NUMERACY VM 3&4

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Advice to students

You are about to embark on a learning journey into Numeracy Units 3&4 subject of your Vocational Major. Use this coursebook to build and develop knowledge and skills to assist your numeracy development over the year. But also be sure to apply what you are learning in classroom situations to your work placements, your VET course and other applied situations, and vice versa! And of course, you should cross-apply knowledge and skills both to and from Literacy, Personal Development Skills and Work Related Skills.

1. In **Numeracy Unit 3**, you will investigate 4 areas of study through 3 applied numeracies.
2. In **Numeracy Unit 4** you will investigate a further 4 areas of study through 3 more applied numeracies.

1 4 PS 2 3

You will need to apply the **4-stage Problem-Solving Cycle** for all activities and tasks that you do. In the beginning stages, your teacher will lead you through the application of the problem-solving cycle. Then as you further develop your numeracy skills, you will be expected to apply this cycle independently.

Throughout the year you will also develop applied skills in the use of many mathematics 'tools' and resources, as well as other tools and resources that relate to your own vocational, health and recreational, financial, civic and personal circumstances. These will form part of your 'Maths Toolkit'.

Use this coursebook by completing the tasks in the spaces and pages provided. You will also need to maintain your own work folios to complete some tasks, as well as others given to you by your teacher.

You may need to collect and keep a work folio with copies of resources, handouts and evidence of you applying numeracy skills.

You should also use your Numeracy Skills Development Booklet to help build skills for various topics throughout the year. Look for the icon to show the corresponding topic.

You might be directed to complete some or even all of the assessment tasks, as well as others supplied by your teacher.

Throughout this coursebook there are a number of quick-reference **Numeracy Superskills**. Use the table opposite to locate these.

When dealing with problems related to visual numeracy it is a good idea to draw a diagram.

Remember that your development of numeracy skills will provide you with the tools for a more successful personal, social and vocational life. So best wishes with your numerical journey.

Numeracy Super Skills

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--- All U1-4 now available ---	Printed Coursebook	Applied Vocational Booklet	Master license PDFs	e-version Master license PDFs
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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
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PDS Planner: VM 1&2	___ @ $33	or ___ @ $220
PDS Planner: VM 3&4	___ @ $33	or ___ @ $220
Foundation Numeracy	___ @ $33	na
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WACE: Career and Enterprise

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Data and Systematics 6

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Comments:

6.01 Unit 4: Introduction

Unit 4 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 4

- **5. Dimension & Direction**
- **6. Data**
- **7. Uncertainty**
- **8. Systematics**

6 Numeracies for Units 3 & 4

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, sy[illegible]ic measures.

e. [illegible]ational Numeracy
[illegible]udes 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 4

Outcome 1
Use and apply numeracy skills and capabilities across the 6 numeracy foci; and through the 4 Areas of Study.
Unit 4: 4 Areas of Study
Unit 4: 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 4: Structure of this Coursebook		
Areas of Study	**Numeracy/Numeracies**	**Assessment tasks**
5. Dimension & Direction Section 7	Recreational or Vocational Vocational (could be applied to Civic and/or Financial)	AT2a: Battle of the Maps pp.200-1 AT2b: By, Buy, Why? pp.202-3
6. Data Section 6	Recreational or Civic Civic (& should be applied to another numeracy)	AT1a: Averaging Out pp.174-5 AT1b: Analysing and Reporting on an Issue pp.176-7
7. Uncertainty (& AOS6 Data) Section 8	Recreational Civic Numeracy or Vocational or Recreational or Financial	AT3a: Sports and Games pp.222-3 AT3b: Managing Risk pp.224-5
8. Systematics Section 6 (& applied through 7-10)	Recreational & Civic Recreational & Vocational Recreational & Civic & others	Section 6 Data: In AT1a & 1b Section 7 Maps: In AT2a & 2b Section 8: Uncertainty in AT3a & 3b
Section 9: Working With Money AOS1: Number AOS6: Data AOS8: Systematics	Financial or Vocational and/or Recreational	AT4: Financial Documents, Measures and Costs pp.252-3
Section 10: Managing Money AOS1: Number AOS6: Data AOS8: Systematics AOS1: Number AOS6: Data AOS8: Systematics	Financial (and could be applied to Personal or Vocational) Financial (and could be applied to Personal and/or Vocational)	AT5a: Attitudes to Money pp.280-3 AT5b: Managing Money pp.284-5

Unit 4 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 Information

Data makes the world go around

We live in a world governed by data. **Data** can be described as all of the measurements, observational records, facts, recordings and other information that can be expressed in numerical or written form and communicated by varied means and media.

Much of our life is governed by digital methods of data collection, sharing and analysis, such as our mobile phone usage data and billing, our banking and financial information, and our **socio-demographic** data, including our personal details, income levels and taxation requirements.

It is important that you are able to understand how data is collected, organised, collated and analysed. Much data is compiled into statistical reports that make it easier to understand, analyse and act upon.

However, not all data is 'digital'. Straightforward uses of data might involve measuring a room to determine the amount of carpet needed, listening to the sound of an engine to pick up misfires and timing issues, and calculating how much petrol you might use to travel for a personal holiday.

In essence, data is just a set of numbers, or a set of words, or a set of words and numbers that mean nothing until a human interprets that data. Otherwise, it's just computer devices exchanging digital binaries with each other, because to a computer, data is just a series of '0's and '1's.

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6B Data and information

1. Complete the table by giving brief descriptions of the types of data and information you rely on in your personal life and for your work-related responsibilities.

Data/information	Personal examples	Work-related examples
i.		
ii.		
iii.		
iv.		
v.		
vi.		

1 4 PS 2 3

Consider the 6 sets of data listed in the table below.

2. What is the sample size in each data set?

3. The numbers are right-justified. Why is that important?

4. What do you notice about how each set of data is organised? Are there any patterns?

Data set 1	Data set 2	Data set 3	Data set 4	Data set 5	Data set 6
12	3	98	17	56	85
27	12	85	27	46	98
56	17	56	19	3	56
46	19	46	12	98	27
19	27	32	98	17	17
85	32	27	32	85	3
3	46	19	56	19	46
1	6	17	3	32	32
9	85	12	8	27	12
5	9	3	2	12	19

There are no headings, descriptions nor other information given to accompany the data. Just 6 data sets each with 10 numbers. Data means nothing until we know what the data refers to. This reference must be given in a heading or description.

5. Match these headings to each set of data. Are they all plausible?

- ❑ Student test marks out of 100, listed alphabetically.
- ❑ Number of errors per worker over a month ranked best to worst.
- ❑ Number of cola beverages (375ml) consumed in a month.
- ❑ The age at which people first travelled overseas.
- ❑ Volume of sales of different products per day.
- ❑ Text messages sent by people per day.

6.05 Data and Information

Data

The proper collection, collation and analysis of data is vital in all business-related activities. **Databases** store customer and client information, account transaction histories, as well as many more kinds of data, including **biodata**. A database can be integrated with **spreadsheets** that are set up using **formulae** to help analyse the data.

However, data only ever exists for a 'human' to use in some way. This means the data must be organised so that it is easy to read, as well as useful and timely for the purpose for which it was intended.

You might not believe it, but it wasn't too long ago that most business information and data was captured, processed and stored manually.

Image: Michael Blann/ Digital Vision/Thinkstock

You may have to organise data for work-related purposes. You might also have to analyse the data to determine what patterns might exist. And of course, you might also be called upon to identify potential errors in data entry. The database and the spreadsheet will only function based on the information that they have been set up to collect; or the information that you, or someone else, has entered. If there is an error, then once again, a 'human' will have to find it!

6C Organising data

1 4 PS 2 3

You are helping out a relative's business and they want you to sort out some of their customer data (p.147). But it really quite intriguing what data can show you!

Complete the following questions giving evidence to support your answer.

1. Rewrite the customer details in the correct order. How did you decide this?
2. What do 'Days', 'DR' and 'CR' mean?
3. How does the presentation of this information help you analyse it easily?
4. Who is the biggest customer?
5. Which customer is owed money? Why might this be the case?
6. Which customer has had equal orders this quarter?
7. Which customers appear to regularly order exactly the same amount?
8. Which customer owes 10% of their annual orders?
9. Which customer still owes money from last quarter and how much?
10. Which are likely to be the oldest and the newest customers?
11. You have a message from a customer's accounts payable clerk saying that their account might be in error, and can you check? But no details are given! What might be the error, and which customer are you most likely to call back?
12. Calculate averages for the relevant columns.

Extension: Spreadsheet

Set up a spreadsheet to show this data. Use formulae to calculate averages.

Name	Customer Number	This month $	This qtr $	Year-to-date $	Balance $	Days
Stoltenberg Inc	145	4,520	4,520	4,520	0	0
Stewart Co.	7	0	0	1,550	0 DR	0
John Stuart	36	1,520	1,760	2,545	1,950 DR	96
Stuart Johns	71	2,000	578	3,650	365 DR	23
Sturat & Johns p/l	14	57	150	3,111	93 CR	14
Stuart, Stewart & John	25	278	556	1,668	278 DR	4
Stotts, S. J.	48	11,250	37,250	45,250	5,625 DR	21
Stew Slotz	103	78	780	7,800	870 DR	86

Name	Customer Number	Last month $	Last qtr $	Year-to-date $	Balance $	Days
Averages						

1.	
3.	
5.	6.
7.	8.
9.	10.
11.	12.

6.07 Data Collection

Primary data

Primary data is data you collect yourself. For example, a plasterer might need to measure the internal dimensions of rooms. A chef will check the number of diners already booked for dinner. A sports trainer might record strength maxes for athletes they are working with.

Primary data can be collected via measuring, counting, observing, surveying, interviewing; and even experimenting, such as a confectioner developing a new chocolate dessert recipe.

Secondary data

Secondary data is data collected by another person or agency. For example, the plasterer might ask a supplier to estimate the cost of a particular type of plasterboard. A chef will need to estimate, plan and order ingredients based on the bookings. A head coach could use the information from the trainer to determine a player's readiness for a specific 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 experience, or a very limited set of experiences. This can also be labelled as **jumping to 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 they say global warming is happening?"

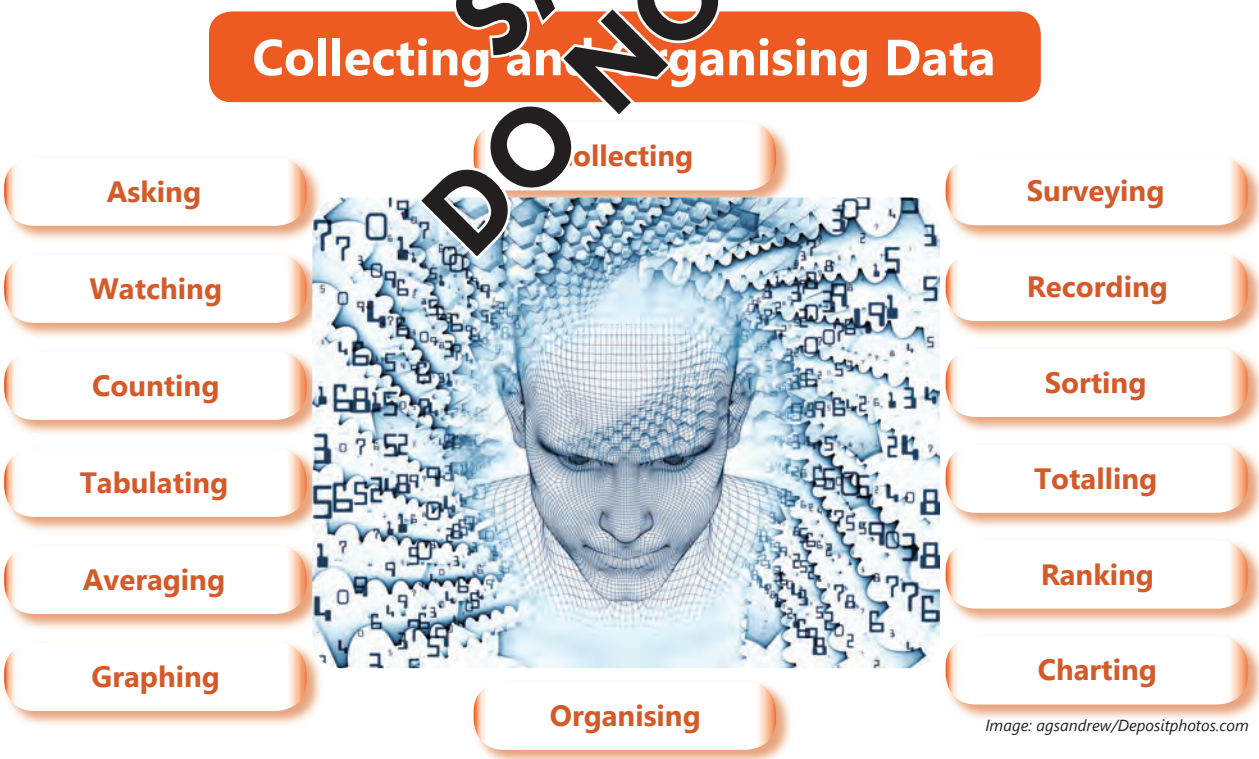


Image: agsandrew/Depositphotos.com

1 4 PS 2 3

1. Mini wants to be a tattoo artist and is researching the types of tattoos chosen by people under 30. What primary data could Mini collect? What secondary data could they access and use? What tools and devices can they use to help them?

2. Complete the table about varied vocational, health, and recreational situations when you might need to collect and organise data.

Collecting and organising	Vocational situations	Health inform	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.148 is 'capturing'. Do you remember that from last year? How is data captured? Who captures data? Why would they want to capture data? And 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'?

6.09 Data Collection

Chipping away

In VM Numeracy units 1&2, you learned how 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, 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 in filing cabinets, or large compactus.

Each year, there is more and more data being generated and collected, with most of this collected and stored digitally - often up there in the cloud somewhere! A lot of this data is collected automatically whenever a person uses a digital smart device.

Let's say you are researching fat content in different foods for a Numeracy assessment. "Hey Google. How much fat is there in a large serve of McDonald's French Fries?"

"In Australia, there is approximately 19 grams of fat in a large serve of McDonald's French Fries."

And then for the next week you get ads for Maccas across all your notifications, feeds and online searches. Or perhaps you will instead be fed ads for Hungry Jacks, or even info about a weight reduction product or a nutrition app. You might even see a 'news article' or two pop up about Maccas, or about healthy living. You could be directed to videos of an influencer, but for a different brand or a new health and wellbeing diet 'secret' or 'hack'. If you are male you could be fed advice on how to get rockhard abs; for women it's more likely to be how to reduce thigh and butt fat! Coincidence?

So with all this information somehow linked to your data, we need to have effective systems to make sense of this. After all, data is of no value if we can't use the information to help us in some productive way. And that is 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, economical, social and work 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 involve **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, as you will experience throughout Sections 6-10. The challenge is to get better at managing and understanding our data inputs and outputs.

Image: anze.bizjan/Depositphotos.com

Planning your holiday flights. That's applied systematics in action!

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. Abdi is a painter and measures the internal dimensions of a room.	b. Bogdan is a basketball player and wants to keep track of the kms he runs at each training session.
c. Cyris is an e-sports gamer and needs to find out how to beat the level bosses in the next tournament.	d. Drake is a cook and needs to measure the internal temperature of roast chicken.
e. Eddie is saving for a car and wants to reduce their spending to save $100 a week.	f. Fry grows organic veggies and wants to link seasonal variations to optimism growth.
g. Grant is planning a holiday to LA and needs to spend no more than $1,500.	h. Ida has type 1 diabetes and needs to monitor her blood glucose levels.
i. Inga is a vegan personal trainer and wants to know the most efficient plant-based protein sources.	j. Jorge is running a small café and needs to find out profit margins for the different types of coffees he makes.

Applied

When do you use data and systematics in recreational situations, health situations, financial situations and vocational situations? Make lists in your work folios and then discuss in small groups. Add to your lists based on what your group members say.

6.11 Data Collection

Checksheets

Checksheets are useful in many personal, work-related and professional situations. For example, checksheets might be used to record:

- ✓ reasons for students coming late to class
- ✓ the number of customers at different times of the day
- ✓ the type of product ordered
- ✓ the reasons for a customer complaint
- ✓ the cause of a technological breakdown
- ✓ the types of motor vehicles using a section of a road
- ✓ the number of public transport passengers alighting at a particular destination
- ✓ the type of meal most ordered.

Image: Daniel Ernst/ iStock/Thinkstock

Old-school v nu skUL

- ⇨ Modern ICT infrastructure collects a lot of data automatically, which means it does the hard work of information gathering for us.
- ⇨ It then presents this data for the user to interpret.
- ⇨ A manual method of data collection that is commonly used is checksheets.
- ⇨ A checksheet is a tool that can be used to collect and record observational information.
- ⇨ To support effective data collection, recording and then collation, checksheets must be pre-prepared so that they can be quickly and easily used to record information.
- ⇨ Many examples of digital **systematics** data collection use similar, automated methods.

Effective checksheets

- ⇨ A space to describe the work task or activity being monitored.
- ⇨ A list of pre-prepared major reasons expected to occur.
- ⇨ A space to record an 'other' and 'all others'. ('All others' should only be a minor component.)
- ⇨ A system for recording occurrences, e.g. a tick.
- ⇨ Columns to show time duration, such as days of the week, or hours of the day.
- ⇨ Columns and rows for easy adding of data and calculation of %'s.
- ⇨ Space to note the person recording the information, the day and date.
- ⇨ Space to record and note any other information that might be important.

NUM SUPER SKILLS

Checksheet

Work task/activity: Cars parked illegally at Westlakes Primary School

Other information: Morning shift

Recorded by: Aaron Tonto Day: Mon - Fri Dates: 17-21 July, 2024

Reason/factor	Mon	Tue	Wed	Thu	Fri	Total	%
double-parked	𝍸 𝍸 𝍸 𝍸 // 17	𝍸 𝍸 𝍸 𝍸 / 16	𝍸 𝍸 /// 13	𝍸 𝍸 𝍸 𝍸 /// 18	𝍸 𝍸 𝍸 𝍸 𝍸 20	84	34
overstaying time	𝍸 𝍸 10	𝍸 𝍸 𝍸 𝍸 20	𝍸 5	𝍸 // 7	𝍸 𝍸 𝍸 15	57	23
parking in no standing zone	𝍸 / 6	𝍸 / 6	𝍸 / 6	𝍸 / 6	𝍸 / 6	30	12
parking in front of driveways	/// 3	/// 3	// 2	/// 3	// 2	13	5
parking too close to corner	//// 4	//// 4	//// 4	/// 3	// 2	17	7
other (describe) parking in bus zone	𝍸 / 6	𝍸 / 6	𝍸 / 6	𝍸 / 6	𝍸 // 7	31	13
all others together (all different)	//// 4	/// 3	/// 3	/// 3	/// 3	16	6
Total	50	58	39	46	55	248	100
%	20	23	16	19	22	100	

Information to consider:

Someone else is calculating total cars parking.

You are required to use a checksheet to record some observational data, such as reasons why students arrive late to school, or cars parked illegally at the local primary school pick-up and/or drop-off, or some other relevant topic negotiated with your teacher. You can report your findings to the key stakeholders.

Checksheet

Task/activity: _____

Other information: _____

Completed by: _____ Day: _____ Date: _____

Reason/factor	Time period (such as day/duration i.e. hour, etc.)										Total	%
other (describe)												
all others together												
Total												
%												

Information to consider:

6.13 Data Collection

Data

A lot of data that you, or some other person, organisation or agency collects, arrives as unorganised or ungrouped data. Consider **ungrouped data** as the raw (or primary) information, facts and figures about something.

For example:

- ⇨ a family shopping list and sales receipt (docket)
- ⇨ the weights of players on a football team
- ⇨ customer responses to a satisfaction survey
- ⇨ a record of your times running 5km over an extended period of time.

Image: bloomua/ Depositphotos.com

But to make data more useful, we often have to organise and collate data so that it can be interpreted and analysed. We can also show organised and collated (i.e. **grouped**) data quite effectively on different graphs, tables, spreadsheets and in other numerical visual formats. Once we organise and collate data, then we are more likely to be able to make informed decisions about what to do based on what the data is showing us.

For example:

- ⇨ the shopping list and sales receipt organised into different types of purchases and then collated on a week-by-week basis and shown in a spreadsheet
- ⇨ the weights of players can be grouped into a 3kg range (and shown on a bar graph)
- ⇨ the customer responses to a satisfaction survey being collected and then organised into 'favourable', 'neutral' and 'unfavourable' responses and then displayed in a pie chart
- ⇨ the record of your times running 5 km sorted into duration brackets with 15-second intervals, with the results then plotted on a line graph over time.

Note: Your teacher might use the term grouped data or they might not. But it is important to know the term because you might come across it for descriptions of data in applied or online situations. Either way, we are talking about primary data that has been organised and collated.

6G Collating data

1 4 PS 2 3

Get hold of your family's most recent shopping receipt from the supermarket.

1. Develop 2 series of categories that you can use to collate (group) the data. These could be: type of item, $ amount, or other categories of your choice.
2. Collate and organise the data into 2 tables so that it is grouped appropriately.
3. Draw 2 pie charts to show the data. Comment on what the data is showing.
4. Use multimedia, or a spreadsheet and computer chart (graph), to organise 1 set of this collated data, and create an appropriate pie chart.
5. Discuss which of the methods for creating the table and pie chart was easier to do - by hand or using multimedia/computer. Which table and chart looked better? Why? Which format was easier to read/interpret? Why?

Frequency

One of the advantages of grouping data is that it allows you to collate, organise, display, interpret and analyse the frequency of data. **Frequency** refers to how often something has happened, or how many times a particular data value occurs. Appropriate use of frequency normally requires the collation of data according to a pre-determined range.

For example, if we investigated how long it takes students to travel to school we might get 100s or even 1,000s of data results, each with slightly different values; such as a range from 1 minute 17 seconds for Aaran who lives across the road; all the way up to 1 hour and 53 minutes 23 seconds for Zultina who walks 12 km to school.

So in this situation, it might be much more useful to organise the data into 10-minute time intervals. This means we will use 12 (or perhaps 13) sets of grouped data.

Image: adapted from/ valdum Depositphotos.com

Frequency 6H

1. Survey your classmates about how long it takes them to get to school. (You'll have to use their estimates).
2. Develop a way to record the data in a table.
3. Develop a method of organising (or grouping) the data (i.e. by time range).
4. Show the grouped data on a properly labelled, hand-drawn bar graph.
5. Comment on the results.

Extension

Use multimedia, or a spreadsheet and computer chart (graph), to organise your collated data, and to create an appropriate bar graph.

Discuss which of the method for creating the table and bar graph was easier to do - by hand or using multimedia/computer. Which table and graph looked better? Why? Which format was easier to read/interpret? Why?

6.15 Data Collection

Spreadsheets

Spreadsheets are used to **organise**, **collate** and **analyse** numerical data and information, and are one of the best tools to effectively deal with significant amounts of collected data.

Although there are lots of online calculators and apps available to help you make calculations, they often require you to enter data over and over again. This makes it hard to make valid comparisons. With a spreadsheet, you can set up different **rows** and **columns** of information to do side-by-side **comparisons** of data. For example, comparing kilojoules burned through different workout programs. You can also alter one or more variables to quickly see how the change influences the other data. For example, planning a budget for personal finances.

With programs such as **Excel**, you can develop **graphs** and **tables** using your data. Spreadsheets can feed-in to, and feed-out from, **databases**. You can save collated and colllected data using a **comma-delimited** form, which can be opened as a spreadsheet. This all makes spreadsheets a vital tool for many business applications, speeding up data collection, collation and analysis.

Spreadsheets

One of the best ways to organise and analyse numerical data is to use a spreadsheet. With spreadsheets, you can enter formulae into the row and column cells to make quick and accurate calculations.

In an Excel spreadsheet, you use an "=" to indicate a formula or calculation. Some useful formulae are given here. But there are numerous more you can use and develop.

- ⇨ = 73*10 will perform the calculation and yield the answer "730".
- ⇨ = A7+54 will perform the calculation of adding 54 to whatever is in the cell "A3".
- ⇨ = SUM(B7:B23) will add up the numerical values across these 17 cells in column B.
- ⇨ = COUNT(A2:E2) will count the number of cells in that range that are not empty.
- ⇨ = COUNTIF(A3:E3, "Black") or = COUNTIF(A3:E3, "1") will count the number of cells within the range that contain the value within the " ".
- ⇨ = AVERAGE(A2:E2) will calculate the mean of the values in the cells within that range.
- ⇨ = IF(A4>0, ("profit"), ("loss")) will print the word within the " " if the logical test is true.

NUM SUPER SKILLS

6I Spreadsheets

1 4 PS 2 3

In your workbooks complete the following tasks.

1. What type of data is in the spreadsheet? What is the time range?
2. What are the expenditure categories? Are these suitable?
3. What are the income categories? Are these common?
4. What is the cell range?
5. What is being calculated?
6. What formulae are being used?
7. How effective is the spreadsheet at setting out data and numerical information?

8. How effective is the spreadsheet at performing calculations?
9. Enter this information in a spreadsheet and construct a suitable graph.
10. Construct a spreadsheet and graph for yourself based on this same type of information.

	A	B	C	D	E	F
1	**Expenditure**					
2	*Month*	Car	Socialising	Phone	Other	Total
3	April	$ 175.00	$ 35.00	$ 40.00	$ 72.00	$ 322.00
4	May	$ 125.00	$ 56.00	$ 40.00	$ 82.00	$ 303.00
5	June	$ 78.00	$ 12.00	$ 40.00	$ 115.00	$ 245.00
6	July	$ 115.00	$ 76.00	$ 48.00	$ 50.00	$ 289.00
7	**Total**	**$ 493.00**	**$ 179.00**	**$ 168.00**	**$ 319.00**	**$ 1,159.00**
8	Average	$ 123.25	$ 44.75	$ 42.00	$ 79.75	$ 289.75
9						
10	**Income**					
11	*Month*	Work	eBay	Etsy	Other	Total
12	April	$ 250.00	$ 27.23	$ 59.00	$ 15.00	$ 351.23
13	May	$ 295.00	$ 53.00	$ 75.00	$ 30.00	$ 453.00
14	June	$ 198.00	$ 117.00	$ 15.00	$ 72.00	$ 402.00
15	July	$ 350.00	$ 140.00	$ 69.00	$ 45.00	$ 604.00
16	**Total**	**$ 1,093.00**	**$ 337.23**	**$ 218.00**	**$ 162.00**	**$ 1,810.23**
17	Average	$ 273.25	$ 84.31	$ 54.50	$ 40.50	$ 452.56
18						
19	**Surplus/Deficit**	$ 600.00	$ 158.23	$ 50.00	-$ 157.00	$ 651.23

	A	B	C	D	E	F
1	**Expenditure**					
2	*Month*	Car	Socialising		Other	Total
3	April	175	35	40	72	=SUM(B3:E3)
4	May	125	6	40	82	=SUM(B4:E4)
5	June	78		40	115	=SUM(B5:E5)
6	July	115	6	48	50	=SUM(B6:E6)
7	**Total**	**=SUM(B3:B6)**	**=SUM(C3:C6)**	**=SUM(D3:D6)**	**=SUM(E3:E6)**	**=SUM(F3:F6)**
8	Ave	=AVERAGE(B3:B6)	=AVERAGE(C3:C6)	=AVERAGE(D3:D6)	=AVERAGE(E3:E6)	=AVERAGE(F3:F6)
9						
10	**Income**					
11	*Month*	Work	eBay	Etsy	Other	Total
12	April	250	27.23	59	15	=SUM(B12:E12)
13	May	295	53	75	30	=SUM(B13:E13)
14	June	198	117	15	72	=SUM(B14:E14)
15	July	350	140	69	45	=SUM(B15:E15)
16	**Total**	**=SUM(B12:B15)**	**=SUM(C12:C15)**	**=SUM(D12:D15)**	**=SUM(E12:E15)**	**=SUM(F12:F15)**
17	Average	=AVERAGE(B12:B15)	=AVERAGE(C12:C15)	=AVERAGE(D12:D15)	=AVERAGE(E12:E15)	=AVERAGE(F12:F15)
18						
19	**Surplus/Deficit**	=B16-B7	=C16-C7	=D16-D7	=E16-E7	=F16-F7

6.17 Graphs

Graphs

Graphs are a way of organising and communicating data in a visual form that enable viewers to more easily interpret and understand the results.

