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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Mathematics 4306
Specification A
2009

SPECIMEN ASSESSMENT MATERIALS

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Introduction

The GCSE awarding bodies have prepared revised specifications to incorporate the range of features required by GCSE and subject criteria. The specimen assessment material accompanying the specifications is provided to give centres a reasonable idea of the general shape and character of the planned question papers in advance of the first operational examination.

Papers

These specimen question papers have been designed to exemplify the question papers, Papers 1 and 2, to be set for Specification A, for first examination in June 2009. The associated mark scheme follows each paper.

The question papers are targeted at two tiers A* - D (Higher) and grades C - G (Foundation).

It should be noted that on both tiers candidates must not use a calculator for Paper 1.

The question papers should be read in conjunction with AQA Specification A for 2009. The specification is available on the web site www.aqa.org.uk

The question papers are intended to represent the length and balance of the papers that will be set for the examination and to indicate the types of questions that will be used. It must be emphasised, however, that the questions have not been subjected to the rigorous review that would take place with questions before use in examination.

Mark Schemes

Principal Examiners have prepared these mark schemes for **specimen** papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
ft	Follow through marks. Marks awarded following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$

Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

General Certificate of Secondary Education

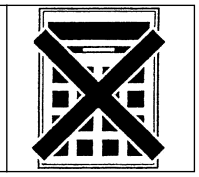
MATHEMATICS (SPECIFICATION A) **4306/1F**
Foundation Tier
Paper 1 Non-Calculator

F

Specimen Paper (Non-coursework Specification) 2009

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.



Time allowed: 1 hour 30 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book.

Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You may ask for more answer paper, graph paper and tracing paper. This must be tagged securely to this answer book.

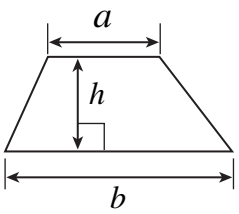
Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22	
TOTAL	
Examiner's Initials	

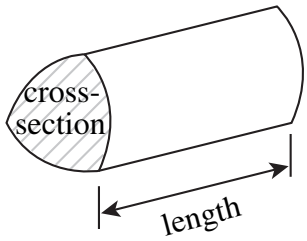
Formulae Sheet: Foundation Tier

You may need to use the following formulae:

Area of trapezium = $\frac{1}{2}(a+b)h$

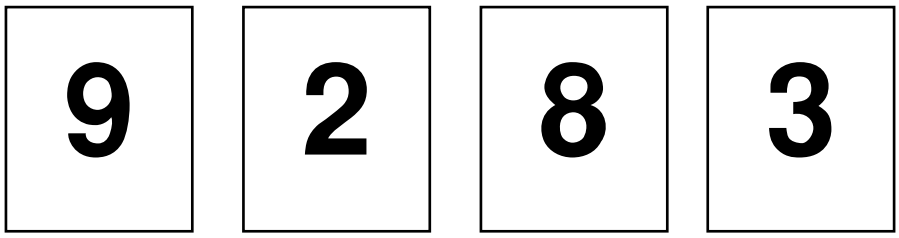


Volume of prism = area of cross-section × length



Answer **all** questions in the spaces provided.

1 Here are four number cards.



The number shown is 9 283

1 (a) Use all four cards to write down the largest number that you can make.

.....

Answer ..... *(1 mark)*

1 (b) Use all four cards to write down the smallest **even** number that you can make.

.....

Answer ..... *(1 mark)*

Turn over for the next question

2

2 Sari is making triangle patterns with matchsticks.

Pattern 1 Pattern 2 Pattern 3

2 (a) Draw Pattern 4 and Pattern 5 below.

(2 marks)

2 (b) Complete the table for the number of matchsticks in each pattern.

Pattern number	1	2	3	4	5
Number of matchsticks					

(2 marks)

2 (c) Explain how to find the number of matchsticks in Pattern 6 without drawing it.

.....

.....

(1 mark)

3 (a) In class 11A there are 30 pupils.
There are twice as many boys as girls.

Work out the number of boys and girls.

.....

.....

Answer ..... boys

..... girls *(2 marks)*

3 (b) In class 11B there are 22 pupils.
There are two more boys than girls.

Work out the number of boys and girls.

.....

.....

Answer ..... boys

..... girls *(2 marks)*

4 (a) The Sun is ninety-three million miles from the Earth.

Write this number in figures.

Answer ..... *(1 mark)*

4 (b) The circumference of Jupiter is 276 498 miles.

4 (b) (i) What is the value of the 6?

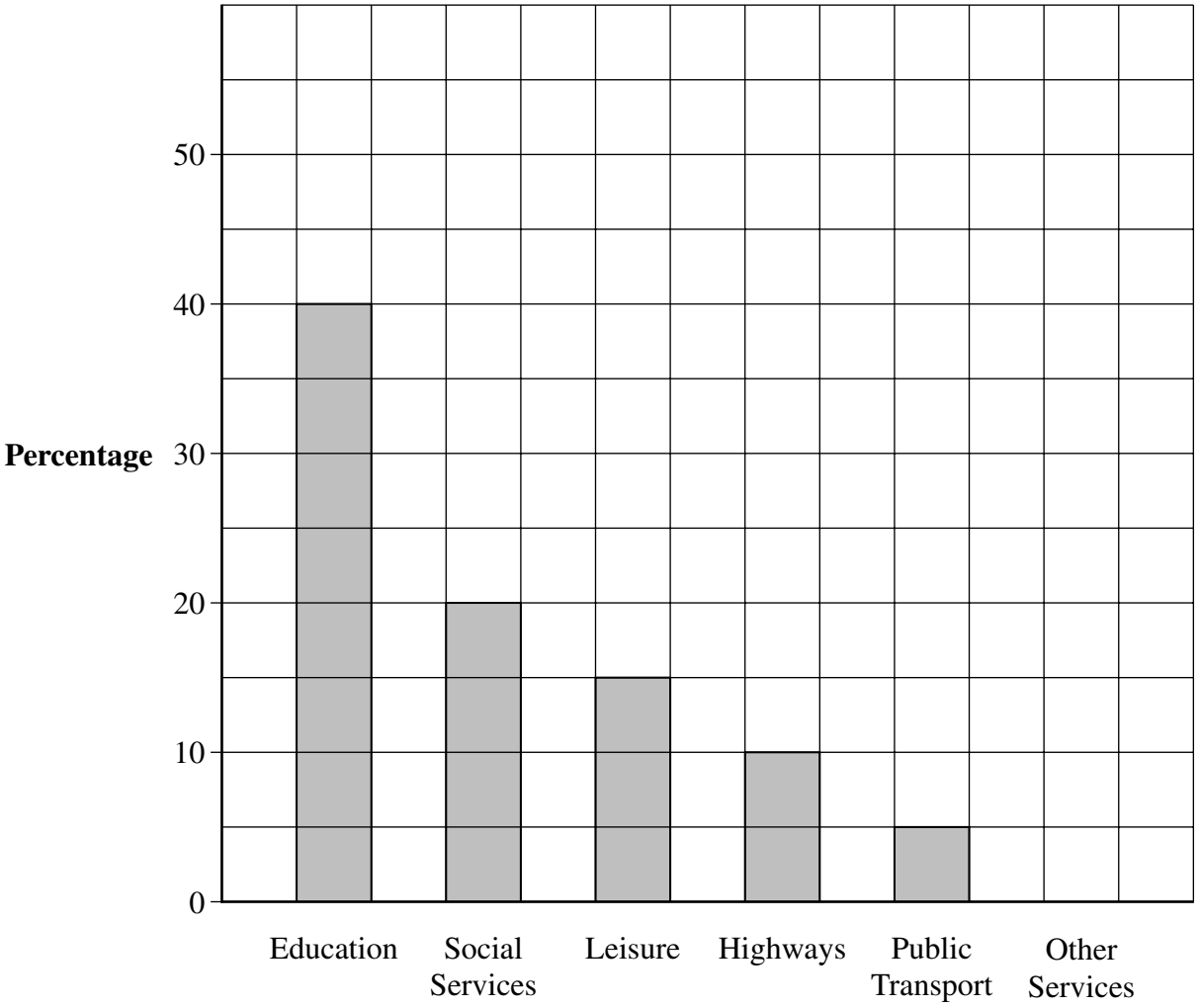
Answer ..... *(1 mark)*

4 (b) (ii) Round 276 498 to the nearest 100.

Answer ..... *(1 mark)*

12

5 The bar chart shows the percentages of the budget spent by a council on local services.



5 (a) Which service has most spent on it?

Answer ..... *(1 mark)*

5 (b) What percentage is spent on Leisure?

Answer ..... % *(1 mark)*

5 (c) (i) What percentage is spent on Other Services?

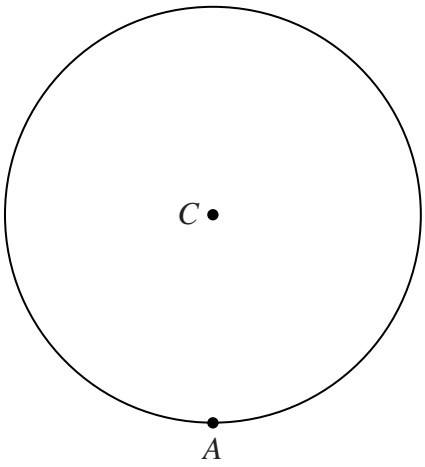
.....

Answer ..... % *(1 mark)*

5 (c) (ii) Complete the bar chart for Other Services.

