

Write your name here

| | |
|---------|-------------|
| Surname | Other names |
|---------|-------------|

Pearson Edexcel
Level 1/Level 2 GCSE (9-1)

Centre Number

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

Candidate Number

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Mathematics

Paper 3 (Calculator)

Higher Tier

Tuesday 12 June 2018 – Morning
Time: 1 hour 30 minutes

Paper Reference

1MA1/3H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

| |
|--|
| |
|--|

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P48864A

©2018 Pearson Education Ltd.

6777777777



P 4 8 8 6 4 A 0 1 2 4



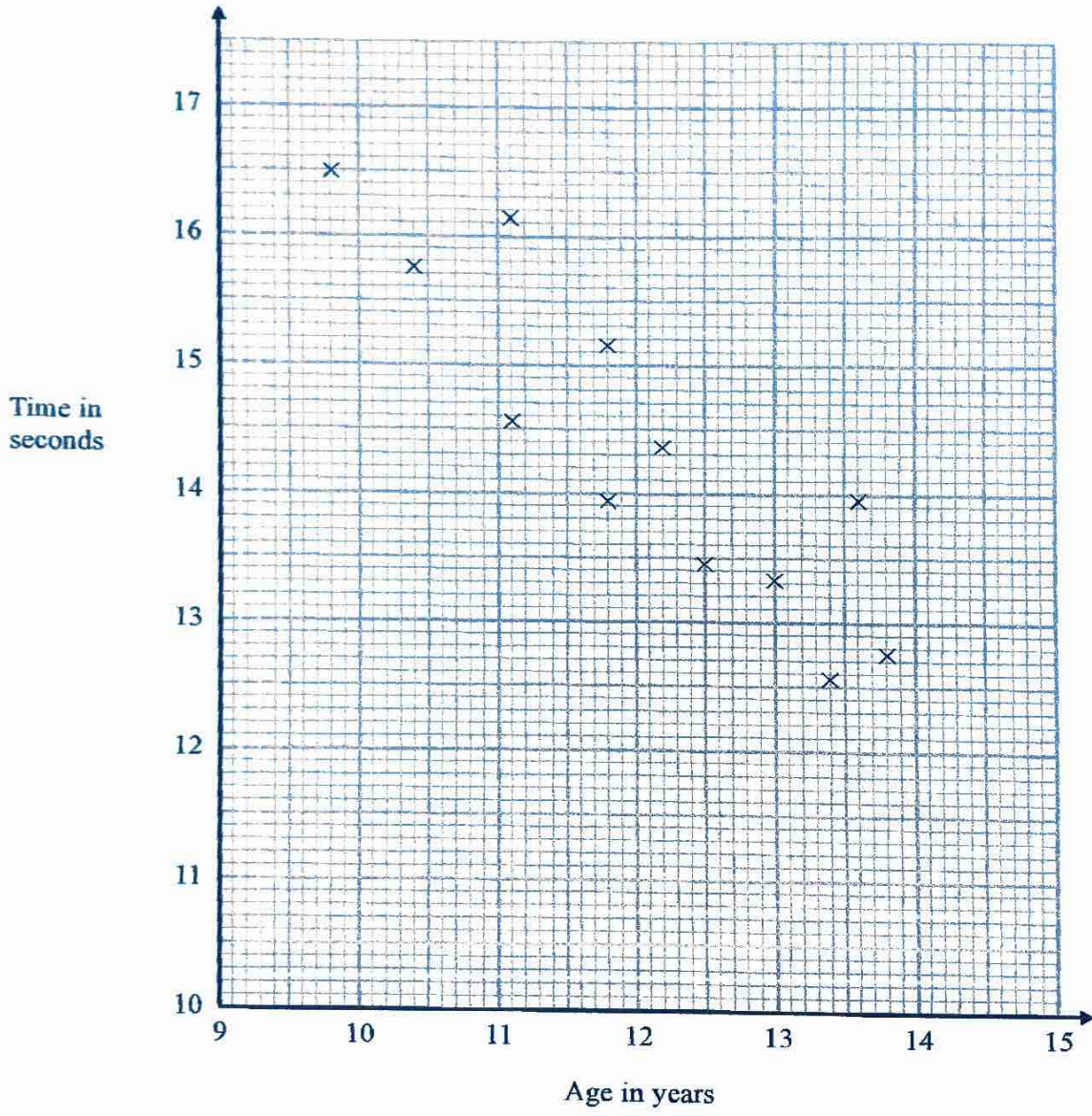
Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 The scatter diagram shows information about 12 girls.
It shows the age of each girl and the best time she takes to run 100 metres.



(a) Write down the type of correlation.

Negative

(1)



DO NOT WRITE IN THIS AREA

Kristina is 11 years old.
Her best time to run 100 metres is 12 seconds.

The point representing this information would be an outlier on the scatter diagram.

(b) Explain why.

This point would not be in line with the trend of the other points

(1)

Debbie is 15 years old.

