'buy-now pay-later'.
- But you get to use the service, or take the item home straight away. But if you miss your repayments you pay fees!

This source of 'credit' is causing severe financial trouble for people aged 18-35 and for people on low incomes.

4. Credit cards

- People use the flexible credit offered by credit cards to buy groceries, personal items, consumer items, entertainment and gifts. Credit cards can also be used to pay for emergencies such as car repairs and medical bills.
- But this form of credit can come at a high price. Credit cards are handy as long as you pay off your debt before the interest-free period expires. Otherwise, you could be up for a BIG interest bill!
- Look ahead. If you can't afford to pay for an item within one month then you really must reconsider using a credit card to buy. Interest accrues quickly.

Beware. If you are using credit cards to pay bills then you are already sliding into financial trouble. Seek help immediately.

5. Interest-free purch[illegible]

- Interest-free purchase per[illegible]ds are offered by retailers to purchasers of household goods, electricals and other big ticket items. Some offer up to 5-years' 'interest-free'.
- The purchaser usually enters into a finance agreement with a third-party lender and/or receives a 'store credit card'.
- If the purchaser pays back the 'loan' within the interest-free period then no interest is charged. However, there are likely to be substantial fees.
- However, if the 'loan' is not paid off within the specified time then the purchaser is usually up for very high interest charges.

Beware: The recommended minimum monthly repayment amount is not likely to pay off the purchase price within the specified time.

6. 'Payday' or instant loans

- This short-term form of credit is basically a cash advance.
- Payday loans are usually from $300 up to $5,000.
- There are government regulations that cap the fees and charges related to these types of loans, but they are still very high.
- Ads for these online and on TV make it seem fun and easy.
- Need money, just Wallett-Nimble it! But they don't talk about paying the loan back!
- Some providers now offer up to $25,000 instantly. That's a lot of pain ready to happen right there!

Beware: If you are considering this type of credit then the best advice is: DON'T. You are already experiencing financial difficulties.

Financial help is available free. Cash advances are not!

Image: glegorly/iStock/Thinkstock

‘Easy’ money, hard debt 11M

Work through the case studies below using the online calculators available at ASIC’s: **www.moneysmart.gov.au**

1 4 PS 2 3

1. Jumbuk turns 18 and gets a credit card with a $1,500 limit (and 18% interest rate). He goes out that day and buys a new phone and accessories for $1000. He has a job and plans to pay this off over time.

On his first statement he receives a notice of his balance, $1,000 and a request to make a minimum payment of $25 which he pays within the time period specified.

Jumbuk is quite financially disciplined and he doesn’t use his card again. On his next statement he receives a notice:

Opening balance:	$975
Add purchases:	$0
Add interest charges:	$14.42
Closing balance:	$989.42
Minimum payment due:	$25.00

a. What will happen if Jumbuk continues to only pay the minimum monthly payment due? Use the credit card calculator.

b. What happens if he increases his minimum monthly payment to $30?

c. What about $50?

d. What about $100?

e. What would you recommend?

2. Leela 18, drives 45 minutes to and from her job as a pharmacy assistant. Her car blows a head gasket and she is quoted $1,000 to repair the engine.

Leela approaches a ‘Payday lender’ and borrows $1,000 over 12 months.

The establishment fee for the loan is $200 (this is set at 20% of the loan amount).

She will pay monthly ‘interest’ fees (they are set at 4% of the total loan amount).

a. What is the total of Leela’s loan amount?

b. How much will her fortnightly repayments be?

c. Calculate the total ‘interest’ and fee amounts that Leela will repay over the life of the loan.

d. Calculate the % in ‘interest’ and fees on the loan. (Total interest and fees/total loan amount) x 100%.

e. Find out what happens if Leela defaults on her loan.

f. Do some research and find alternative sources of finance for Leela.

11.25 Credit

11N Comparing credit

1 4 PS 2 3

For this applied task, you are required to compare the cost of credit across a range of different borrowing options. It's very likely that this task will also form part of your assessment task for your Financial Numeracy unit. Your teacher might instruct you to complete this investigation in pairs.