(1 mark)

6 (a) *C* is the centre of the circle and *A* is a point on the circumference.



6 (a) (i) Draw the diameter from *A*.

(1 mark)

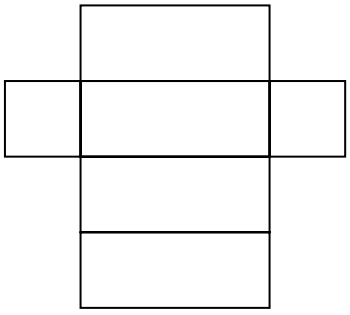
6 (a) (ii) Draw the tangent at *A*.

(1 mark)

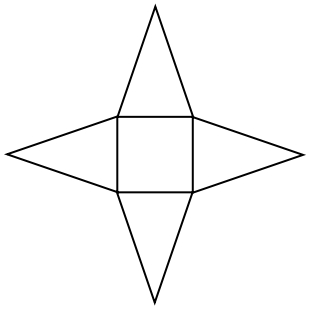
6 (a) (iii) Measure the radius of the circle.

Answer ..... cm *(1 mark)*

6 (b) Here are the names of some solids:
cylinder, triangular based pyramid, cuboid, square based pyramid, cube
These are nets of two of the solids.



Net A



Net B

What are the names of the solids?

Answer Net A .....

Net B ..... *(2 marks)*

9

Turn over ▶

7 Here is a sign outside a petrol station.

Petrol
90p per litre

7 (a) Mrs Kitson buys 20 litres of petrol.

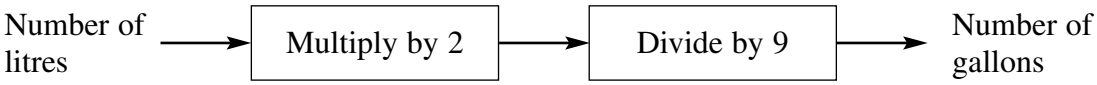
How much does she pay?

.....

.....

Answer ..... *(2 marks)*

7 (b) This flow chart shows how to change litres to gallons.



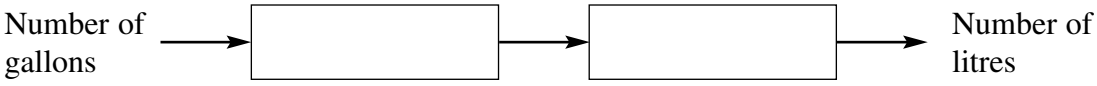
Use the flow chart to change 18 litres into gallons.

.....

.....

Answer ..... gallons *(2 marks)*

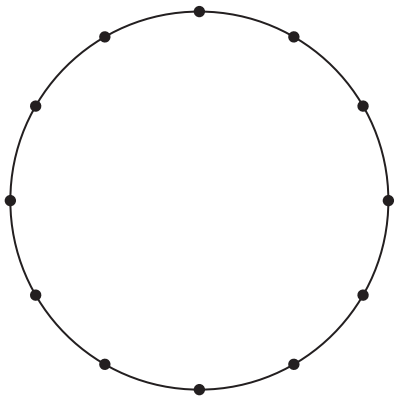
7 (c) Complete this flow chart to show how to change gallons into litres.



(2 marks)

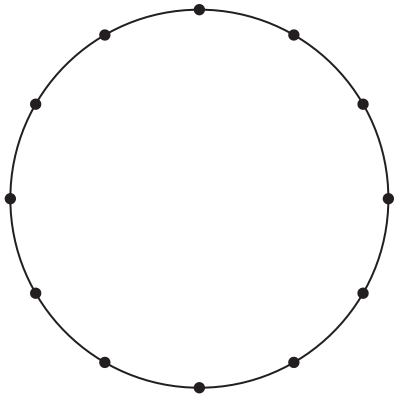
8 There are twelve points equally spaced around a circle.

8 (a) Join four points together to make a square.



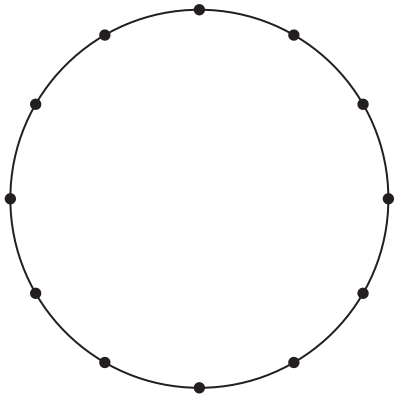
(1 mark)

8 (b) Join three points together to make an equilateral triangle.



(1 mark)

8 (c) Join six points together to make a hexagon.



(1 mark)

9

Turn over ▶

9 (a) Work out 6% of 500.

.....

Answer ..... *(2 marks)*

9 (b) Estimate $\sqrt{87}$.

.....

Answer ..... *(1 mark)*

9 (c) Calculate 265×37.

.....

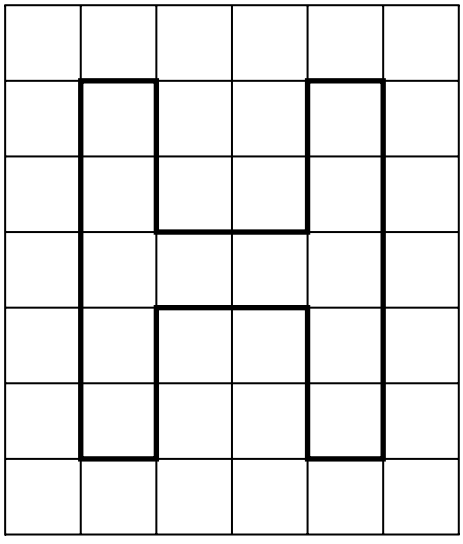
.....

.....

.....

Answer ..... *(3 marks)*

10 The letter H shape is drawn on a centimetre square grid.



Draw the lines of symmetry on the shape.

(2 marks)

11 (a) The height of two boys are between 140 cm and 160 cm.
The range of their heights is 7 cm.

Give an example of what their heights could be.

.....

Answer ..... cm and ..... cm *(1 mark)*

11 (b) The heights of two girls are the same.

What is the range of their heights?

.....

Answer ..... cm *(1 mark)*

12 A bottle contains 150 ml of medicine.

Adult dose: 10 ml three times a day
Child dose: 5 ml three times a day

One adult and one child need to take the medicine for 4 days.

Is there enough medicine in one bottle?
You **must** show your working.

.....

.....

.....

.....

.....

.....

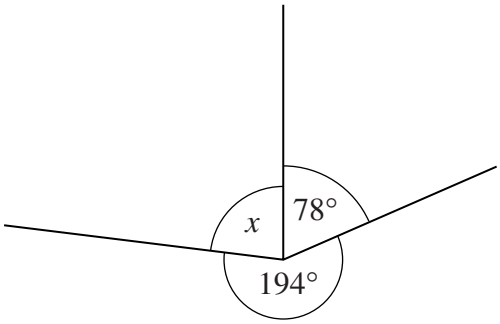
(3 marks)

13

Turn over ▶

13 (a)

Not drawn accurately



13 (a) (i) The angle 78° is an acute angle.

What is the special name for the angle 194°?

Answer ..... *(1 mark)*

13 (a) (ii) Sally thinks that angle x is 78°.
Is she correct?

You **must** show your working.

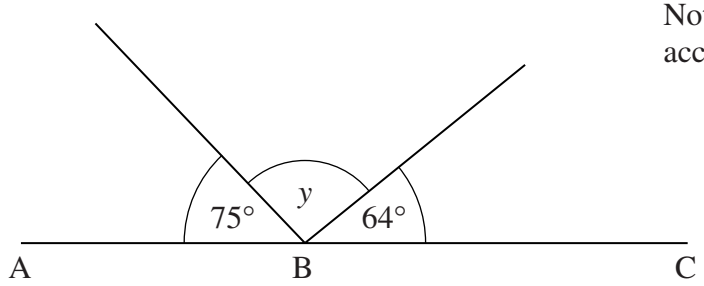
.....

.....

(2 marks)

13 (b) ABC is a straight line.

Not drawn accurately



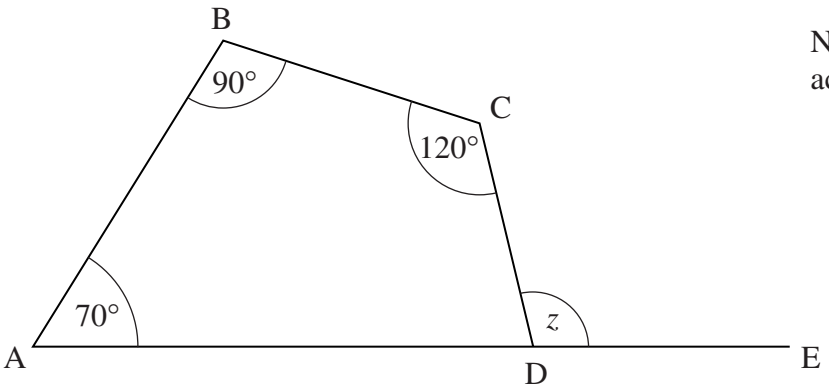
Work out the value of y.

.....

.....

Answer ..... degrees *(1 mark)*

13 (c)



Not drawn accurately

ABCD is a quadrilateral.
ADE is a straight line.

Find angle *z*.

.....

.....

.....

.....

Answer *z* = ... degrees *(3 marks)*

Turn over for the next question

7

14 Work out $\frac{2}{5} \times \frac{1}{6}$

Give your answer in its simplest form.

.....