Debbie says,

"The scatter diagram shows I should take less than 12 seconds to run 100 metres."

(c) Comment on what Debbie says.

This point would be outside the range of the scatter graph

(1)

(Total for Question 1 is 3 marks)

2 Expand and simplify $5(p + 3) - 2(1 - 2p)$

$$5p + 15 - (2 - 4p)$$

$$9p + 13$$

$$-(-) = +$$

$$9p + 13$$

(Total for Question 2 is 2 marks)

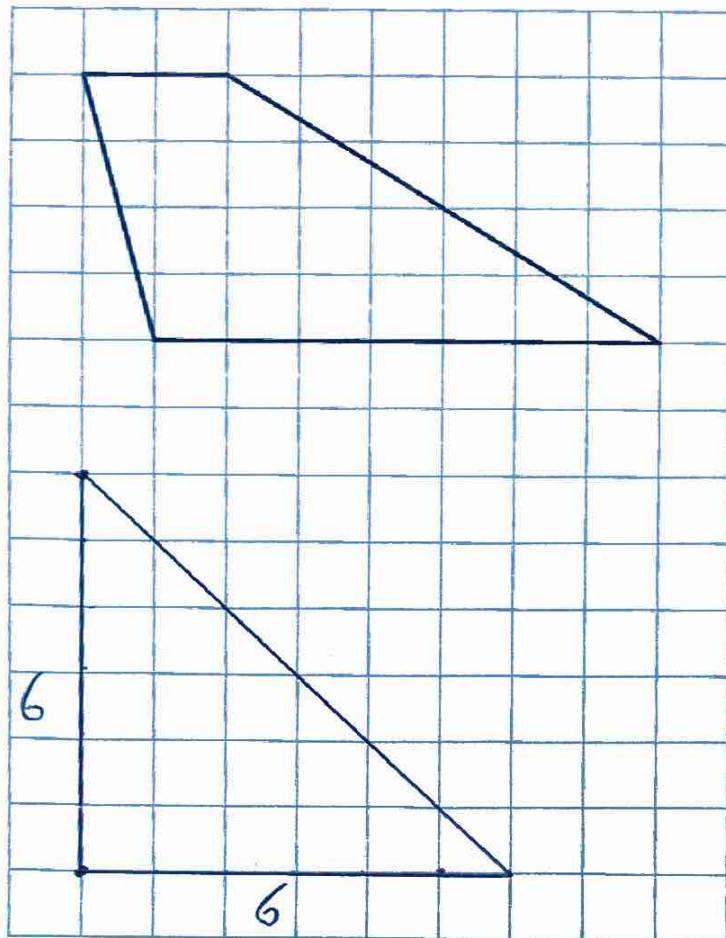
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 4 8 8 6 4 A 0 3 2 4

3 Here is a trapezium drawn on a centimetre grid.



On the grid, draw a triangle equal in area to this trapezium.

$$\text{Area of Trapezium} = 18$$

$$\frac{1}{2} b \times h = 18$$

$$b \times h = 36$$

$$6 \times 6 = 36$$

(Total for Question 3 is 2 marks)



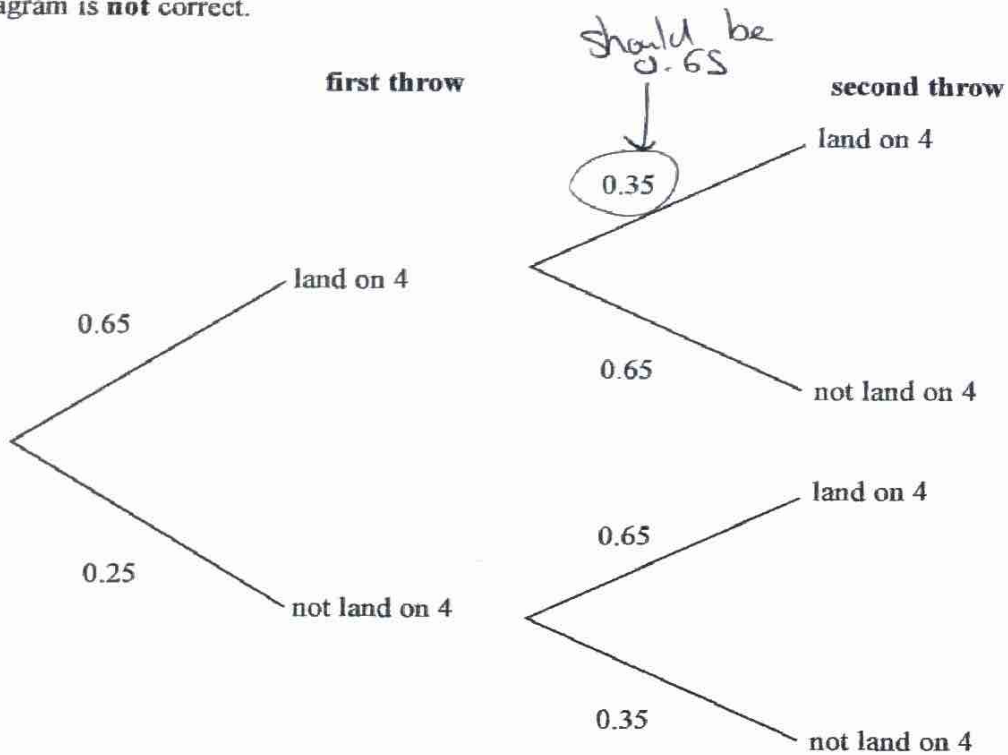
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

4 When a biased 6-sided dice is thrown once, the probability that it will land on 4 is 0.65
The biased dice is thrown twice.