Part A: Credit Cards

Research the interest payable, fees and other conditions related to 2 different credit cards from 2 different financial institutions. Choose a card from one of the 'Big 4' banks, and a credit card from a financial provider that says it is aimed at younger people.

Set your results up in a table like the one below. Use this table to collect and draft your information. You should also use a spreadsheet to make comparisons. It is a good idea to use the loan calculators on the ASIC website to help you.

Card feature	Card 1	Card 2
Provided by...		
Name of 'card'		
Annual fee		
Purchase interest rate		
Interest-free period		
Cash advance interest rate		
Other fees		
Spending limits		
Other conditions and information		
Scenario	Put $1,000 on your new credit card. Pay back $50 a month	Put $1,000 on your new credit card. Pay back $50 a month

Part B: Instant loans

Research the interest, fees and other conditions related to a traditional personal loan from a bank or financial institution, and a loan from an 'instant loan' provider.

Set your results up in a table like the one below. Use this table to collect and draft your information. You should also use a spreadsheet to make comparisons. It is a good idea to use the ASIC loan calculators to help you. **www.moneysmart.gov.au**

Loan feature	Personal loan	Instant loan
Provided by...		
Name of 'loan'		
Loan period		
Interest rate: & fixed or variable?		
Set-up fee		
Ongoing fees		
Other fees		
Security needed?		
Other conditions and information		
Scenario: Monthly loan repayments? Total interest? Total amount repaid?	Borrow $5,000 over ___ years	Borrow $5,000 over ___ years

11.27 Assessment

AT6 Saving for a Vehicle
Financial Numeracy // or Personal

1
4 PS 2
3

You are required to prepare an accurate budget to help you save for a vehicle.

Your teacher will guide you through the stages/tasks you have to complete, and the timeframe for your budget (most likely a 1-3 year plan).

Use a budget template (see p.249, or source/create your own, e.g. a spreadsheet).

Your teacher might instruct you to present your information to the class in the form of an oral or multimedia report.

Stage 1: Budgeting for your vehicle

- ❑ Find or draw an image of your likely first vehicle. Estimate a realistic cost of this vehicle. Find an advertisement for one that is available for sale to use as a benchmark. Include this ad as part of your report.
- ❑ Prepare a budget for yourself that shows your anticipated average (mean) monthly expenses and income for the next 1-3 years.
- ❑ After completing your budget, explain the likelihood of you being able to buy the vehicle that you wanted. What changes might you need to make?

Stage 2: [illegible]

- ❑ Prepare a second set of budgets based on you cutting down your spending in various areas by 20%, and boosting your income/earning by 20%.
- ❑ Explain how and where you would save. When you earned more income, the impact of these changes to your lifestyle, and on your ability to buy your vehicle.
- ❑ Are you prepared to make those sacrifices? Why/why not?

Stage 3: Saving up

- ❑ Research the deposit rates on at least 2 different savings accounts.
- ❑ How much could you save a week, based on you cutting your spending by 20% and boosting your income by 20%?
- ❑ Calculate how much your savings account would grow if you saved for 1 year, for 2, and for 3 years.
- ❑ Repeat this, based on you earning an extra $100 per week, and saving 80% of that amount.

Stage 4: Borrowing the difference

- ❑ Research potential sources of finance (loans) that you could borrow money from. How much would you need to borrow?
- ❑ Do calculations to compare the different costs associated with these sources of finance on the loan.
- ❑ Which loan would you choose? Justify your preferred source of finance by using numerical evidence to explain why.

Name(s):

Key dates:

AOS6: Data
AOS8: Systematics
Financial or Personal Numeracy

Tasks - AT6: Saving for a Vehicle	Do?	Due by	Done	Level
Stage 1: Budgeting				
1. Research a suitable vehicle and collect information.	✓			
2. Prepare your budget.	✓			
3. Prepare a report explaining your budget.	✓			
Stage 2: Trying harder				
1. Prepare adjusted budget.	✓			
2. Prepare a report on this adjusted budget.	✓			
3. Outline issues surrounding sacrifices.	✓			
Stage 3: Reporting				
1. Research deposit rates on different savings accounts	✓			
2. Calculate savings based on 20% change	✓			
3. Calculate savings growth over time periods	✓			
4. Calculate savings growth based on extra saving	✓			
Stage 4: Borrowing the difference				
1. Calculate different costs of possible finances	✓			
2. Compare different potential costs of finance.	✓			
3. Choose source of finance; explain why using evidence.	✓			
Task completion				
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			
Develop and apply mathematical tools & techniques	✓			
Prepare and submit your final budgets and report.	✓			
Present a report to the class (if required).				