If we have a lot of data covering different and/or disparate variables, then displaying this data in visual form makes it easier to follow. It certainly makes it easier than long lists of numbers in a table, or detailed lists of summary statements using numbers and statistics.

There are many different types of graphs, but the three you are going to focus on are: **line graphs**, **bar graphs** and **pie charts**.

Infographics

An infographic is a pictorial way of representing data and information. Infographics use a combination of **words** (describing the data and information), **numbers** and percentages (presenting the statistics or observational data) and **images** (pictures, symbols and pictograms presenting the information, the data or a combination of both).

Infographics are usually prepared using **digital design** software and specialised **apps.** The aim of an infographic is to use design elements to communicate both linked and varied numerical data and information.

Image: whilerests/ iStock/Thinkstock

Which graphs? 6J

a. Working in pairs, research online and try to identify each of the graphs shown opposite.

b. What type of data and information might be best suited to each graph?

c. Which of the graphs do you find visually appealing? Why so?

i. _____ b. c.	ii. _____ b. c.	iii. _____ b. c.
vi. _____ b. c.	iv. _____ b. c.	iv. _____ b. c.
vii. _____ b. c.	viii. _____ b. c.	ix. _____ b. c.
x. _____ b. c.	xi. _____ b. c.	xii. _____ b. c.

d. What types of visual elements do you prefer in infographics so that you can better understand and analyse data and information? Why is that?

6.19 Graphs - Lines Graphs

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 the weather
- sales, revenue, expenses and profit amounts over time
- 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 data (by using more than one line on a graph).

Image: moodboard/ odboard/Thinkstock

ine 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

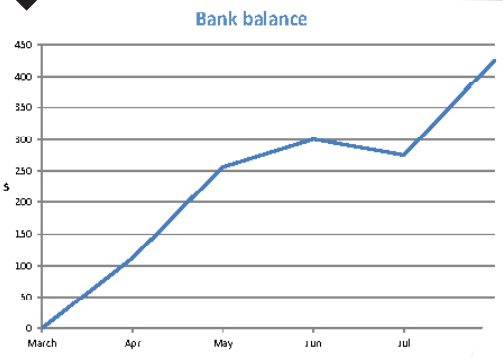
Vertical axis (y): Plots the variable over time

Heading and **data labels**: Tells the reader what is in the graph

Data line: Shows the data in visual or graphical form.

e.g. Lerry has just started working as a casual in March as he is saving for his first car.

By the start of April he had saved $1[illegible]y May $256, $275 in July, but rose to $425 by August.



NUM SUPER SKILLS

6K Line graphs

Effie and Jay started an online business, J&F Beauty Emporium, two years ago selling hair straighteners and other haircare accessories which they import. They sell across platforms, such as eBay, Shopify, through a Facebook shop and also through their own website. Shown opposite are their sales for the last calendar year. They want to expand their business and get a bank overdraft, but their bank manager wants them to supply a graph of their recent sales.

Part A: Effie and Jay

Month	Sales $
Jan	8,000
Feb	14,000
Mar	7,500
Apr	16,500
May	14,500
Jun	2,500
Jul	5,000
Aug	7,500
Sep	9,500
Oct	12,000
Nov	16,000
Dec	19,500

1. Prepare a properly labelled line graph that shows their sales for the previous calendar year.
2. Describe the line of the graph.
3. Prepare another line graph on the same axes showing their average sales on a quarterly basis.
4. Use a computer or tablet to plot the graphs, adding visual effects and print these out. Which was easier to construct? Which format was better? Why?
5. Their bank manager asks them why there is such a discrepancy in their sales levels both on a monthly and quarterly basis. Why do you think this is the case? What could you advise them to help deal with this discrepancy?

Part B

Consider the graphs in the image opposite. We can't see any labels or data. So let's assume that the 4 graphs relate to measures of personal health and wellbeing measured in percentage terms.

Image: decisiveimages/ iStock/Thinkstock

1. Choose which graph you would most prefer for each of these situations, briefly stating why.
2. Then consider the same graphs but for a different set of scenarios related to personal financial outcomes.

Strength gains	Kilojoule intake	Hours spent in physical activity	Time spend on 'screens'

Income earned	Total expenditure	Bank balance	Credit card balance

3. In your work folios, or using multimedia, construct a properly labelled time series line graph to illustrate something related to your own personal or financial situation. You might use months, weeks or even days. But you must have at least 12 points to plot.
4. Describe the trend shown by the line. How are you doing; improving or not?

6.21 Graphs - Bar Graphs

Bar graphs

A common way of representing **comparative** numerical information in a visual form is through the use of a bar graph. Bar graphs are generally used to display relative data for a category of different incidences. Plotting the different categories along the horizontal axis using equal spaces enables a comparison to be set out. Bar graphs commonly use different **coloured bars** to represent each category and use spacing between each bar.

Plotting the height of the data on the vertical axis using a scale establishes the relative size of the data in each category. The height of the bars gives a simple visual comparison of the amount of each data. However, bar graphs can be plotted horizontally, especially if there are a lot of categories to be included on the chart.

Bar graphs are commonly used to represent:

- preferences between people, such as the car they drive, or their preferred brand of breakfast cereal
- records of incidence, such as reasons for customers' complaints, or causes of road accidents
- differences between continuous data, such as sales per quarter.

Image: Fuse/Thinkstock

Bar graphs

A bar graph represents a comparison between various categories.

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 bar graph are:

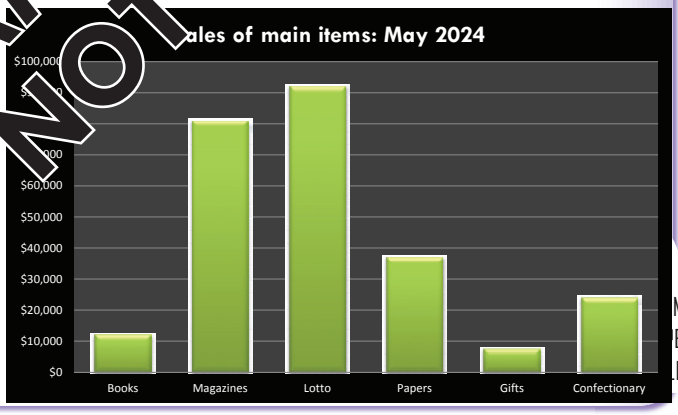
Horizontal axis (x): Plots the categories, usually with spaces between

Vertical axis (y): Plots the incidence, i.e. the count or amount

Heading and **data labels**: Tells the reader what is indicated by the graph

Bars: Indicate the amount and can be shown using the same, or different, colours.

e.g. This bar graph shows the sales in dollars of the six main items for a newsagency for the month of May 2024.



6L Bar graphs

Part A: Effie and Jay

Effie and Jay want to focus in on their best-performing models, so they need to see how sales of their various units are going.

They have extracted the information about last year's sales of various models from their spreadsheet.

Model	Units
Flat Chat	11
Bambilino	9
Kurl-Begone	36
Friz-Killer	85
Fuzz-No-More	125
Porta-Delux	72

1 4 PS 2 3

1. Prepare a properly labelled bar graph that illustrates unit sales for their 6 models of hair straighteners.
2. Describe what the graph indicates.
3. Use a computer or tablet to plot the graph, adding visual effects, and print these out. Which was easier to construct? Which format was better? Why?
4. After looking at the graph, Jay explains to the bank manager that they are going to focus marketing efforts on Fuzz-No-More and Friz-Killer. Why might this be a good course of action?
5. The bank manager adds, "That might be a good strategy but we need more information before making that decision." Effie says that she thinks they should focus on Porta-Delux and Kurl-Begone. Explain what type of information the bank manager might want, and also why Effie might (rightly) disagree with Jay.

Part B

1 4 PS 2 3

Glasses filled with liquid are a pretty cool way to construct a 3D bar graph. But once again there are no labels nor a heading. So let's assume the 'bars' correspond to consumption of various items.

Image: PhotoObjects.net/ PhotoObjects.net/ Thinkstock

1. Choose which 'bar' you would most prefer for each of these situations, briefly stating why. Estimate relative percentages.
2. Then consider the same graph but for a different set of scenarios related to personal time use.

Consumption of fruit juice	Consumption of water	Consumption of fizzy drinks	Consumption of tea and/or coffee

Time spent online and on screens	Time spent on school responsibilities	Time spent working	Time spent sleeping

3. In your work folios, or using multimedia, construct a properly labelled bar graph that accurately represents your use of time (in various categories) over a normal school week. Do the same for your use of time on a 'school holiday' week. They could even be plotted on the same set of axes.
4. Describe the patterns shown by the graph(s). How well are you spending your time?

NUMERACY 17

6.23 Graphs - Pie Charts

Pie charts

Pie charts are a very effective way of visually showing numerical information that represents relative proportions of a whole.

Essentially the pie represents the whole, and each **segment** or slice of the pie represents a part 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.).

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.

Pie charts might work in conjunction 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. Pie charts are commonly used to represent:

- proportional spending patterns of an individual (or a group as a whole)
- sources of income for an individual (or a group as a whole)
- allocation of time between various tas
- preferences, likes or dislikes for a gro p, such as the football team they
- demographic information, s as count of birth, or type of reside elling, participation in recreatio activiti

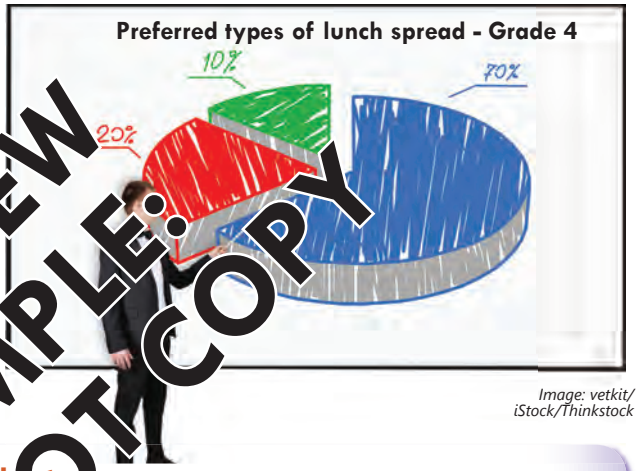


Image: vetkit/ iStock/Thinkstock

Pie ch rts

A pie chart is a graphical representation o the **lative size** of different factors shown by pie segments of a proportional size.

We can quickly see the difference be we n **variables** shown by the size (or area) of the pie segments.

The chart should include the **se me ts**, a **legend**, **data values** (or %'s) and a **heading**.

Shown above is a pie chart that sh ws the preferred types of lunch spread by Grade 4 students if they made their own lunch. 70% = Vegemite. 20% = Peanut Butter. 10% = Nutella. How could you use this data to make a safer school environment?

NUM SUPER SKILLS

6M Pie charts

Part A: Effie and Jay

Effie and Jay have some information from their online analytical data. They have found out some demographic data about: gender of visitors, gender of purchasers, age of visitors and age of purchasers.

Visitors	%
Female	63
Male	26
Other	4
Unknown	7

Purchasers	%
Female	44
Male	42
Other	3
Unknown	11

1 4 PS 2 3

Visitors	%
<18	6
18-24	22
25-34	19
35-44	15
45-54	13
55-64	8
65+	5
Unknown	12

Purchasers	%
<18	1
18-24	35
25-34	24
35-44	9
45-54	9
55-64	4
65+	12
Unknown	6

1. Prepare properly labelled pie charts to illustrate the demographic characteristics of their visitors and purchasers.
2. Describe in words what each graph indicates.
3. Use a computer or tablet to plot the graphs, adding visual effects, and print these out. Which was easier to construct? Which format was better? Why?
4. Effie and Jay are in disagreement about the data. Effie says they should focus on marketing to females because that's who is hitting their sites more often. But Jay says that males are actually doing a lot of buying even though they visit less often. Jay also thinks there might be a gift market for older people, potentially males, whereas Effie says that they should try to reach more younger females as that age group results in a lot of sales. What do you think?

Part B

1 4 PS 2 3

3D pie charts look pretty effective, just like this one, but once again there are no labels nor a heading! So let's assume that the pie corresponds to daily dietary preferences.

Image: scanrail/ iStock/Thinkstock

1. Choose which segment you would most prefer for each of these situations, briefly stating why. Estimate relative percentages.
2. Then consider the same graph but for a scenario related to the relative proportion of the methods that you use to 'contact' your friends outside of school hours.

Daily proportion of meat, eggs, and meat substitute servings.	Daily proportion of fruit servings.	Daily proportion of vegetable and legume/bean servings.	Daily proportion of bread and grain servings.	Daily proportion of diary and dairy alternative servings.

Text messaging	Phone calls	Social media DMs & online chat	Social media posts	Face-to-face

3. In your work folios, or using multimedia, construct a properly labelled pie chart that accurately represents your weekly consumption of these 5 food groups.
4. Describe your eating pattern as represented by the pie segments. How well are you doing compared to Australian recommended dietary guidelines?

6.25 Average - Mean

Different averages

Not all averages are created equal! Some averages are more equal than others.

Three of the most common types of averages are **mean**, **median** and **mode**. They all measure the same thing - an 'average' of a set of ungrouped data. However, each of these three measures might yield quite different results. Therefore particular measures of averages are more suitable, and therefore more useful, than others.

And just like the proper use of statistics, this usefulness is dependent upon the type of data that has been collected, as well as the nature of the statistics being measured.

Mean

When we hear the word 'average' we usually think of the 'mean'. So if you were 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:

- $20, $16, $12, $11, $9, $6, $3.
- Total price = $77 (sum of all prices)
- Total number of items = 7.
- Average = $77/7 = $11.

See, 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

ickens don't lay eggs exactly to size.
gs are sold based on n average (mean)
weight, which is clos their designated
weig grams.

Image: dyH/ ck/Thu tock

Mean

- The mean average is called the simple average.
- It is calculated by adding the sum of the total values divided by the number of values.

mean = total of values (sum) / number of values (n)

$$\bar{X} = \frac{\sum X}{X}$$

e.g. Bruce earned $1,200, $700, $350, $210 and $450 over each of the last 5 weeks.

$$\text{mean} = \frac{\text{(sum) } \$1{,}200 + \$700 + \$350 + \$210 + \$450}{n}$$

$$\text{mean} = \frac{\$2{,}910}{5}$$

mean = $582 (earned per week by Bruce over the last 5 weeks.)

NUM SUPER SKILLS

Average - Mean 6N

Part A

The table has data that represents how much each class member of a 20-student VM class earned last week from paid employment (rounded to the nearest dollar).

1. Calculate the mean income earned from paid employment for the entire class.
2. Calculate the mean income earned from paid employment for all those who worked last week.

20% of the class do not have jobs.

3. Calculate the mean income earned from paid employment for all those employed students who worked last week.
4. Calculate the mean income earned from paid employment for all the students in the class who are employed.

Class members income last week			
$73	$45	$0	$37
$124	$0	$0	$76
$450	$0	$0	$45
$112	$98	$54	$0
$0	$76	$118	$175

Part B

Collect data from your classmates for their income earned last week and for the last month (4 weeks). In your workbooks complete questions 1-4 above for this data.

5. Describe the income-earning patterns of your class.
6. Is there any data that distorts the figures? Explain carefully.
7. You could repeat these tasks for average hours worked per week, and per month.
8. What tools of systematics are used to calculate and pay income amounts?

Applied

What tools of systematics would be used to collect and calculate mean averages in vocational and other situations?

6.27 Averages - Median

Median

Sometimes a simple average might not be the best measure. This could be because of **outliers** (really high or low numbers) that distort the simple (mean) average, especially in small data sets.

Another measure of average is to find out the value that sits in the **middle** of a set of data. This will give you an idea of where a value sits in a line-up. Just like the class lining from shortest to tallest on school photo day! In this case, there will be the same amount of values above and below the median.

So for the example of $3, $6, $9, $11, $12, $16, $20 the value in the middle is $11.

- The median price is $11. (And for this example the median value just happens to be the same as the mean.)

The median is the **midpoint** of a set of values. Median prices are used a lot in real estate, and median is a good measure to find an 'average' when dealing with populations, such as finding median height and weight, median income, and median wealth. Consider these examples.

- The median full-time adult average weekly ordinary time earnings as at May 2023 was $1,838. This is the figure that sits right in the middle of all 'adult' workers. This is the median average (ABS, Aug '23)
- The median house price in Melbourne metropolitan areas for the June 2023 quarter was $938,000. (REIV, July 2023).
- The median house price in Victoria regional centres for the June 2023 quarter was $605,000. (REIV, July 2023)

Image: Stian Iversen/ iStock/Thinkstock

Median

- The median average is used to find the **midpoint** in a set of data.
- The median is the figure that sits exactly in the middle. If the data set is an even number of values, then the median is the simple average of the 2 middle values.
- Arrange the data from lowest to highest.
- If a data set has 19 values, then the median will be the amount of the 10th value.
- If the data set has 20 values, then the median will be the simple average of the amounts for data numbers 10 & 11.

e.g. Bruce earned $1,200, $700, $350, $210 & $450 over each of the last 5 weeks.

data = $210, $350, $450, $700, $1,200

median = $450 (Bruce's median income over the last 5 weeks was $450.)

NUM SUPER SKILLS

Part A

Rewrite the student income data from the table on p.167 from lowest to highest (ascending order).

Class members income last week									

1. Calculate the median income earned from paid employment for the entire class.
2. Calculate the median income earned from paid employment for all those who worked last week.

20% of the class do not have jobs.

3. Calculate the median income earned from paid employment for all those employed students who worked last week.
4. Calculate the median income earned from paid employment for all the students in the class who are employed.

Part B

Collect data from your classmates for their income earned last week, and for the last month (4 weeks).

In your work folios complete questions 1-4 above for this data.

5. Describe the income-earning patterns of your class using median.
6. Is there any data that distorts the figures? Explain carefully.
7. You could repeat these tasks for average hours worked per week, and per month.

Applied

What tools of systematics would be used to collect and calculate median averages in vocational and other situations?

6.29 Averages - Mode

Mode

The mode is the count of the **most frequent** value. It is useful for finding the value that is occurring most often. As such, mode is useful for sales and purchasing data, observational data on what types of occurrences are happening; and it can assist in **problem-solving** (such as the **80-20 rule**). Consider this example.

> You want to find out the most likely price you will pay when buying items. If you buy 7 objects priced at $14, $14, $14, $14, $14, $16, and $111 then the simple mean is $28.14. (i.e. $197/7).

However, the mode is a measure of the most frequently occurring value. In this example, $14 comes up five times so the modal average is $14. We can say that although the 'average' price is $28.14 (the mean) the most likely price you will pay is $14 (the mode).

As an example, this might be the difference between catching a taxi, as opposed to using Uber, during surge pricing situations, such as on New Year's Eve! Discuss this.

Image: crspix/iStock/Thinkstock

Which colour represents the modal average from these jelly beans?

Mode

- The modal average is simply the most frequently occurring data value
- To find out the mode you calculate which value occurs most often
- Mode is useful when the spread of numbers is very high, e.g. student marks on a test out of 20, or average teenage wage per hour rounded to whole dollars.
- Mode is not so useful if the data set is small and/or so has the amount of possible data values. e.g. Australian household.
- However, mode can be good for averages related to action and achievement, such as the modal average of goals Jeff Cameron kicks in a match.

NUM SUPER SKILLS

Systematics

Many work-related situations collect and use data and information. And when working, you will be expected to collect, collate, organise and analyse this data and information. Therefore, the tools of systematics are used extensively in work-related situations for data collection and analysis, including average measures such as mean and median, customer records and databases, financial information and spreadsheets, and many other forms of industry-specific data organisation and display.

You might also need to use the tools of systematics to take measurements, make counts of items, create financial documents including quotes, purchase orders, invoices and receipts, and many other occupational-specific work-related tasks.

Image: nikkitok/ Depositphotos.com

Although there is a growing range of digital devices and apps to help you do these tasks, it is important to realise that analogue methods are still often used, and in some cases, are more efficient - such as writing down a café order rather than using an iPad. So why not ask your boss when it's better to create a paper trail as part of systematics, and when it is better to use digital tools of systematics? Then report back to the class.

Average - Mode 6P

Part A

Rewrite the student income data from the table on p.167 based on a count of the number of times a particular value occurs.

Class members income last week						
/	/	/	/	/	/	/
/	/	/	/	/	/	/

1. Calculate the mode income earned from paid employment for the entire class.
2. Calculate the mode income earned from paid employment for all those who worked last week.

20% of the class do not have jobs.

3. Calculate the mode income earned from paid employment for all those employed students who worked last week.
4. Calculate the mode income earned from paid employment for all the students in the class who are employed.
5. How useful is the modal average measure across these different situations? Explain carefully using evidence.

Part B

Collect data from your classmates for their income earned last week and for the last month (4 weeks).

In your workbooks complete questions 1-5 above for this data.

6. Describe the income-earning patterns of your class using mode.
7. How useful is mode as an average for these types of measures?
8. You could repeat these tasks for average hours worked per week, and per month.

Applied

What tools of systematics would be used to collect and calculate mode averages in vocational and other situations?

6.31 Spread and Range

Range

Sometimes calculating an average using mean or median or even mode, 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 a range because one or two very high, or very low, data samples (**outliers**), could **skew** the data. Data that is skewed with a large range, might not paint a true picture when using a simple average.

For example: Range

- The average weight of the Sunnyvale wrestling team = 100kg.

  The wrestlers' weights are: Bron = 75kg, Ron = 85kg, Ziggy = 95kg, Biggy = 105kg. But big Yoko weighs in at a whopping 140kg. So Yoko has skewed the average weight somewhat.

  The range of these values is 140kg (heaviest) less 75kg (lightest) which = 65kg. That's a pretty big difference there!

- The team goes to lunch to celebrate a win. Bron has $10, Ron has $10, Ziggy has $5 and Biggy has just $2. Yoko's got $28 so he'll shout Biggy and spot Ziggy a $5!

  The average $ across the five wrestlers is $11. But the range is $26 ($28 less $2).

Some averages are less average than others

An average is a good way to get an overall view of a sample of data. But we have to treat some averages with a bit of care in how we apply these to real-life situations.

Some data in the sample might vary widely from the average. So the average is not really indicative of that data. For example:

Wealth of each household on Easy Street							
House 1	House 2	House 3	House 4	House 5	House 6	House 7	House 8
$ 1.5m	$2.6m	$4.5m	$2.7m	$0.[illegible]m	$10m	$1.2m	$1.4m
Mean average household wealth = [illegible] = $3m Median average = $2.05m							

When we measure the average wealth of each household on Easy Street we can see that only two households are above the mean and six are below, with four of these well below.

So does the mean average show a true picture in this case? And this data also includes one very high **outlier** and one very low outlier, and these outliers have distorted the mean average.

And you might also find that not one single item of data in the sample equals the average. In fact, there might be considerable **variation** in the actual data from the average. You can see this in the Easy Street example. So the average might not be as representative of a sample as you would expect.

Let's try another example looking at the 3 types of averages and see what we get. Do you think any of these averages are indicative of the real patterns of the class members?

Distance jogged by class members last 7 days											
Tim	Tam	Jim	Jan	Cat	Nat	Dat	Yat	Rik	Bik	Vik	Zed
2.1km	0	0	17.8km	4km	2.5km	0	7.5km	0	0.1km	4.4km	0
Mean distance jogged = 38/12 = 3.2km Median distance jogged = 1.1km Modal average = 0											

Let's take a look at one last set of data. This data set is based on a survey of Year 12 students who are working, reporting the number of hours they worked in the previous week. Student workers were asked to use whole numbers only (i.e. to round up or down so as to not worry about exact minutes). As this data set is quite large, the results will be more reliable. And another improvement to the data involves excluding students who are not working, as all those zeros could '**skew**' the data averages.

Year 12 students hours worked in the previous week														
4	8	5	8	12	16	4	8	6	12	10	4	8	12	9
8	28	8	9	8	4	12	16	18	23	8	8	10	11	18
12	8	12	16	4	9	7	8	9	12	2	5	7	6	9
4	8	12	16	15	11	8	9	20	16	15	8	15	8	14
n = 60 Mean = 10.3 hours Median = 9 hours Mode = 8 hours														

Spread and range 6Q

Use the examples on pp.172-3 to answer these questions.

A. Easy street mean?	B. Easy street median?	C. Easy street high outlier?	D. Easy street low outlier?
e. Explain how useful you think the mean average is for this data set.		f. Explain how useful you think the median average is for this data set.	
g. Take out the outliers from this data set and then calculate the new mean and median averages. Do you think these averages now better represent this data set? Why/why not?			
H. Distance jogged mean?	I. Distance jogged median?	J. Distance jogged mode?	K. Distance jogged outliers?
l. Which is a more useful measure of average for this data set, mean median or mode? Why so?		What is the problem with this data set? How could it be improved to give a better indication of average?	
n. Take out the zeros (non-joggers) and recalculate the new mean and median averages. Do you think these averages now better represent this data set? Why/why not?			
O. Hours worked mean?	P. Hours worked median?	Q. Hours worked mode?	R. Hours worked outliers?
s. Each of the averages gives different results. Which would you choose to report on the data? Why so?		t. There are 60 items of data in this data set. Why does that make the averages more useful?	

6.33 Assessment Task

AT1a Averaging Out
Recreational Numeracy/ Civic Numeracy

1
4 PS 2
3

You are required to use your numerical skills related to the measures of mean, median and mode to complete an investigative and reporting task into a set of statistical data.

You have a choice between 2 applied projects. They each draw on the same skills. But your analysis of the data will vary based on your data population.

The requirements for each project are outlined in the table below. Your teacher will discuss the suitability of each project for you and your class.

The two projects from which to choose are as follows.

1. **Research, collect and analyse key physical and performative data related to a sporting team**. or
2. **Research, collect and analyse data related to a population of your choice using variables to find out information in which you are interested. You might have to collect the data yourself. You might investigate a local issue or an issue that impacts on young people**.

A. Sports data	B. Demographic data
a. Choose a team to focus on, it might be your team or a professional team. b. How could you use and apply the tools and techniques of systematics to collect, organise and analyse this data? c. Calculate the mean, median and mode height, weight, age and games played for all players on the team list or roster. d. Create relevant graphs/charts/tables to illustrate this information. e. Use the graphs/charts/tables to report on the various averages for the team. Create suitable graphics. f. Explain what these averages indicate about the players. Are they too short or too tall, too light or too heavy, or perhaps too young or too old, and so on? Or are they just right!? g. AFL and other sports use lots of simple average (mean) statistics such as average disposals per game and other key indicators. Explain circumstances whereby the use of median and mode might be better. Hint: median (physical characteristics) mode (goals kicked). Ideas?	a. Choose a population for which you would like to research, investigate and/or collect data e.g. Income levels, learning patterns, youth employment or a local issue of your choice! Note: n must > 30! b. How could you use and apply the tools and techniques of systematics to collect, organise and analyse this data? c. Calculate the mean, median and mode for different variables based on the data you have found and collected. d. Create relevant graphs/charts/tables to illustrate this information. e. Use the graphs/charts/tables to report on the various averages shown by your data. Create suitable graphics. f. Explain what these averages indicate about your population. g. A lot of data uses simple average (mean) statistics such as average hours worked. Explain circumstances when the use of median and mode might be better. Hint: median (income earned by teens) mode (hours worked by teens). Ideas?

Assessment Task 6.34

Name(s):

Key dates:

AOS6: Data
AOS8: Systematics
Recreation or Civic Numeracy

Tasks - AT1a: Averaging Out	Must do?	Due by	Done	Level
SPORTS				
Focus:				
Explain applied use of systematics.	○		○	
Calculation of means, medians and modes.	○		○	
Create graphs/charts/tables to illustrate this information.	○		○	
Use graphs/charts/tables to report on this information.	○		○	
Explanation of what the data and averages indicate.	○		○	
Analysis of what the data and averages indicate.	○		○	
Justify circumstances to use specific data and measures.	○		○	
Demonstrate analogue and digital skills of systematics.	○		○	
	○		○	
	○		○	
DEMOGRPAPHIC				
Focus:				
Explain applied use of systematics.	○		○	
Calculation of means, medians and modes.	○		○	
Create graphs/charts/tables to illustrate information.	○		○	
Use graphs/charts/tables to report on information.	○		○	
Explanation of what the data and averages indicate.	○		○	
Analysis of what the data and averages indicate.	○		○	
Justify circumstances to use specific data and measures.	○		○	
Demonstrate analogue and digital skills of systematics.	○		○	
	○		○	
	○		○	
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.	✓		○	

6.35 Assessment Task

AT1b 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.