Amir draws this probability tree diagram.
The diagram is **not** correct.



Write down **two** things that are wrong with the probability tree diagram.

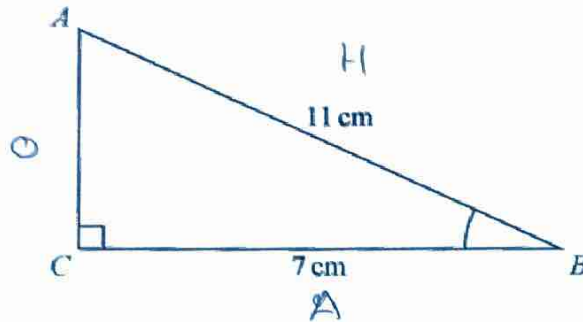
- 1 $0.65 + 0.25 = 0.9$. The probabilities must sum to equal 1.
- 2 For the second throw the 0.65 & 0.35 reverse

(Total for Question 4 is 2 marks)



P 4 8 8 6 4 A 0 5 2 4

5 ABC is a right-angled triangle.



- (a) Work out the size of angle ABC .
Give your answer correct to 1 decimal place.

$$\frac{O}{S} \frac{O}{T} \frac{O}{H} \quad \frac{A}{C} \frac{A}{T} \frac{O}{H} \quad \frac{O}{T} \frac{O}{A}$$

$$\cos x^\circ = \frac{A}{H} = \frac{7}{11}$$

$$\cos^{-1} \frac{7}{11} = x$$

$$\underline{50.5} \quad (2)$$

The length of the side AB is reduced by 1 cm.

The length of the side BC is still 7 cm.

Angle ACB is still 90°

- (b) Will the value of $\cos ABC$ increase or decrease?
You must give a reason for your answer.

Increase - ~~$\cos \frac{7}{10} > \cos \frac{7}{11}$~~

$$\frac{7}{10} > \frac{7}{11} \quad (1)$$

(Total for Question 5 is 3 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

6 There are some counters in a bag.
The counters are red or white or blue or yellow.

Bob is going to take at random a counter from the bag.

The table shows each of the probabilities that the counter will be blue or will be yellow.

| | | | | |
|-------------|-----|-------|------|--------|
| Colour | red | white | blue | yellow |
| Probability | 0.2 | 0.1 | 0.45 | 0.25 |

18 10

There are 18 blue counters in the bag.

The probability that the counter Bob takes will be red is twice the probability that the counter will be white.

(a) Work out the number of red counters in the bag.

$$18 = 0.45$$

$$\left. \begin{array}{l} \div 9 \\ \div 9 \end{array} \right\} \div 9$$

$$2 = 0.05$$

$$0.45 + 0.25 = 0.7$$

$$1 - 0.7 = 0.3$$

$$\text{Red} : \text{white}$$

$$2 : 1$$

$$0.2 : 0.1$$

$$0.05 = 2 \text{ counters}$$

$$\text{Red} = 0.2 = 8 \text{ counters}$$

$$\text{White} = 0.1 = 4 \text{ counters}$$

~~11~~ 8
(4)

A marble is going to be taken at random from a box of marbles.
The probability that the marble will be silver is 0.5

There must be an even number of marbles in the box.

(b) Explain why.

0.5 multiplied by an odd number will not give a whole number of marbles.

(1)

(Total for Question 6 is 5 marks)