Identify	Act on & use maths	Evaluate & reflect	Communicate & report

Additional information:

Signed: _____ Date: _____

11.29 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT1 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: Level:	Choose maths tools	Done: Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: Level:	Check processes	Done: Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: Level:	Oral processes	Done: Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

How Does it Work? 12

Activities 12: How Does it Work?	p.	Due date	Done	Comment
12A **What can I do?**	267			
12B **My strengths**	268-269			
12C **Unpacking my strengths**	270-271			
12D **My weaknesses**	272-273			
12E **I think they can?**	274-275			
AT7 Learning to Learn	276-279			
PST **Problem-Solving & Toolkit**	280			

Comments:

12.01 Context-Based Learning

Context-based learning

Applied learning is one of the best ways to develop real skills that will make you more employable. You have consistently applied what you have learned across your Vocational Major program and VET studies. And you have also applied learning from your vocational and VET experiences to each of your VM subjects.

Context-based learning is when we combine theoretical learning and applied learning to better understand why we are learning. It's just like those metacognition skills in PDS.

By being aware of the context, you can make deeper connections. You not only understand **what** you are learning, but also **why** you are learning this. Context-based learning helps you to see the **connections** between the different requirements that lead to successful task completion. This is a bit like the concept of synergy.

When you embrace context-based learning you become better at **problem-solving**, **decision-making**, **information recall** and **task-based** knowledge. Essentially you start to **learn how to learn**, because everything you are now learning has a purpose.

For example, some students struggle with formulae and algebraic equations. But a formula is just a shorthand method of explaining a relationship.

A chef doesn't think 6T + 4W + 2P + 1S = tomato soup. But by combining ingredients, assessing the constitution and colour, tasting the outcome, and making adjustments, they are applying and refining a formula. They know a little too much salt and not enough pepper ruins the taste. Too many tomatoes and not enough water makes the soup too thick. So they play around with the variables, T, W, P and S. And then they apply their experiences to other soups, to sauces and other recipes - that's how they become better at what they do.

You are most likely to have understood context-based learning in your personal life to develop **personal** and **social competencies**. Consider driving a car, playing an instrument, mastering an art or craft, playing sport, beating a video game, learning new languages, and managing your money. How about learning how to cook, to garden, to build, to dance, to code, to communicate? People learn these things because they want to, or they come to a point in their life or career when they need to. It is about **growing** and **maturing**.

Context-based learning isn't about finding out information and knowledge, **just-in-time**. A brain surgeon doesn't just Google it before an operation. A chef doesn't go on YouTube to learn a recipe for something they've added to the menu. And a train driver doesn't post on Facebook asking what is the next station after Glen Iris.

Sometimes, what we neglect to understand, is that we are surrounded by people who know how to do different things. And some of these things you might always have wanted to learn, like riding a unicycle. Other things you might need to learn, like basic nutrition for better health and wellbeing. Some skills could save money. Some could save time. And some skills could save a life.

So maybe it's time to find out: "How does it work?"

The most important part of a puzzle is always you.

Image: chaiyapruek/ Depositphotos.com

What can I do? 12A

1. Describe 4 things that you believe you are very good at doing, or that you understand well.

i. iii.

ii. iv.

2. Describe 4 things that you are good at doing, when you are working with someone else or in a team.

i. iii.

ii. iv.

3. Describe 4 things that you've always wished that you could do.

i. iii.

ii. iv.

4. Describe 4 things 'out' you have no idea of how they work, but knowing these will improve your personal life.

i. iii.

ii. iv.

5. Describe 4 things that you have no idea how to do, but knowing how to do these will improve your career prospects.

i. iii.

ii. iv.

6. Describe 4 'mysteries' of the world that have always baffled you.

i. iii.

ii. iv.