You should strongly consider choosing a focus that **crosses over** another **numeracy** area such as **financial** e.g. youth wages and cost of living; **recreational** e.g. patterns and benefits of community sport and/or engagement, or **vocational** e.g. the impact of work/life balance on working families.

At all stages, you will need to apply the tools of **systematics** to your investigation.

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 a civic/social issue to investigate. Might be an economic, social, environmental, health or other issue.	**2. Design and use a survey.** Decide on the respondents, type of questions, format, and other matters.
3. Collate, tabulate & organise the results. Organise your data and information in a meaningful way.	**4. Calculate and analyse relevant averages.** Analyse what these averages indicate about the data.
5. Create visual representations of the results, including graphs. Represent the data in a more user friendly visual format.	**6. Source reputable data, information and/or reports about the same issue.** Find and evaluate potential sources of suitable data and information.
7. Compare your results to the existing data and information. Analyse both sets of data and information to find similarities and differences.	**8. Report recommendations or suggestions using both sets of data and information.**

Assessment Task 6.36

Name(s):

Key dates:

AOS6: Data
AOS8: Systematics
Civic Numeracy

Tasks - AT1b: Analysing and Reporting on an Issue	Must do?	Due by	Done	Level
1. Issue:	✓			
2. Design and use a survey.	✓			
3. Collate, tabulate and organise results.	✓			
4. Calculate and analyse averages.	✓			
5. Create visual representations of the results; inc. graphs.	✓			
6. Source existing data and information.	✓			
7. Compare results to existing data and information.	✓			
8. Make recommendations and suggestions.	✓			
Apply and use tools of systematics.	✓			
Draft my report and submit for feedback.	✓			

Task completion

	Must do?	Due by	Done	Level
1 4 PS 2 3 **Describe applied use of the problem-solving cycle.**	✓			

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

	Must do?	Due by	Done	Level
Develop and apply mathematical tools and techniques.	✓			
Prepare and submit your final report.	✓			
Present a report to the class.	✓			

6.37 // 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:
4. 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	**Maps and bearings**	180-181			
7B	**Angles**	183			
7C	**Language of location**	185			
7D	**Going downtown**	186-187			
7E	**Giving instructions**	189			
7F	**Coordinates**	190			
7G	**Making and using maps**	191			
7H	**Drawing directions**	192-193			
7I	**What would you do?**	194-195			
7J	**Apps v Maps**	196			
7K	**Old-school v Nu skUL**	197			
7L	**Get out and fill up**	198-199			
AT2a	**Battle of the Maps**	200-201			
AT2b	**By, Buy, Why?**	202-203			
PST	**Problem-Solving Cycle and Maths Toolkit**	204			

Comments:

7.01 Compass and Angles

Which way do I go?

Do you know where you are going? And more importantly, do you know how to get there?

We live in a big complex world and we rely on maps to help us navigate between locations. These maps include macro maps, such as geographical maps, street directories and digital maps, all the way through to more micro maps, such as retail layout maps, seating plans and even circuit diagrams.

In the 21st century, the world has experienced the dominance of apps, satellite navigation systems and GPS to help us navigate the world. But is this really helping us? Is it better to work out where to go for yourself, or be told where to go by someone, or increasingly, something else?

Compass and GPS

A compass is the most fundamental tool for navigation. The face of a compass consists of 360 degrees with each **quadrant** (quarter) equating to 90^0. So each quarter turn north, south, east or west = 90^0 (the four **cardinal direction**s).

Each half of a quarter turn, which is 1/8, = 45^0 (e.g. N, NE, E, SE, S, SW, W, NW).

Each half turn of an eighth, which is 1/16th, = 22.5^0 (e.g. NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, NWN, NW, and NNW).

And naturally, 16 times $22.5^0 = 360^0$, 8 by 45 = [illegible] and 4 by $90^0 = 360^0$.

In contemporary times, GPS has replaced the use of a compass for many navigation needs. In simple terms, GPS uses **trilateration** based on the distance travelled by a location signal to at least three satellites (plus a fourth to adjust for time offsets) to precisely calculate the latitude, longitude and altitude of any location on Earth.

Image: @ Route55/ Depositphotos.com

7A Maps and bearings

1. Describe examples of when you use maps and for what purposes. Also, state the type of maps you use.

2. Mark the correct points on the compass below and/or identify the correct compass directions (bearings).
3. The needle on a compass always points north. But how do you use a compass to navigate? Research this online and summarise in your work folios.

a. West 	b. South-East 	c. North-West 
d. Nor Nor East 	e. SSW 	f. ENE 
g. _____ 	h. _____ 	i. _____ 
j. In degrees _____ 	k. In degrees _____ 	l. In degrees _____ 

4. Find out what types of occupations use compass directions and bearings as part of their day-to-day work roles. How well would you go at doing this?

7.03 Compass and Angles

Angles

As you already know, an angle measures the 'distance' between 2 **rays**. When drawn these rays might be represented by lines. In the **3-dimensional** world the 'rays' might 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.

Angles in action

Sometimes people use angles when describing direction and location. This is especially relevant in practical, manual and technical occupations, and in many movement, transport and travel situations.

Angles are also used for describing direction and location in performative areas such as dance, in sports, in many creative areas such as photography, design, staging and lighting, and in some health and recreation situations.

One of the best ways to apply directional angles is to rotate an object, or yourself, the number of turns signified by the angle. So given that a quarter turn is 90^0, this will see you or the object, facing in a totally different direction. Four quarter turns and you are back to where you started.

When an under-performing apprentice says they had to completely change my direction in life and do a full '360' you know. Although we applaud their change in life, their Numeracy skills leave a little to be desired. But they actually will turn themselves around by doing a '180'. If they did a '360', they'd be still facing in the same direction as when they stared. At least they are giving 110%; or is that impossible?

Angles and degrees are also used as descriptive terms in 'artistic' sports to describe body rotations such as twists, flips and somersaults in snowboarding, ski-jumping, water skiing, skating, BMX, diving and gymnastics.

For example, "Woo-hoo, Jumpy Jaxxson just landed a 720 in the half-pipe! How rad is that!"

You explored angles last year, as well as earlier this year in Section 2. So right now, go back to pp.42-47 and have a recap.

Image: adapted from bojanovic/ Depositphotos.com

1. Match the type of angle with the correct explanation. In your work folios, draw a representation of each angle.

- ❑ An angle that is less than 90°.
- ❑ An angle that is exactly 90°.
- ❑ An angle that is more than 90° but less than 180°.
- ❑ An angle that is exactly 180°.
- ❑ An angle that is greater than 180°.
- ❑ An angle that is 360°.

Acute	Full	Obtuse
Reflex	Right	Straight

2. Draw or represent these common angles.

a. 15^0	b. 30^0	c. 45^0	d. 60^0	e. 90^0	f. 120^0	g. 135^0
h. 160^0	i. 180^0	j. 225^0	k. 270^0	l. 315^0	m. 360^0	n. 0^0

1
4 PS 2
3

3. Describe how an understanding of applied angles is important in recreational situations, and in vocational situations.

7.05 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. And few people know how to use a compass and where locations are in terms of compass bearings. And even fewer still carry a compass around with them - although there are apps for that.

Another issue is that maps usually run **vertically** within a rectangular 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. Some e-maps try to overcome this by using a simulated 3-D view.

So when you describe location, you will need to take into account **relative location** based on **length** (distance), **width** (size) and **depth**.

Digital dimension dilemma

Some of the biggest skills changes that are happening in the contemporary digital world are that people are '**listening**' to directions and maps when driving, or following a '**visual trail**' on their **screens** when walking, rather than actively planning a travel route.

Compounding this problem is that people are paying more attention to what they are told or shown by their digital devices. As a result, people are not **navigating** themselves **3-dimensionally** in the **physical world**. This means they are not taking in **reference points**, **landmarks** and other **features** that would normally help them to develop **spatial awareness**, **locational memory** and other **markers** of their physical location and direction.

So if someone can't accurately describe their location without the help of their device, then in reality, they don't really know where they are. And that is a sign of devolution rather than evolution. Or in other words, as our devices get smarter, we get dumber!

Image: Sunmax/ Depositphotos.com

Have a look at this workshop layout. How would you describe how the tools and other items are organised and located in relation to one another? And which of these tools can you name?

Language of Location

top left	up	top	top right
left			right
above			below
front			back
together			apart
column	centre/middle		row
beside			opposite
over			under
forward			backward
in front			behind
bottom left	down	bottom	bottom right

Image: Rawpixel/ Depositphotos.com

Language of location 7C

1. How many people are in the image above? Name them. Use the language of location to describe the relative positions of at least 12 of these people.

2. Use suitable language of location to describe the workshop layout on p.184.

7.07 Describing Location

7D Going downtown

1 4 PS 2 3

1. Pair up. Use the map to find suitable buildings, structures and areas that might represent these town amenities, features, areas and landmarks.
2. Describe the location of each, and show these on the map with a letter. What do you think would be the scale of the map? Would a grid help?
3. There are some common town amenities and features missing. Suggest and locate suitable buildings/areas and locations for these as well.
4. Feedback to the class. What is the level of similarity between your choices and other pairs? Why is that?

A. **CBD apartments**	B. **Central business district**	C. **City park**
D. **Fuel depot**	E. **Gallery & museum**	F. **Hospital**
G. **Monorail station**	H. **N[illegible]**	**Old gaol**
J. **Old village**	**Police complex**	L. **Primary school**
M. **Retirement Village**	N. **Secondary school**	O. **Shopping plaza**
P. **Sweets factory**	Q. **TAFE**	R. **Town bakery**
S. **Town hall**	T. **University**	U. **Warehouse**
V.	W.	X.
Y.	Z.	aa.

7.09 Describing Location

The language of directions

When someone asks you for directions you are taking responsibility for them arriving at their destination safely and quickly. You have to develop your **instructions** so that they can easily **navigate** to their required **destination**. This means that you have to use language that the traveller is likely to understand.

When people give and follow oral directions, they often use and prefer certain **language** to describe 'where' and 'how' about location and directions. And most people usually combine oral directions with physical **gestures** such as pointing.

Do people respond to directions such as 'North', or 'SSW', or will they prefer 'left' or 'right'? Can they estimate distance such as '400 metres'? Will they prefer time, 'about 5 minutes' or do they rely on landmarks such as 'the church on the corner'? Do they think in general directives such as 'around the corner', 'over there' or a 'little bit further', or do they respond to precise directives such as 'veer to the left', 'at the 3rd exit' or take a 45^0 turn? Tough job - that's why people get lost!

Compass directions (or **bearings**) 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 in the real world, there are many times when we don't even know which direction is which, unless we have a map, or have prior knowledge of an area.

Instead, we rely on **directional** words that are relevant to our position. These 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 combine these types of descriptions describe **relative position**. We also use **descriptors** that give an indication of how far, such as "soon", "4-blocks", "half-a-kilometre", "in 2 minutes" or simply even, "go around the corner and you'll see it"!

When giving directions, it is also 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.

So what about you? What type of language do you use to describe location and how to get around? Also bear in mind that:

- the most direct route might not be the most practical
- the most direct route might not be the quickest route
- the most direct route might not be the safest route
- the most direct route might not be the easiest to communicate, and
- the route that is quickest, safest or easiest to communicate might not be the most practical for you, but it might be the most practical for a traveller following instructions.

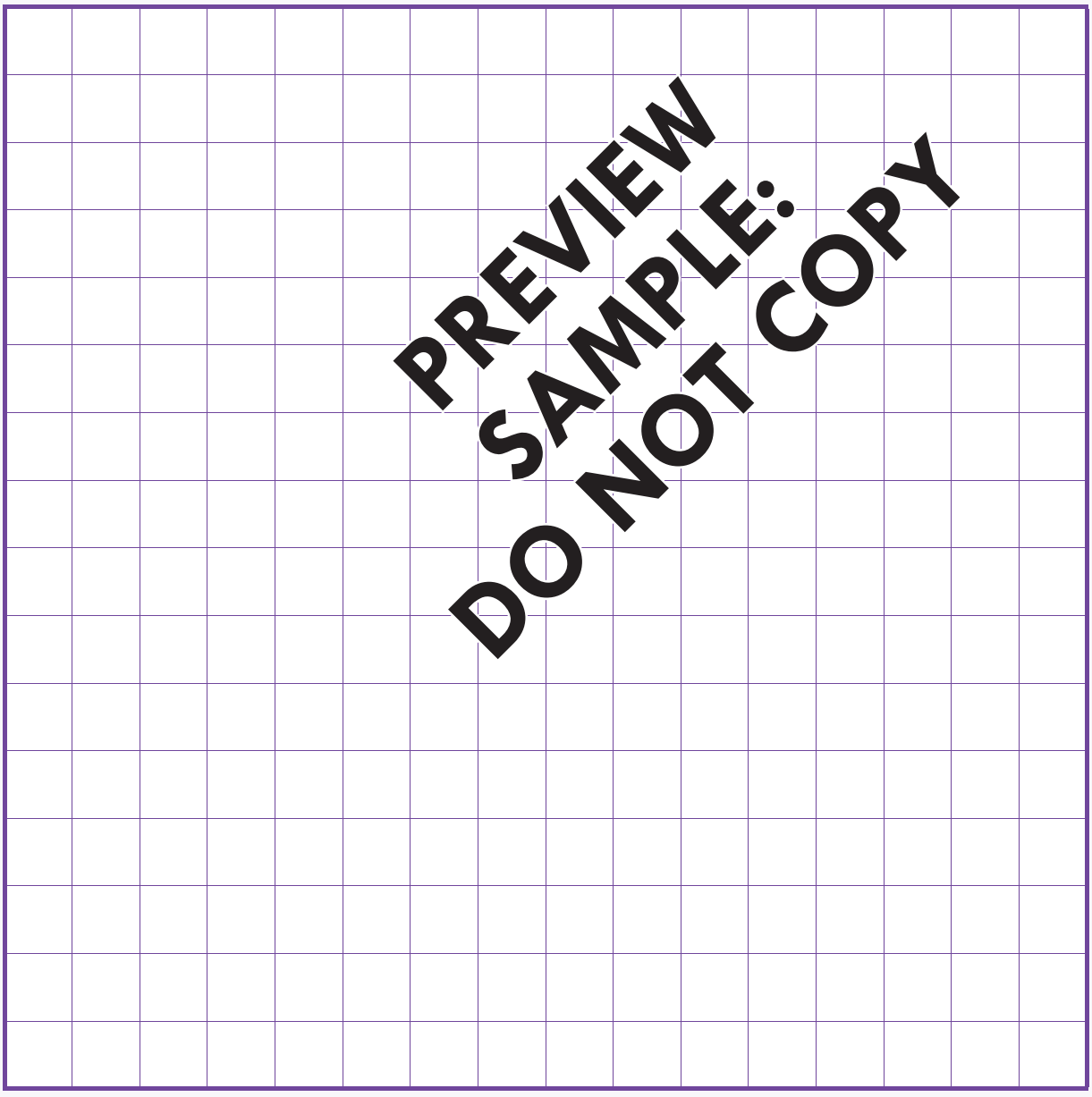
Image: s-c-s iStock/Thinkstock

Giving instructions 7E

1 4 PS 2 3

Develop a set of verbal instructions for someone to use to navigate to a place they are not likely to know, but which is familiar to you. Work in pairs.

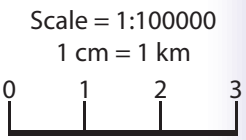
1. Start at your school or your classroom.
2. Sketch a rough map for your own use. Use the scaled grid below or enlarge this.
3. Using this map, develop your instructions in your work folios.
4. Communicate the instructions verbally to the traveller.
5. The recipient of the instructions should listen and plot the route on their own map.
6. The recipient follows your verbal instructions, adding any improvements to their own map.
7. Swap over. Record any issues, areas of improvement, etc..



7.11 Using Maps

Mapping features

- **Directions**: North, south, east and west (90^0). Or N, NE, E, SE, S, SW, W, NW (45^0). Also NNE, NSE, SSW and 13 more (22.5^0). Directions may often be arbitrary such as left, right, around the corner, over there, three blocks, after the hill, etc..
- **Scale**: A scale measures a ratio, such as 1cm = 1km and might be written as 1:100000 (e.g. 1cm =1km). Scale shows an allotted distance on a map corresponding with a distance in real life. Scale enables us to make a visual estimate of travel distance and travel time and to get our spatial bearings. (However, not all maps are to scale).



- **Pathways**: Include the ways or routes to get from 'point A' to 'point B'. On GPS, street directories and maps, pathways might include roads, streets, highways, freeways and other methods of travel. Pathways might also include public transport routes, pedestrian traffic areas, waterways, terminals and exchanges (e.g. airports) and so on.
- **Features and landmarks**: On macro maps features include places of interest, government buildings and services, emergency facilities, green areas, schools, signs, landmarks and other distinguishing and useful features. Features on micro maps might include specific locations and exact replication to scale.
- **Coordinates**: Maps, especially digital maps, such as Sat Navs, make use of global positioning coordinates (GPS) that are triangulated from satellite systems in space. These coordinates correspond to latitude - horizontal 'bands' around the earth; and longitude - vertical 'bands' around the earth (because the earth is a globe, spherical.)

  Geographic coordinates are most often measured in:
  - ❑ degrees, minutes and seconds e.g. [illegible]
  - ❑ decimal degrees e.g. 37.8[illegible]° S 144.9[illegible]° E

So what is located at these coordinates?

NUM SUPER SKILLS

7F Coordinates

1 4 PS 2 3

1. Find out the coordinates for the following. Add 3 more of your own choosing.

Your home	Your school	Your nearest train station
The MCG	The Sydney Opera House	Disneyland

2. Problem-solving

Your mate Billy Bignoter is always cracking on about how much he travels the world and posting pictures on Instagram. He just posted a picture of The Eiffel Tower with the caption, "Deal with it plebs, cry me a river if you're stuck at home." However, a mutual friend has commented saying, "Nice 'travel' pic Billy, how's the French Fries at... Melton Maccas. 37.68756 S 144.56747 E !"

So what's going on?

Making and using maps 7G

1 4 PS 2 3

1. You are required to create a map from your home to your workplace (or a work location you would like to be employed at).

   Create your map 'from your head' without any research. Use large format paper or multimedia. Include:

   - ❑ a suitable scale and directional guides
   - ❑ 2 different pathways routes
   - ❑ key landmarks and features
   - ❑ appropriate directions
   - ❑ estimated travel distances and times for relevant travel modes (at least 2 different).

Start planning and drafting here

2. When you are finished compare your map to a digital map. Use the digital map to find out:

   - ❑ the scale and directional guides
   - ❑ 2 different pathways routes
   - ❑ key landmarks and features
   - ❑ appropriate directions
   - ❑ estimated travel distances and times for relevant travel modes.

3. Comment on the similarities and differences between the 2 map formats. Which was better and more useful for the varied features? Explain why.

7.13 Using Maps

Drawing maps

So how did you go at activity 7E, using verbal instructions? Some of you might have done quite well, especially if you have well-developed communication skills and a preference for an auditory learning style. However, some people will ask for a map to help them out because they would rather work out and understand location, visually.

In these situations, it is your responsibility to draw a useful and representative map to guide the traveller safely to their destination. Therefore, 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 easy to identify.
- 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.

Image: photos.com

7H Drawing directions

1 4 PS 2 3

Task: Work as a group of 4. Each one will once again draw a map to help guide someone to a place they are not likely to know. Don't show each other!

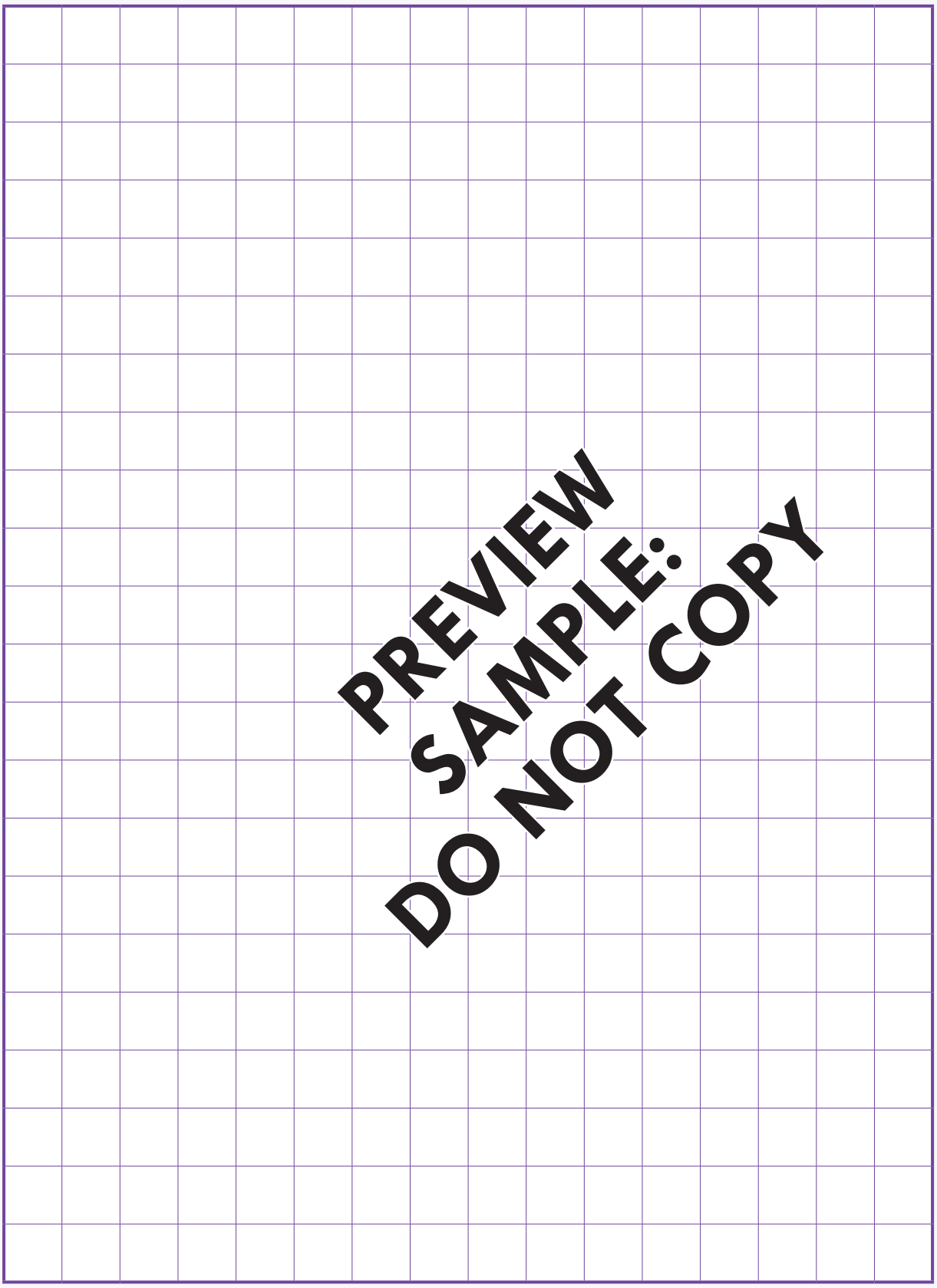
But this time one of your team members (the speaker) will give verbal directions to someone else (traveller one) based on your drawn map.

At the same time, the other team member (traveller two) will try to get to the destination based just on your map.

1. Once again, start at your school or your classroom. Sketch a rough map for your own use. Use the scaled grid opposite.
2. Using this map, develop your instructions in your workbooks.
3. Give the instructions, but not a map, to 'the speaker'. They'll work with traveller one.
4. Give the map to traveller two.
5. See how they go!
6. Swap over. Record any issues, areas of improvement, etc..
7. Why not strap a GoPro on each traveller and then watch the outcomes back in class? Not only will it be instructive; it's probably going to be quite funny!

Name(s): _____

Map of: _____ Date: _____ Scale: 10mm: _____



7.15 Using Maps

7I What would you do?

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 role-play these scenarios?

It's 5:30 and you are at work and a visually-impaired guy comes into your workplace. Using a cane, he approaches you and asks for directions to the nearest post box as his letter has to make the 6pm mail. He says that his phone has run out of charge so he can't get audio instructions.

a. What is the first thing you should ask him?

b. What else should you ask him?

c. List the verbal instructions you would give to help him find the post box in time.

d. How did you decide on what to include in these verbal instructions?

e. Now partner up. Blindfolded, but with someone to accompany you for safety, try these instructions out! How'd you go?

Soon after, an anxious woman comes in carrying a petrol can and hands you a piece of paper with the nearest petrol station circled. She shrugs her shoulders and points to the paper and makes a 'please help me' gesture with her hands.

f. What is the first thing you should ask her?

She doesn't understand your question and replies in a language you don't understand.

g. What would you do next?

h. Draw an instructional map to help this woman find petrol.

i. How did you decide on what to include in the visual map?

j. How would you communicate if you were out of petrol in a non-English speaking country? Is there any technology that might help you?

7.17 Apps & Maps

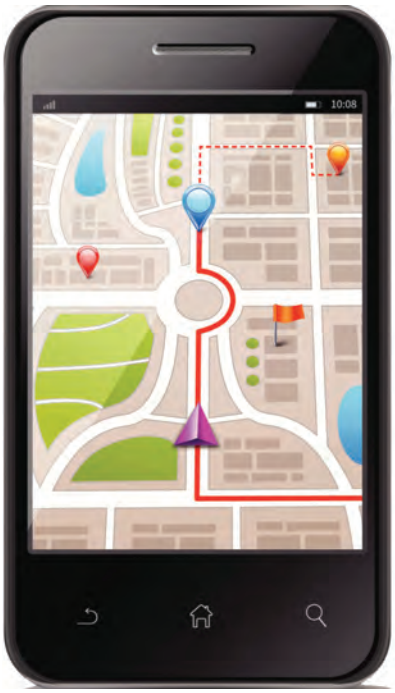
Maps v apps

Do you ever see people walking around the streets while using their devices to find out where they are going? What do you think about them? Or is that you?

Mapping apps, GPS and other technological locators can provide enormous benefits for travellers, as well as for everyday people. They are very useful when one is lost, because they can show you, or even tell you, where to go!

On the downside, screens can be too small, GPS can suggest routes that ignore local knowledge (which can increase travel time) and users seem to be dumbing-down and becoming technologically dependent. People are even walking past destinations while looking at their phones, instead of just looking up!

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 can cause distractions when driving.



"Where would you be without me?"

Image: Askold Romanov/ iStock/Thinkstock

7J Apps v Maps

Outline the advantages and disadvantages that you experience when using 'printed maps', such as a street directory, as opposed to electronic maps, such as GPS or a phone app. Consider personal and work-related situations.

Personal situations		Work-related situations	
Example	Advantage/disadvantage	Example	Advantage/disadvantage

Old school v Nu skUL 7K

Which do you prefer, old-school paper maps or new-school digital maps; or even some other method of finding out where to go? Each can be useful in different situations. Which type of map (or method) would you use in these situations and why? Can you foresee any problem arising from your choice? Explain carefully.

Situation	Method?	Why so?	Potential problems?
You have to travel to the CBD for a job interview at 10am on a Monday.			
You are meeting a friend outside their workplace; you've never been there before.			
You have to plan a 5km jog finishing back at your home.			
You want to hit all the bargain, retro and opp shops in a hipster suburb in a one-day blitz.			
You are planning a one-week road trip, with friends, by car.			
You are planning a one-week road trip, alone, by car.			
You are planning a weekend of off-roading in the bush.			
You want to undertake a series of nature walks over a weekend.			
Going to a party in a seedy neighbourhood you exit the platform to a very dark street.			
You land at an airport in a foreign non-English speaking, major city.			
You get off the train in a foreign non-English speaking, rural village.			
You encounter an unexpected roadblock while driving and your Sat Nav isn't up-to-date.			

7.19 Apps & Maps

7L Get out and fill up

1 4 PS 2 3

1. Plot all the outlets of your favourite fast food joint or another favourite destination on a map. Choose a geographic boundary to work within, or limit to a manageable number of venues.
2. Starting from and finishing at your house or school, plot the most efficient route to visit them all. Choose a mode of transport such as walking, bike, public transport, car or some other way of getting around.

   Allow for time of day, traffic conditions, mode(s) of transport, one-way streets or other features that might affect your journey. Record these.