.....

Answer ..... *(2 marks)*

15 The cost of a holiday is made up of three parts.

accommodation + insurance + travel

City Break to Paris

3 nights

Total cost of £ 245

The accommodation for this holiday costs £52 each night.
The insurance costs £26.
How much does the travel cost?

.....

.....

.....

.....

Answer £ ..... *(4 marks)*

16 (a) Complete the table of values for $y = 3x + 4$

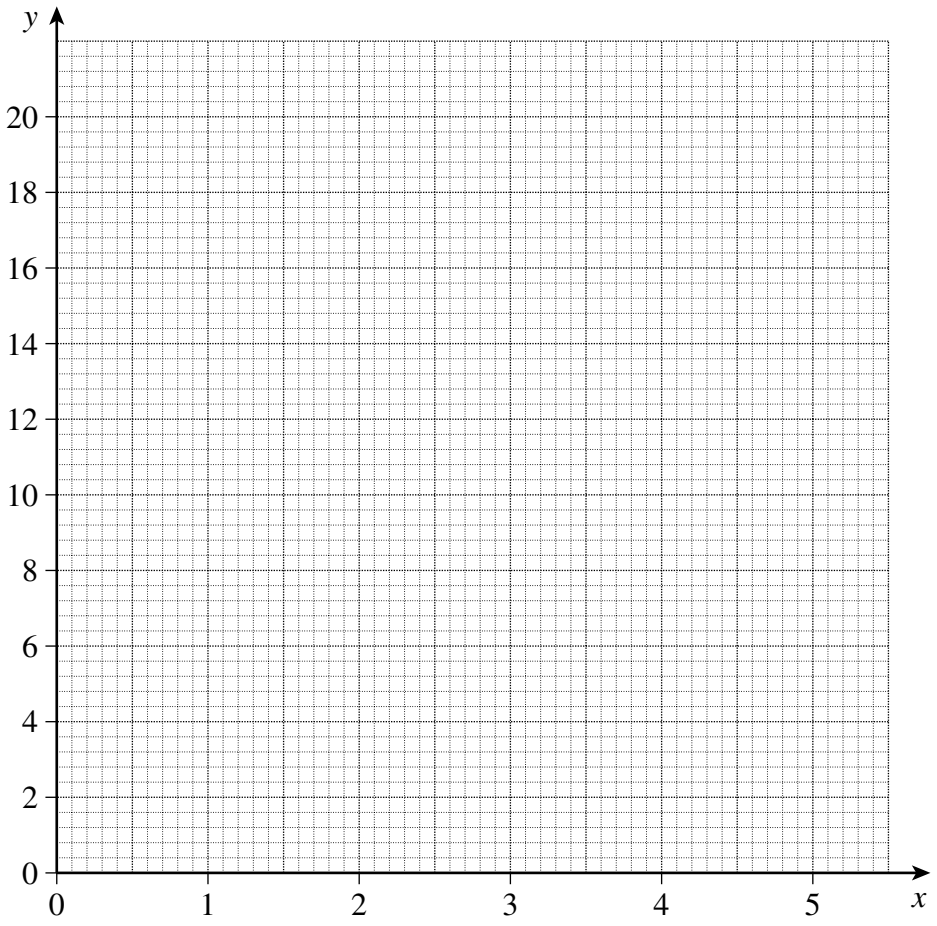
x	0	1	2	3	4	5
y	4		10		16	19

(1 mark)

.....

.....

16 (b) On the grid draw the graph of $y = 3x + 4$ for values of x from 0 to 5.



(2 marks)

16 (c) On the grid draw and label the line $x = 2.5$

(1 mark)

10

Turn over ▶

17 A rounders coach records the number of rounders the players in her squad score.
All the players score at least once.
She shows the data in a stem and leaf diagram.

Key | 2 | 7 represents 27 rounders

0	1	1	2	7
1	2	5	5	
2	3	7		
3	6			
4	0			
5	0	9		

17 (a) What is the greatest number of rounders scored by any player?

.....

.....

Answer ..... *(1 mark)*

17 (b) How many players are there in the squad?

.....

.....

Answer ..... *(1 mark)*

17 (c) What is the median number of rounders scored?

.....

.....

Answer ..... *(1 mark)*

17 (d) A player is chosen at random from the squad.

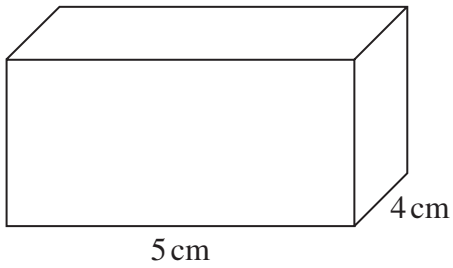
What is the probability that the player scored more than 40 rounders?

.....

.....

Answer ..... *(2 marks)*

18 A cuboid has a volume of 60 cm^3.
Its length is 5 cm.
Its width is 4 cm.



Not drawn accurately

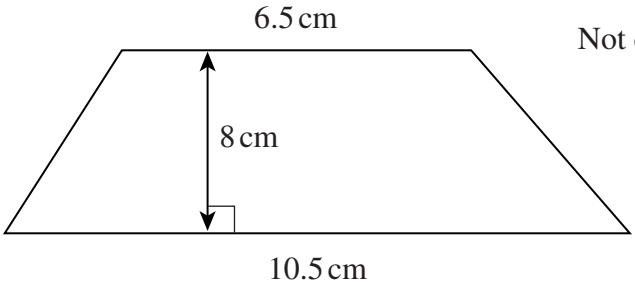
Find the height of the cuboid.

.....

.....

Answer ..... cm *(2 marks)*

19 The diagram shows a trapezium.



Not drawn accurately

Calculate the area of the trapezium.
State the units of your answer.

.....

.....

.....

Answer ..... *(3 marks)*

10

Turn over ▶

20 (a) Solve $\frac{w}{5} = 11$

.....

Answer w = ... *(1 mark)*

20 (b) Solve $3(2m - 1) = 21$

.....

.....

.....

Answer m = ... *(3 marks)*

21 Ruby the cat eats $\frac{3}{5}$ tin of cat food each day.

What is the least number of tins that need to be bought in any one week?
You **must** show your working.

.....

.....

.....

.....

Answer ..... *(3 marks)*

22 The table shows the number of goals scored by 100 soccer teams.

Number of goals	Frequency
0	24
1	40
2	15
3	16
4	5

22 (a) Calculate the mean number of goals scored by these teams.

.....

.....

.....

.....

.....

Answer ..... *(3 marks)*

22 (b) Abigail says that the median number of goals scored is 1.

Explain why she is right.

.....

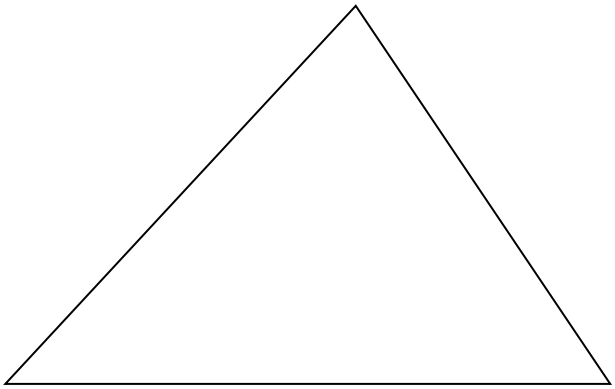
.....

(1 mark)

11

Turn over ▶

23 This triangle is drawn accurately.



Work out the area of the triangle.

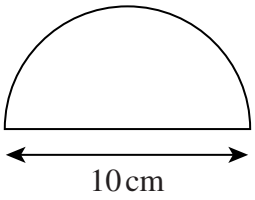
.....

.....

.....

Answer ..... cm^2 *(2 marks)*

24 The diagram shows a semi-circle of diameter 10 cm.



Not drawn accurately

Find the perimeter of the shape.

Use $\pi = 3.14$

.....

.....

.....

Answer ..... cm *(3 marks)*

25 (a) Complete the statement $2\frac{1}{2} = \frac{\square}{2}$

(1 mark)

25 (b) Which of the following is the reciprocal of $2\frac{1}{2}$?

Circle the correct answer.

0.25 2.5 $\frac{2}{5}$ $-2\frac{1}{2}$ 5.2

(1 mark)

26 Use approximations to estimate the value of $\frac{305.2}{0.618}$

.....

.....

.....

Answer ..... *(2 marks)*

Turn over for the next question

9

27 (a) Expand and simplify $2(x-4) + 3(2x + 5)$

.....

.....

Answer ..... *(2 marks)*

27 (b) Solve the inequality $3x + 1 \geqslant 7$

.....

.....

.....

Answer ..... *(2 marks)*

28 A spinner has five possible scores of 1, 2, 3, 4 and 5.
The spinner is biased.
The probabilities of it landing on each of the numbers are shown in the table.

Score	1	2	3	4	5
Probability	0.1	p	$2p$	0.1	0.2

28 (a) What is the probability of a score of 2 or 3?

.....

.....

.....

Answer ..... *(2 marks)*

28 (b) Work out the value of p.

.....

.....

.....