12.03 My Strengths

12B My strengths

1 4 PS 2 3

1. List your strongest tasks, activities, knowledge and understanding for the 6 numeracies. These will be things that can do and understand at a proficient level. You can be relied upon to do these things competently over and over again.

My Personal skills

My Vocational skills

My Health skills

My Recreational skills

My Financial skills	My Civic skills

2. Take a look at your lists and think about how you learned to develop these strengths. Was it at school, at work, on your own, asking for help, being trained or coached, a family member teaching, through online research and so on? Also reflect on why you developed these strengths. What motivated you?

The main ways I developed my Personal skills were:	The main ways I developed my Vocational skills were:	The main ways I developed my Health skills were:
Why I developed these skills.	Why I developed these skills.	Why I developed these skills.
The main ways I developed my Recreational skills were:	The main ways I developed my Financial skills were:	The main ways I developed my Civic skills were:
Why I developed these skills.	Why I developed these skills.	Why I developed these skills.

12.05 My Strengths

12C Unpacking my strengths

1
4 PS 2
3

1. Choose 5 of your strongest skills and/or areas of knowledge. Try to feature 3 different numeracies.
2. Consider how you apply each of the 4-stages of the problem-solving cycle to do this task or activity, and/or to demonstrate your knowledge and understanding.
3. Describe the mathematical tools and techniques you use, including analogue, digital and technological tools.

My skills strength is...	Numeracy area
1. Identify the maths involved in the task. What tools and techniques do I use?	2. Use and apply the maths to do the task. What tools and techniques do I use?
3. Evaluate and reflect on what I've done. What tools and techniques do I use?	4. Communicate and report for others. What tools and techniques do I use?

My skills strength is...	Numeracy area
1. Identify the maths involved in the task. What tools and techniques do I use?	2. Use and apply the maths to do the task. What tools and techniques do I use?
3. Evaluate and reflect on what I've done. What tools and techniques do I use?	Communicate and report for others. 4. What tools and techniques do I use?

My skills strength is...	Numeracy area
1. Identify the maths involved in the task. What tools and techniques do I use?	2. Use and apply the maths to do the task. What tools and techniques do I use?
3. Evaluate and reflect on what I've done. What tools and techniques do I use?	4. Communicate and report for others. What tools and techniques do I use?

My skills strength is...	Numeracy area
1. Identify the maths involved in the task. What tools and techniques do I use?	2. Use and apply the maths to do the task. What tools and techniques do I use?
3. Evaluate and reflect on what I've done. What tools and techniques do I use?	4. Communicate and report for others. What tools and techniques do I use?

My skills strength is...	Numeracy area
1. Identify the maths involved in the task. What tools and techniques do I use?	2. Use and apply the maths to do the task. What tools and techniques do I use?
3. Evaluate and reflect on what I've done. What tools and techniques do I use?	4. Communicate and report for others. What tools and techniques do I use?

12.07 My Weaknesses

12D My Weaknesses

1 4 PS 2 3

1. List tasks, activities, knowledge and understanding that you struggle with for each of the 6 numeracies. These are your skills-gaps and represent areas in which you should, and need, to develop your skills.

My Personal skills-gaps

My Vocational skills-gaps

My Health skills-gaps

My Recreational skills-gaps

My Financial skills-gaps	My Civic skills-gaps

2. Take a look at your lists and think about why you have these weaknesses or skills-gaps. Is it because you don't understand the task, or you've never been motivated to learn about it? Or have you never been shown or taught how to do it? Or do you have poor skills in the area generally, and/or you are avoiding it?!

Why I haven't developed these Personal skills.	Why I haven't developed these Vocational skills.	Why I haven't developed these Health skills.
Why I need to develop these?	Why I need to develop these?	Why I need to develop these?
Why I haven't developed these Recreational skills.	Why I haven't developed these Financial skills.	Why I haven't developed these Civic skills.
Why I need to develop these?	Why I need to develop these?	Why I need to develop these?

12.09 My Network

12E I think they can?

1 4 PS 2 3

1. In the digital age, people are relying too much on the internet and social media to find out about things. But what they are forgetting is that they are surrounded by people in their networks who already know different things, as well as people who can do complex tasks. So it's time to tap into the knowledge of your network.