3. Using your preferred style of map, estimate the distance. Compare your estimates to the actual distance travelled recorded on an odometer, fit tracker or pedometer. Comment on the accuracy of your estimate versus the actual.

4. Using your preferred style of map, calculate the travel time. Compare your estimates to the actual distance travelled recorded on a timing device. Comment on the accuracy of your estimate versus the actual.

5. Estimate the time you will spend in each venue. Did this change? Why or why not?

6. Collect a souvenir from each destination visited (legally of course).

Name(s): _____

Map of: _____ **Date:** _____ **Scale: 10mm:** _____

7.21 Assessment Task

AT2a Battle of the Maps
Recreational Numeracy // or Vocational Numeracy

1
4 PS 2
3

For this assessment task, you are required to create and use annotated **maps** to compare the effectiveness of **analogue** and **digital map** versions.

You can apply your focus to either a **recreational situation** or a **vocational situation**, depending on advice from your teacher.

1. Working in groups, choose a destination in consultation with your teacher. This could be:
   - ❑ a **workplace** or **worksite(s)** that you are interested in working, or
   - ❑ a **recreational destination** or **series** of recreational **destinations**.
2. Split your groups in half. One group will only use old-school technology to navigate to the destination. The other group will only use 'nu skUL' technology to navigate to the location.

Old-school group - Paper

3. Use a grid to make a detailed old-school map of the route. Choose a suitable scale and compass bearings.
4. Include any landmarks, roads, intersections or any other distinguishing features, prominently.
5. Estimate travel times and distances.
6. Test your route by travelling using your map.
7. Time the travel and record any failures in the route or map - inaccuracies failure to account for time of day, traffic, conditions, legibility of map, use of scale, etc..

Nu skUL group - Digital

3. Use only nu n-skUL technology to navigate to your destination.
4. Note any landmarks, roads, intersections or any other distinguishing features given by your technology.
5. Get estimates of the travel times and distances from the technology.
6. Test your route by travelling using digital maps.
7. Time the travel and record any failures in the technology - inaccuracies failure to account for time of day, traffic, conditions, legibility of map, use of scale, etc..

Swap roles based on a new destination and repeat the tasks

8. In your groups, discuss the success or otherwise of old-school v nu skUL. Report to the class.
9. Who or what is better suited to each method? Why/why not?
10. What improvements would you suggest and/or what advice would you give?

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 Vocational Numeracy

Tasks - AT2a: Battle of the Maps	Must do?	Due by	Done	Level
1&2. Focus is:	✓		○	
Old-school group - Paper				
3. Make detailed route map with scale and bearings.	✓		○	
4. Include landmarks, roads and any other features.	✓		○	
5. Estimate travel times and distances.	✓		○	
6. Test your route by travelling it using your map.	✓		○	
7. Time the travel; record any failures in the route or map.	✓		○	
	○		○	
Nu skUL group - Digital				
3. Use digital technology to navigate to your destination.	✓		○	
4. Note any landmarks, roads and other features given.	✓		○	
5. Get estimates of travel times and distances.	✓		○	
6. Test your route by travelling it using digital r…	✓		○	
7. Time the travel; record any failures in th… or map.	✓		○	
	○		○	
3. Swap roles				
3-7 Repeat the tasks - Old to Nu.	✓		○	
3-7 Repeat the tasks - Nu to old.	✓		○	
8. Evaluate and compare the effectiveness of ea… od.	✓		○	
9. Analyse the suitability of each method.	✓		○	
10. Suggest and justify improvements; a… dvice.	✓		○	
Task completion				
Applied use of the tools of systematics.	✓		○	
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).	○		○	

7.23 Assessment Task

AT2b By, Buy, Why?
Vocational Numeracy // & Civic/Financial Numeracy

1
4 PS 2
3

Retail layouts

The mission of the retail industry is to get you to buy stuff, and lots of it. Retail design aims to ensure that consumers spend as much money as possible with a particular retailer (actually them!). So given this, different retail establishments are set up to suit the 'needs' of their target market.

Retail supermarket layouts are designed to try and get consumers to pass as many items as possible on their way to those few staple items that they came in to buy such as milk or bread. Product manufacturers and wholesalers pay undisclosed amounts to get the best shelf sites so as to attract the eye and $ of consumers. Some items are also co-located to encourage complementary purchases, e.g. corn chips and salsa.

In modern times, most workers earn more income but have less time. So we go to a supermarket that has been designed to make us queue up and waste our time to pay for 'cheaper' items. We even self-scan now, or in other words, do ourselves what used to be the job of the supermarket. Does this save time? What do you think?

As at August 22 (released Dec 22) the average full-time hourly wage (in a person's main job) was about $37 *(ABS: Employee Earnings, Aug 2022)*. So technically an hour of shopping costs $37. Are supermarkets designed to save people $37 an hour? Or are they designed to get people to spend more? Talk it over as a class.

You are required to visit your local supermarket (or another retail setting) to research and map the store layout. You might be best doing this task in pairs or in a group. Your teacher will instruct you as to your requirements and the tasks to complete.

Your teacher will also instruct you as to whether different groups will be mapping different stores, (which is the best way of doing this task). You will need to gain relevant permissions including an unsupervised student form (if applicable) and, of course, permission from the retailer.

1. **Draft supermarket/retail layout.**
   a. Use a grid to map out the retail store from your memory, prior to visiting it.
   b. Make sure that you include all aisles, registers and relevant sections. Try to get the dimensions and layout as accurate as possible.
2. **Accurate supermarket/retail map.**
   a. Visit the supermarket/retail outlet, take notes and make sketches so as to complete your map.
   b. Complete your final map. Make sure that you include all aisles, registers and relevant sections. Try to get the dimensions and layout as accurate as possible.
   c. You should make and use a scale.
3. **Analysis of supermarket/retail map.**
   a. Prepare a report to the class that discusses the effectiveness of the supermarket/retail layout, customer flows, retail 'tricks' used by the supermarket in its layout, OHS/WHS hazards, accessibility problems and any other issues that you noticed. Use PowerPoint or Canva or some other way of showing your supermarket map to the class.
   b. Design a more suitable layout for a supermarket, or for a retail store of your choosing. Report to the class.

Name(s):

Key dates:

AOS5: Dimension & Direction
Vocational Numeracy Civic/Financial

Tasks - AT2b: By, Buy, Why?	Must do?	Due by	Done	Level
My focus is:				
1. Draft supermarket/retail layout.				
a. Create draft map of a supermarket/retail layout.	✓			
b. Include all relevant elements on the map.	✓			
Develop and apply appropriate scale.	✓			
Applied use of the tools of systematics.	✓			
2. Accurate supermarket/retail map.				
a. Visit supermaket/retail outlet, make notes and sketches.	✓			
b. Create supermarket/retail outlet map.	✓			
Include all relevant elements on the map.	✓			
c. Develop and apply appropriate scale.	✓			
Applied use of the tools of systematics.				
3. Analysis of supermarket/retail map.				
a. Describe the retail layout.	✓			
Analyse the purpose of the retail layout.	✓			
Discuss the strengths of the retail layout.	✓			
Discuss the limitations of the retail layout.	✓			
b. Create a map of an improved retail layout.	✓			
Justify the reasons for your changes to the layout.	✓			
Applied use of the tools of systematics.	✓			
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 map and report.**	✓			
Present a report to the class.				

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

7.25 // 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 conclusions	Done: ○ Level:	Assess conclusions	Done: ○ Level:
4. 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?**	207			
8B	**Uncertainty and likelihood**	209			
8C	**Probabilities**	211			
8D	**A toss of the coin**	213			
8E	**Life could be a dream**	215			
8F	**Predicting**				
8G	**Making it rich?**	221			
AT3a	**Sports and Games**	222-223			
AT3b	**Managing Risk**	224-225			
PST	**Problem-Solving Cycle and Maths Toolkit**	226			

Comments:

8.01 Uncertainty and Likelihood

Good luck

Last year we asked you if you feel you are lucky. But how do you know, or how can you measure this? And just what actually is luck? Perhaps fortunate is a better term to use. Do you remember the concept of being fortunate rather than lucky - what is the difference?

So how fortunate are you? Are you likely to lead a fortunate life and build a fortune? Are you feeling more or less fortunate than this time last year? Or are you hoping to get lucky and strike it rich through a win on Powerball, or through some long-lost, rich relative leaving you a fortune in their will?

It is important to reiterate that 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 hi[illegible]lled an[illegible]ositive p[illegible]

Image: dizanna/ Depositphotos.com

They rarely, if ever, say that luck w[illegible] a reason [illegible] their s[illegible] apart from sometimes saying that they were in the ri[illegible]ce at the[illegible]ht time - [illegible]at is really more due to good planning rather than luck. S[illegible]here does t[illegible]s leave [illegible]u?

What Chance Do I Have?

Likelihood

Probability

Odds

Luck

Chance

Probable

Unlikely

Coincidence

Random

Conditional

Unconditional

Cause

Effect

Apophenia

Image: Brother_Grin/ Depositphotos.com

What is the Likelihood?

Certain
Probability = 1
This is the highest possible likelihood. e.g. a 100% chance of happening!

Likely
Probability is between 0.5 and 1.
This is more likely to happen than not, especially as the probability moves away from 0.5 and gets closer to 1, e.g. 0.75.

Even chance
Probability = 0.5.
This is as likely to happen as it is not likely to happen. e.g. 50/50.

Unlikely
Probability between 0 and 0.5
This is more likely **not to happen**, especially as the probability moves away from 0.5 and gets closer to 0, e.g. 0.25.

Impossible
Probability =0
This is the lowest possible likelihood. This will not happen! e.g. a 0% chance.

What are the chances? 8A

1. What are the chance and the probability for each of these situations?

Coin Chance of tossing a tail? Chance = 1 out of 2 Probability = 50%	**Coin** Chance of tossing a head?	**2 Coins** Chance of tossing 2 tails?
Die Chance of rolling a 1? 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 black?	**Toast** Chance that dropped toast will fall butter side down!

Discussion
"Gambling is a fool's game. The only guarantee is that over time, you will lose your money." So, what do you think about this?

8.03 Uncertainty and Likelihood

Uncertainty

It is important that we revisit the concept of **uncertainty** that you may have explored last year. 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** with 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**, You then need to 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

As you may already have learned, 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 a much chance at getting their preferred option as does the captain of the English team. Even/Stevens!

The same principle applies to rolling a die. There's a one in six chance of rolling a '6'. That's the same likelihood as rolling a '1', a '2', a '3', a '4', or a '5'. That's not very good odds at all: 16.7%. You would not 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 Spades, then there's a 1 in 4 chance of you randomly picking a card that is a Spade (13/52).

If the magician instead told you to pick a face value, and you selected 'King', then there's only a 1 in 13 chance of you randomly selecting a 'King' (4/52).

If the magician now asked you to pick one card, and you choose the King of Spades, 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?

Uncertainty and likelihood 8B

1. Explain the meaning of randomness and the meaning of likelihood.
2. Explain how each of these might play a part in your personal life, and in your vocational life.
3. Did you experience any of these since you explored this topic last year? Report back to the class.

Definitions	In my personal life	In my vocational life
Randomness is...		
Likelihood is...		

Applied

1 4 PS 2 3

What's the weather going to be tomorrow? Fine? Wet? How do you know? How do meteorologists apply uncertainty and likelihood to weather forecasting? What data and variables do they have to consider?

Discussion

What is Apophenia? Last year you might have investigated coincidence and how people feel the need to assign patterns and likelihood to events and occurrences that are random and not linked.

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 - what do you think the probability/odds are of that?

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.

View

Penn and Teller are recognised as the two greatest magicians of the contemporary era. Have you checked them out yet? Start by viewing some episodes of:
Penn and Teller: Fool Us.
How do magicians create 'tricks' that make the extremely unlikely, happen?

8.05 Chance and Probability

Probability

You are likely to have heard the term probability before, especially if you did Numeracy last year in your Vocational Major.

It is important to be aware of the concept, language and measures of **probability**, because you might be in a work or community situation, and a manager or colleague might use the term to make a **prediction** about the **likelihood** of an outcome.

"There's almost zero probability of any customers coming in after 7pm."

"I reckon there's a 75% probability of it raining later. We might have to reschedule the BBQ!"

In simple terms, probability means how **likely** it is that something will happen. This means that probability measures **chance**. And if you like, you can always substitute the word chance for the numerical term, probability.

'Tails never fails'

A good way to illustrate probability is with a simple coin toss.

When tossing a coin, there are 2 potential **outcomes**. Heads or tails.

Image: robynmac/ Depositphotos.com

(Yes, there is a minute chance that the coin could land on its edge, but that is so small that you can ignore it...or wait until you see something pigs!).

So the chance of landing as heads is 1 in 2. The chance of landing as tails is also 1/2. There is an equal likelihood of spinning heads or tails. That's 50/50.

If you **predict** a head, you have a 50% chance of being correct. If your friend predicts tails. Then they also have an **even chance** of guessing correctly.

So the likely outcome is the same.

But see and hear how different language was used. '1 in 2', '1/2'. '50/50'. '50%'. 'Even chance'.

The language used doesn't alter the chances. The coin will do what it likes. And over time, if you spin a coin long enough, it will land on heads about 50% of the time, just as it will land on tails about 50% of the time.

But that doesn't mean it will alternate heads, tails, heads, tails, etc.. Nothing could be further from the truth. The coin will determine for itself what it wants to show. The result is a chance event. So therefore, the outcome is **random**.

But this is where people can get sucked in (or suck themselves in). They try to see or predict **patterns** in an event that is random. And that's why gambling on chance can only ever see you lose, unless you quit after your first ever win and bet never, ever again! Ever!

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

Probabilities 8C

1 4 PS 2 3

1. Put these chance likelihoods of occurring in order from most likely to least likely. All events refer to Australian situations.

- Being attacked by a shark.
- Drawing a club card.
- Guessing Melbourne Cup winner.
- Rolling a 3 (6-sided die).
- Rolling a 6 (8-sided die).
- Spinning a 5 (on roulette wheel).
- Tossing a head, and then 2 tails.
- Tossing a tail, then 2 heads.
- Winning Saturday lotto.

2. Describe the likelihood of these probabilities using 'very high chance', 'fairly high chance', 'even chance', 'fairly low chance', 'very low chance', 'no chance'.

- 50/50
- 99 out of 100
- 10 in 15
- 3 in 4
- 1/2
- 2 chances in 5
- 1 in 10
- 1 in 36
- You winning an Olympic gold medal.

8.07 Chance and Probability

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?

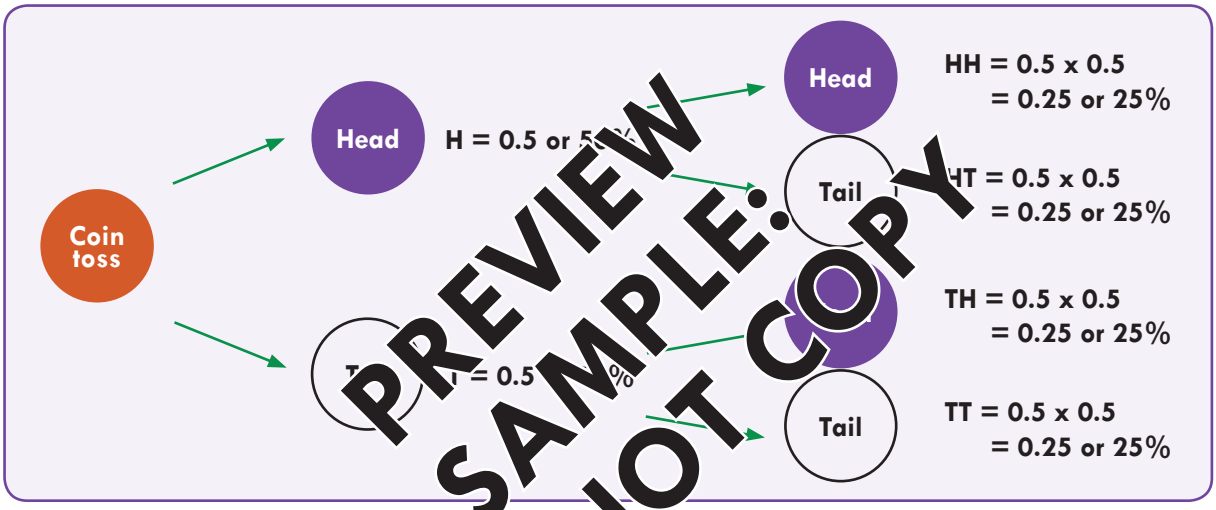
The probability of this is 1/2 times 1/2 which equals 1/4 (or 25%).

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

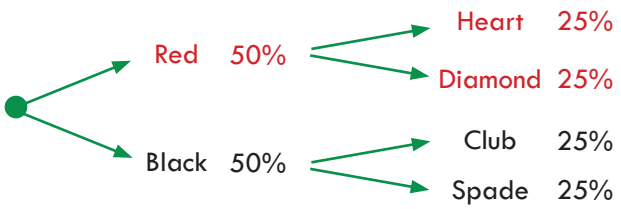
A tree diagram is a visual tool to display all the possible outcomes of an event.

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

A toss of the coin 8D

1. What is the chance of a coin toss landing on heads? Why is that?

2. What is the chance of a coin toss landing on tails? Why is that?

3. A coin toss results in a head. What is the chance of it next being heads? Why?

4. A coin toss results in a tail. What is the chance of it next being tails? Why?

5. What is the chance of 2 heads in a row? Think carefully now.

Investigation and discussion

1 4 PS 2 3

a. You're in a casino watching where [illegible] roulette [illegible] lands. What would you predict to be the next outcome in each of [illegible] situations? Why is that?

a. R R R R R R R R ?	b. R B R B R B R B R ?	c. 3 7 5 9 7 11 9 ?
d. odd, even, odd, odd, even, odd, odd, odd ?	e. low, high, high, low, high, high, low, high ?	f. 32, 22, 12, 2, 33 ?

b. Would you bet your own money on any of your predictions? Why/ why not? Report back to the class.

c. Be very wary of online gambling simulators. Most place you just one digital step away from creating a real account with an online casino. After a few tries on a roulette simulator, I regularly lost '$1,000' in less than 2 minutes each time. So why should all people not play roulette - ever?

8.09 Predicting the Future

Life Could be a Dream

Maureen has her heart set on winning Tattslotto. She believes that if she continues to spend her $41.40 a week on a 50-game ticket then one day she will strike it rich. Good luck to her, I hope she wins. I really do! But it is not very likely. Rule 1: 'Return = Risk'.

How do I know? Well here's how.

What are the odds?

The odds of winning Tattslotto are 1 in 8,145,060 or about 8.15 million to 1.

This means that if you play 1 game every week then it will take you 8,145,060 weeks to win.

That's only 156,635.76 years!

You can calculate the odds like this.

- You have a 6 from 45 chance of getting the first number correct.
  So your odds of getting 1 number are 7.5:1.
- You then have a 5 from 44 chance of getting the second number correct.
  So your odds of getting this second number are 8.8:1; and your odds of getting both numbers are 7.5*8.8 = 66:1.
- You have a 4 from 43 chance of getting the third number correct.
  So your odds of getting this third number are 10.75:1. Your odds of getting all 3 numbers so far are 7.5*8.8*10.75 = 709.5:1.
- You have a 3 from 42 chance of getting the fourth number correct.
  So your odds of getting this 4th number are 14:1. Your odds of getting all 4 numbers are 7.5*8.8*10.75*14 = 9,933:1.
- You have a 2 from 41 chance of getting the fifth number correct.
  So your odds of getting this 5th number are 20.5:1. Your odds of getting all 5 numbers correct are 7.5*8.8*10.75*14*20.5 = 203,626.5:1.
- You have a 1 from 40 chance of getting the sixth number correct.
  So your odds of getting this 6th number are 40:1. Your odds of getting all 6 are 7.5*8.8*10.75*14*20.5*40 = 8,145,060:1.

Again: odds of getting all 6 numbers = 7.5 * 8.8 * 10.75 * 14 * 20.5 * 40 = 8,145,060

{Odds of winning 6 from 45= (45!/39!)/6! Ask your teacher to explain this formula}.

So is it worth it?

However, people play more than just 1 game and Maureen plays 50 games a week, so she has increased her chances of winning to 50 in 8,145,060.

This means that if she plays 50 games a week, every week, then it will now only take her 162,901.2 weeks or 3,132.7 years before she should win. That's a lot better!

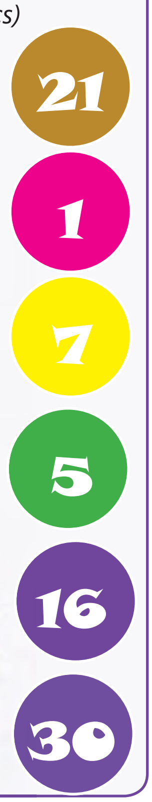
In order to win she will have to spend at least $6,744,100 (assuming the ticket price of $41.40 as at July '23 doesn't increase over those 3,132.7 years... not likely!)

And the average prize for 6 numbers is about $1.36m* (since you didn't increase the ticket price you can't increase the average prize). Of course she might pick up some smaller prizes on the way. Good luck to her if she does!

However, what could've happened for Maureen if she had used her money in a different way? Perhaps after studying the benefits of compound interest you could instruct her more wisely.

Calculated using 2023 results up to July 30. Based on [illegible] Division 1 winners winning a total of $[illegible]3.1m. ([illegible]w./mediacentre.thelott.com statistics)

Image: elvira_gumirova/Thinkstock



Life could be a dream 8E

1. Outline 6 important numerical facts that you have learned from the article, 'Life could be a dream'.
2. Add 2 supplementary pieces of advice that you would give someone who was hoping to get rich playing lotto. Perhaps do some research online and discuss your findings.

1 4 PS 2 3

What are your chances?

Some years ago the Tattslotto draw changed from having 40 balls to 45 balls. Tattersalls (the owner at the time) said that they made this change so as to increase the potential Division 1 prize. In your workbooks complete the following tasks.

1. Calculate the odds of winning a 6 from 40 lotto draw.
2. Calculate the odds of getting 4 and 5 numbers.
3. Calculate how many years it would take to win the prize, assuming playing 50 games per week.
4. How might the change from 40 to 45 balls increase the prize pool?
5. In reality, did it get any harder for a person to win the Division 1 prize in their lifetime?

8.11 Predicting the Future

Investment is a gamble

All investment is a gamble. However, some gambles are safer than others.

For example, in Australia we enjoy a well-developed and sophisticated modern economy. So when you invest your money with a bank this means that it is very unlikely that the bank will go broke and lose your money. It could happen, but it's not likely to happen as there are certain guarantees in place to try to prevent this from happening.

Unfortunately the bank will not give you all that much **return** (interest) on your investment, but it is a very safe investment. Herein lays the first of two main rules you should consider for investment for the rest of your life.

Rule 1: Return = risk

⇨ **low risk = low return** ⇨ **high return = high risk**

Investments don't automatically guarantee that you'll earn any money nor even get your money back! If an investment promises you a higher return then you are more likely to lose your money. Simple. Let's say it again.

RETURN = RISK

Investment vs gambling

Some people invest in companies on the sha[illegible]t (ASX). This type of investment is **riskier** than putting money in a bank, howe[illegible] the potential returns [illegible] usually higher.

Some share prices are more **volatile** th[illegible]s. Th[illegible] promise greater return but also offer greater risk. **Speculators** invest in th[illegible]olatile s[illegible]res in th[illegible]rm hoping to 'get-in' as the share price goes up so a[illegible] make a[illegible]ck milling [illegible]long as they can sell their shares and 'get-out' before the[illegible] crops.

This speculation requires t[illegible] skill of knowi[illegible]hen [illegible]e share price is likely to drop. How could you possibly know that? Therefo[illegible] is type [illegible] investment is quite risky; it offers greater potential returns but also [illegible]oses the in[illegible]stor to potential losses. Some speculators are left holding the baby! (What does that actu[illegible]ly mean?)

Most successful **investors** choose to buy s[illegible]res in safe, '**blue-chip**' companies that offer the likelihood that they will continue t[illegible] trade profitably on an ongoing basis into the future. This means the investor is likely to [illegible] continuous **dividend** from the company and that the **value** of the shares will mos[illegible]ikely go up over the medium-long term.

These types of shares are a better, safer (but certainly not guaranteed) long-term investment. However, nowhere near as safe as the bank!

And in the contemporary world of investment, many people have bought cryptocurrencies hoping the value of these will go up. It did for a while when people were buying in, thereby creating demand (and higher value). But some values have fallen to almost zero, (gone bust). Bitcoin, the most recognisable cryptocurrency, lost more than 65% of its value in 2022. So a person that held $100,000 'worth' of Bitcoin saw their investment lose $65,000 over 2022, to be worth just $35,000 by year's end. Very risky indeed.

Image: VFX/ Depositphotos.com

Rule 2: Invest for medium or long-term growth.

If you invest to get a large short-term gain it could happen. Nice. Lucky you!
But it is far less likely that you will be successful; and it's very risky.

What is more likely is that you will get a large immediate loss.
And there goes your money! Unlucky you; and you, and you and him and her and them!

SMALLER RETURN BUT LESSER RISK

⇨ **low risk = low return** ⇨ **high return = high risk**

Investments don't automatically guarantee that you'll earn any money, nor even get your original money back! If an investment promises you a higher return then you are more likely to lose your money. Simple. Let's all say it again.

RETURN = RISK

Compound interest

If you invest $1,000 at 3% interest for 10 years how much money will you have at the end of 10 years?

Who said $1,300? i.e. $1,000 (principal) plus 10 x $30 interest? Are you sure?

Much has been said about the magic of compound interest. What have you heard?

When you invest money (this is called the **principal**) you earn interest on that investment. If you leave both the principal and the interest in the investment you now have a higher principal. The amount has **compounded**. You will now earn inter[illegible] higher amount. And so on. And so [illegible] so on. Discuss this as a class and also find out about the **Rule of 72** (or 69).

Image: karenr/ Depositphotos.com

Compound i[illegible]

Assumptions: Principal = $1,000 Annual interest rate = 3%.

Interest is calculated and paid once only at the end of the year.

Year 1: $1,000 + 3% interest = $1,03[illegible]
Year 2: $1,030 + 3% interest = $1,061
Year 3: $1,061 + 3% interest = $1,093
Year 4: $1,093 + 3% interest = $1,126
Year 5: $1,126 + 3% interest = $1,159
Year 6: $1,159 + 3% interest = $1,194
Year 7: $1,194 + 3% interest = $1,230
Year 8: $1,230 + 3% interest = $1,267
Year 9: $1,267 + 3% interest = $1,305
Year 10: $1,305 + 3% interest = $1,344

So the compounded interest of $344 is higher than the simple interest amount of $300. Although this doesn't seem like much, the more years you leave the investment to work its own compounding magic, then, the more it will grow and grow and grow! And if you can get a higher guaranteed interest rate, without risk to your principal, well then, it can really grow.

Did you know that if you leave this original principal of $1,000 in for another 10 years it will compound to $1,806? If you leave it in for another 10 years it will compound to $2,427. Remember this is still that same $1,000 and you haven't added any money to it!

8.13 Predicting the Future

Predicting

You will already have developed some skills applying maths tools and techniques for problem-solving as part of making estimates. However, **making predictions** is different from estimating, because predicting often involves dealing with unknowns.

People often need to make predictions in their personal, social or vocational lives, such as how many people will come to a party, or how many diners they will have next week in their restaurant. Predictions such as these will influence how they plan and organise.

For example

The owner of a new cafe might say that it will sell 200 coffees a day so it needs about 24kg of coffee beans (4kgs x 6 days). In this vocational situation, there is an estimate and there is a prediction. One is sound and based on problem-solving. Whereas the other seems to be simply a prediction of likelihood, and may or may not be based on solid information. Which is which?

Well, the estimate of how many bags of beans are needed is a sound estimate, because it is based on the amount of beans needed per coffee. And if we accept that a decent quality coffee requires about 20 grams of coffee beans. then a 1kg bag will yield 50 units. Therefore 200 coffees equals 4kgs. And 200 coffees per day over six days will require about 24kgs of coffee beans. Do you think that this beans per cup estimate is accurate? Go online and find out.

However, what about the prediction of 200 coffees per day? What is that based on? Market research? Customer surveys? Past experience? Observation of similar traders? Industry information? Or is this prediction based more on wishful thinking? Has the owner of the new café calculated that they need to sell 200 coffees per day to make a decent profit; and therefore presented (or presumed) that volume of trade as a likelihood?