Answer ..... *(2 marks)*

END OF QUESTIONS

8

Q	Answers	Mark	Comments
1(a)	9832	B1	
1(b)	2398	B1	
2(a)	4 triangles, 5 triangles	B2	B1 each
2(b)	3, 5, 7, 9, 11	B2	–1eeoo
2(c)	Add 2	B1	$2n + 1$, goes up in 2's
3(a)	20 boys, 10 girls	B2	B1 if reversed, B1 for 10 or 20
3(b)	12 boys, 10 girls	B2	B1 if reversed, B1 for 12 or 10
4(a)	93 000 000	B1	
4(b)(i)	Thousand	B1	6000
4(b)(ii)	276500	B1	
5(a)	Education	B1	40
5(b)	15	B1	
5(c)(i)	10	B1	
5(c)(ii)	Their '10' drawn	B1ft	
6(a)(i)	Line through A and C to other point on circumference	B1	
6(a)(ii)	Line that looks perpendicular to AC	B1	
6(a)(iii)	2.6 to 3.0	B1	
6(b)	A cuboid	B1	Rectangular based box
	B square based pyramid	B1	

Q	Answers	Mark	Comments
7(a)	20 × 0.9	M1	20 × 90
	£18	A1	1800p
7(b)	18 × 2 ÷ 9	M1	
	4	A1	
7(c)	× 9, ÷ 2	B2	B1 for reverse order
8(a)	Correct square	B1	
8(b)	Correct equilateral triangle	B1	
8(c)	Correct hexagon	B1	
9(a)	6 ÷ 100 × 500	M1	
	30	A1	
9(b)	9.1 to 9.5	B1	
9(c)	9805	B3	B2 for 7950 and 1855, B1 for 795 and 1855 or B2 for 10600 – 795, B1 for 1060 – 795 oe
10	Correct vertical and horizontal line	B2	B1 each
11(a)	2 numbers that differ by 7 between 140 and 160	B1	
11(b)	0	B1	Zero
12	10 × 3 × 4 or 5 × 3 × 4	M1	oe
	Their 120 + Their 60	M1dep	
	No, 30 more needed	A1	No, need 180

Q	Answers	Mark	Comments
13(a)(i)	Reflex	B1	
13(a)(ii)	360 – 194 – 78	M1	
	88 and No	A1	
13(b)	41	B1	
13(c)	360 – (90 +70 + 120) (80)	M1	
	180 – Their "80"	M1	
	100	A1	
14	$\frac{1}{15}$	B2	B1 for $\frac{2}{30}$
15	3 × 52	M1	156
	Their 156 + 26	M1dep	
	245 – Their 182	M1dep	
	63	A1	SC2 167
16(a)	7,13	B1	
16(b)	Correct plotting to $\frac{1}{2}$ sq accuracy	B1ft	
	Line from (0,4) to (5,19) to $\frac{1}{2}$ sq	B1	
16(c)	Line at least 3 cm long to $\frac{1}{2}$ sq	B1	
17(a)	59	B1	
17(b)	13	B1	
17(c)	15	B1	
17(d)	Number ÷ Their " 13"	M1	
	$\frac{2}{13}$	A1ft	oe

Q	Answers	Mark	Comments
18	$60 \div (5 \times 4)$	M1	
	3	A1	
19	$(6.5 + 10.5) \times 8 \div 2$	M1	
	68	A1	
	cm^2	B1	
20(a)	($w =$) 55	B1	
20(b)	$6m - 3 = 21$	M1	$2m - 1 = 21/3$ Allow 1 error
	$6m = 21 + 3$	M1	$2m$ = Their 7 + 1
	($m =$) 4	A1	
21	$7 \times \frac{3}{5}$	M1	
	$\frac{21}{5}$ or $4\frac{1}{5}$	A1	
	5	A1	SC1 for 3 tins ($5 \times \frac{3}{5}$)
22(a)	$(0 \times 24) + (1 \times 40) + (2 \times 15) +$ $(3 \times 16) + (4 \times 5)$ or 138	M1	
	(Their "138") ÷ 100	M1	
	1.38	A1	
22(b)	1 is the 50^{th} / 51^{st} value	B1	oe 50 is in group 24 + 40
23	Attempt at $\frac{1}{2}$ × base × perp. height	M1	Their measurements from diagram
	19.5 to 20.5	A1	
24	$3.14 \times 10 \div 2$	M1	
	15.7	A1	
	25.7	A1	

Q	Answers	Mark	Comments
25(a)	5	B1	
25(b)	$\frac{2}{5}$	B1	
26	300 and 0.6	M1	Both correct
	500	A1	
27(a)	$2x - 8 + 6x + 15$	M1	Allow 1 error
	$8x + 7$	A1	
27(b)	$3x \geq 7 - 1$	M1	
	$x \geq 2$	A1	
28(a)	$1 - (0.1 + 0.1 + 0.2)$	M1	$p + 2p$
	0.6	A1	$3p$
28(b)	$3p$ = Their 0.6	M1	$3p = 1 - (0.1 + 0.1 + 0.2)$
	0.2	A1	

Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

General Certificate of Secondary Education

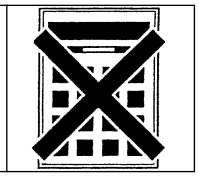
MATHEMATICS (SPECIFICATION A) **4306/1H**
Higher Tier
Paper 1 Non-Calculator

H

Specimen Paper (Non-coursework Specification) 2009

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.



Time allowed: 2 hours

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book.

Information

- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You may ask for more answer paper, graph paper and tracing paper. This must be tagged securely to this answer book.

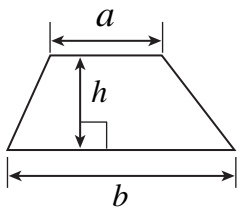
Advice

- In all calculations, show clearly how you work out your answer.

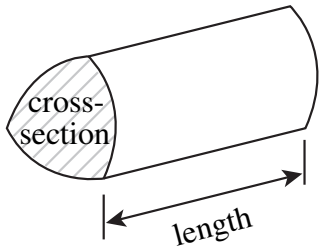
For Examiner's Use	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22	
TOTAL	
Examiner's Initials	

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

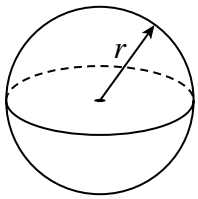


Volume of prism = area of cross-section × length



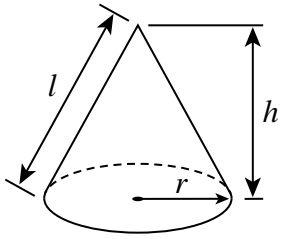
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

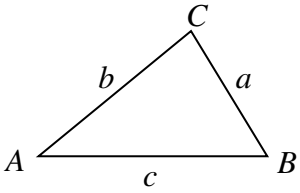
Curved surface area of cone = $\pi r l$



In any triangle ABC

Area of triangle = $\frac{1}{2}ab\sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Answer **all** questions in the spaces provided.

1 (a) Tom and Jerry share £200 in the ratio 4 : 1

How much does each receive?

.....

.....

.....

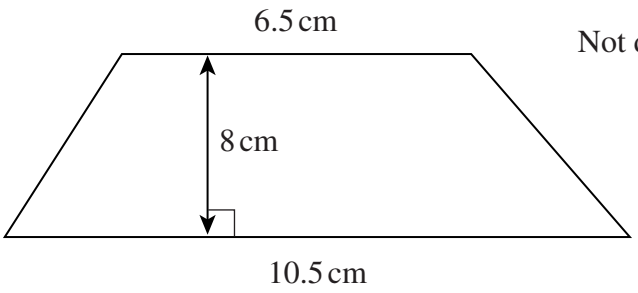
Answer Tom £ ..... , Jerry £ ..... *(3 marks)*

1 (b) What percentage of the £200 does Jerry receive?

.....

Answer ..... % *(1 mark)*

2 The diagram shows a trapezium.



Not drawn accurately

Calculate the area of the trapezium.
State the units of your answer.

.....

.....

.....

Answer ..... *(3 marks)*

7

Turn over ▶

3 (a) Solve $\frac{w}{5} = 11$

.....

Answer $w =$ ..... *(1 mark)*

3 (b) Solve $3(2m - 1) = 21$

.....

.....

.....

Answer $m =$ ..... *(3 marks)*

3 (c) Find the value of $\frac{a - 2b}{4}$ when $a = 8$ and $b = -3$

.....

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.....

Answer ..... *(3 marks)*

3 (d) Write down an expression for the total cost of x pencils at 25p each and y rulers at 99p each.

.....

.....

Answer ..... *(2 marks)*

4 Ruby the cat eats $\frac{3}{5}$ tin of cat food each day.

What is the least number of tins that need to be bought in any one week?
You **must** show your working.

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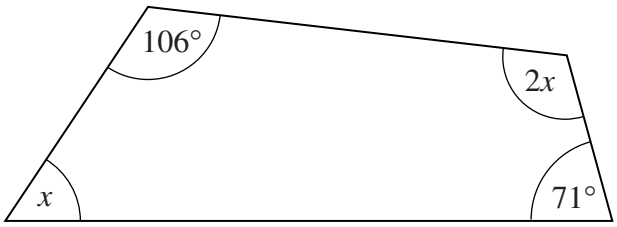
.....

Answer ..... *(3 marks)*

5 A quadrilateral has angles of $x°$, 71°, $2x°$ and 106



Not drawn accurately

Calculate the value of x.

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.....

Answer x = ... *(4 marks)*

16

Turn over ▶

6 The table shows the number of goals scored by 100 soccer teams.

Number of goals	Frequency
0	24
1	40
2	15
3	16
4	5

6 (a) Calculate the mean number of goals scored by these teams.

.....

.....

.....

.....

.....

Answer ..... *(3 marks)*

6 (b) Abigail says that the median number of goals scored is 1.