What might my classmates know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

What might my friends in other classes know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

What might my teachers know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

What might the other teachers know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

What might <u>my work contacts</u> know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

What might <u>my community contacts</u> know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

What might <u>my family members</u> know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

What might the <u>contacts of my family</u> know about - what's their expertise?

⇨

⇨

⇨

⇨

⇨

⇨

2. Now it's time to find out what these people know and can do. But don't use digital methods to contact them. Ask them face-to-face, or call them on the phone. You'll be surprised how much more you'll learn that way. Take summary notes of what you find out, or video what you learn to do.

12.11 Assessment

AT7 Learning to Learn
Applied Numeracies

1
4 PS 2
3

Consider these situations.

Tone is always late but their classmate Yi is always on time. Tone is worried that they won't be able to get to their work placement on time.

Yi wants to be a tradie and will need to get a manual license. But Yi had one lesson and kept stalling. Sam has already clocked up 90 learner hours driving in a manual car and found using a clutch a very natural skill to master.

Sam would like to start their own business one day but has no idea of budgets and basic accounting concepts. Red does accounting and finds it all very relatable because they work as a casual at the local newsagency.

Red's partner loves dancing but Red has a poor sense of rhythm and is too embarrassed to tell their partner. So Red avoids going out anywhere with their partner if it involves music. Tone is a natural on the dance floor and can pick up any dance style very quickly.

What's going on here? What do you think these guys should do?

Required

For this assessment task, you are required to share your knowledge and skills to help other people. You will also learn new knowledge and skills from other people.

Step 1: Can do

- Your teacher will give each class member 5 pieces of stiff card.
- On each card write down 5 areas of knowledge, or specific skills, that you understand or can do very well. Do not put your name on these.

Step 2: Can't do

- Your teacher will give each class member another 5 pieces of stiff card.
- On each, write down 5 important areas of knowledge, or specific skills, that you do not understand, or that you can't do or improve at. Again, no names.

Step 3: Class noticeboard

- Your teacher will shuffle the 'Can do' cards and then put them up on a wall on one side of the room.
- Your teacher will shuffle the 'Can't do' cards and then put them up on a wall on the other side of the room.

Step 4: Skills and skills-gaps

- Go to the 'Can do' cards and find at least 3 that feature knowledge or skills that you'd like to learn, or need to learn.
- Go to the 'Can't do' cards and find at least 3 that are asking for knowledge or skills that you'd be able to help that person with.

Step 5: Helpers and helpers

- Find the 'Can do' and 'Can't do' people, and work out if you could help one another.

Step 6: Look close - Your strengths/Their weaknesses

1. Work with a **classmate** to help them develop their knowledge and/or skills.
2. Identify how each of the 4 stages of the problem-solving process applies to this knowledge or skill.
   - ❑ Identify the maths involved
   - ❑ Act on and use the maths
   - ❑ Evaluate and report
   - ❑ Communicate and report
3. Describe the appropriate use of maths tools and techniques.
4. Summarise the objectives, the learning processes used, and the outcomes that are achieved.
5. Make a summary video, or perform a demonstration for the class.

Step 7: Look close - Your weaknesses/Their strengths

1. Work with a **classmate** with them helping you to develop your knowledge and/or skills.
2. Clarify how each of the 4 stages of the problem-solving process applies to this knowledge or skill.
   - ❑ Identify the maths involved
   - ❑ Act on and use the maths
   - ❑ Evaluate and report
   - ❑ Communicate and report
3. Describe how to use and apply maths tools and techniques.
4. Summarise the objectives, the learning processes used, and the outcomes that are achieved.
5. Make a summary video, or perform a demonstration for the class.

Step 8: Look further - Your strengths/Their weaknesses

1. Work with a **peer (not in this class)** to help them develop their knowledge and/or skills.
2. Identify how each of the 4 stages of the problem-solving process applies to this knowledge or skill.
3. Describe the appropriate use of maths tools and techniques.
4. Summarise the objectives, the learning processes used, and the outcomes that are achieved.
5. Make a summary video, or perform a demonstration for the class.