And think carefully. What level of patronage does it take to sell 200 coffees per day and what level of staff is needed to make and sell this amount? Well, it's an average of 25 coffees per hour over an eight-hour trading period. That's a coffee every 2 minutes and 24 seconds, all the trading day, 6 days of week! And that's just the barista working flat out. What other staff are needed?

Many people make predictions based on what they want to happen, rather than what might likely happen. To improve the accuracy of their predictions, they should use past **data**, **knowledge** and **information** about situations, **preferences** and **trends**; and apply this to make better, truer and more accurate predictions - by **forecasting**. So what data, knowledge and research would help you to better predict these outcomes?

- ⇨ Numbers of visitors or attendees who will turn up to an event.
- ⇨ The outcome of sporting contests.
- ⇨ Amounts of patrons, sales and profit levels for a business.
- ⇨ If and when a future event is likely to happen.
- ⇨ The biological sex of a newborn baby.
- ⇨ Whether and when an innovation or invention might occur.
- ⇨ The likelihood of someone succeeding in life.

So what do you predict is going to happen? And what about the weather?

Predicting 8F

1. Make these predictions. Discuss in small groups and report back to the class.

The team that wins the AFL grand final next year.	The number of gold medals won by Australia at the next Olympics.	The number of gold medals won by Australia at the next Commonwealth Games.
Your age when you get your first full-time job.	A % chance prediction of you earning $1 million before you turn 40.	Predict how much you might earn from working in your lifetime.
When Australia will source more than 50% of its energy needs from renewables?	When humankind will next land on the Moon?	When humankind will land on Mars?
Who the next Prime Minister will be?	How much you will need to pay for your first new vehicle?	Which of Instagram or TikTok will first cease to be important?

2. Predict the greater likelihood between these situations. Give reasons for your choice. You add 3 more comparisons.

a. Car accident as a driver vs as a passenger?	b. Being unemployed at age 18 vs age 28?	c. If the weather tomorrow will be sunny vs overcast vs rain?
d. You earning $1m in your lifetime vs you winning $1m in lotto?	e. Regions in your state experiencing bushfires vs floods?	f. Experiencing a shark attack vs being struck by lightning?

1
4 PS 2
3

8.15 Predicting the Future

8G Making it rich?

1 4 PS 2 3

Part A

1. Set up a spreadsheet to calculate the amount a $10,000 investment would compound to after 10, 20, 30 years and 40 years. What formulae will you use? What interest rate will you use? How about a nice, conservative 3% per year?
2. Do your calculations. What are the results? Are you surprised?
3. Now change the interest rate to 6%. Predict the likely difference.
4. Now do the new calculations. What are the results?
5. Create line graphs to compare these 2 amounts over 10, 20, 30 and 40 years.
6. Would you have the financial discipline to invest $10,000 when you are 20 and leave it sitting and compounding until you are 60? How does this relate, well sort of, to superannuation?

Part B

1. Create a new spreadsheet based on you saving $50 a week, every week for 40 years. Stay with the 3% interest rate. Assume that interest is calculated and paid annually.
2. What are the amounts in the investment after 10, 20, 30, 40 years?
3. Now change the interest rate to 6%. Predict the likely difference.
4. Do the new calculations. What are the results?
5. Create line graphs to compare these 2 amounts over 10, 20, 30 and 40 years.
6. Would you have the financial discipline to save $50 a week, every week, during your working life? How does this relate, quite closely, to superannuation?

Part C

1. This time, assume that 3% interest is calculated and paid monthly. What do you predict will happen?
2. What are the amounts in the investment after 10, 20, 30, 40 years?
3. Again, change the interest rate to 6%. Predict the likely difference.
4. Do the new calculations. What are the results?
5. Create line graphs to compare these 2 amounts over 10, 20, 30 and 40 years.
6. Now would you have the financial discipline to save $50 a week, every week, during your working life? How does this relate, very closely, to superannuation?

Investigation

Visit ASIC's Money Smart website and check out the compound interest and superannuation calculators.

https://moneysmart.gov.au/budgeting/compound-interest-calculator

https://moneysmart.gov.au/how-super-works/superannuation-calculator

1
4 PS 2
3

Part D: Dream Big or Dream On?

So what do you reckon? Are you more likely to get rich by squirreling away some money every week and letting the interest compound over time (such as with superannuation), or taking a punt on snagging a Division 1 prize in Tattslotto?

Well you can work this out you know. But you will have to apply the problem-solving cycle and use your maths toolkit, including systematics, to make this comparison. So right now, what do you think is a better option and by what margin?

And now it's time for you to think about how you will set up this comparison.

- ❑ You will need to create a spreadsheet to calculate the annual and total investment amounts.
- ❑ You need to average a 52-week investment figure over 12 months. So let's take a $41.40 a week ticket x 52 weeks = $180 per month (round up for ease).
- ❑ You should assume that interest compounds and is paid monthly, which is more realistic in the real world. And assume that the money goes in on the 1st day of the month so that it compounds fully.
- ❑ Keep the investment amount the same over the lifetime of the investment, as well as the interest rate. For superannuation-style investing, take a safe rate of return of 5% (after fees). If it is a bank-only investment, then stick with a 3% interest rate. And remember, that's an annual rate: a monthly rate will be /12.
- ❑ Each 'total', must get carried forward as the next period's beginning figure.
- ❑ Let's give it 40 years. Here's a sample Year 1 calculation, but your teacher might show you a more efficient way to set this up. And of course, you'll need to know what formulae to use.

Year 1		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Amount $		0	360.45	541.35	722.70	9[illegible]51	[illegible]86.77	17[illegible]9.45	[illegible]452.66	1636.29	1820.39	2004.94	2189.95
Deposit $	180	180	180	180	180	[illegible]	180	[illegible]	180	180	180	180	180
Int %	0.03	0.03	0.03	0.03	0.03	0.0[illegible]	0.0[illegible]	[illegible]03	0.03	0.03	0.03	0.03	0.03
Interest $		0.45	0.90	1.35	1.81	2.26	2.7[illegible]	3.17	3.63	4.09	4.55	5.01	5.47

- ❑ If you get that December figure, then bingo. You can now switch to an online calculator. Check Year 1 to see if it is accurate. Then use the calculator to compound for 40 years, including monthly contributions.
- ❑ Now for the Lotto player, you don't need an interest rate. Just the same monthly contributions that you will accumulate yearly.
- ❑ But a player will win some minor prizes along the way. So you'll have to calculate these based on their odds of occurring, and estimate the prizes based on a recent draw. Now don't double-dip on the wins! Your teacher will explain this.
- ❑ Then take away the total prize wins from the total ticket spend. Will the lotto-player be in front or behind? And by how much?

Saturday Lotto (Tattslotto)

Chance of winning with 1 game

6 winning numbers	8,145,060:1
5 winning numbers + **1** supp	678,755:1
5 winning numbers	36,690:1
4 winning numbers	733:1
3 winning numbers + **1** supp	298:1
3 winning numbers	53:1

Source: https://mediacentre.thelott.com/wp-content/uploads/2022/07/Saturday-Lotto-Fact-Sheet.pdf

8.17 Assessment Task

AT3a Sports and Games Recreational Numeracy

1 4 PS 2 3

Last year some of you might have undertaken an investigation into likelihood and probabilities associated with sports and games. So now it's time to revisit and expand this, or indeed - do this fun and informative investigation for the first time.

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** vs **skills**.

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 and 'luck' 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.

This is your investigation into something you like - so you decide on the **data**, use of **systematics**, and expressions of likelihood.

Recreation Numeracy: Likelihood in Sports

Sports participation, and watching and supporting sports, are 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** vs **skills**.

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.

This is your investigation into something you like - so you decide on the **data**, use of **systematics**, and expressions of likelihood.

Assessment Task 8.18

Name(s):	AOS7: Uncertainty AOS6: Data AOS8: Systematics Recreational Numeracy			
Key dates:				
Tasks - AT3a: Sports and Games	**Must do?**	**Due by**	**Done**	**Level**
A. Pre-report - I am investigating:				
a. How does chance apply?	✓			
b. How do likelihood and probability apply?	✓			
c. How does skill vs randomness apply?	✓			
d. How does information and knowledge apply?	✓			
e. How does luck vs skills apply?	✓			
Applied use of data and systematics.	✓			
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 vs skills.				
Applied use of data and systematics.	✓			
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 vs skills	✓			
Applied use of data and systematics.	✓			
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 analysis.**	✓			
Present a report to the class (if required).				

8.19 Assessment Task

AT3b Managing Risk
Civic Numeracy // and/or Vocational or Recreational or Financial

1 4 PS 2 3

For this assessment task, you are required to undertake a research investigation into the risks, likelihood and probabilities, as well as other relevant factors, associated with a particular activity/situation that you are involved with, or interested in.

You must prepare a summary report and presentation to your class, or to a suitable audience. You will also need to submit your written and numerical research report to your teacher. The information, analysis and conclusions you need to cover in your research investigation are listed in the planner opposite. Note: Your teacher might modify these based on your chosen activity/situation.

Civic & others as applied

Incidence, likelihood, probabilities and risks associated with:

- motor vehicle use
- younger drivers
- forms of travel & transport
- cycling & pedestrians
- driverless vehicles
- public transport options
- environmental issues
- global warming trends
- incidence & impact of natural disasters
- socio-economic issues & impacts
- demographic characteristics
- geographic location
- lifestyle choic
- life event
- life proje
- epidemics & pandemics
- disease & health conditions
- preventable conditions
- crime & anti-social behaviour
- scams & digital crime
- gambling
- public health & safety

Vocational

Incidence, likelihood, probabilities and risks associated with:

- workplace injuries
- industry hazards
- occupational hazards
- ional tra
- ang work
- entar
- use of
- ph ical
- hig sk occu
- uct sa
- ce safety
- /giene & health
- safe use of materials
- work/life balance

Recreational & others

Incidence, likelihood, probabilities and risks associated with:

- injuries & accidents
- direct ac ity risks
- tr risks
- e viro mental risks
- festyle risk
- ealth and wellbeing
- public recreation programs
- success measures
- achievement outcomes

Vocational & Financial

Incidence, likelihood, and probabilities associated with:

- starting a business
- running a business
- sales levels
- customer/client levels
- sales/profit forecasting
- managing costs
- achieving budgets
- business investment
- success vs failure

Civic	Vocational	Recreational	Vocational & Financial
Mitzi's going to investigate the characteristics, patterns and risks associated with crime in her local town.	Bitzi's going to investigate the incidence and likelihood of workplace injuries for chefs.	Fitzi's going to investigate common risks, factors and likelihood of achieving success as an AFL draftee.	Ditzi's going to investigate the risks and likelihood of success of running a mobile coffee cart.

Assessment Task 8.20

Name(s):

Key dates:

AOS7: Uncertainty
AOS6: Data AOS8: Systematics
Civic &/or Recreational &/or Vocational &/or Financial

Tasks - AT3b: Managing Risk	Must do?	Due by	Done	Level
Negotiate the task details with my teacher. My focus is:				
A: Describe the activity/situation for investigation.				
a. Describe the activity/situation I am investigating.	✓		○	
b. Discuss the risks associated with the activity/situation.	✓		○	
c. How do chance, likelihood and probability apply?	✓		○	
d. How might luck apply?	✓		○	
e. How do information and knowledge apply?	✓		○	
f. How does skills development apply?	✓		○	
	○		○	
Applied use of data and systematics.	✓		○	
B. My applied investigation.				
a. (My) goals and aims related to the activity/situation.	✓		○	
b. Information/knowledge about chance.	✓		○	
c. Actions to deal with/improve chance outcomes.	✓		○	
d. Information/knowledge to improve likelihood of success.	✓		○	
e. Actions to improve likelihood of success.	✓		○	
f. Information/knowledge to reduce and deal with risk.	✓		○	
g. Actions to reduce and deal with risk.	✓		○	
	○		○	
Applied use of data and systematics.	✓		○	
C. Communicate my conclusions.				
a. Evaluation of potential positives and negatives.	✓		○	
b. Numerical information showing positives and negatives.	✓		○	
c. Proposed advice and action plan for success.	✓		○	
Applied use of data and systematics.	✓		○	
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.	✓		○	

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

8.21 // 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:
4. 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

Working With Money 9

Activities 9: Working With Money		p.	Due date	Done	Comment
9A	**Money and me**	228-229			
9B	**Discounts**	231			
9C	**Making change**	232-233			
9D	**Compare the basket**	235			
9E	**Converting currency**	238-239			
9F	**Sales receipts and quotes**	241			
9G	**Purchase orders and invoices**	24[illegible]			
9H	**Bank statements**	[illegible]			
9I	**Account statements and bills**	24[illegible]			
9J	**Financial documents**	245			
9K	**Keeping it safe**	247			
9L	**Productivity**	[illegible]			
9M	**Fixed and variable costs**	251			
AT4	**Financial Documents, Measures and Costs**	252-253			
PST	**Problem-Solving Cycle and Maths Toolkit**	254			

Comments:

9.01 Working With Money

Calculating with money

One of the most important suites of applied numerical skills you need throughout your entire life, is to be able to perform calculations involving money.

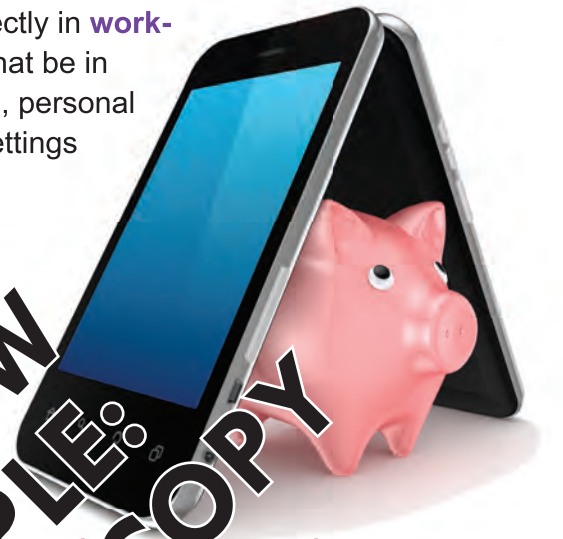
Effective **money management** is vital for your personal life. This involves buying goods and services, budgeting, comparing discounts, evaluating different purchasing options, saving for your future, analysing varied credit options, and many other money management tasks.

As your **personal life** crosses over into your **vocational life,** money management requires you to interpret timesheets, pay slips, bank statements and other financial documents including bills, bills and more bills!

You will also be required to apply these skills directly in **work-related situations** as part of your **job**, whether that be in retail, trades, community services, manufacturing, personal services, or hundreds of other diverse industry settings and demanding work roles.

So be ready to **use** the applied skills, including data and **systematics**, that you have developed in previous sections, as well as those you have picked up through your **educational** and **work experiences**, to improve your own money management skills.

Image: rukanoga/ Depositphotos.com



"s not h nmers I worry about anymore, instead ose too-easy scanners and new-shifty scammers. "

9A Money and me

1. Briefly describe situations w ere y you ave o perform each of these types of numerical calculations involv m mone .
2. What tools of systematics could/do y u use for each?

a. Adding	b. Subtracting
c. Multiplying	d. Dividing
e. Estimating	f. Budgeting
g. Calculating percentages	h. Discounting

3. Complete these calculations based on money in your head or on paper. Then check your answers using a calculator.

a. $5.50 + $7.95 + $27.95 =	b. $18.50 - $9.99 + $49.95 =	c. $7.50 x 500 =
d. $20 x 45 - $150 =	e. $750 - $7 x $42 =	f. $2,500 / 15 + 10% =
g. half a dollar x 2,950 =	h. -$1.50 x 15,000 =	i. 100 $100s less 15% tax =
j. 65 x $7m + $42m =	k. $7.8b less 20% plus $100m =	l. 6 x $3b averaged over 4 years.

4. Describe money situations you have to deal with in your personal or work-related activities by writing them in short numerical form (with just a few words for description; see below). Complete any appropriate calculations for these.

5. What tools of systematics could you apply to help with recording and calculating these?

e.g. Wages earned last week. $12 x 15 = $180	e.g. Spending on lunch last week. $5.70 + $7 + $7.5[illegible] + $3 + $15 = $41.20	e.g. My mobile bill per week & per annum $40 ÷ 4 = $10 $10 x 52 = $520
a.	b.	c.
d.	e.	f.
g.	h.	i.

9.03 Working With Money

Discounts

As you know, a discount is an amount that is deducted from the normal price or cost of an item. And you are already aware that not all discounts represent a 'smart' purchase!

Some discounts are good because as a buyer you purchase items at a reduced price. However, other discounts are used to entice or encourage you to purchase something that you don't want, or to try to get you to buy more of an item than you actually need.

Price (or **retail**) **discounts** are generally used by businesses to encourage **consumers** either; to buy more from them, to switch their business to them, or to remain loyal to them.

A seller might also offer retail discounts to new customers, to regular customers and/or for early payment of an account.

Cost (or **trade**) **discounts** are used by businesses to encourage other businesses to purchase from them. These discounts occur on the **wholesale** side (or supply side) of business transactions. Cost discounts (or **trade** or wholesale discounts) can include volume discounts, wholesale trade discounts, bulk purchase discounts, early payment discounts and other **business-to-business** (**B2B**) discounts.

So there are many instances when you might have to estimate or calculate if a discount is indeed, a 'good bargain', or just a waste of more of your money.

And as a seller, you need to factor in appropriate **sales margins** when selling B2B, as well as in retail situations based on retail margins.

Are you drawn in by discount sales?

Image: focu blur/ Depositph

Discounts

Discounts are normally applied as a % reduction to a retail or wholesale price.

Most (but not all) discounts are calculated using percentages.

e.g. i: End of season clearance on jackets - save 40%!

e.g. ii: Buy 2 and save 25% off both

i. 40% off		ii. 25% off for 2	
Normal price	= $100	Normal price	= $40 and $40
Discount	= $100 x 40% = $40	Discount	= ($40 + $40) x 25%
New price	= $100 - $40 = $60	Discount $	= $80 x 25% = $20
		New total	= $80 - $20 = $60

e.g. iii: Buy two pizzas get a third for free! (Offer applies to lowest priced item).

iii. Buy two pizzas get a third free.

Normal price	= $16, $14 and $10 = $40
Total price paid	= ($30 + $0)
Discount $	= $40 - $30 = $10 (normal price less price after discount)
Discount %	= $10/$40 x 100%
	= 25% (So what is the after discount average price of each pizza?)

NUM SUPER SKILLS

1. In your work folios calculate the discount amount, and the new price(s), on each of these consumer transactions. How much was the total discount %?

a. Buy 3 items at $30 each and get a 10% discount in total.	b. Buy 5 items at $25 each and get a 20% discount in total.	c. Buy 3 items at $30, $40 and $50 each and get the lowest at a discount of 50%.
d. Order 3 pizzas and 4th is free. (Applies to lowest price). Prices: $16, $12, $14 & $17.	e. Loyalty discount: For every 10th coffee ($5) get one free.	f. 5th diner eats free! Meals were $22, $27.50, $23, $16, $22.50.

2. In your work folios calculate the discount amount(s), the new cost(s), the cost per item (unit costs); and total discount savings amount and %'s, on these B2B transactions.

a. Order 100 units @ $2.75 and 200 units @ $3.50. Receive a 10% large order discount on the total cost.	b. Order 2,000 units @ $40 with a trade discount of 12.5%. Repeat orders within 30 days will get a discount of twice the amount.
c. Buy bakery ingredients from a wholesaler of 10 @ $100, 50 @ $50, 120 @ $10 and $500 @ $5. Trade discount is 40%. Receive a further 5% off any item sub-total that exceeds $1,000.	d. Order 5,000 units @ $6.50. Trade discount = 30%. Long-term client discount of 2.5%. Early payment discount = 1.25%.

3. Find examples of these types of discounts in retail or B2B situations. Add other types of discounts that may exist. Discuss your examples as a class.

sales discount	volume discount	buy one get one free	end of season discount	loyalty discount	for cash discounts
wholesale trade discount	bulk purchase discount	pensioner discounts			

9.05 Calculating Change

Working with cash

When you are buying using cash, the transaction will often involve change. The change amount is the difference between the **purchase price** and the **money tendered**. As a **purchaser**, it is important to know that you are being given the correct amount of change to avoid being **short-changed**.

If you are the worker then you must be able to **calculate** and **make change** accurately, as many transactions (depending on the types of customers, industry and location) will still be conducted using cash. And these are also likely to be speedy transactions as well.

If you use an electronic point-of-sale register that tells you how much change to give, you will also have to manually 'make' the correct change using notes and coins.

But is the age of cash over? Although the use of **e-transactions** is growing rapidly and is well over half of all transactions, cash is still a preferred form of currency in some industries and businesses, especially for smaller transactions. Cash is also still favoured by people over 60, children and younger teens, and for most transactions under $10. So you need to be able to work out the right **currency units** for different amounts of money.

As the shift to digital and **e-payments** becomes more pronounced, you might think this means that you don't need to develop cash-based estimating and calculating skills. But in reality, as more and more everyday purchases are transacted using e-payment devices and apps, it actually becomes more vital that you [illegible] your own applied numerical skills to be able to calculate and make change. Why do you think this might be the case? Think of the theory of evolution but in reverse - de[illegible]n - or another word for "use it or lose it".

9C Making change

1. Complete these transactions [illegible] or on paper. Calculate the amounts and list the notes and coins you would provide. (Don't forget about rounding!)

a. Purchase of 10 cans of Popsi D[illegible] @ $1.75c. Handed a $20 note.	b. Purchase of 3 sundaes @ $2, 4 burgers @ $2, 4 fries @ $3, and 2 shakes @ $2.75. Handed 9 $2 coins and heaps of $1 coins.
c. Order of 4 pieces of flake, 7 potato cakes, 4 fried dim sims, family chips, a pumpkin fritter and a 2-litre bottle of Sarsaparilla. What's left from $60?	d. Purchase of jeans @ $89.99, top @ $40, shoes @ $149.99 and a beanie @ $25. (Beanie is free with sales over $300). Handed a $100 and four $50s.

2. Check out making change with the currency simulators at:
   https://www.mathsisfun.com/money/money-master.html
   Choose $Aud and the Give Change (no totals) option.

3. 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 $39.95 sale. Given $100.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ $2 $1 50c 20c 10c 5c
b. Purchase of 3 items at $57.50 each. Given 3 x $50 a $20 and a $10.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ $2 $1 50c 20c 10c 5c
c. Purchase of 3 items for $175 and a different item at $44.99. Given 6 x $100 notes.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ $1 10c 5c
d. Total sales = $73.11. PayWave of $40 then given 2 x $20s.	$100 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ $2 50c 20c 10c 5c
e. Purchase of 7 @ $1.50 and 20 @ $2.20 Given a $100.	$50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ $2 $1 50c 20c 10c 5c
f. Purchase of 3 x $2.50, 2 x $9.75 and 2 x $15.10. Given a $20, a $10, 6 x $5 and a 10c.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ $2 $1 50c 20c 10c 5c
g. Purchase of $89.95 and $94.95. Given 9 x $20s.	$100 $50 $20 $10 $5 x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ x ___ $2 $1 50c 20c 10c 5c

9.07 Comparing Prices

Who is cheapest?

For thousands of years, people have been comparing prices by picking and choosing who to buy from so as to manage their budget to get better value. That is how the concept of the '**market**' began.

Image: JohanH / Depositphotos.com

In our more recent times people might compare prices at Woolworths, Coles, Aldi, IGA, NQR, Costco, 7-Eleven, the local market, Crazy Cracka's discount store, Nick's friendly grocers, the milk bar around the corner, or even the nearest servo, just to find out who has the cheapest milk!

But in the contemporary world, **eCommerce** and **online shopping** has become a natural part of many people's lives. One of the most common price comparisons people might make nowadays is between items available from traditional retail outlets, i.e. 'bricks', and those offered for sale online, i.e. 'clicks'.

Consumers have really embraced digital app services for food delivery, pre-packaged meal boxes, holiday and holiday rental bookings, clothing and footwear items, and many other convenience and lifestyle purchases. In addition, people are increasingly buying online from overseas suppliers. In fact, in the early waves of online digital shopping, overseas sales accounted for the largest proportion of digital sales.

Why digital?

Some shoppers hunt many digital sites trying to find bargains on the types of goods they buy regularly (i.e. **household staples**). This helps them to stretch their money further as part of their weekly shop.

Other people shop online because they like to hunt for the best bargains on **occasional** or **luxury purchases**; and they might source these items (such as a dress or a camera) either domestically or from overseas. You might see them '**showrooming**' at Chaddy on a Sunday, trying on different outfits, taking a few selfie (loaded to Insta of course!), and then heading home to see if they can they can save $5 online.

An increasing number of shoppers, especially younger consumers, opt for the **convenience** of online shopping and use **home delivery** services. This saves them time so that they can sit at home and track their Uber Eats delivery.

"Cool. I can order a rad beanie from the US and it's like five bucks cheaper. Good one Nige! This means I can use the money I saved to get another single-blend Soy latte."

Image: gpointstudio/ iStock/Thinkstock

And of course, many online shoppers do so because of their geographical **location** or **isolation**. For them it is better to get items delivered because they can't easily source these products locally, or local prices are too high. This can also extend to shoppers searching for goods online that they cannot track down in retail stores. The online shopping experience is **faster** for them.

Compare the basket 9D

Part A

One way to compare different prices is to select a basket of staple goods that you purchase regularly and record the prices of these from different sellers. Using the data you collected you can set up a table and calculate the $ differences and/or percentage differences in the price of particular goods, as well as the differences in the entire basket of goods. You can also show your results on a bar graph.

Jodie has collected some data from retail stores and online retailers. Do the calculations to complete the table. Compare the total price of the basket of goods What would you recommend Jodie do? Add prices from one more retailer. What else might Jodie need to take into account before choosing where, or how, to buy?

Item	Boles	Boles Online	Baldi	IPA	www.omeshop'n 2 u!	
Bread	$4.50	$4.50	$3.79	$4.15	$4.95	
Milk	$2	$2	$1.50	$1.50	$2.50	
Shampoo	$7.99* (on special)	$9.50	$3.50	$4.75* (on special)	$2.50	
Chicken thighs	$12.99	$12.99	$9.99	$15.99	na	
Chocolate	$4.75	$4.75	$2.[illegible]	$2.5[illegible] (on spe[illegible])	$5[illegible]	
Toilet paper	$12.50	$12.50	$7.9[illegible]	$1.5[illegible]	$8.[illegible]	
Totals						

Part B

You are required to compare the price of a basket of items that are available from traditional retail outlets (i.e. 'bricks') versus online retailers (i.e. 'clicks').

1. Form into pairs and select 8-10 items to investigate. Choose physical goods such as household grocery items, or perhaps a clothing outfit ensemble, or a suite of electrical and electronic goods.
2. Research and investigate prices from traditional retailers and online retailers.
3. Record and organise your information in a table, and then transfer the information and data to a spreadsheet to make calculations.
4. Communicate your findings by creating summary statements that use numerical information. Consider reporting on:
   a. least and most expensive
   b. range and availability
   c. convenience and time
   d. delivery costs and other charges
   e. your recommendations.
5. How can you apply the tools of systematics to help you compare prices?

Do you know the concept of 'false economy?

9.09 Converting Currencies

Go global

Image: PinkyPills/iStock/Thinkstock

The world of commerce has evolved with a significant proportion of shoppers now buying using online purchasing portals.

The growth of Amazon, eBay, Etsy, Alibaba, Facebook stores, Shopify and other online platforms has been astounding. This growth will increase as mobile apps continue to dominate consumers' online shopping experiences, with consumer shopping becoming more systematised.

Many of these transactions involve buying from overseas which means that we have to convert our currency, Australian dollars, into the overseas currency ($US, Yen or Euro) in order to carry out the transaction.

"She'll be right mate!"

Image adapted from: olga.angelloz/ Depositphotos.com

Types of eCommerce

B2C: Business to consumer transactions are concerned with the sale of **goods** or services to consumers. Electronic sales of goods (i.e. e-tailing) involves selling physical items using an online presence. e.g. Buying a box of paper from Officeworks locally or buying a hand-crafted beard grooming set from an online store in Denmark.

Electronic sales of **services** include online banking, online bookings, electronic bill-paying, online education, ebooks, digital media content streaming services, information and news, gaming subscriptions and many other products. Many electronic services complement the actual sale of the physical service, such as **online booking** and payment for an airline flight.

B2B: Business to business involves businesses managing their **supply chain** by conducting online (**wholesale**) transactions with each other.