P 4 8 8 6 4 A 0 7 2 4

7 Solve $\frac{5-x}{2} = 2x-7$

$$\times 2 \quad \times 2$$

$$5-x = 2(2x-7)$$

$$5-x = 4x-14$$

$$+x \quad +x$$

$$5 = 5x-14$$

$$+14 \quad +14$$

$$19 = 5x$$

$$\div 5 \quad \div 5$$

$$\frac{19}{5} = x$$

$$x = \frac{19}{5} \text{ or } 3.8$$

$$x = \dots\dots\dots$$

(Total for Question 7 is 3 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

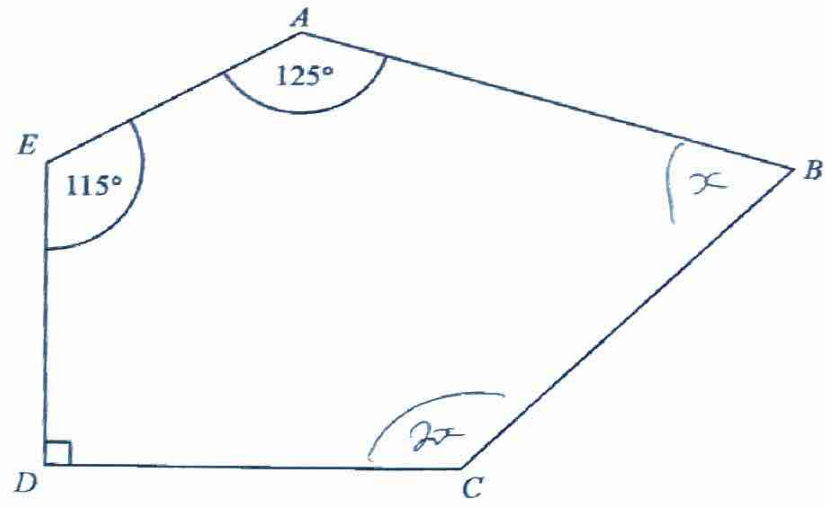


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

8 *ABCDE* is a pentagon.



Angle *BCD* = $2 \times$ angle *ABC*

Work out the size of angle *BCD*.
You must show all your working.

$$5. \quad 180 \times (n - 2) = 180 \times 3 = 540$$

$$540 - 115 - 125 - 90 = 210$$

$$210 = 3x$$

$$x = 70$$

$$BCD = 2x = 140^\circ$$

140°

(Total for Question 8 is 5 marks)



P 4 8 8 6 4 A 0 9 2 4

$$9 \quad T = \sqrt{\frac{w}{d^3}}$$

$$w = 5.6 \times 10^{-5}$$

$$d = 1.4 \times 10^{-4}$$

(a) Work out the value of T .

Give your answer in standard form correct to 3 significant figures.

$$\sqrt{\frac{5.6 \times 10^{-5}}{(1.4 \times 10^{-4})^3}} = 4517.5308 \dots$$

$$4.52 \times 10^3$$

$$T = 4.52 \times 10^3$$

(2)

w is increased by 10%

d is increased by 5%

Lottie says,

"The value of T will increase because both w and d are increased."

(b) Lottie is wrong.

Explain why.

$$\sqrt{\frac{5.6 \times 10^{-5} \times 1.1}{(1.4 \times 10^{-4} \times 1.05)^3}} = 4.40 \times 10^3$$

This is smaller than previous T value

(2)

(Total for Question 9 is 4 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

10 Here are three lamps.

lamp A



lamp B



lamp C



Lamp A flashes every 20 seconds.

Lamp B flashes every 45 seconds.

Lamp C flashes every 120 seconds.

The three lamps start flashing at the same time.

How many times in one hour will the three lamps flash at the same time?

A 20 40 60 80 100 120 140 160 180
 200 220 240 ... 360

B 45 90 135 180 225 270 315 360
 405

C 120 240 360

1 every 6 mins

10 times in 60 mins

10

(Total for Question 10 is 3 marks)



P 4 8 8 6 4 A 0 1 1 2 4

11 In 2003, Jerry bought a house.

In 2007, Jerry sold the house to Mia.
He made a profit of 20%

In 2012, Mia sold the house for £162 000
She made a loss of 10%

Work out how much Jerry paid for the house in 2003

2003 x

$$0.9(1.2x) = 162,000$$

$$\div 0.9 \qquad \div 0.9$$

2007 $1.2x$

$$1.2x = 180,000$$

$$\div 1.2 \qquad \div 1.2$$

2012 $0.9(1.2x)$

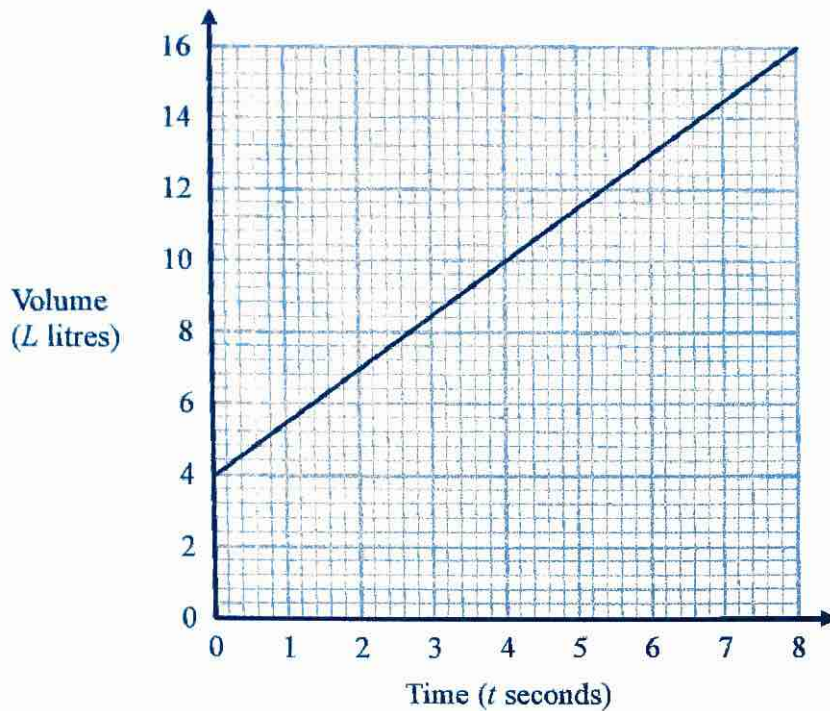
$$x = 150,000$$

£ 150,000

(Total for Question 11 is 3 marks)