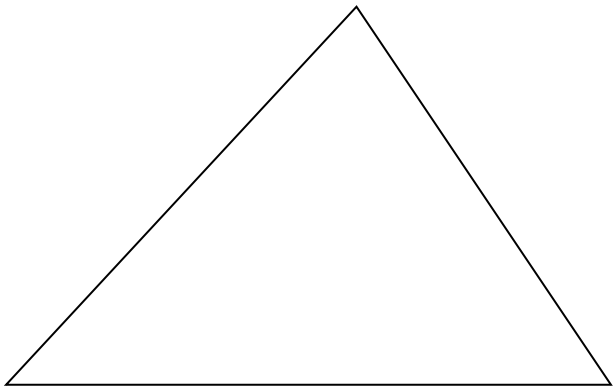
Explain why she is right.

.....

.....

(1 mark)

7 This triangle is drawn accurately.



Work out the area of the triangle.

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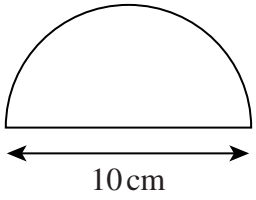
.....

Answer ..... cm^2 *(2 marks)*

Turn over for the next question

6

8 The diagram shows a semi-circle of diameter 10 cm.



Not drawn accurately

Find the perimeter of the shape.

Use $\pi = 3.14$

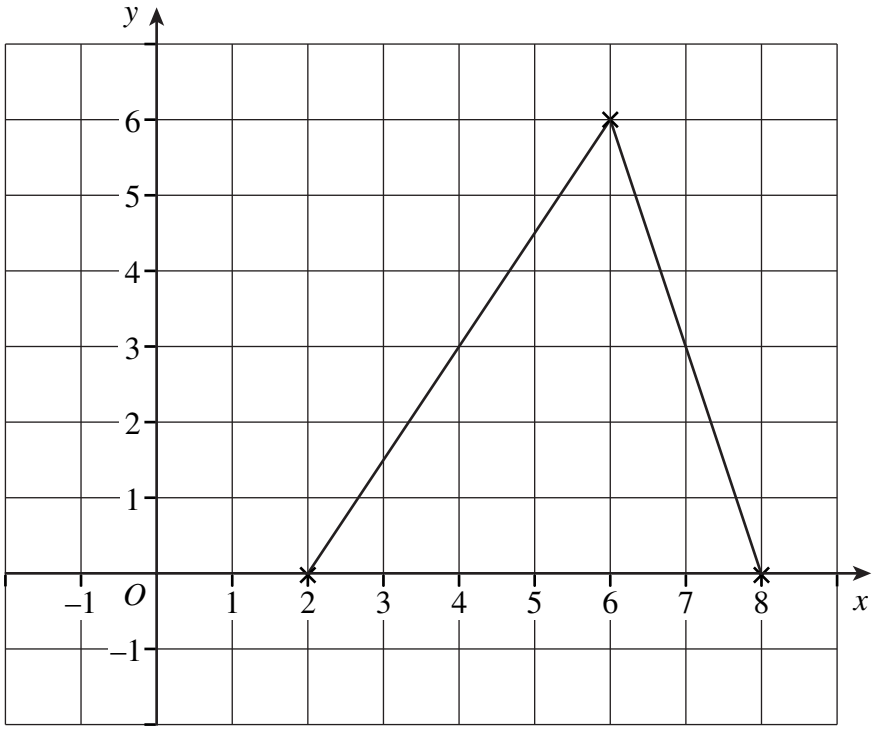
.....

.....

.....

Answer ..... cm *(3 marks)*

9



Enlarge the triangle by scale factor $\frac{1}{2}$ with (0, 4) as the centre of enlargement.

(2 marks)

10 (a) Work out the reciprocal of 2.5
Give your answer as a fraction in its simplest form.

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Answer ..... *(2 marks)*

10 (b) Use approximations to estimate the value of $\frac{305.2}{0.618}$

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Answer ..... *(2 marks)*

11 (a) Expand and simplify $2(x-4) + 3(2x + 5)$

.....

.....

Answer ..... *(2 marks)*

11 (b) (i) Solve the inequality $3x + 1 \geqslant 7$

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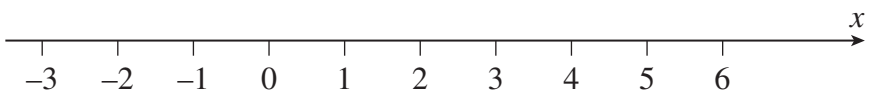
.....

Answer ..... *(2 marks)*

11 (b) (ii) Represent your solution to the inequality on this number line.



(1 mark)

14

Turn over ▶

12 Simplify

12 (a) $x^6 \times x^8$

.....

Answer ..... *(1 mark)*

12 (b) $y^{12} \div y^4$

.....

Answer ..... *(1 mark)*

12 (c) $(w^4)^3$

.....

Answer ..... *(1 mark)*

13 A spinner has five possible scores of 1, 2, 3, 4 and 5.
The spinner is biased.
The probabilities of it landing on each of the numbers are shown in the table.

Score	1	2	3	4	5
Probability	0.1	p	$2p$	0.1	0.2

13 (a) What is the probability of a score of 2 or 3?

.....

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.....

Answer ..... *(2 marks)*

13 (b) Work out the value of p.

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Answer ..... *(2 marks)*

14 You are given that $n = 2^2 \times 5$

14 (a) Write $30n$ as the product of its prime factors.

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Answer ..... *(2 marks)*

14 (b) Write $30n$ in standard form.

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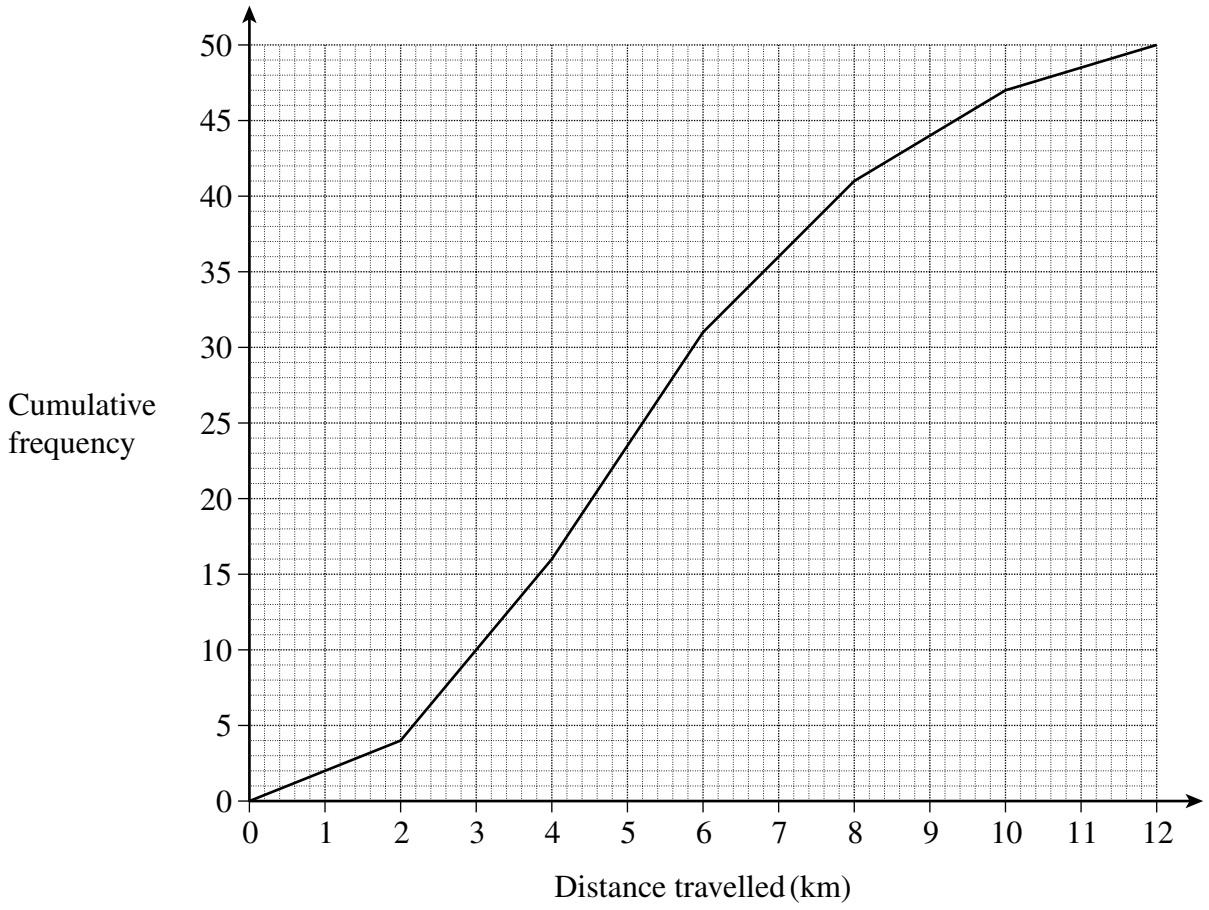
Answer ..... *(2 marks)*

Turn over for the next question

11

15 The cumulative frequency diagram shows the distances travelled to work by 50 AQA employees.



Use the cumulative frequency diagram to estimate

15 (a) the median

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Answer ..... km *(1 mark)*

15 (b) the interquartile range

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.....

Answer ..... km *(2 marks)*

15 (c) The percentage of employees who travelled more than 9 km to work.

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.....

.....

.....