12.13 Assessment

Step 9: Look further - Your weaknesses/Their strengths

1. Work with a **peer (not in this class)** with them helping you to develop your knowledge and/or skills.
2. Clarify how each of the 4 stages of the problem-solving process applies to this knowledge or skill.
3. Describe how to use and apply maths tools and techniques.
4. Summarise the objectives, the learning processes used, and the outcomes that are achieved.
5. Make a summary video, or perform a demonstration for the class.

Step 10: Look beyond - Your strengths/Their weaknesses

1. Work with a **external experienced person** to help them develop their knowledge and/or skills.
2. Identify how each of the 4 stages of the problem-solving process applies to this knowledge or skill.
3. Describe the appropriate use of maths tools and techniques.
4. Summarise the objectives, the learning processes used, and the outcomes that are achieved.
5. Make a summary video, or perform a demonstration for the class.

Step 11: Look beyond - Your weaknesses/Their strengths

1. Work with an **external experienced person** from your network with them helping you to develop your knowledge and/or skills.
2. Clarify how each of the 4 stages of the problem-solving process applies to this knowledge or skill.
3. Describe how to use and apply maths tools and techniques.
4. Summarise the objectives, the learning processes used, and the outcomes that are achieved.
5. Make a summary video, or perform a demonstration for the class.

Step 12: How does it work?

So what do you know?

Name(s):	AOS1 - AOS 8 Applied Numeracies			
Key dates:				
Tasks - AT7: Learning to Learn	**Do?**	**Due by**	**Done**	**Level**
1-3 **Identify strengths and weaknesses.**	✓			
4-5 **Match strengths to weaknesses; and vice versa.**	✓			
6. **Train a classmate.**	✓			
1 4 PS 2 3 - Identify and apply the problem-solving cycle.	✓			
- Description of maths tools and techniques.	✓			
7. **Learn from a classmate.**	✓			
1 4 PS 2 3 - Clarify use of the problem-solving cycle.	✓			
- Description of maths tools and techniques.	✓			
8. **Train a peer.**				
1 4 PS 2 3 - Identify and apply the problem-solving cyc				
- Description of maths tools and techni				
9. **Learn from a peer.**	✓			
1 4 PS 2 3 - Clarify use of the problem-s	✓			
- Description of maths too and	✓			
10. **Train an external person.**				
1 4 PS 2 3 - Identify and apply the problem-solving cycle.				
- Description of maths tools and techniques.				
11. **Learn from an external person.**	✓			
1 4 PS 2 3 - Clarify use of the problem-solving cycle.	✓			
- Description of maths tools and techniques.	✓			
12. **So what do you know?**	✓			
Task completion				
1 4 PS 2 3 **Describe overall use of the problem-solving cycle.**	✓			
Identify / Act on & use maths / Evaluate & reflect / Communicate & report				
Develop and apply mathematical tools & techniques	✓			
Present or report to the class (if required).	✓			

12.15 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT1 -

1. Identify the maths					
Identify problem(s)	Done: ○ Level:	Recognise maths	Done: ○ Level:	Select information	Done: ○ Level:
Interpret information	Done: ○ Level:	Choose processes	Done: ○ Level:		Done: ○ Level:
2. Act on and use maths					
Perform estimations	Done: ○ Level:	Decide techniques	Done: ○ Level:	Choose maths tools	Done: ○ Level:
Select technologies	Done: ○ Level:	Perform calculations	Done: ○ Level:		Done: ○ Level:
3. Evaluate and reflect					
Check Estimations	Done: ○ Level:	Compare results	Done: ○ Level:	Check processes	Done: ○ Level:
Review actions	Done: ○ Level:	Check calculations	Done: ○ Level:	Assess conclusions	Done: ○ Level:
Communicate and report					
Written processes	Done: ○ Level:	Written results	Done: ○ Level:	Oral processes	Done: ○ Level:
Oral results	Done: ○ Level:	Digital processes	Done: ○ Level:	Digital results	Done: ○ Level:

Mathematical Toolkit					
Analogue tools - What & how?		Digital Devices - What & how?		Software & Apps - What & how?	
Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy	Choice & Range	Skill & Accuracy

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