12 The graph shows the volume of liquid (L litres) in a container at time t seconds.



(a) Find the gradient of the graph.

$$\text{grad} = \frac{\Delta y}{\Delta x} = \frac{12}{8} = 1.5$$

1.5
(2)

(b) Explain what this gradient represents.

The rate at which the container fills
(change in volume over time)

(1)

The graph intersects the volume axis at $L = 4$

(c) Explain what this intercept represents.

The volume of liquid in the container at the start

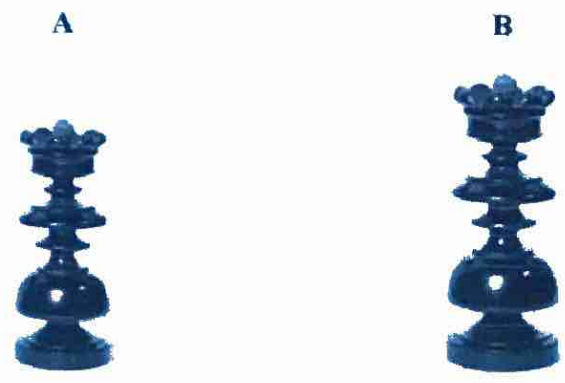
(1)

(Total for Question 12 is 4 marks)



DO NOT WRITE IN THIS AREA

13 Here are two similar solid shapes.



surface area of shape A : surface area of shape B = 3 : 4

The volume of shape B is 10 cm³

Work out the volume of shape A.
Give your answer correct to 3 significant figures.

| | A | B |
|--------|------------|------------|
| SA | $\sqrt{3}$ | $\sqrt{4}$ |
| Area | 3 | 4 |
| volume | 6.5 | 10 |

$\sqrt{4} = 2$
 Scale factor = $\frac{2}{\sqrt{3}} =$
 $Sf = 1.155...$
 $Sf^3 = 1.5396$
 $\frac{10}{1.5396} = 6.495...$

6.5 cm³

(Total for Question 13 is 3 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- 14 There are 16 hockey teams in a league.
Each team played two matches against each of the other teams.

Work out the total number of matches played.

each Team will play 15 games

16 teams

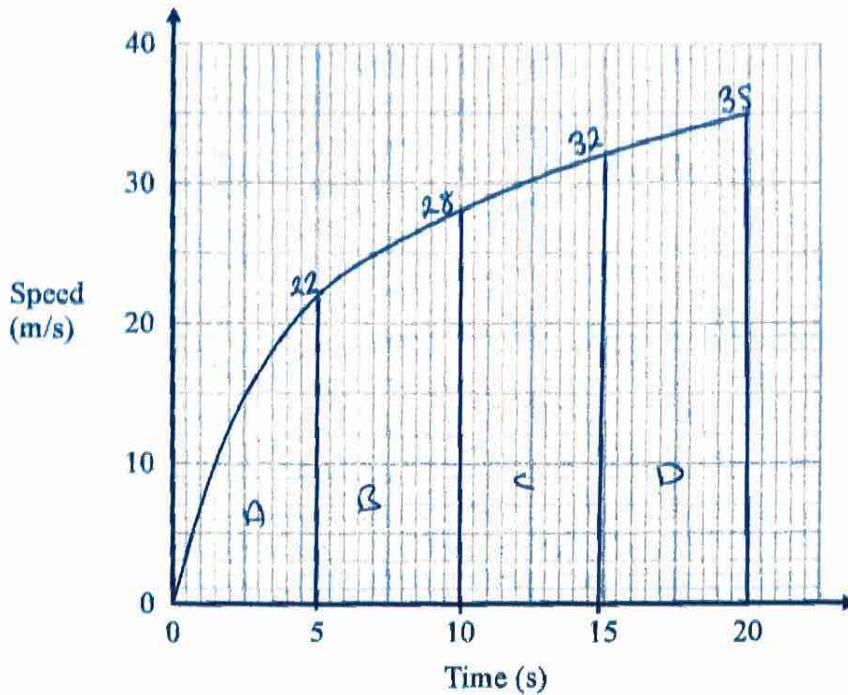
$$15 \times 16 = 240$$

240

(Total for Question 14 is 2 marks)



15 The graph shows the speed of a car, in metres per second, during the first 20 seconds of a journey.



(a) Work out an estimate for the distance the car travelled in the first 20 seconds.
Use 4 strips of equal width.

$$A = \frac{1}{2}(0+22) \times 5 = 55$$

$$B = \frac{1}{2}(22+28) \times 5 = 125$$

$$C = \frac{1}{2}(28+32) \times 5 = 150$$

$$D = \frac{1}{2}(32+35) \times 5 = 167.5$$

~~187.5~~

497.5

Range = 488 → 507

497.5

~~497.5~~

metres

(3)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- (b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 20 seconds?
Give a reason for your answer.