Answer ..... % *(2 marks)*

16 Solve the simultaneous equations

$$x - 4y = 22$$
$$3x + 2y = -4$$

You **must** show your working.
Do **not** use trial and improvement.

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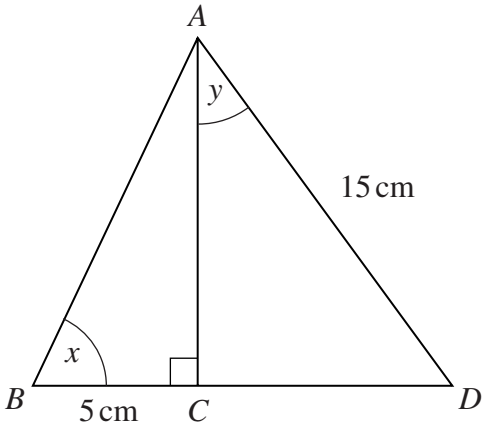
Answer ..... *(3 marks)*

8

Turn over ▶

17 The diagram shows two right angled triangles.
$AD = 15$ cm
$BC = 5$ cm



Not drawn accurately

17 (a) Given that $\tan x = 2.4$ calculate the length AC.

.....

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.....

Answer ..... cm *(2 marks)*

17 (b) Find the value of $\tan y$.

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Answer ..... *(4 marks)*

18 Expand and simplify $(3x - y)(2x + 5y)$

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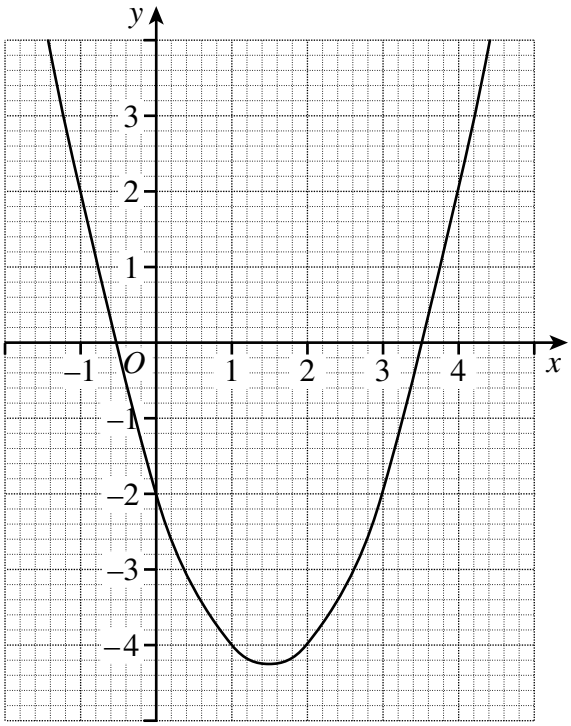
Answer ..... *(3 marks)*

19 The grid shows the graph of $y = x^2 - 3x - 2$



By drawing the graph of an appropriate straight line, solve the equation

$$x^2 - 3x - 2 = x - 3$$

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Answer ..... *(3 marks)*

12

Turn over ▶

20 (a) State **two** conditions that must be satisfied when collecting data for a stratified sample.

Condition 1

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(1 mark)

Condition 2

.....

.....

(1 mark)

20 (b) A village has a population of 2000.
The population is classified by age as shown in the table below.

Age (years)	0–11	12–25	26–44	45–64	65+
Number of people	268	356	504	478	394

A stratified sample of 100 is planned.

Calculate the number of people that should be sampled from each age group.

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Answer 0–11 years .....

12–25 years .....

26–44 years .....

45–64 years .....

65+ years ..... *(3 marks)*

21 (a) (i) Show that $\sqrt{18} = 3\sqrt{2}$

.....

.....

(1 mark)

21 (a) (ii) Expand and simplify $(\sqrt{6} + \sqrt{3})^2$

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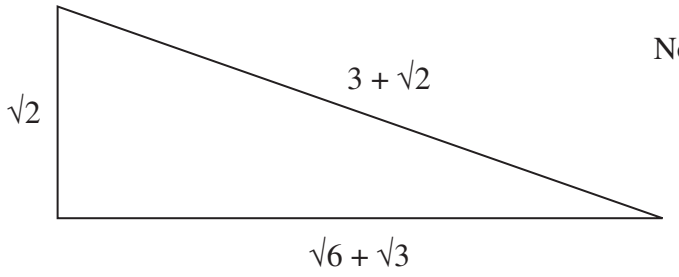
Answer ..... *(2 marks)*

21 (b) Is this triangle right angled?



Not drawn accurately

You **must** show your working.

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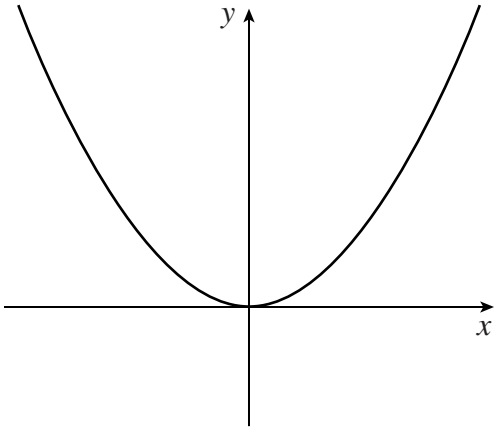
(3 marks)

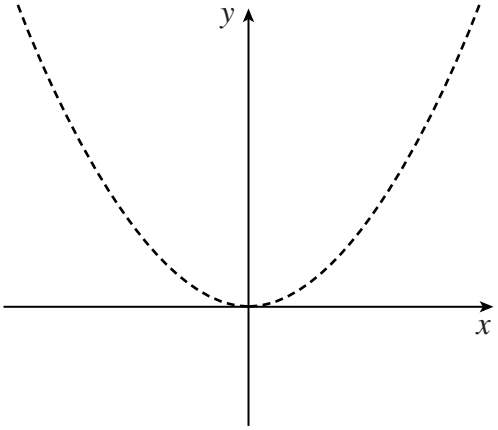
11

22 The sketch below is of the graph of $y = x^2$



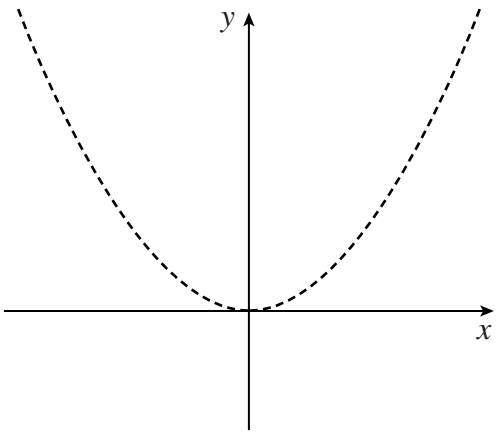
On the axes provided, sketch the following graphs.
The graph of $y = x^2$ is shown dotted on each set of axes to act as a guide.

22 (a) $y = x^2 - 3$



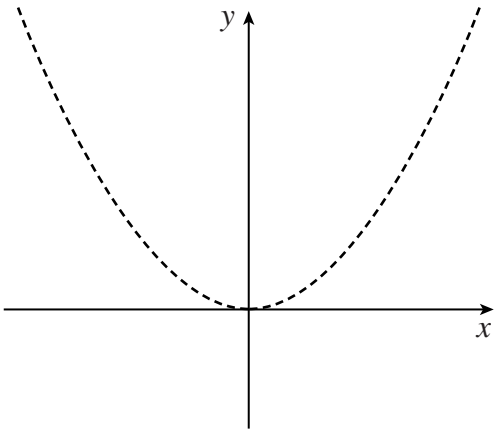
(1 mark)

22 (b) $y = (x + 1)^2$



(1 mark)

22 (c) $y = 2x^2$

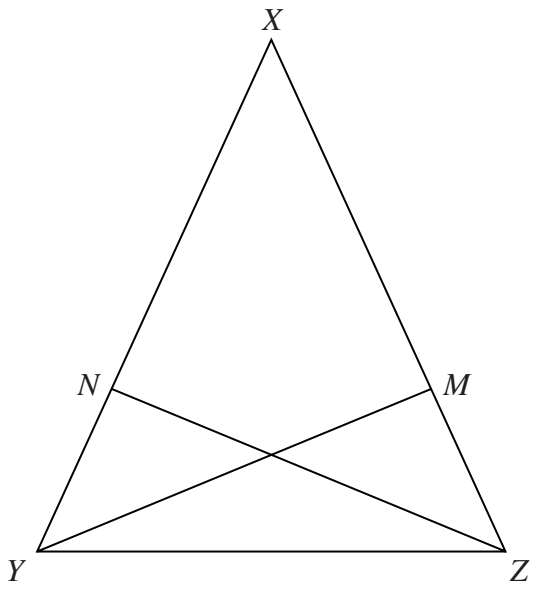


(1 mark)

3

Turn over ▶

23 *XYZ* is an isosceles triangle in which $XZ = XY$.
M and *N* are points on *XZ* and *XY* such that $XM = XN$.



23 (a) Prove that triangles *XYM* and *XZN* are congruent.

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(4 marks)

23 (b) *P* is the point of intersection of *MY* and *NZ*.
Explain why triangle *YPZ* is isosceles.
You **must** show your working.

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.....