C2C: Consumers to consumers or (peer to peer) involves consumers making transactions with each other, such as '**classified**' types of ads on Marketplace or Gumtree and **auction** ads. Online job sites, such as seek.com.au are usually included in this category.

C2B: Consumers to business refers to consumers forming a buying group to deal with businesses as a whole

Value of Australian dollar versus...				
Year	$US	Euro	Yen	GB Pound
June 30 2012	1.0191	0.8092	80.89	0.6529
June 30 2014	0.9420	0.6906	95.43	0.5531
June 30 2016	0.7426	0.6699	76.23	0.5549
June 30 2018	0.7391	0.6344	81.82	0.5634
June 30 2020	0.6863	0.6111	73.94	0.5586
June 20 2021	0.7518	0.6320	83.07	0.5429
June 30 2022	0.6889	0.6589	93.95	0.5671
June 30 2023	0.6630	0.6099	95.92	05250
June 30 2024				
June 30 2025				
June 30 2026				

Source: RBA, Historical Data, month end.

Converting the Australian dollar

Float like a butterfly...

Australia has what is called, a floating exchange rate. What this means is that the value of the Aussie dollar is determined by the demand for and supply of the dollar.

Different countries of the world have their own currency. When purchasing a good or service from a country you have to pay in their currency.

Generally, if you are buying something from overseas you have to pay in their currency. If you are selling overseas you generally want to be paid in your own currency.

There are some exceptions to this, such as when a very powerful country trades with a weak country and dictates the currency to be used, or when trading is being undertaken in a very recognisable currency that both parties are happy to trade with, such as $US.

In order to help international trade run more smoothly, international foreign exchange markets buy and sell different currencies. Essentially, the value of a currency is determined by the demand for (people wanting it) and the supply of (people offering) a particular currency.

It is not necessarily better to have a high valued currency; nor is it necessarily bad to have a low-valued currency. In fact, sometimes it might be better to have a lower currency.

The exchange rate represents the relative purchasing power of one currency versus another currency at any one particular time. This exchange rate will fluctuate on a daily and hourly basis, and even by the second!

But what an exchange rate always represents is the proportion that one currency can purchase of another.

Image: SashaGalatchenko/ iStockThinkstock

Sting like a bee!

When we see a finance update at night we see the value of the Australian dollar reported. Alan Kohler might say something like...

“And on global financial markets, the Australian dollar is buying 75.6c US, 89 yen, 61 Euro cents and 0.52 Pound Stirling.” This statement indicates the relative purchasing power of the Australian dollar expressed in terms of other currencies. Sometimes the commentator might say:

“...On the global financial markets the value of the Australian dollar fell over half a cent from 75.6c US to 75.1c US.”

The next morning at work people all complain about the weaker Australian dollar and how that hurts Australians. But does it?

Ask yourself this question.

“Is it better if the value of the Australian dollar increases or decreases?”

Find out what your class members think.

Calculating the value of the dollar

If 1 Australian dollar buys $US0.75 cents this means that to purchase something priced at $US75 you have to spend $100 Australian dollars. Make sense? Read the statement again.

If 1 Australian dollar can buy $US0.75c then 100 Australian dollars can buy $US75. Simple isn’t it!

So at this exchange rate, how much Australian currency can one whole $US dollar buy? It must be more than a dollar in this case!

We can set the equation out like this:

$$\$US0.75 = \$1Aud$$

You need to use some basic transposing to solve this. We need to get the $US dollar on its own.

To do this we divide both sides by $0.75.

$$\frac{\$US0.75}{0.75} = \frac{\$1Aud}{0.75}$$

so therefore:

$1US = $Aud1.33 (i.e.$1/0.75)

It really is that simple, and faster than checking on your phone!

9.11 Converting Currencies

9E Converting currency

1 4 PS 2 3

1. Add 2 countries of your own choosing to the table.
2. Find out and list the currencies of each of the countries in the table.
3. Show how much $1 Australian will purchase of each country's currency.
4. Show how much 1 of each country's currency will purchase of Australian dollars.
   (Note: For Japan, think of the yen like a cent. So you will need to show how much 100 yen will purchase in Aussie dollars.)
5. How much of this currency will $100 Aud buy?

You want to buy a signed soccer jersey as a present for a friend. You can buy it at various auctions on eBay for 75 Euro, $US110 or 50 UK pound. You can also buy it locally for $155. Postage and insurance from Europe is 20 Euro, from the US is $US30 and from the UK is 15 pounds.

6. Calculate how much each transaction will cost in Australian dollars.
7. Which transaction would you recommend and why?
8. What other costs/issues should be considered when buying from online auction sites?
9. Draw a diagram that shows the relative purchasing power of the Australian dollar against 2 other currencies. The size ratio must be exact. (Why not base the graphic around the basic currency unit of these countries.)

Country	Currency	Symbol	Value ($1 Aud buys)	Value (1 of this unit buys? $Aud)	$100 Aud will buy?
Australia	dollar		1	1	$100
USA					
New Zealand					
France					
Japan					
UK					
China					
Canada					
Mexico					
India					
Switzerland					

1
4 PS 2
3

Stage 2

1. A farmer wants to buy a new American tractor from a local dealer. The dealer has quoted him $100,000. What would be the equivalent price of this tractor in US dollars? Assume that $1 Aud buys $US0.70. (This is the US sticker price.)

Assume that the US sticker price of this tractor has not changed for some years.

2. Calculate the sticker price of this tractor in Australian dollars as at today and also for June 30, 2022, 2020, 2018, and 2012 (Remember: Assume that there have been no price changes to this US sticker price.)
3. Draw a line graph to show these prices over time. Remember to label the graph.
4. Copy and complete the statements below to describe the relationship between the value of the Australian dollar and the price of the tractor.
5. As the value of the $Aud rises against the $US, the price of an imported tractor goes _____. For example, in ____ when one $Aud was buying $US _____ the price of the tractor in Australian dollars was _____.
6. As the value of the $Aud falls against the $US, the price of an imported tractor goes _____. For example, in ____ when one $Aud was buying $US _____ the price of the tractor in Australian dollars was _____.

Stage 3

1. Copy and complete these statements describing the possible relationship between the $Aud and purchase of imports and exports. Choose the correct alternatives.
   a. When the value of the $Aud rises against overseas currencies, Australian purchasers can buy **more** / **less** overseas currency with the same amount of Australian dollars. This means that imports become relatively **cheaper** / **dearer**. This is likely to result in Australia importing **more** / **fewer** goods and services, which may cause direct economic **benefit** / **harm**.
   b. When the value of the $Aud falls against overseas currencies, Australian purchasers can buy **more** / **less** overseas currency with the same amount of Australian dollars. This means that imports become relatively **cheaper** / **dearer**. This is likely to result in Australia importing **more** / **fewer** goods and services, which may cause direct economic **benefit** / **harm**.
   c. When the value of the $Aud rises against overseas currencies, overseas purchasers can buy **more** / **fewer** Australian dollars with the same amount of their own currency. This means that exports become relatively **cheaper** / **dearer**. This is likely to result in Australia exporting **more** / **fewer** goods and services which may cause direct economic **benefit** / **harm**.
   d. When the value of the $Aud falls against overseas currencies, overseas purchasers can buy **more** / **fewer** Australian dollars with the same amount of their own currency. This means that exports become relatively **cheaper** / **dearer**. This is likely to result in Australia exporting **more** / **fewer** goods and services which may cause direct economic **benefit** / **harm**.
2. Explain how a low dollar might benefit Australian farmers when they sell their produce, but harm them when they buy their machinery.
3. Explain with reasons and examples which situation - a lower Aussie dollar or a higher Aussie dollar - is better for you.

9.13 Financial Documents

Financial documents

There are hundreds of different financial documents that you might come into contact with as part of your personal, social or working lives. Some you will encounter as a consumer, i.e. a customer or client. Some will be hard copy, but increasingly many of these will be in a digital form. It is important that you can interpret the financial information on these so that you can manage your budget and check that you are being billed and charged correctly. You have also investigated some of these as organisational transactional texts in Literacy.

Many other documents are used internally and externally by enterprises to manage their operations. These documents need to collate and clearly communicate numerical information and must be developed to meet legal guidelines (especially for tax receipts, for banking, and for utilities bills).

Sales receipts

Sales receipts are used to collate and record customer transactions and to process payments. By law, they must include certain information.

The restaurant sales receipt is used to keep track of customer ordering and dining experiences. The order is entered on the point-of-sale system either manually, or digitally through an app (i.e. the server might use a phone or tablet to take the order). The POS system will use a database that stores menu items and prices. And the receipt for the makeover below, shows an itemised client services details.

These sales receipts make it easy for [illegible] take payment. The customers also get a receipt that meets the legal requirements as a tax invoice.

Sumo Burgers

7a Station Street Moonee Junc[illegible]2052

03 9929 1526

www.sumoburgers.com.au

Table	Diners	Server	Time in	Time out
4	2	Sam	12:00pm	1.5[illegible]pm

Menu Item	Qty	Price	Total
Yokuzuna	1	$19.95	$[illegible]
Ozeki	1	$15.95	$[illegible]
Judo fries	2	$8.00	[illegible]6.00
Dojo rings	2	$7.50	[illegible]5.00
Diet Coke	2	$4.50	$9.00
Soy shake	1	$8.00	$8.00
Corkage	0	nil	nil
GST			$7.22
Total			$83.85
Paid by:	Visa	**** 2159	$83.85

24/9/2024

Note: All prices are GST Inclusive.

This receipt acts as a tax invoice.

Thrank & Schtenier's Male Makeovers

Crafting Men from Beast for over 30 years

Stylist:	Herman	30/9/2024
Client:	Glonsork Elver	11am-2pm

Treatment:	Level:	Fee:
Nail grinding	- Deluxe	$40
Smile bleaching	- Radiant +4	$60
Hair straightening	- Flatchat	$80
Back wax	- Intensive III	$100
Face peel	- Abrayso B	$70
Spray tan	- Supra	$100

	Consultation:	$450.00
Discount coupon	School formal teacher discount 10%:	$45.00
	Total:	$405.00
	GST:	$40.50
	Total with GST:	$444.50
	Paid by cash:	$444.50
	Balance:	$0

Thrank & Schtenier's Male Makeovers
666 Mockingbird Lane, Addamstown, 3159
0466 266 36666
www.thrank&schteniers.com

This receipt acts as a tax invoice.

1. Use the sample sales receipts on p.240 to list the main types of numerical and other information that is shown.
2. Obtain 2 sales receipts and assess these for the clarity of information shown.
3. Assume you are running a micro business. Develop a sample sales receipt for a transaction for the types of goods or services that you would be offering.
4. Use the sample quote below to list the main types of numerical and other information that it shows.

Applied

a. Obtain a quote from an enterprise, and assess this for the clarity of information shown.

b. Assume you are running a micro business. Develop a quote for the types of goods or services that you would be offering.

c. What tools of systematics would you use for a micro enterprise?

Quotes

Many businesses have to prepare quotes, especially those that do practical tasks; i.e. tradies, car repairers, builders, gardeners and other similar services.

Quotes are used to estimate what a job might cost, the materials needed and the time it might take to complete the job (labour time). This gives the potential customer a guide to the estimated, or even actual, price.

Becoming good at quoting takes experience.

If a person over-quotes they might not get the 'job'.

And if they under-quote they may not be able to do the job for the amount they promised!

Sometimes quotes might include a % allowance for variation from the original price; due to price changes or other problems occurring.

[illegible]ent's Paintngogh

Why [illegible] - Expression is o[illegible] flair.

2[illegible] ervic[illegible] Lower Yi[illegible] 319[illegible]

041[illegible] 2 02636

[illegible]est for [illegible]:	82
Da[illegible]	[illegible]ep 1[illegible] 2024
By:	Henry Gorgon
For:	[illegible]lfie Renovator
[illegible]ss:	12 Gr[illegible]mb[illegible] Way , Moonee Junction, 3125

Clean and [illegible]rip exterior	$1400
Pre[illegible]ds, windows & gutters	$800
We[illegible]roof undercoat	$250
Ex[illegible]rior gloss 60 litres - Pink	$600
[illegible]erior metal 10 litres - purple	$200
Waste disposal	$100
Painting labour & callout 40 hours	$2000

Note: This quote is valid for 30 days.
Price is correct subject to no unreasonable occurrences.
Ask us about pensioner discount.

A 25% deposit is required on acceptance of this quotation and to be paid by direct debit.

Total	$5350

Note: All quoted prices include GST.

www.vincentspaintngogh.com

9.15 Financial Documents

9G Purchase orders and invoices

1. What are the differences between purchase orders and invoices; and what is the relationship between these 2 types of financial documents? You have also investigated these as organisational transactional texts in Literacy.
2. When might you be likely to come into contact with each of these financial documents? Use examples to explain.
3. Use the sample purchase order and invoice below to list the main types of numerical and other information that is shown.
4. Obtain a purchase order and an invoice (these don't have to be two sides of the same transaction) and assess them for the clarity of information shown.
5. Assume you are running a micro business. Develop a sample purchase order and a sample invoice, for a transaction for the types of goods or services that you would be offering.

Purchase orders and invoices

A purchase order is a request to buy. These are used a lot for B2B transactions. Many businesses cannot process orders unless an official purchase order is generated. This authorises someone to order/buy goods or services.

A purchase order will include information such as name, address, products, quantities, expected prices, GST, etc. from the buyer's (purchaser) point of view.

The seller will generate an invoice to 'out' with the order. The invoice includes purchaser account details, product information, price, GST, etc., and payment terms from the seller's (supplier) point of view.

Here is a purchase order from a bakery and the corresponding invoice from the wholesale supplier.

Finnegan's Bakery
For your daily bread - and more
24a Station Avenue Yirra Junction 3194
M: 0411 0912 89256 ABN: 21 2121 21 236

Purchase order: **PO705** Date: 12 Oct 2024

Qty	Item	Price	Total
3	x 20 kg flour - White		
1	x 20 kg flour - Wholemeal		
10	x 1 doz free range eggs		
10	x 2 litre milk		
5	x 10 kg Sugar - white		
5	x 2 kg butter - salted		

Total approx. $ 400

Includes GST of: $ 0

Ordered by: Sam Finnegan (Manager)

Delivery instructions:
To: Shainia Joyce (Kitchen manager)
After 5am. Call kitchen using buzzer at back.

www.finneganbakery.com.au

Tax Invoice

To:
Finnegan's Bakery
24a Station Avenue Yirra Junction 3194
ABN: 21 2121 21 236
per: Sam Finnegan del: Shainia Joyce

Invoice: 201486 Date: 13 Oct 2024

Qty	Product	Tax	Price	Total
3	FL W20k	GST-Free	60	180
1	FL B20k	GST-Free	80	80
10	EG F12	GST-Free	4	40
10	MIL 2l	GST-Free	2	20
5	SUG W10k	GST-Free	10	50
5	BUT S2k	GST-Free	2	10
1	Free delivery	na		0

PO: PO705 Total $ 380

Includes GST of: $ 0

From: Ulysses Wholesale
1/17 Kent Way Dovetown 3172
www.ulysseswholesale.com.au
orders@ulysseswholesale.com.au
p: 03 9523 25416 f: 03 9523 25417

Salesperson: Ronnie Marker Terms: 30 days

ABN: 41 4141 41 436

Bank statements 9H

1. What are the most important examples of numerical and other information that a person needs to analyse on a bank statement? Why?
2. Use these transactions to complete a bank statement for the time period. Include a running balance.
3. Do you use digital or hard copy bank statements? Why so? What are some useful features in apps?
4. Businesses should use printed hard copy bank statements in order to track both money in and money out. Why might this be the case?

Sep 1	VISA EFTPOS - Coles Mt Liza	56.00
Sep 2	VISA EFTPOS - Haggis Hoose	17.50
Sep 3	Wacko Taco - Wages	145.00
Sep 8	DD 25365964 - HiTunes	50.00
Sep 9	VISA EFTPOS - Maisie's Hair	75.00
Sep 10	Wacko Taco - Wages	145.00
Sep 12	Brayshine ANZ - ATM	100.00
Sep 14	VISA EFTPOS - El Munchos	15.00
Sep 17	Wacko Taco - Wages	145.00
Sep 19	VISA EFTPOS - Scoffburgers	19.50
Sep 21	VISA EFTPOS - Pizza Glut	17.50
Sep 23	Sunbrook NAB - ATM	100.00
Sep 24	Wacko Taco - Wages	290.00
Sep 26	VISA EFTPOS - McJaks	11.00
Sep 28	DD 2175268 - NetStan	20.00
Sep 29	Non-bank ATM 758-259	100.00
Sep 29	Non-bank ATM fee	3.00
Sep 30	Wacko Taco - Wages	222.50

Branch	**Account Details**	**Statement Summary**	
Brayshine	Freeki Zanzibar	Opening balance	214.00
Account descriptor	**Branch no 022 -999**	Total deposits	
Everyday Saver	**Account no 013 677 7789**	Total withdrawals	
		Closing balance	
		Statement starts	1/9/2024
		Statement ends	30/9/2024
		Statement number	3

Date	Transaction Details	Withdrawals ($) DR	Deposits ($) CR	Balance ($)
1 SEP	OPENING BALANCE			214.00
30 SEP	ACCOUNT SERVICE FEE	10.00		
	TOTAL AT END OF PAGE			
	TOTALS AT END OF PERIOD			

9.17 Financial Documents

9I Account statements and bills

1 4 PS 2 3

1. What are the most important examples of numerical and other information that a person needs to interpret and analyse on an account statement or bill? Why?
2. Develop 5-8 short sentences that explain the usage costs and patterns shown by the information on the bill below. Use numbers in support.
3. How does this electricity bill summary both resemble, and differ from, your own household's electricity bill? Why so?
4. Electricity bills are a major household expense and prices and charges keep rising every year. So can you get a better deal - the state government thinks so!
   a. Estimate and/or calculate your household's electricity bill as a weekly amount; and also as a proportion of the household weekly budget.
   b. Research ways to reduce electricity consumption. Make 3-5 key recommendations about how to achieve these.
   c. Estimate potential energy savings from reducing electricity consumption.
   d. Estimate potential money savings from reducing electricity consumption.
   e. Source a better deal and explain the savings. Share with the class.

ENERGY OZ

Get in touch
Enquiries: 13 11 11 1 Faults: 13 11 11 2
Internet: www.energyoz.com.au

Lindsay Noone
17 Through Road
Croywood Vic 3546

Your electricity bill

Service address: 17 Through Road Croywood Vic 3546

ACCOUNT DETAILS	DUE DATE	AMOUNT DUE
Account Number 222 222 222 Tax invoice 91 93 56 78 Issue date: 12 June 24 Total amount due: See Account summary	12 July 24 Direct debit: 12 July 24	$660.89

ADJUSTMENT	USAGE STATEMENT		
Direct debit discount (2%)	Average cost per day	$7.19	**19% increase** in usage since last year
	Average daily usage	14.4 kWh	
	Same time last year	12.1 kWh	
	Indicative greenhouse gas emissions	1.9 tonnes	
	Same time last year	1.1 tonnes	
	Saved with green power	n/a	

HOW TO PAY

DIRECT DEBIT	CREDIT CARD	IN PERSON & MAIL	TELEPHONE & BPAY
Details specific to the biller and the account	Details specific to the biller and the account	Details specific to the biller and the account	Details specific to the biller and the account

Financial documents 9J

Investigate 2 different personal financial documents and 2 different work-related financial documents. These can be in hard copy or digital form.

1. Explain the purpose of each financial document and how it is issued and used.
2. Identify, interpret and explain the financial information on each document using clear and concise statements and numerical information where appropriate.
3. Discuss the importance of each document for your personal and work-related financial literacy beyond Year 12, and into your future.

Financial document type:	Issued by:	Time period:
Customer/Client details:	Business/issuer details:	
Purpose:	Summary description:	
Numerical information:		Importance/action required:
Numerical information:		Importance/action required:
Numerical information:		Importance/action required:
Numerical information:		Importance/action required:
Numerical information:		Importance/action required:
Numerical information:		Importance/action required:
Numerical information:		Importance/action required:
Numerical information:		Importance/action required:
Other important information/points to consider?		
Evaluate the clarity and usefulness of the information.		

9.19 Keeping It Safe

Cash and digital security

It is your responsibility to look after the security of your money. This means keeping your **cash** money safe.

There are a lot of shifty characters out there who are more than happy to steal from you if they see an opportunity to do so. Indeed some of these people actually make a 'living' from being a crook. So don't be one of their victims.

Cash is convenient and portable. But it is one of the easiest ways to be ripped off. So be cash smart!

Lots of people get ripped-off when they are on the phone because their attention is elsewhere. Don't let this be you!

Image: VitalikRadko/ Depositphotos.com

One of the problems with contemporary **digital** methods of banking and paying electronically is that there are so many ways to get ripped-off! Scammers and crooks have devised many strategies to steal money from unsuspecting, naive, greedy or even trusting people.

These lists have only <u>some</u> of the many cash and digital rip-off methods for you to be on the lookout for. So discuss as a class things that young people should do to protect their money from thieves, crooks, cheats and scammers.

Money Security: Cash

- Only carry the cash you need.
- Don't store too much cash at home. That is what the bank is for!
- Use a good quality wallet, purse, handbag, money carrier, etc..
- Carry your wallet, purse, handbag, etc. in a safe manner - not sticking out of your back pocket or slung back over your shoulder.
- Separate big notes from little notes so that when you open up your money stash only a small amount can be seen.
- Don't tell people about all your cash - and certainly don't show them.
- When travelling, or in large pushy crowds, at shopping centres, at ATMs, or on public transport, AND ON YOUR MOBILE, be aware of pickpockets and wallet/bag lifters (who often operate in teams).
- Don't leave a wallet, purse, handbag, etc. unattended; thieves can swoop before you even know it.
- Be careful what you say about your money on social media. Do you know the character of your friends-of-friends?
- Limit the cash you carry when going to the beach, playing sport, going to the gym and other situations where you have to leave your stuff unattended.
- Always be wary of people you don't know, or barely know, asking about your money situation.

  You can ask them, "You seem very interested in my money - why do want to know that?"

  If they get defensive - then be on your guard.

Money Security - Digital

- Don't tell people your PIN, except relevant adults (i.e. family). No-one in the workplace, shops or in other situations can ever demand your PIN.
- Don't store your PIN and/or password with your card/device.
- With PayWave and other tap methods, your card or device provides easy access to your bank account for crooks. They can quickly make a lot of small transactions using your money. So keep your card, phone or watch safe!
- Use a transaction account, such as a digital wallet, for digital and online banking that only has a small portion of your funds as a safeguard.
- Keep your card and device safe when out and about (refer to methods for carrying cash).
- Don't lend your card or device to other people. If you are helping them out by giving them some money, then yo make the transaction, not them.
- When your card or device is ou hands, watch it carefully.
- If your card is lost or stolen then repo this to the bank immediately.

  This will help cover you for any purchases that a crook might ring up using your account.
- Your device might include many one touch apps to make transactions. S what happens if your device gets lifte Crooks can start spending all your money. So know where your device is at all times.
- Log out of one-touch apps; only log-in when you are using them.
- Be very wary of who you lend your phone or device to.
- Protect your device and bank accounts with difficult passwords.
- If you are using a public computer or device (or someone else's) to make a transaction, then make sure you log out of the online portal when you are finished. Otherwise the next person could access your accounts.
- Don't post your PIN, your account detail or your signature on social me this includes photos that might hav ese in the backgrou d.
- ery, v careful of iffe nt online ayment ethods. Th must be safe, secure nd verifi (u ly with an ht .
- EVER OSE ACCOUNT ETAILS ARD NUMBERS, PASSWORDS OR PINS TO PEOPLE CALLING, TEXTING OR MA ING YOU AND ASKING FOR ETAILS.

  E SCAMMERS WILL OFTEN ETEND THEY'RE FROM A BANK, THE AUSTRALIAN TAXATION OFFICE, CENTRELINK OR SOME OTHER AUTHORITY.

  THE REAL ORGANISATIONS WILL NEVER, EVER DO THIS.

Keeping it safe 9K

1. Develop a list of the top 5 tips for achieving both cash, and digital, financial security. Add images and visuals, and set this up as a poster or multimedia work. You might do this in pairs or as a group; and role-play scenarios for the class.
2. What tools of systematics can you use to help protect your digital financial security? Research these and report back to the class.

9.21 Vocational Numeracy in Action

Efficiency

Appropriate tools and equipment, as well as the training and skills to use these, can improve efficiency.

Image: lexaarts/iStock/Thinkstock

One of the key operational goals of enterprises and their workers is to achieve efficiency. The relationship between time and money is a relationship based on efficiency. **Efficiency** refers to how quickly, or how cost-effectively tasks are completed.

Some people are more efficient than others. This means that they get things done faster. This might also mean that they complete tasks more **cost-effectively**. This can make them more productive workers.

However, being efficient doesn't always result in a high level of **quality**. Sometimes greater efficiency means a drop in quality, more rejects and waste, and bad service.

So how well do you use your time? Are you using it efficiently? And perhaps more importantly, how efficiently are you using other peoples' time, especially your boss's?

We measure efficiency by calculating productivity. **Productivity** simply measures the **ratio of outputs**, compared to the **ratio of inputs**. Out versus in.

For example, if it takes one chef, one hour, to prepare 30 pizzas, then this chef has a productivity rating of 30 pre-prepared pizzas per hour. The chef achieves an output of one pizza every two minutes.

Another example might show that it takes a team of two carpenters, five days each to put up the complete timber framing on a 300 square house. So the framing of this 300-square house will be completed in 10 working days. This is a productivity rating of two workers achieving six squares per day. That is an average, each worker completing three squares per day.

One final example might see a car wash attendant clean six standard-sized vehicles per hour by hand; or 12 per hour using a high pressure hose. This means that the use of the hose increases productivity by 100%, i.e. 12 cars per hour versus 6 cars per hour. Technology has made this employee much more (twice as) productive.

Calculating productivity II

Productivity is a measure of the ratio of outputs, compared to the ratio of inputs. Common work-related output/input measures are per/worker, per/$ or per/hour.

e.g. Gigi, aged 21, can make 30 coffees per hour at a retro café. Gigi is paid $30 per hour.

⇨ Productivity = $\frac{30 \text{ (coffees)}}{}$ = 30 units (coffees) per hour (= 1 coffee every 2 minutes.)

⇨ Productivity = $\frac{30 \text{ (coffees)}}{\$30}$ = 1 unit (coffee) per dollar. (1 coffee 'costs' $1 in Gigi's labour. Labour cost = $1 per coffee.)

e.g. Gigi's friend, Gogo is only 15 and works at the café on Sundays. Gogo is paid $15/hour. But Gogo is less-skilled and can only make 20 coffees per hour.

⇨ Productivity = $\frac{20 \text{ (coffees)}}{}$ = 20 units (coffees) per hour (= 1 coffee every 3 minutes.)

⇨ Productivity = $\frac{20 \text{ (coffees)}}{\$15}$ = 1.33 units (coffee) per dollar. (1 coffee now only 'costs' 75c in Gigi's labour = $0.75 per coffee.)

NUM SUPER SKILLS

Productivity 9L

1. In one sentence describe the meaning of productivity. In another sentence give a numerical example from a workplace to support your explanation.

2. Calculate the productivity of each worker per week, per day and per hour. They each work a 38-hour week with 8-hour days. (i.e. 1 RDO every 4 weeks.)

a. Ren can sew 20 jackets a day.	b. Schtimp can assemble 8 pairs of leather gloves per hour.	c. Alain is able to serve 48 customers each 4-hour shift.
d. Dolores is able to serve 18 customers per hour.	e. Gronk can serve 12 clients per 8-hour day.	f. Nikki can make 18 doors every 8-hour shift.

3. Describe what might either speed up or slow down a worker's productivity.

4. List some productivity measures that might be relevant for your industry and/or workplaces. How are the tools of systematics used to record and measure these?

9.23 Vocational Numeracy in Action

Fixed and variable costs

It is important to understand the relationship between fixed and variable costs, as part of business operations and the **transformation process**.

A **fixed cost** is the cost incurred in production regardless of how many products (or outputs) are produced. For example:

- Factory: Rental/lease, establishment costs, research and development, legals, insurance, wages and salaries for minimum staff, tools, equipment, machinery for fit-out, etc.
- Milk bar: Rent/lease, cash register, fittings, insurance, legals, wages for minimum staff, etc..