Underestimation - Since parts are not included / under graph

(1)

(Total for Question 15 is 4 marks)



P 4 8 8 6 4 A 0 1 7 2 4

16 The n th term of a sequence is given by $an^2 + bn$ where a and b are integers.

The 2nd term of the sequence is -2

The 4th term of the sequence is 12

(a) Find the 6th term of the sequence.

$$\text{2nd term } n=2 \quad a \cdot 2^2 + b \cdot 2 = -2 \quad = 4a + 2b = -2$$

$$\text{4th term } n=4 \quad a \cdot 4^2 + b \cdot 4 = 12 \quad = 16a + 4b = 12$$

now solve as simultaneous equations

$$\times 2 \quad (4a + 2b = -2)$$

$$16a + 4b = 12$$

$$8a + 4b = -4 \quad -(-) = +$$

Sub a in

$$4 \times a + 2b = -2$$

$$4 \times 2 + 2b = -2$$

$$8 + 2b = -2$$

$$2b = -10$$

$$b = -5$$

$$8a = 16$$

$$a = 2$$

$$\text{Sequence} = 2n^2 - 5n$$

$$6^{\text{th}} = 2 \times 6^2 + (-5 \times 6)$$

$$2 \times 36 + -30$$

$$72 - 30 = 42$$

$$\frac{42}{(4)}$$

Here are the first five terms of a different quadratic sequence.

0 2 6 12 20

0 2 6 12 20

$$\begin{array}{cccc} \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} \\ 2 & 4 & 6 & 8 \\ \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} & \\ 2 & 2 & 2 & \end{array} = n^2$$

$$n^2 - n$$

-1 4 9 16 25

-1 -2 -3 -4 -5

$$\begin{array}{cccc} \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} & \underbrace{\quad} \\ -1 & -2 & -3 & -4 \end{array}$$

$$-1n + 0$$

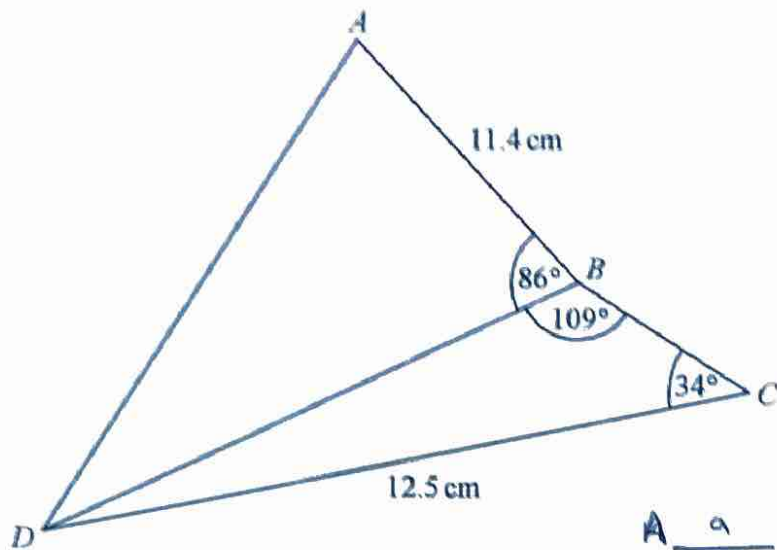
↑
not needed

$$\frac{n^2 - n}{(2)}$$

(Total for Question 16 is 6 marks)



17



$$\frac{A}{\sin A} = \frac{b}{\sin B}$$

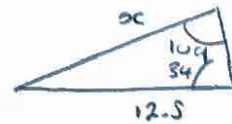
Work out the length of AD .

Give your answer correct to 3 significant figures.

1) Sine rule to find BD

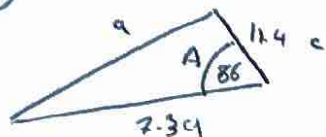
$$\frac{x}{\sin(34)} = \frac{12.5}{\sin(109)}$$

$$x = \frac{12.5}{\sin 109} \times \sin 34 = 7.39 \dots$$



2) cosine rule length

$$AD = a$$



$$a^2 = b^2 + c^2 - 2bc \cos(A)$$

$$a^2 = 11.4^2 + 7.39^2 - 2 \times 11.4 \times 7.39 \times \cos(86)$$

$$a^2 = 172.85 \dots$$

$$a = 13.1 \text{ 3 sig fig}$$

13.1 cm

(Total for Question 17 is 5 marks)