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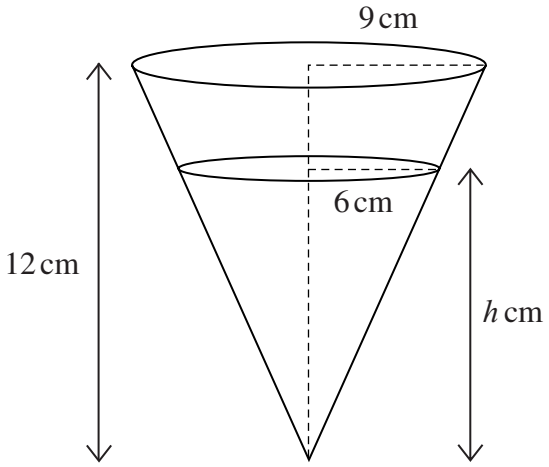
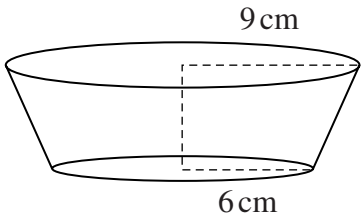
(3 marks)

Turn over for the next question

7

24 The first diagram shows a cone of base radius 9 cm and perpendicular height 12 cm.
A smaller cone of base radius 6 cm is cut off the bottom to leave a frustum.
The frustum has a lower radius of 6 cm, an upper radius of 9 cm.





Not drawn accurately

24 (a) Explain why the height, h, of the smaller cone is 8 cm.

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(1 mark)

24 (b) Find the volume of the frustum.
Give your answer in terms of π.

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.....

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Answer ..... cm^3 *(4 marks)*

END OF QUESTIONS

5

Q	Answers	Mark	Comments
1(a)	(£) 200 ÷ 5	M1	
	(Tom) £ 160	A1	
	(Jerry) £ 40	A1	
1(b)	20	B1	
2	(6.5 + 10.5) × 8 ÷ 2	M1	
	68	A1	
	cm^2	B1	
3(a)	(w=) 55	B1	
3(b)	$6m - 3 = 21$	M1	$2m - 1 = 21/3$ Allow 1 error
	$6m = 21 + 3$	M1	$2m$ = Their 7 + 1
	(m =) 4	A1	
3(c)	Sight of 8 – (–6)	M1	
	Sight of 8 + 6 or 14	M1	
	3.5	A1	
3(d)	$25x + 99y$	B2	B1 for either $25x$ or $99y$ but no + sign
4	$7 \times \frac{3}{5}$	M1	
	$\frac{21}{5}$ or $4\frac{1}{5}$	A1	
	5	A1	SC1 for 3 tins ($5 \times \frac{3}{5}$)
5	Sight of 360	M1	
	$x + 2x + 106 + 71$ = (Their) 360	M1	
	$3x$ = (Their) 360 – 106 – 71	M1	
	(x =) 61	A1	

Q	Answers	Mark	Comments
6(a)	$(0 \times 24) + (1 \times 40) + (2 \times 15) +$ $(3 \times 16) + (4 \times 5)$ or 138	M1	
	(Their 138) ÷ by 100	M1	
	1.38	A1	
6(b)	1 is the 50^{th} / 51^{st} value	B1	oe 50 is in group 24 + 40
7	Attempt at $\frac{1}{2} \times$ base $\times$ perp. height	M1	Their measurements from given accurate diagram or correct application of $0.5ab\sin C$
	19.5 to 20.5	A1	
8	$3.14 \times 10 \div 2$	M1	
	15.7	A1	
	25.7	A1	
9	Triangle at (1,2) (4,2) (3,5)	B2	Correct size but wrong position scores B1
10(a)	$\frac{1}{2.5}$	M1	
	$\frac{2}{5}$	A1	
10(b)	300 and 0.6	M1	Both correct
	500	A1	
11(a)	$2x - 8 + 6x + 15$	M1	Allow one error
	$8x + 7$	A1	
11(b)(i)	$3x \geq 7 - 1$	M1	
	$x \geq 2$	A1	
11(b)(ii)	ft Their inequality	B1	Must be from an **in**equality

Q	Answers	Mark	Comments
12(a)	x^{14}	B1	
12(b)	y^{8}	B1	
12(c)	w^{12}	B1	
13(a)	$1 – (0.1 + 0.1 + 0.2)$	M1	$p + 2p$
	0.6	A1	$3p$
13(b)	$3p$ = (Their) 0.6	M1	$3p = 1 – (0.1 + 0.1 + 0.2)$
	0.2	A1	
14(a)	Sight of $2 \times 3 \times 5$	M1	Attempt to find factors of Their 600 Two correct steps needed
	$2 \times 3 \times 5 \times 2 \times 2 \times 5$	A1	$2^3 \times 3 \times 5^2$
14(b)	Sight of 600	B1	
	6×10^2	B1	ft Their 600
15(a)	5.2	B1	5.1 – 5.3
15(b)	7.3 – 3.4	M1	(7.2 – 7.4) – (3.3 – 3.5)
	3.9	A1	3.7 – 4.1
15(c)	Attempt to do 50 – 44	M1	Their attempt at 44 (must subtract)
	12	A1	
16	$x – 4y = 22$ or $3x – 12y = 66$ $6x + 4y = –8$ or $3x + 2y = –4$	M1	Allow error in **one** term
	$7x = 14$ or $14y = –70$	A1	Correct elimination from Their equations
	$x = 2$ **and** $y = -5$	A1	SC1 Correct answers with no working or using T & I

Q	Answers	Mark	Comments
17(a)	2.4×5	M1	
	12	A1	
17(b)	$CD^2 = 15^2 - (\text{Their}12)^2$	M1	
	$CD = \sqrt{}(\text{Their } 81)$	M1dep	
	$\tan y = (\text{Their } 9) \div (\text{Their } 12)$	M1dep	Dependent on first M1
	0.75	A1	oe
18	$6x^2 - 2xy + 15xy - 5y^2$	M1 A1	Allow one error, must have four terms
	$6x^2 + 13xy - 5y^2$	A1	
19	Attempt at $y = x - 3$	M1	'm' or 'c' correct
	Correct ruled line	A1	
	$0.2 \leq x \leq 0.4$ **and** $3.6 \leq x \leq 3.8$	A1ft	ft Their line, **two** solutions only, tolerance of ± 0.1
20(a)	The number chosen from each sub-group(strata) must be proportional to the size of the sub-group	B1	'proportionality' (select from all sub-groups)
	Selection from each sub-group must be representative	B1	Random selection from within each sub-group is acceptable Just ... 'random selection' is not
20(b)	Division by 20	M1	**Use** of the fraction $\frac{1}{20}$ oe
	13.4 17.8 25.2 23.9 19.7	A1	Not rounded but accurate …or… rounded (at least 3 correct)
	13 18 25 24 20	A1	All correct

Q	Answers	Mark	Comments
21(a)(i)	$\sqrt{18} = \sqrt{(9 \times 2)} = \sqrt{9} \times \sqrt{2} = 3\sqrt{2}$	B1	Must show $\sqrt{(9 \times 2)}$ since answer given
21(a)(ii)	$6 + \sqrt{6}\sqrt{3} + \sqrt{6}\sqrt{3} + 3$	M1	oe eg, $6 + \sqrt{18} + \sqrt{18} + 3$ or $\sqrt{36} + \sqrt{18} + \sqrt{18} + \sqrt{9}$ Allow **one** error
	$9 + 6\sqrt{2}$ or $9 + 2\sqrt{18}$	A1	
21(b)	$(3 + \sqrt{2})^2 = 9 + 6\sqrt{2} + 2$	B1	
	$(3 + \sqrt{2})^2 - (\sqrt{2})^2$	M1	or $(\sqrt{6} + \sqrt{3})^2 + (\sqrt{2})^2$
	Valid conclusion	A1	Conclude 'yes' or 'no' if (a)(ii) is incorrect
22(a)	Correct sketch	B1	Attempt at translation of $\binom{0}{-3}$
22(b)	Correct sketch	B1	Attempt at translation of $\binom{-1}{0}$
22(c)	Correct sketch	B1	Attempt at one-way stretch of SF2 // to *y*-axis
23(a)	*XY* = *XZ* (sides of isosceles Δ *XYZ*)	B1	Mention equal sides of isosceles triangle *XYZ*
	XM = *XN* (given)	B1	Mention of given fact
	Angle *X* is common	B1	**Must** mention common angle
	Congruent SAS	B1	**Must** give correct reason for congruency
23(b)	Angle *XYZ* = angle *XZY* (base angles of isosceles Δ*XYZ*)	B1	Reason **not** necessary
	Angle *XYM* = angle *XZN* (from proof in part (a))	B1	Reason **not** necessary
	Subtraction gives Angle *PYZ* = angle *PZY* Hence Δ *YPZ* is isosceles	B1	**Must** attempt to show that these 'base' angles are equal … proof cannot follow from equal sides

Q	Answers	Mark	Comments
24(a)	6 cm is $\frac{2}{3}$ of 9 cm so $\frac{2}{3}$ of 12 cm = 8 cm	B1	oe
24(b)	Vol large cone = $\frac{1}{3} \times \pi \times 9^2 \times 12$ or Vol small cone = $\frac{1}{3} \times \pi \times 6^2 \times 8$	M1	Alternatively, Vol large cone = $\frac{1}{3} \times \pi \times 9^2 \times 12$ M1
	324π or 96π	A1	Vol large cone = 324π A1
	Subtraction of cone volumes	M1dep	Vol frustum = $\frac{8}{27} \times 324\pi$ M1
	228π	A1	$\frac{1}{3} \times \pi \times 684$ scores 3 marks altogether Allow $\pi 228$

Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

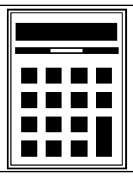
General Certificate of Secondary Education

MATHEMATICS (SPECIFICATION A) **4306/2F**
Foundation Tier
Paper 2 Calculator

F

Specimen Paper (Non-coursework Specification) 2009

For this paper you must have:
- a calculator
- mathematical instruments.