A **variable cost** is a cost incurred per unit of production. For example:

- Factory: Cost of materials, supplies and stock, wages and salaries for production staff, electricity and other utilities, freight, storage and warehousing, etc.
- Milk bar: Purchase of stock, wages for extra staff at busy times, electricity for longer working hours, freight for extra stock.

Essentially a fixed cost won't alter regardless of how many outputs you make or sell. Variable costs change depending on the volume of production and sales. Variable costs usually go down per unit as volume is increased. This happens due to cost savings and other **efficiencies** achieved through **economies of scale**.

You have to be aware that an enterprise must cover its fixed costs. Regardless of how many products they sell, they will always have to first meet these fixed costs. These might include initial establishment costs; and also, basic payments such as overheads to stay open, including wages and salaries and other expenses. Then the enterprise has to cover its variable costs, hopefully by having an appropriate margin on its sales and services. Then if there is anything over, after taxes, the owner might record a profit based on its sales or service income.

Image: wildpixel/ iStock/Thinkstock

Fixed and variable costs

- Total fixed costs should be calculated on a weekly basis.
- For example, a new restaurant might have $260,000 of fixed costs including rent, equipment, wages and other basic expenses that must be covered regardless of how well it is doing! So this equates to $5,000 per week (over 52 weeks).
- The restaurant might have an average variable cost of $10 per meal which includes ingredients, extra staff, extra electricity and so on.
- If the average spend per customer is $20 then this means that they have an average variable gross margin of $10 per sale.
- In order to cover their fixed costs over the year they will need to service 26,000 customers ($260,000/10). On a weekly basis that is $5,000/$10 = 500 customers.
- That is almost 72 customers, every day, for 7 days a week for 52 weeks. Just to cover costs! Now that's a tough gig!

NUM SUPER SKILLS

Fixed and variable costs 9M

1. What is the difference between fixed costs and variable costs? Use examples from enterprises within an industry to illustrate your answer.

1 4 PS 2 3

A café has $35,000 of annual fixed costs including rent, equipment and other basic expenses. About half the customers buy coffee only, averaging $5 per spend with a $2 variable cost per coffee. The other half of the clientele buy coffee and a snack averaging $16 with a variable cost of $9 per spend.

2. How much does the café need to make just to cover its weekly fixed costs? How many 'coffee only', or 'coffee and snack' transactions might this be?
3. Based on their current sales profile, how many 'coffee only', and 'coffee and snack' customers per week, and per day, would they need, to cover their fixed costs?

1 4 PS 2 3

Applied

a. Choose an industry in which you are interested and list all of the fixed and variable costs that enterprises within this industry would usually experience.
b. Estimate amounts and %'s to show whether fixed costs, or variable costs, would be likely to account for a higher proportion of expenses.
c. How does 'economies of scale' help an enterprise deal with its fixed costs?

9.25 Assessment Task

AT4 Financial Documents, Measures and Costs
Financial Numeracy // and Vocational and/or Recreational

1
4 PS 2
3

Overview

This assessment task has **3 parts** and you are required to complete each of these. Your teacher might also add other applied Financial numeracy activities, some of which you may have undertaken throughout Sections 9 & 10.

For each part, you need to identify, explain and apply the use of the tools of **systematics**. And of course, you need to apply the **4-stage Problem-Solving Cycle** throughout the assessment task.

Part A: Financial documents

1. Identify and interpret the numerical information from a range of **financial documents** (at least 3) related to your personal and/or vocational life.
2. Identify, prepare and calculate information from **pay slips** and **timesheets.**
3. Summarise the **key numerical information** using clear, concise statements.
4. Prepare and present a report to communicate **key recommendations** to assist young people to use financial documents, pay slips and timesheets more effectively.

Part B: Vocational Numeracy

1. Describe the use of cash-based and digital payment methods in a workplace in which you are interested.
2. Demonstrate the use of cash and/or digital payment processes in that workplace.
3. What steps need to be taken to secure cash and digital transactions in that workplace?
4. Research and report on measures of productivity and efficiency that are used in that workplace.
5. Investigate and analyse the applied impact of fixed and variable costs for an enterprise in which you are interested.

Part C: Cost of Recreating

We hear a lot about the need to lead a healthy life through social activities, hobbies, recreation and sports participation. Indeed this is an important part of achieving work/life balance and personal health and wellbeing. But at times, the cost of 'recreating' can become a financial burden on ourselves and/or our families. Added to this burden is that people are being 'convinced' that they need the latest and fanciest devices, the best athletic clothing and footwear and top of the line equipment just to recreate. And then there are the participation costs, travel costs and the very real opportunity cost of giving up extra work so as to allocate time to recreational activities. So what does your recreational life cost you, or others? And how might this change after you leave school?

1. Document what you do and how you spend your time in 'recreational' activities.
2. Analyse the costs associated with these activities, and who actually pays for them.
3. Discuss ways to reduce costs, and/or make better use of your 'recreational' dollar.
4. How might you be recreating next year; and/or when you are a full-time worker?
5. Analyse the costs associated with your future activities, and who might pay for these.
6. Discuss ways to reduce costs, and/or make better use of your future 'recreational' dollar.

Assessment Task 9.26

Name(s):

Key Dates:

AOS1: Number AOS6: Data AOS8: Systematics
Financial Numeracy and Vocational or Recreational

Tasks - AT4: Financial Documents, Measures and Costs	Must do?	Due by	Done	Level
Part A: Financial documents				
1. Interpret and analyse information on financial documents.	✓		○	
2. Calculate information from pay slips and timesheets.	✓		○	
3. Summarise key numerical information from these.	✓		○	
4. Report to communicate key recommendations.	✓		○	
Effectively apply the tools of systematics.	✓		○	
Part B: Vocational numeracy				
1. Describe the use of cash-based and digital payment.	✓		○	
2. Demonstrate the use of cash and/or digital payments.	✓		○	
3. Explain how to secure cash and digital transactions.	✓		○	
4. Report about productivity and efficiency measures.	✓		○	
5. Analyse the impact of fixed and variable costs.	✓		○	
Effectively apply the tools of systematics.	✓		○	
Part C: Cost of recreating				
1. What you do and your time in recreational activities.	✓		○	
2. Costs of these activities, and ways to pay for them.	✓		○	
3. Ways to reduce costs, &/or better use your funds.	✓		○	
4. Your recreation next year; &/or as a full-time job.	✓		○	
5. Costs of those activities, and who will pay for them.	✓		○	
6. Ways to reduce future costs, &/or better use your funds.	✓		○	
Effectively apply the tools of systematics.	✓		○	
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 reports and calculations.**	✓		○	
Present a report to the class (if required).	○		○	

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

9.27 // 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 conclusions	Done: ○ Level:	Assess conclusions	Done: ○ Level:
4. 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 10

Activities 10: Managing Money		p.	Due date	Done	Comment
10A	**My money management**	257			
10B	**My budgets**	260-261			
10C	**Wage rates**	263			
10D	**Apprentice & trainee wages**	264-265			
10E	**Timesheets**	266			
10F	**Pay slips**	267			
10G	**Me and money management**	2			
10H	**Loan repayments**	2			
10I	**Investigating credit**	2			
10J	**Credit cards and loans**	274-275			
10K	**Income tax**	279			
A5a	**Attitudes to Money**	280-283			
A5b	**Managing Money**	284-285			
PST	**Problem-Solving Cycle and Maths Toolkit**	286			

Comments:

10.01 Money Management

Managing Money

All people need to understand, use and apply various numerical and other skills as part of day-to-day personal, social and work-related money management, budgeting and commercial decision-making.

When it comes to money management you need to analyse your personal circumstances in relation to this question.

"Are you in control of your financial situation, or is your financial situation in control of you?"

This question applies to all stages of your life on an ongoing basis. At this time in your life, when you are soon to transition into post-secondary options, it is even more vital that you are able to build and apply your financial management skills.

Who is it that really has the control?

Image: den0909/ Depositphotos.com

As you get older, life becomes more expensive. Vehicle and transport costs. Clothing and workwear costs. TAFE and study costs. The naturally more expensive costs of an adult lifestyle including rent and self-independence costs, insurances and other obligations - not forgetting relationship and family costs. These can all accumulate very quickly. But what doesn't accumulate nearly as fast is the income you earn!

In units 1&2 you were introduced to the money management equation. However, it is probably even more relevant to you now. Let's revisit this.

Money management equation

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: start building savings (wealth).

In theory, the money management equation is simple, but <u>managing your money is actually quite hard</u>**.** Contemporary life is expensive and young people, even if they do have a job, generally don't earn much at all!

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. And it is becoming even harder because people are increasingly using digital payment platforms and purchasing apps when shopping face-to-face, and especially online. This means people are spending too much, spending too quickly, losing track of how much they're spending, and over-using credit, especially through digital spending platforms.

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.

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.

My money management 10A

1. Discuss the extent to which you agree or disagree with these statements.
2. Outline an example related to you that illustrates your view of the statement.
3. What do you think your responses say about your approach to money management?

Statement	My point of view	Applied example
1. I need to budget so that I can manage my money.		
2. I'll have my finances under control when I get paid more.		
3. Cash is old school. I just tap or app.		
4. Before buying, I ask myself, "do I really need this?"		
5. I can't wait to start working because there are so many things I need to buy.		
6. If I run out of money there's always credit cards, instant loans or buy-now pay-later available. I'll pay these back easy.		
7. Casual work pays more per hour, so that's the way to go for me.		
8. Saving creates financial discipline which will pay off for me in the long term.		
9. Starting early on superannuation is the way for me to enjoy a comfortable retirement.		
10. I get more enjoyment from paying for something up front - it means it's really mine because I don't owe anything.		

10.03 Money Management

Personal budgets

Many of you were introduced to budgeting in Numeracy last year so you might be familiar with the key concepts around budgeting and personal financial management. But we need to reinforce these, as they are an essential component of your life, especially as you transition beyond Year 12 and into your adult lives!

It is essential that you manage your expenditure and minimise the use of credit; especially seemingly easy sources of credit, such as **credit cards**, '**payday**' or **instant** loans, **interest-free** purchase contracts; as well as the growing use of **AfterPay**.

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 going out with your income coming in; to manage your day-to-day financial obligations, to provide for longer-term spending requirements, to save for assets such as a car, as well as saving 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 (a **surplus**) or more money going out (a **deficit**).

A budget can help you plan your spending more responsibly and allow you to take control of your finances. When budgeting, it is important to be as accurate as possible and to list 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 this year while you are still in Year 12, compared to next year when you might be working, or studying in post-secondary education.

An important aspect of budget review is to compare your forecasted amounts with the actual amounts to see how much variation has occurred. This will help you budget more accurately in the future.

Image: PeterFZ30/iStock/Thinkstock

Budgeting

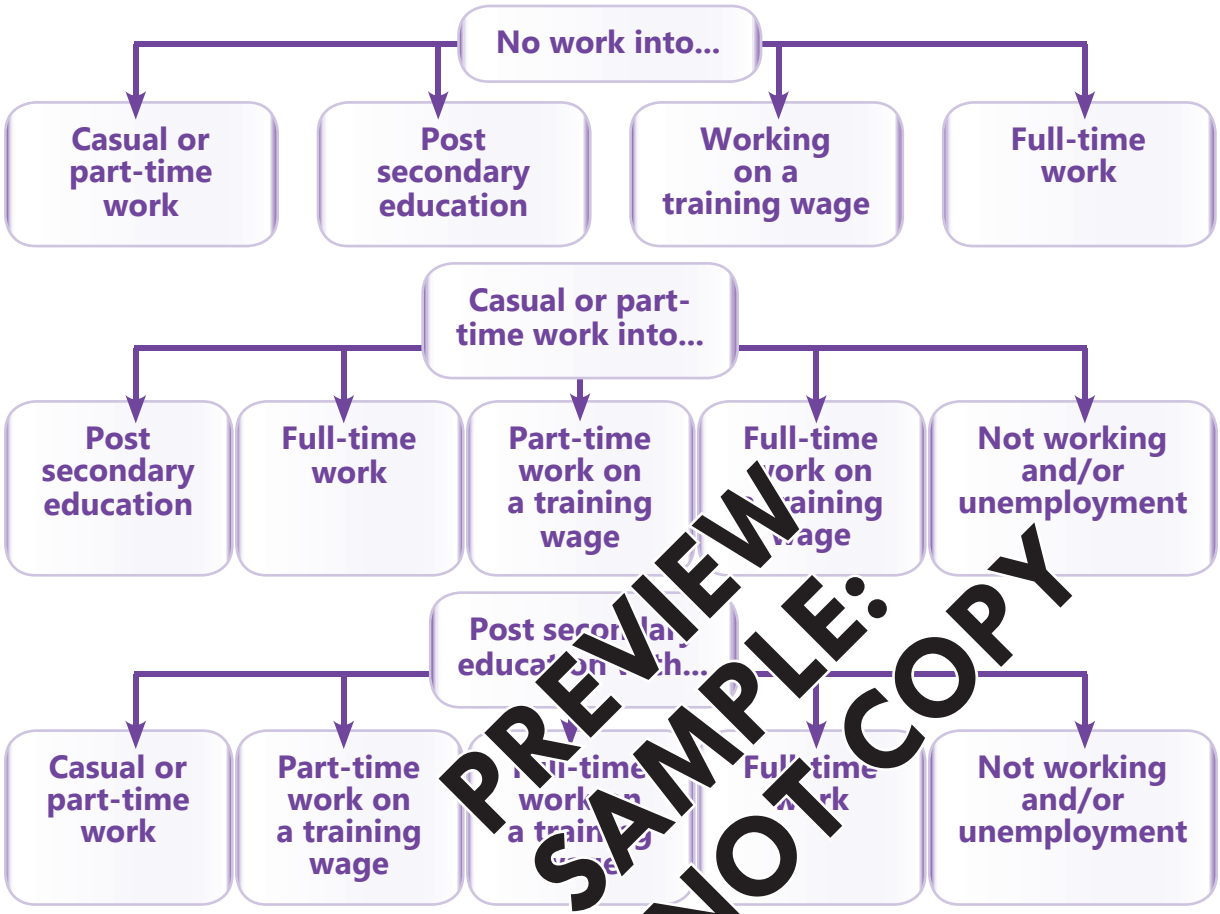
Prepare your budget as accurately as possible.

- ⇨ Be realistic.
- ⇨ Plan to the dollar, not to the cent (except for variable costs).
- ⇨ Always underestimate revenue.
- ⇨ Always overestimate expenses.
- ⇨ Calculate forecasted surplus or deficit.
- ⇨ Include amounts and allowances for unknowns and 'other' items.
- ⇨ Use budgeting software, a spreadsheet, or an app to manage your budget.

NUM SUPER SKILLS

Changing you

Very soon you are in for some changes. Big changes. And these changes will impact on your personal financial circumstances. Some of you will transition into the workforce which might see you move from no work into paid work, from casual work into full-time work, or even from higher-paid casual work into lower-paid entry-level career employment (such as a 1st-year Australian Apprentice).



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
- groceries
- pharmacy, dental, physio, optical, vet and other medical
- phone
- internet
- video/TV subscriptions
- music purchases
- entertainment
- clubs
- toiletries, beauty & health
- household products
- take-away, lunches and meals
- 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

Image: Violka08/iStock/Thinkstock

10B My budgets

1 4 PS 2 3

Part A

1. Identify expense categories that are part of your spending patterns (p.259). Add other expenses not on the list that are relevant for you.
2. 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).
3. Create and complete a table like this one, for each of these time periods. A spreadsheet will be ideal.

(Note: There is an average of 4.4 weeks for each of the 12 months of a year.)

Personal Budget per	week		month		year
Expenses	$		$		$
		x 5		x 12	
Total		x 5		x 12	

4. 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?
5. Include an 'other' category. How much should you allocate to this? Why so?
6. Use the planner to forecast a monthly budget for yourself based on your current financial situation.
7. You might have to convert some expenses from weeks into months.
8. You will also need to include any repayment obligations that will fall due such as buy-now pay-later debts.
9. Will you be in surplus or deficit? What can you do to consolidate or improve your financial situation?

Part B

Both your income patterns, and your expenditure patterns, are very likely to change as you transition from school into the adult phase of your life.

1. Use this type of budget planner to forecast a monthly budget for yourself based on your most likely situation next year (work, or study, or a combination of these).
2. Again you might have to convert some expenses from weeks into months.
3. You will also need to include any repayment obligations that will fall due such as buy-now pay-later debts.
4. Will you be in surplus or deficit? What can you do to consolidate or improve your financial situation?
5. Why does life get more expensive as you get older?

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:**

10.07 Earning an Income

Income

Income is money that any individual or enterprise earns from various sources, such as working, investing, or operating a business.

Most people in Australia earn a **wage** or a **salary**; and about 2 million people are **owner/operators** of their own businesses hoping to earn a **profit**. Many investors receive **dividends** from both private and public (sharemarket) companies. Banks and other financial institutions offer **interest** on savings and investment bonds. Many people also receive **transfer income** from the government through various welfare payments.

Image: Suriyapong Thongsawang/ iStock/Thanasstock

As people accumulate **wealth** over the course of their working lives (by spending less than they earn) they might then **invest** in assets to earn investment income, such as:

- interest from savings
- dividends from owning shares
- capital gains from selling assets (shares, property, art, etc.) and
- rent from investment properties.

Main types of income

- **Wages**: Income amounts paid to employees' labour, determined on an hourly basis. They are commonly used for trades, part-time, casual, clerical and service industries.
- **Salaries**: Income amounts paid to professional and high-skilled employees. Salaries are calculated but not paid on a yearly (annual) basis.
- **Commission**: An incentive payment usually based on a proportion of sales, fees or revenue. Often used for people in sales roles and real estate.
- **Payment in kind**: Non-monetary payments given in return for labour. For example, a nanny might receive free food and accommodation as part of their employment remuneration in return for a lower income.
- **Piece-rate**: Payment used to pay 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 food might receive $5 per delivery.
- **Allowance**: Payments given to offset the cost of work-related necessities, such as uniform cleaning, or for meals associated with travel and overtime shifts. Allowances might also be paid for clothing, tools of the trade or other specific work-related requirements and higher-level responsibilities (e.g. first-aid).
- **Superannuation**: Amounts paid under law by employers that become available at retirement. 11% of an employee's income in '23/24 rising to 12% by '25/26.
- **Interest**: Amounts earned on savings and investments.
- **Dividend**: Amounts earned on shares as part of a company's profit (a dividend is paid at a rate per each share held).
- **Profit**: The net result (or gain) of a business after all expenses and costs have been accounted for.

NUM SUPER SKILLS

Wages

Image: vinnstock/iStock/Thinkstock

Wage-earners are paid for the number of hours that they work. A standard **full-time** working week is usually considered to be 38 hours.

Most jobs that you do as a young person are likely to be paid using **wages**, and nearly all trades occupations and most other non-professional occupations are also paid using hourly **wage rates**. This means that you and your employer **might** have to fill in a **timesheet**, or you might have your hours recorded automatically when you sign in and/or clock on and off.

The amount you get paid is your hourly wage rate. Wage rates are determined by one of three work arrangements: **awards**, **registered agreements** or a **minimum hourly wage rate** (set annually by **The Fair Work Commission**).

Wage rates

A timesheet (and a pay slip) will also include the relevant hourly wage rate for the hours that are worked. This hourly rate might differ depending on varied factors.

- ⇨ The award or registered agreement under which the employee is employed (or the minimum wage rate).
- ⇨ The occupational classification of the employee.
- ⇨ The age of the employee (for junior staff under 21 and/or trainees and apprentices).
- ⇨ The time of day worked (if penalty rates apply).
- ⇨ The day of the week worked (if weekend penalty rates apply).
- ⇨ Extra hours worked (if overtime penalties apply).

So how could you actually find out which rates and conditions apply to various jobs, or for your own job? You've done this before. So, discuss as a class.

Wage rates 10C

1. Research and compare the wage rates for an occupation you are interested in. Find out the hourly pay rate, casual loading and penalty loading that might apply.
2. Calculate the proportional junior rates for different ages.
3. If relevant for this occupation, estimate and/or calculate the proportional pay rates for an apprentice at 1st year, 2nd year, 3rd year and 4th year.

Applied

Check out Fair Work Ombudsman which has an online Pay Calculator tool called PACT. But you'll need to know some key information to use this correctly. Your teacher can help guide you through the PACT tool.

https://calculate.fairwork.gov.au

10.09 Earning an Income

Workplace arrangements, pay and conditions

Last year you would have started to investigate various elements related to workplace arrangements, including wages and salaries. But of course, 12 months on, you need to re-engage with these elements as part of your investigation into your future career pathway. So in small groups, discuss what you remember, know and understand about these terms.

Workplace Arrangements, Pay and Conditions

Wages & salaries	Fair Work Ombudsman	Penalty rates
Awards	PACT tool	Overtime
Registered agreements	Apprentice rates	Allowances
Minimum pay rates	National training wage	Superannuation

10D Apprentice & trainee wages

1 4 PS 2 3

Part A: Australian apprentices

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

Find out 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**

Part B: Traineeships

Given below are National Training Wage rates for a **non-adult** trainee as applicable for 2023/24, based on school level and years out of school.

1 4 PS 2 3

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: 2023/24 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: $384.30	Week: $423.10	Week: $503.30
	Hour: $12.64	Hour:	Hour:
	Year: $19,983.60	Year:	Year:
Plus 1 year out of school	Week: $423.10	Week: $503.30	Week: $585.70
	Hour:	Hour: $16.55	Hour:
	Year:	Year: $	Year:
Plus 2 years out of school	Week: $503.30	Wee	Week: $68
	Hour:		$2.42
	Year:	ar:	: $35,433.20

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:

3. What is the current minimum wage rate for adults? What about for juniors - is this universal or award dependent?

10.11 Earning an Income

Timesheets

Timesheets are used to record employee working hours, work days, break times, rates of pay, as well as other information relevant to the particular work setting and employee. Timesheets often use a **24-hour clock**. Timesheets are used to calculate weekly (or fortnightly) gross pay amounts.

In some workplaces it might be your responsibility to fill in your own timesheets; and it is definitely your responsibility to check that your timesheets are correct.

Crazy Cracka's Discount p/l: Weekly Timesheet

Name:	Robbi Grenoble			*Work period:*	August 19 - 25, 2024		
Employee number:	9875698			*Classification:*	Retail Worker Level 1		*Age:* 18
	Date	*Start*	*Finish*	*Break*	*Hours Worked*	*Rate*	*Total*
Monday	19/8	10:00	19:00	12:30-13:30	8	$12	$96
Tuesday	20/8	____	____	____	____	____	____
Wednesday	21/8	10:00	19:00	13:30-14:00	8.5	$12	$102
Thursday	22/8	10:30	20:00	13:00-14:00	8.5	$12	$102
Friday	23/8	12:00	19:30	16:00-17:00	6.5	$12	$78
Saturday	24/8	12:30	19:00	[illegible]	6	$18	$108
Sunday	25/8	10:00	17:30	na	7.5	[illegible]	$180
Totals					45		$666

10E Timesheets

1. Use the sample timesheet above to interpret and communicate 10 clear and concise points of numerical information.
2. Complete a timesheet based on the following information. Make up personal and work-related information as required.

   Adult retail employee working standard, 38-hour week, Monday to Friday.
   - ⇨ Sign-on is 08:45 am.
   - ⇨ Unpaid lunch break is from 13:00 to 13:45.
   - ⇨ The employee is paid $21.38 per hour (as per the *National Minimum Wage* for 2022/23 but you can update this figure with the current amount for this year).
   - ⇨ The worker does 2 hours overtime (at time and a half) on Thursday, after a break of 20 minutes. You need to adjust the timesheet's format slightly to show this.

3. Complete a timesheet based on your most likely work situation for next year.
4. Obtain an actual timesheet from a workplace and analyse how it is the same as, and/or different from, the sample shown above.

Pay slip

A pay slip is a hard copy or digital document that must be issued by law for each pay period. Pay slips must include relevant employer and employee details, pay and pay rate information, deduction information and summary information.

A pay slip usually will also include loadings, allowances, bonuses, incentives, penalty rates, other entitlements, leave balances, etc., and other information.

Crazy Cracka's Discount p/l	**ABN: 4225 214 4875**		**Date:**	**August 27th, 2024**
Employee: Robbi Grenoble			**Period:**	**August 19-25, 2024**
Entitlements	Total	Total	Deductions	
Ordinary hourly rate:				
$12	31.5	$378		
Overtime hourly rate:				
$18	nil	nil		
Saturday penalty rate:				
$18	6	$108		
Sunday penalty rate:				
$24	7.5	$180		
Gross entitlement		**$666**	Tax deducted:	$86
Net entitlement		**$580**		
Paid into bank account: 046 334360 BSB 093 134				
Year to date		Gr[illegible]	Year to date	$753
Employer superannuation contribution				
RESFund		$73.2[illegible]	Year to date	$662.75

Pay slips 10F

1. Use the sample pay slip above to interpret and communicate 10 clear and concise points of numerical information.
2. Complete a pay slip based on the following information. Make up personal, work-related and other financial information as required.

Employer: Hairex Tensions	Super deducted: na
ABN: 23 456 987 01	Other information:
Pay period: Sunday-Saturday last week	You have been working 3 weeks
Pay date: This Thursday	Week 1: Same ordinary hours, no overtime.
Hourly rate: $17.50	Week 2: Identical as week 3 just gone.
Hours worked: 20 in total	Tax deducted: 12.5% each week
Overtime rate: +25%	Note: No superannuation contributions required as under the 30-hour cut-off for an employee aged under 18.
Overtime hours: 6	
Tax deducted: 12.5%	

3. Complete a pay slip based on your most likely work situation for next year.
4. Obtain an actual pay slip from a workplace and analyse how it is the same as, and/or different from, the sample shown above.

10.13 Managing Your Spending

Money matters

As you start to move into financial independence you will have to develop tools, strategies and even an action plan to manage your spending. Of course, a **budget** is a good way to help estimate your planned income and expenditure. But a budget is of little or no use if you don't actually stick to it.

When you start **working** you will earn an **income**. However, apart from working more hours (and getting overtime if applicable), or getting a higher-paid job (which will happen in time over the course of your career), you will find that you can't do much about your income level. That is basically in the hands of someone else.

However, your own **personal expenditure** is within your **locus of control**. You decide what to spend your money on. Your spending patterns are based on your own decision-making. Of course, you know that moving out of home or buying a car are both very costly decisions. And these are decisions that are going to result in you having **financial obligations** week after week for the remainder of your days. Generally, these are financial obligations that must be met before any other spending. And that includes your own **discretionary spending** on social activities, treats or new clothing!

Image: stockarch/ Depositphotos.com

So what steps are you going to take to manage your money?

Managing your money

Don't	Do
× Don't use plastic for all transactions as it makes it harder to keep track of your spending.	✓ Do arrange direct debits for essential items, such as loan repayments and bills.
× Don't overuse credit. You'll be working to pay for what you have already bought.	✓ Do use cash for things for yourself. When you run out of cash, you can't buy any more stuff.
× Don't buy expensive items until your employment is secured. If you lose your job, how are you going to pay off that loan for your car?	✓ Do use credit sparingly and only if absolutely necessary.
× Don't use 'payday' and instant loans. They have fees and costs that mean you are usually paying back almost twice what you borrowed.	✓ Do pay back your card, pay-later and other debts as soon as you can.
× Don't borrow 'long' to buy 'short'. i.e. Using a personal loan or a rolling credit card for a holiday means that you could be paying for your 2-week suntan for 5 years or more.	✓ Do always pay back more than your credit card minimum balance payment required.
× Don't buy things you don't need. Most people have too much of what they don't need. Ask yourself? "Do I need this and do I need the debt!"	✓ Do go without luxuries to pay off debt, this reduces interest, and means more luxuries for you a little bit later!
× Don't gamble to win. Gambling is designed to make you lose. That's how the industry makes its profits - by you losing!	✓ Do save for expensive items.
	✓ Do go without if you don't need something you can't afford. Who are you trying to impress - or fool?
	✓ Do get financial advice and help. It's often free from government and community agencies. Avoid financial advice from organisations trying to sell you a 'product', i.e. their advice.

1 4 PS 2 3

1. For each of these situations outline honestly how you handle these, or how you are likely to handle these in the near future. Add 2 more of your own.
2. Need to improve? In the final column, explain actions you can take to improve your financial management skills. Where could you get help and advice?