P 4 8 8 6 4 A 0 1 9 2 4

18 (a) Show that the equation $x^3 + x = 7$ has a solution between 1 and 2

$$1^3 + 1 = 2$$

$$2 < 7 < 10$$

$$2^3 + 2 = 10$$

\therefore answer between 1 & 2

(2)

(b) Show that the equation $x^3 + x = 7$ can be rearranged to give $x = \sqrt[3]{7-x}$

$$x^3 + x = 7$$

$$-x \quad -x$$

$$x^3 = 7 - x$$

cube
root

$$x = \sqrt[3]{7-x}$$

(1)

(c) Starting with $x_0 = 2$, use the iteration formula $x_{n+1} = \sqrt[3]{7-x_n}$ three times to find an estimate for a solution of $x^3 + x = 7$

$$\sqrt[3]{7-2} = 1.7090\dots$$

$$\sqrt[3]{7-1.709\dots} = 1.742\dots$$

$$\sqrt[3]{7-1.742\dots} = 1.7388\dots$$

Both round 2 dp to
give 1.74

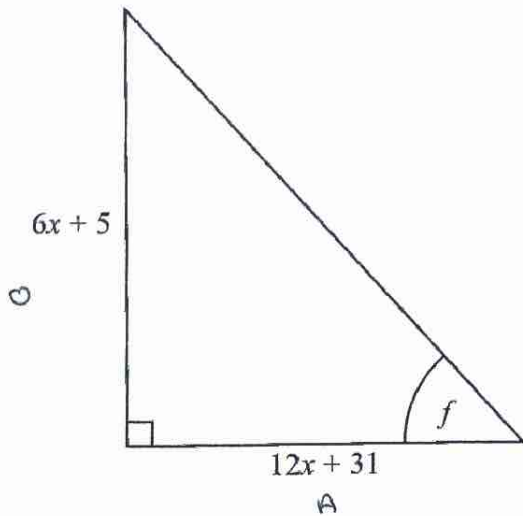
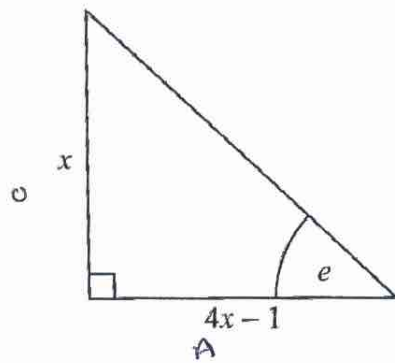
1.74

(3)

(Total for Question 18 is 6 marks)



19 Here are two right-angled triangles.



Given that

$$\tan e = \tan f$$

find the value of x .

You must show all your working.

$$\tan(e) = \frac{x}{4x-1}$$

$$\tan(\theta) = \frac{O}{A}$$

$$\tan(f) = \frac{6x+5}{12x+31}$$

If $\tan e = \tan f$ then

$$\frac{x}{4x-1} = \frac{6x+5}{12x+31}$$

$$\times 4x-1$$

$$\times 4x-1$$

$$x = \frac{(6x+5)(4x-1)}{12x+31}$$

$$\times 12x+31$$

$$\times 12x+31$$

$$x(12x+31) = (6x+5)(4x-1)$$

$$12x^2 + 31x = 24x^2 - 6x + 20x - 5$$

now solve for x

$$12x^2 + 31x = 24x^2 + 14x - 5$$

$$-31x$$

$$-12x^2$$

$$0 = 12x^2 - 17x - 5$$

$$0 = (4x+1)(3x-5)$$

$$4x+1=0$$

$$x = -\frac{1}{4}$$

$$3x-5=0$$

$$x = \frac{5}{3}$$

only real world solution

$$\frac{5}{3}$$

(Total for Question 19 is 5 marks)