Situation	My situation	What can I do about this?
Using credit cards regularly.		
Paying bills by borrowing.		
Paying off credit card/ pay-later debt.		
Having job security and a steady income.		
Buying things I don't need.		
Using taps & apps rather than cash.		
Buying online.		
Spending my pay before I have earned it.		
Still paying off things I no longer like, use or have.		
Borrowing for luxuries and things I don't need.		
Gambling!!!		
Having a budget.		
Accessing free and sound financial advice and support.		

View

Ever watched Extreme Cheapskates? If not, you're in for a real treat. Find some episodes online and discuss how these ultra-misers save money. Is there anything you can learn from their approaches?

10.15 Managing Credit

Credit

Credit can be useful, but credit can be a trap: **because credit = debt**.

Increasingly, people are turning to credit to get the things they can't afford to buy right now. Many of their credit-based purchases are for luxuries or 'wants'.

One of the most shocking emerging socio-economic problems is the amount of debt being accumulated and carried by young people, including university and TAFE fees, personal loans for cars, credit card debt, mobile phone debt, 'interest-free loan' debt, 'payday' or instant loan debt, and of growing concern, 'buy-now pay-later' debt

Credit is often advertised or sold as 'easy money'. Now you can get an instant or **payday loan** approved over the internet in just one hour. And many shoppers are turning to methods, such as **AfterPay** and others to buy-now and pay-later.

But never forget. The other side of credit is debt. And with debt comes interest and/or fees on that debt. And if you don't reduce your debt then you don't reduce the interest you have to pay. And then you will also pay interest on interest. And then interest on interest on interest. And by then you're in so deep you're going to find yourself in big financial trouble.

Image: kostsov/iStockThinkstock

So is credit easy money? Read on! There are six main types of personal credit finance available in Australia. You might have investigated these before, but now it is time to apply your more advanced Numeracy skills to better manage credit, and to avoid the pitfalls associated with debt.

1. Mortgage

- 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 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**.
- Borrowers actually gain **utility** (by living in the house) while building an **investment** from the value of the house (the land!) increasing.
- Younger people often over-borrow, using a deposit that is too small, and buying houses that are too expensive for a first-home buyer.
- They suffer mortgage stress and might default on their loan. Sometimes their 'house' is worth less than when they bought it, especially new house and land packages. So they end up in deeper financial trouble, with debt, and with no house.

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 devices, 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!)

3. By-now pay-later

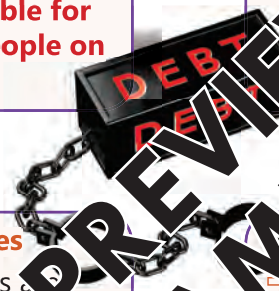
- This is one of the fastest-growing sources of 'credit' for consumers in Australia.
- This 'pay in 4' type of credit is becoming the most easily accessible credit for young people
- Key providers include AfterPay, Zip Pay and others.
- Technically this is not a form of credit; it is an agreement to 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!
- Be very careful, as this can seem like 'easy' credit' but it adds up very fast!

Beware. 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 [illegible] into financial trouble. Seek help immed[illegible]y.



5. Interest-free purchases

- Interest-free purchase periods are offered by retailers to purchasers of household goods, electricals and other big-ticket items.
- Some offer finance periods of up to five 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. 'Pay[illegible]' or instant loans

- This [illegible]ort-term form of credit is [illegible]ally a cash advance.
- [illegible]ayday 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!

10.17 Managing Credit

Principal and interest

All loans have a principal amount and of course an interest amount (and various fees). The principal simply refers to the amount borrowed. For example, for a home loan of $450,000 the principal is $450,000. For a personal loan of $20,000 for a car, the principal is $20,000. And for a credit card purchase of $800 then that adds $800 to the 'principal'.

When you borrow you agree to repay the principal over a certain amount of time. For example, 25 years for a home loan, 5 years for a personal loan, or within a certain number of days (say 28) for a credit card. **But note: Credit cards are extremely unlikely to have an interest-free period for cash advances!**

All loans attract an interest charge. This is how banks and financial institutions make some of their money. They don't hand out money willy-nilly out of the goodness of their heart and trust you to pay it back when you feel like it!

Loans are structured so that interest is charged on the principal amount that is borrowed, as well as on any interest accumulated on that principal. Loans use compound interest - which can really 'add up' over the life of a loan. So it is important to try and pay down your loan as quickly as you are able. Otherwise, you owe interest on interest, as well as interest on the principal. And that's why so many people get into trouble with credit cards. They never pay off their purchases, let alone the interest on these purchases.

Loan repayment calculator

The formula to calculate periodic loan repayment amounts is:

$$P = \frac{r(PV)}{1 - (1+r)^{-n}}$$

P = Loan repayment period amount you are calculating.

PV = Present value (principal amount).

r = Interest rate per period (i.e. 12% would be 0.01 for monthly repayments).

n = Number of payment periods per time (i.e. monthly would be 12 per year, fortnightly would be 26 per year).

ASIC's online loan calculator is the best calculator tool to use. You don't need any others (especially 'commercially provided' loan calculators).

www.moneysmart.gov.au/tools-and-resources/calculators-and-apps

NUM SUPER SKILLS

10H Loan repayments

Use ASIC's money start calculators for the following situations.

https://moneysmart.gov.au/loans/personal-loan-calculator

i. Loan $5,000 15% interest rate Repayments monthly	ii. Loan $5,000 15% interest rate Repayments fortnightly
iii. Loan $10,000 20% interest rate Repayments fortnightly	iv. Loan $10,000 18% interest rate Repayments fortnightly

1 4 PS 2 3

1. Work through the case studies below using the online calculators available at ASIC: **www.moneysmart.gov.au**

1. Lanny gets a credit card at 18 with a $2,000 limit (and 18% interest rate). He only wants the card to buy one thing and he goes out that day and buys a new SmartWatch and accessories for $2000. He has a job and plans to pay this off over time.

On his first statement he receives a notice of his balance, $2,000 and a request to make a minimum payment of $40 which he pays within the time period specified.

Lanny is quite financially disciplined and he doesn't use his card again. On his next statement he receives a notice:

Opening balance	$1,960
Add purchases	$0
Add interest charges	$29.40
Closing balance	$1,979.40
Minimum payment due	$39.59

a. What will happen if Lanny 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 $60?
c. What about $100 and what about $[illegible]?
d. What would you recommend?
e. Do some research and find alternative sources of finance for Lanny.

2. Tregan 18, rides her scooter (an 18th birthday present) 30 minutes to and from her job as a casual animal attendant. She gets side-swiped, slides on the road and her uninsured scooter is written off. Because she wasn't wearing protective riding gear, she loses a lot of skin and needs to have gravel removed from her wounds. Without private health insurance (but still with a pretty good Medicare system in Australia) she gets treated well, but is out of pocket $800 for various medical expenses and prescriptions.

Tregan sees an ad for a 'Payday lender' online and borrows $800 over 12 months.

The establishment fee for the loan is $160 (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. How m[illegible]ill her fortnightly repayments be?
b. Ca[illegible] total 'interest' and fee amounts t[illegible]regan will repay over th[illegible]e of the loa[illegible]
c. Calculate the [illegible] 'interest' and fees on the loan. [illegible]tal interest and fees/total loan amo[illegible] [illegible]%.
d. Fi[illegible]ou[illegible]hat ha[illegible]pens if Tregan defaults on [illegible]
e. D[illegible] some r[illegible]arch and find alternative sources [illegible]finan[illegible] for [illegible]egan.

2. Investigate the costs, terms and conditions associated with an example of each of a personal loan, credit card, 'interest-free' loan and instant loan.
3. Use the ASIC calculators to assist you to set up a spreadsheet comparing the costs associated with each type of credit.
4. Calculate effective annual interest rates associated with using these types of credit.
5. Vary the repayment amounts and repayment times and see the difference that this makes. Show this information in the spreadsheet.
6. Develop comparison graphs to illustrate the differences.
7. Prepare a report to the class that presents a series of guidelines to assist young people to effectively use credit and minimise debt. You could create an infographic to present your findings.

Investigation

AfterPay and other similar digital lay-by methods are the fastest-growing types of 'credit' for young people. What are the advantages and disadvantages of these types of 'credit'? What charges, fees and penalties apply?

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10.19 Managing Credit

10J Credit cards and loans

1 4 PS 2 3

For this applied problem-solving task you are required to compare the cost of credit across a range of different borrowing options. It's also likely that this task will form part of your assessment for the learning outcomes. Your teacher might instruct you to complete this investigation in pairs.

Part A: Credit Cards and instant loans

Research the interest payable, fees and other conditions related to different credit cards from different financial institutions, as well as an 'instant loan'. Choose a card from one of the 'Big 4' banks, a credit card from another financial institution, and an instant or payday loan.

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	Instant loan
Provided by...			
Name of 'card' or loan			
Annual fee/ Establishment fee			
Purchase interest rate			
Interest-free period			
Cash advance interest rate			
Other fees			
Spending limits			
Other conditions and information			
Scenario: Total interest? Total amount repaid? Time taken?	Put $2,000 on your new credit card. Pay back $100 a month	Put $2,000 on your new credit card. Pay back $100 a month	Borrow $2,000. Pay back $100 a month

1 4 PS 2 3

Part B: Personal loans and instant loans

Research the interest payable, fees and other conditions related to 3 different loan options from 3 different lenders. Choose a personal loan from one of the 'Big 4' banks, a personal loan from another financial institution that targets younger people, and an instant loan from a 'Payday' lending 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 loan calculators on the ASIC website to help you.

Loan feature	Loan 1	Loan 2	Instant Loan
Provided by...			
Name of 'loan'			
Loan period			
Interest rate: & fixed or variable?			
Set-up fee/ Establishment fee			
Ongoing fees			
Other fees			
Security needed?			
Other conditions and information			
Fortnightly repayment? Total interest? Total amount repaid?	Borrow $2,000 over 1 year. Fortnightly repayments.	Borrow $2,000 over 1 year. Fortnightly repayments.	Borrow $2,000 over 1 year. Fortnightly repayments.
Monthly repayment? Total interest? Total amount repaid?	Borrow $10,000 over 2 years. Monthly repayments.	Borrow $10,000 over 2 years. Monthly repayments.	Borrow $10,000 over 2 years. Monthly repayments.

10.21 Income Tax

Income Tax

Australia has an egalitarian society whereby we pay income taxes. One of the aims of income tax is to redistribute income from those earning more, to those in our society who need government support such as welfare and other benefits. The other aim is to provide government services and support. This is a sign of a mature, responsible and developed society.

In Australia, we pay income tax on our earnings including our wages, salaries, interest, dividends and other forms of income. In the 2023/24 **Federal Budget**, the Commonwealth Government forecasted it would collect $236b from **income tax**. This represents about 48% of all tax it expects to collect. The next biggest category is **company and resource rent taxes**, $134b (19.7% of all tax). States and local governments do not collect income tax and all **GST revenues** (these are collected federally) are paid back to the states and are treated separately from these amounts.

Some people insist that they shouldn't pay any tax at all! Yet they are happy to use government services such as schools, hospitals, defence, welfare, roads, parks, universities and TAFEs, sport, arts and cultural facilities, among others services.

I have even worked with some people, who are employed by the government, who resent paying any tax. But their incomes are paid by taxpayers! Go figure!

Income tax collections

Throughout the year your employer will withhold tax from your pay. The amount they withhold is based on an estimate generated by the Australian Taxation Office.

Your employer sends those payments to the ATO regularly. But at times, they might withhold a little too much tax. This is especially the case with casual or part-time employees. So this means that you might be entitled to a refund at the end of the financial year.

Income tax return

At the end of the financial year, you lodge an income tax return. The amount of income you have earned and the amount of tax you have paid during the year will be shown on your payment summary.

When you lodge your income tax return, the ATO will calculate any tax owed to you, or any tax that you owe the ATO. They will also take into account (if appropriate to you) any rebates, deductions and your Medicare Levy.

This will give you a refund for any excess tax which has been withheld from your pay. On the other hand, you might have to pay the ATO if too little tax has been taken from your ongoing pay.

Image: EmilieGerard/ iStockThinkstock

Withholding example

- Liam normally works about 6 hours a week as a casual retail employee and earns about $100. But over the school holidays, he works about 30-40 hours per week and earns about $600. So in those weeks when he works a lot of hours, he pays much more tax.
- Liam might not even need to pay tax over the course of the entire year, but the ATO does not know Liam's working patterns, nor those of the 12 million or so other Australians that are employed. So in the weeks that Liam earns a big wage, the ATO asks his employer to **withhold** much more tax from his pay.
- But when Liam does his tax return at the end of the financial year, he is likely to get most, if not all, of this tax back, because he will be under the **tax-free threshold**.

Background image: Acquir/ iStockThinkstock

Income Tax Brackets

Tax Brackets 2023/24

Income	Tax on income
0-$18,200	nil (Tax-free threshold)
$18,201-$45,000	19c for each $1 over $18,200
$45,001-$120,000	$5,092 plus 32.5c for each $1 over $45,000
$120,001-$180,000	$29,467 plus 37c for each $1 over $80,000
$180,000 and over	$51,667 plus 45c for each $1 over $180,000

Does not include Medicare levy of 2% (as at 2023/24) or the Medicare levy surcharge or any low income tax offsets (rebates). Source: www.ato.gov.au

Proposed Tax Brackets 2024/25

Income	Tax on income
0-$18,200	nil (Tax-free threshold)
$18,201-$45,000	19c for each $1 over $18,200
$45,001-$200,000	$5,092 plus 30c for each $1 over $45,000
$200,001 and over	$51,592 plus 45c for each $1 over $200,000

Does not include Medicare levy of 2% (as at 2023/24) or the Medicare levy surcharge or any low income tax offsets (rebates). Source: www.ato.gov.au

Deductions

Deductions are work-related expenses that you can claim to reduce your assessable income. These will then reduce your taxable income.

You can also claim deductions for donations and gifts to registered charities, known as Deductible Gift Recipients.

Other deductions relate to investment income, personal super contributions, cost of managing tax affairs and income protection insurance.

Medicare Levy/Surcharge

The Medicare Levy is calculated at a % of taxable income when earning over $23,365* ('23/24), * higher for pensioners. If earning above $29,207 (and not eligible for a reduction) then the full levy rate of 2% is paid.

The Medicare Levy Surcharge applies for higher-income earners, who don't have eligible private health insurance cover. It kicks in at $90,000 for singles, $180,000 for families (+$1,500 for each dependent child after the first one).

Offsets/Rebates

A tax offset (rebate) reduces the tax you pay on your taxable income. Some common offsets that might apply are:

- Low and middle-income earner tax offsets
- Seniors and pensioner's tax offset
- Offset for maintaining an invalid or invalid carer.

Calculating Income Tax

Tax Brackets

See the 2023/24 tax brackets on the previous page. The way that tax brackets work is that you pay the relevant tax rate depending on the amount of income you earned that is taxable.

For example, you may have a casual job for which you earn $200 a week. Given this, you would earn $10,400 for the year. Your employer will have taken a little tax out of your wages each week, let's say $10. This will add up to $520 for the year. When you submit your tax return you will get all $520 back. Your total tax bill will be $0 because you are under the tax-free threshold of $18,200.

You could use this money to pay for driving lessons or to buy your teacher a nice present.

If your friend has earned $18,201 for the year and has no deductions then how much will they pay? They are in the 19% tax bracket. Does that mean they pay 19% of their taxable income in tax?

No, of course not. They pay 19% on every dollar **over** $18,200, but no tax on all the dollars earned under $18,200. Their tax bill would be 19c. Imagine if they earned one more dollar and had to pay $3,458 in tax on that extra dollar. This wouldn't be fair.

Medicare Levy

The normal Medicare Levy is calculated at a % of taxable income when earning over $23,365*, (*higher for pensioners). In 2023/24, you pay a reduced rate for every $ between $23,365 and $29,207*. Beyond that, the full rate of 2% is paid.

The Medicare Levy Surcharge applies for higher-income earners, who don't have eligible private health insurance cover. The surcharge is calculated at an extra 1%, 1.25% or 1.5%.

So, if single people have a taxable income of $90,000 per year, or a family has $180,000, and don't have appropriate private health insurance, then they have to pay an extra 1% levy (or more, depending on their income levels).

So 1 extra $ means that they get slugged with an extra Medicare surcharge tax of $900! The government really wants you to take out private health insurance, doesn't it!

Calculating income tax payable

We use the tax brackets to calculate total tax payable. We can then calculate total tax paid as a proportion of total income to compare tax amounts at different income levels.

Note: None of these examples include the 2% Medicare Levy, Medicare Levy Surcharge, or any low-income tax offsets, rebates or exemptions.^

e.g. 1: Tax payable on $17,000 = $0

e.g. 2: Tax payable on $30,000

- ($30,000 - $18,200) = $11,800
- ($11,800 x 0.19) = $2,242
- Tax payable = $2,242
- (Total tax % = $2,242/$30,000 = 7.5%)

So an annual taxable income of $30,000 will incur a tax bill of $2,242. Tax payable represents about 7.5% of total annual income. (+ ^)

e.g. 3: Tax payable on $60,000

- ($60,000 - $45,000) = $15,000
- ($15,000 x 0.325) = $4,875
- Tax payable = $4,875 + $5,092 = $9,967

So an annual taxable income of $60,000 will incur a tax bill of $11,047. Tax payable on this amount represents about 16.7% of total annual income. (+ ^)

e.g. 4: Tax payable on $150,000

- ($150,000 - $120,000) = $30,000
- ($30,000 x 0.37) = $11,100
- Tax payable = $11,100 + $29,467 = $40,567

So an annual taxable income of $150,000 will incur a tax bill of $59,446. Tax payable on this amount represents about 27.0% of total annual income. (+ ^)

e.g. 5: Tax payable on $300,000

- ($300,000 - $180,000) = $120,000
- ($120,000 x 0.45) = $54,000
- Tax payable = $54,000 + $51,667 = $105,667

So an annual taxable income of $300,000 will incur a tax bill of $108,547. Tax payable on this amount represents about 35.2% of total annual income. (+ ^)

Part A

1. Use the 2023/24 (or current) tax brackets to calculate tax payable on the following incomes. For each of these amounts, calculate the average tax rate paid.
   a. $4,567
   b. $22,754
   c. $33,500
   d. $55,000
   e. $75,000
   f. $150,000
   g. $350,000
   h. $1,000,000

This calculation is for simple tax and doesn't include the Medicare Levy, nor any rebates or deductions.

2. Calculate the amount of tax paid based on your income, or the income of another part-time/casual worker you know.
3. Plot your calculations for questions 1a. to 1h. on a bar graph for both income and tax paid.
4. Plot the average tax paid % on a bar graph. Describe the patterns shown by the graph.
5. Describe the patterns of income tax paid at the different income levels. Does it seem fair? Why/why not?

Part B

1. For each of the incomes in Part A, calculate the appropriate Medicare Levy and (other relevant surcharges or levies) and recalculate tax payable on each of these incomes. (Assume that the taxpayers do not have private health insurance.)
2. For each of these amounts, re-calculate the average tax rate paid.
3. Find a tax calculator online. Does it include the Medicare Levy, or other surcharges and rebates?

Part C

1. Find out about allowable deductions for your current occupation or an occupation you are interested in. (Start with **www.ato.gov.au**)
2. List these deductions. Calculate whether you are entitled to a reduction in your assessable income and your overall tax payable.
3. Perhaps your teacher can arrange for an accountant or tax agent, or someone from the ATO, to visit and explain about relevant deductions.
4. Find out about any allowable rebates that you might be entitled to. Most of you will not be entitled to a tax rebate at this stage of your lives but some of your parents might be. (Start with **www.ato.gov.au**)

10.25 Assessment Task

AT5a Attitudes to Money
Financial Numeracy // and Personal or Vocational

1
4 PS 2
3

Overview

There are 2 parts to this task.

- ⇨ Part A: Respond to a simulated case study.
- ⇨ Part B: Applied investigation based on the examples in the case study.

The different lives of Dot and Dit

Read the case study then complete the tasks that follow. Identify all the examples of 'numerical information' about Dot and Dit by underlining or highlighting these.

Dot and Dit

Twins Dot and Dit have different approaches to money management. Dot is very frugal and careful with money, whereas Dit has a more carefree approach to spending. Indeed Dot is always telling Dit that, "If you look after the cents then the dollars will look after themselves". Dit usually replies by saying, "You're only on this planet once, so you might as well make the most of your time while here."

When the twins are out shopping Dit always uses his phone app to pay. Sometimes he doesn't have enough money in his account and has to make a swift transfer from another account. Dot says to Dit "You should be embarrassed bro!". This becomes a joke between them and a challenge to Dot. Dit finds a 'loophole' and decides he will instead just use credit on his SmartWatch.

Dot mainly uses cash when shopping and stops spending when she has run out. In contrast, Dit loves *Get-it-now* the newest digital buy now method of buying. When he gets the bill down the track, Dit just uses his credit card to pay it off anyway. For large purchases, Dot uses her debit card and double checks her balance before flexing it.

Both Dot and Dit work at the Golden Digit Inn. Dit struggles to make change when serving customers and counts on his fingers. An older customer handed him the notes and the cents to get 'round' change for a payment and Dit couldn't work out how to do it. Dot is used to handling cash and quickly calculates change.

Dit loves a discount and is proud when he gets one. He buys up big when the opportunity presents, often from overseas and shares his savvy on TikTok with vids and comments such as "They were almost giving it away!" But Dot points out that sometimes the discounts only work out to be a few per cent, and that he doesn't take into account other charges and costs. But Dit doesn't know how to estimate these.

Every fortnight when they get paid Dit only looks at the gross pay on his pay slip and always complains he is suffering from wage theft from tax and super. Dot sometimes finds mistakes in the hourly rates and numbers of hours worked and lets the boss know, who fixes it straight away.

Dot and Dit organise a party for their twin friends Ni and Bary. At the market, Dit has no idea how to plan what to buy and how much he needs to spend. He buys a box of ripe bananas and some fish because they are being cleared cheaply. In contrast, Dot plans what she needs to get for the party in advance, and looks online to find out which stores are running specials on the most expensive and highest quantity items needed. This will help stretch her money further.

In terms of saving, Dot is doing well and is debt-free. Dit has a debt that he finds puzzlingly large (due to interest). Even though they earn the same amount, Dit seems to be far less fortunate than his twin Dot.

So don't be a Dit. When it comes to managing money, join the Dots!

Part A: Response to case study

1. Dot and Dit have different approaches and attitudes to money. Which of Dot or Dit do you more relate to, or agree with? Explain why.
2. Identify all the examples of numerical information from the case study.
3. Explain whether these examples represent 'effective' money management or 'not so effective' money management.
4. Develop short statements as feedback strategies to Dot and Dit about their money management skills.

Part B: Applied investigation

You are required to **describe real-life examples**, using **evidence**, related to **your own experiences,** that match each of the numerical situations from the case study of Dot and Dit. You also need to discuss how these **money management skills** can be **applied** to **vocational** situations.

You need to describe situations involving:

- ❑ Money calculations using both cash and digital transaction methods
- ❑ Estimating, calculating, making and checking change
- ❑ Converting discounts to and from $ amounts and percentages, and estimating, calculating and evaluating discounts
- ❑ Comparing traditional and digital shopping methods
- ❑ Comparing buying locally to buying from overseas
- ❑ Interpreting pay slips
- ❑ Interpreting varied financial information
- ❑ Discussing saving vs spending
- ❑ Investigating use of credit and its relationship with debt
- ❑ Explaining money management and budgeting
- ❑ Applied numerical skills for work-related tasks
- ❑ Applied use of the tools of systematic
- ❑ Other information that your teacher might add.

Topic ideas and other information, notes, key dates, etc..

10.27 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT5a -

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 conclusions	Done: ○ Level:	Assess conclusions	Done: ○ Level:
4. 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

Assessment Task 10.28

Name(s):

Key Dates:

AOS1: Number AOS5: Data AOS8: Systematics

Financial Numeracy & Personal or Vocational

Tasks - AT5a: Attitudes to Money	Must do?	Due by	Done	Level
Part A: Response to case study				
1. Your similarity/differences with Dot and/or Dit?	✓			
2. Numerical information from case study.	✓			
3. Evaluation of the actions of Dot and Dit.	✓			
4. Feedback for Dot and Dit.	✓			
Effectively apply the tools of systematics.	✓			
Part B: Applied investigation				
1. Money calculations using cash & digital methods.	✓			
2. Estimating, calculating, making and checking change.				
3. Estimating, calculating and evaluating discounts.				
4. Comparing traditional and digital shopping methods.	✓			
5. Comparing buying locally to buying from overseas.				
6. Interpreting pay slips.				
7. Interpreting varied financial information.	✓			
8. Discussing saving vs spending.	✓			
9. Investigating use of credit and its relationship to debt.	✓			
10. Explaining money management and budgeting.	✓			
11. Applying numerical skills for work-related tasks.	✓			
Effectively apply the tools of systematics.	✓			
Draft responses & investigation/ submit 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 your final responses and reports.**	✓			
Present a report to the class (if required).				

10.29 Assessment Task

AT5b Managing Money
Financial Numeracy // and Personal and/or Vocational

1
4 PS 2
3

Overview

This assessment task has **3 parts** and you are required to complete each of these. Your teacher might also add other applied Financial Numeracy activities, some of which you might have undertaken throughout Sections 9 & 10.

For each part you need to identify, explain and apply the use of the tools of **systematics**. And of course, you need to apply the **4-stage Problem-Solving Cycle** throughout the assessment task.

Part A: Group budget

Prepare a detailed budget for a group activity. This might be an activity related to a group PDS or WRS project or activity, or a community enterprise. **or**

Alternatively, you might prepare a group budget for a simulated situation, such as managing finances for a sharehouse next year, or going into partnership with a friend to start up a micro business or community enterprise.

1. Identify and calculate your key **income** sources and **expenditure** categories.
2. Prepare a '**before**' **budget**.
3. Prepare an '**after**' **budget**, and calculate **variations**.
4. Make a list of **recommendations** based on the data and numerical information.
5. Prepare and present a report communicating your **budgeting process** and **success in budgeting**.

Part B: Vocational Numeracy - Income tax

1. Research, compare and communicate the **wage rates** and other financial entitlements for at least **2 occupations** in which you are interested.
2. Use the **current tax brackets** to estimate **income tax payable** for these occupations based on annual working patterns.
3. Find out the amount of **Medicare levy** and **other surcharges** that might apply.
4. Find and estimate likely annual **tax deductions** that might apply to workers in these occupations.
5. Find out if any **rebates** might apply to you if you are working.
6. **Re-calculate** estimated **tax** payable. Find and use any **tax calculators** online. Compare your own calculations to these.

Part C: Cost of borrowing

1. Research **interest**, **fees**, **penalties** and other **requirements** related to 3 different types of **credit/loan** products, such as **credit cards**, **personal loans**, **buy-now pay-later** and '**instant loans**'.
2. Make a list of **recommendations** based on the data and numerical information.
3. Prepare and present a report to communicate **key recommendations** about the effective use of **credit/loan products** for **loan amounts** of $1,000, $5,000 and $10,000.

Assessment Task 10.30

Name(s):

Key Dates:

AOS1: Number AOS5: Data AOS8: Systematics

Financial Numeracy and Personal and/or Vocational

Tasks - AT5b: Managing Money	Must do?	Due by	Done	Level
Part A: Group budget - Focus:				
1. Identify and calculate income and expenditures.	✓			
2. Prepare 'before' budget.	✓			
3. Prepare 'after' budget, and calculate variations.	✓			
4. Make recommendations based on the information.	✓			
5. Report on your budgeting process and success.	✓			
Effectively apply the tools of systematics.	✓			
Part B: Vocational numeracy - Income tax				
1. Wage rates and financial entitlements for occupations.	✓			
2. Use tax brackets to estimate income tax for occupation	✓			
3. Medicare levy and other surcharges that might ap	✓			
4. Tax deductions that might apply for these occ	✓			
5. Rebates that might apply to you if you c working.	✓			
6. Re-calculate tax payable. Compare to calcu rs.	✓			
Effectively apply the tools of s matics.	✓			
Part C: Cost of borrowing				
1. Research credit/loan product interest, and pen ties	✓			
2. Make recommendations using data and numer	✓			
3. Report by communicating key recommen s.	✓			
Effectively apply the tools of syste	✓			
Draft your findings and submit 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 your final reports and calculations.	✓			
Present a report to the class (if required).				

10.31 // Problem-Solving Cycle // Maths Toolkit

1
4 PS 2
3

Task: **Names/Dates:**

AT5b -

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:
4. 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