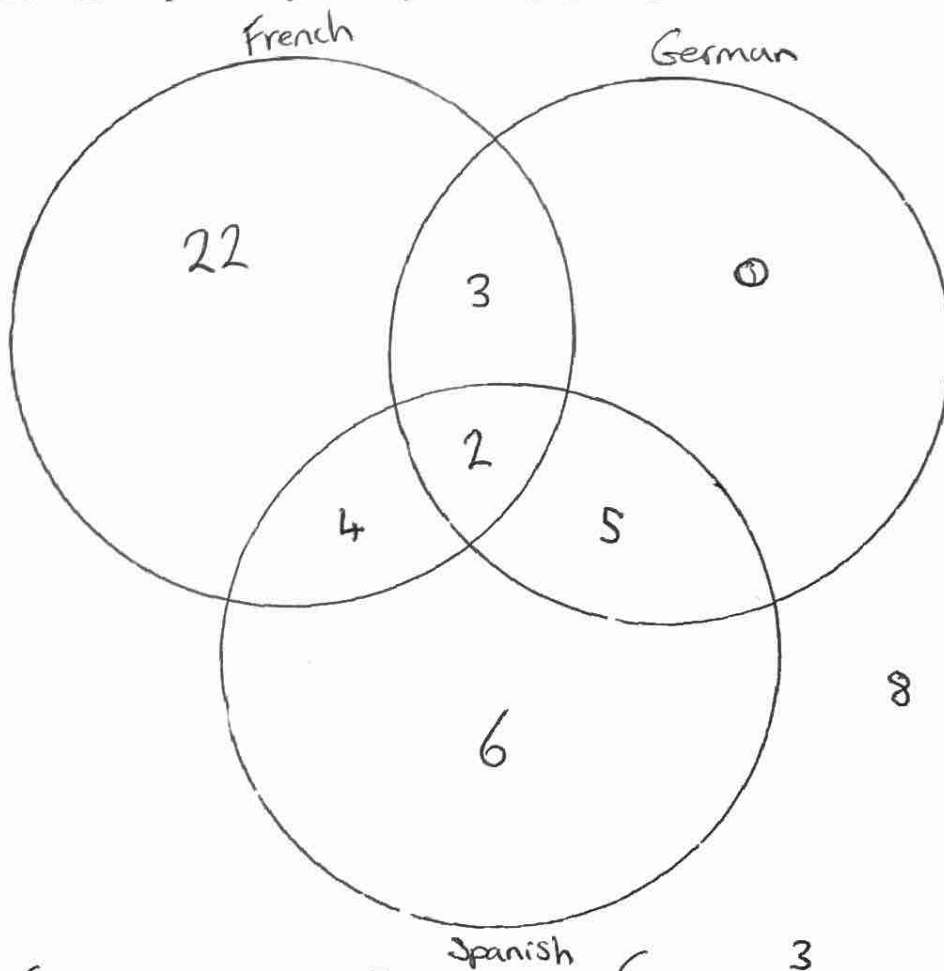
20 50 people were asked if they speak French or German or Spanish.

Of these people,

- 31 speak French
- ✓ 2 speak French, German and Spanish
- ✓ 4 speak French and Spanish but not German
- ✓ 7 speak German and Spanish
- ✓ 8 do not speak any of the languages
- all 10 people who speak German speak at least one other language

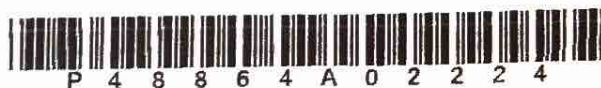
Two of the 50 people are chosen at random.

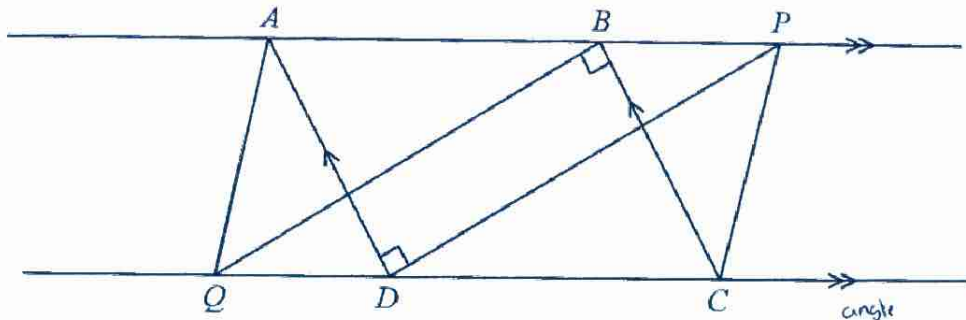
Work out the probability that they both only speak Spanish.



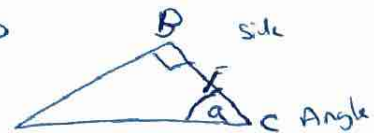
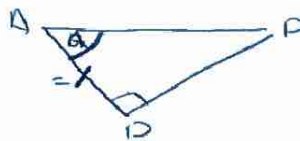
$$\frac{6}{50} \times \frac{5}{49} = \frac{30}{2450} = \frac{6}{490} = \frac{3}{245}$$

(Total for Question 20 is 5 marks)





$ABCD$ is a parallelogram.
 ABP and QDC are straight lines.
 Angle $ADP = \text{angle } CBQ = 90^\circ$



(a) Prove that triangle ADP is congruent to triangle CBQ .

$AD = BC$ as opposite sides of a parallelogram are equal
 $\angle BAD = \angle DCB$ as opposite angles in a parallelogram are the same

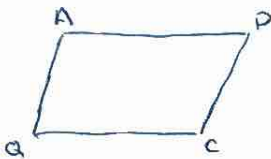
$\angle ADP \text{ \& } \angle CBQ = 90^\circ$

angle, side, Angle

\therefore These two ^{triangles} ~~angles~~ are congruent as ASA

(3)

(b) Explain why AQ is parallel to PC .



$AP = PC$ (as triangles congruent!)

this means $AQPC$ is a parallelogram

$\therefore AQ \parallel PC$ must be parallel

(2)

(Total for Question 21 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