Time allowed: 1 hour 30 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Use a calculator where appropriate.
- Do all rough work in this book.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You may ask for more answer paper, graph paper and tracing paper. This must be tagged securely to this answer book.

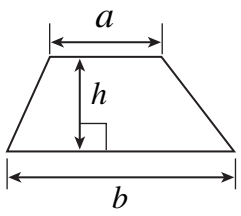
Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
TOTAL	
Examiner's Initials	

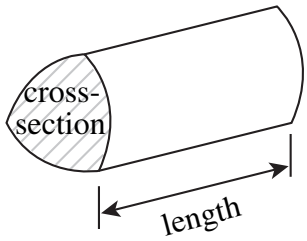
Formulae Sheet: Foundation Tier

You may need to use the following formulae:

Area of trapezium = $\frac{1}{2}(a+b)h$



Volume of prism = area of cross-section × length



Answer **all** questions in the spaces provided.

1 (a) Write a number that is bigger than seven hundred and smaller than seven hundred and eleven.

Write the number in figures.

.....

Answer ..... *(1 mark)*

1 (b) Write 0.7 as a fraction.

.....

Answer ..... *(1 mark)*

1 (c) Write $\frac{1}{4}$ as a decimal.

.....

Answer ..... *(1 mark)*

1 (d) Write 0.62 as a percentage.

.....

Answer ..... % *(1 mark)*

2 Write the missing numbers in the boxes.

2 (a) $4 \times$ ☐ $+ 2 = 18$

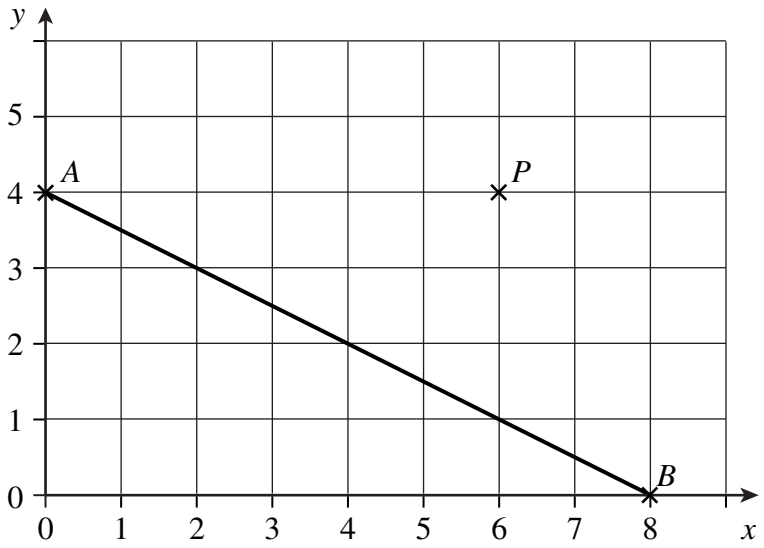
2 (b) $4 \times 2 +$ ☐ $= 18$

2 (c) $4 \times$ ☐ $- 2 = 18$

(3 marks)

7

3 A line *AB* is shown on the grid.



3 (a) Mark the mid-point of *AB*.
Label it *M*.

(1 mark)

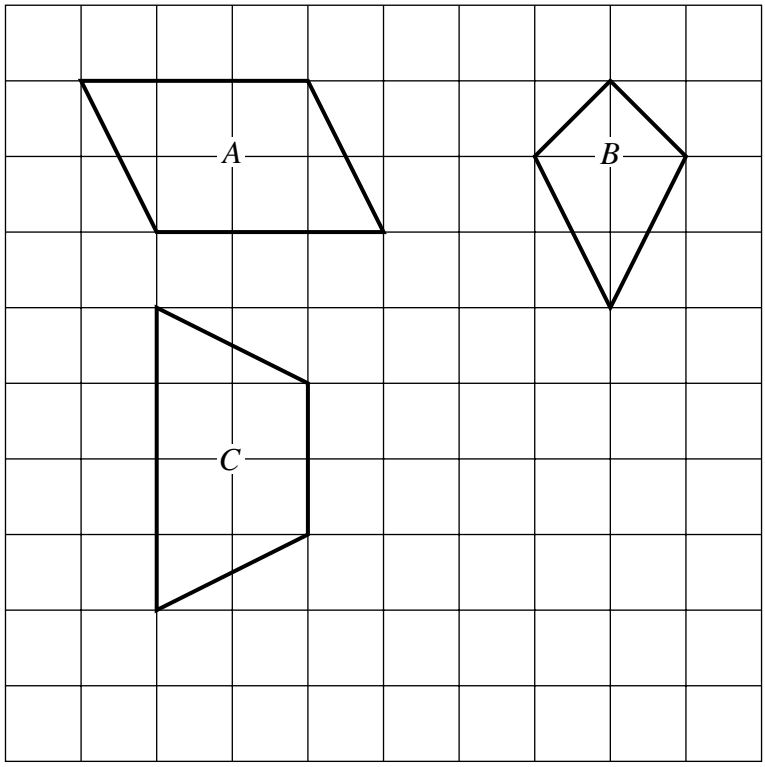
3 (b) Write down the co-ordinates of *M*.

Answer (..... , ...) *(1 mark)*

3 (c) Draw a line through *P*, parallel to the line *AB*.

(1 mark)

4 Matthew is drawing different quadrilaterals on a square grid.
Here are three of his quadrilaterals.



4 (a) What name is given to each quadrilateral?

Answer Quadrilateral *A* .....

Quadrilateral *B* .....

Quadrilateral *C* .....

(3 marks)

4 (b) (i) On the grid draw a different type of quadrilateral.

(1 mark)

4 (b) (ii) What is the name of the type of quadrilateral you have drawn?

Answer ..... *(1 mark)*

8

Turn over ▶

5 (a) A postal service charges £36 for delivering 25 identical parcels.

What is the charge per parcel?

.....

.....

Answer £ ..... *(2 marks)*

5 (b) A company has some small letters and some large letters to be posted on three separate days.

	Number of small letters	**Number of large letters**
1st day	5	10
2nd day	10	10
3rd day	5	5

Small letters cost 35p each.
Large letters cost 45p each.

Calculate the total cost of posting all the letters.

.....

.....

.....

.....

Answer £ ..... *(3 marks)*

6 Here is a list of numbers.

3 5 7 3 4

6 (a) Find the mode.

.....

Answer ..... *(1 mark)*

6 (b) Find the median.

.....

Answer ..... *(1 mark)*

6 (c) Find the mean.

.....

.....

.....

Answer ..... *(3 marks)*

7 (a) Is 6 a factor of 30?

Explain your answer.

.....

.....

(1 mark)

7 (b) Another number is also a factor of 30.
Wayne thinks that this number **must** be an even number.

Is Wayne correct?
Explain your answer.

.....

.....

(1 mark)

12

8 (a) Write down the next term in each of these sequences.

8 (a) (i) Rule **Add 7**

2 9 .....

(1 mark)

8 (a) (ii) Rule **Multiply by 4**

3 12 .....

(1 mark)

8 (b) A sequence of numbers starts

24 19 15

Darren thinks that the rule for the sequence could be

Subtract 5

Is Darren correct?
Explain your answer.

.....

.....

(1 mark)

9 The rule for working out a taxi fare is

£1.40
plus
75p per mile

9 (a) Jo travels 2 miles.

Work out her fare.

.....

.....

Answer ..... *(2 marks)*

9 (b) Sam's taxi fare is £5.15

How many miles did he travel?

.....

.....

Answer ..... *(3 marks)*

10 (a) Put these decimals in order, smallest first.

0.41 0.299 0.6

..... , ... , ...

(1 mark)

10 (b) Work out $\frac{4}{7} \times 168$

.....

Answer ..... *(2 marks)*

10 (c) Round 35.7281 to 2 decimal places.

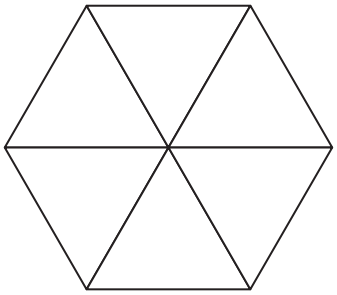
Answer ..... *(1 mark)*

12

Turn over ▶

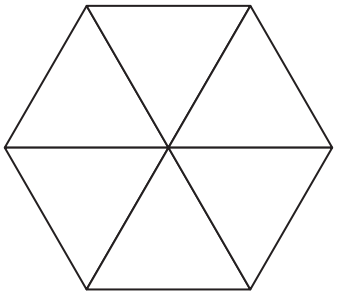
11 On each spinner write six numbers to make the statements correct.

11 (a) It is certain that you will get a number more than 4.



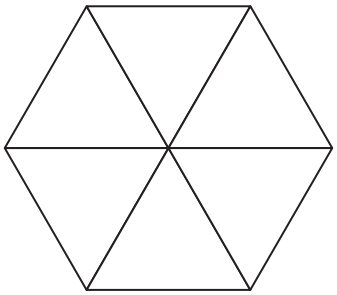
(1 mark)

11 (b) It is impossible that you will get an even number.



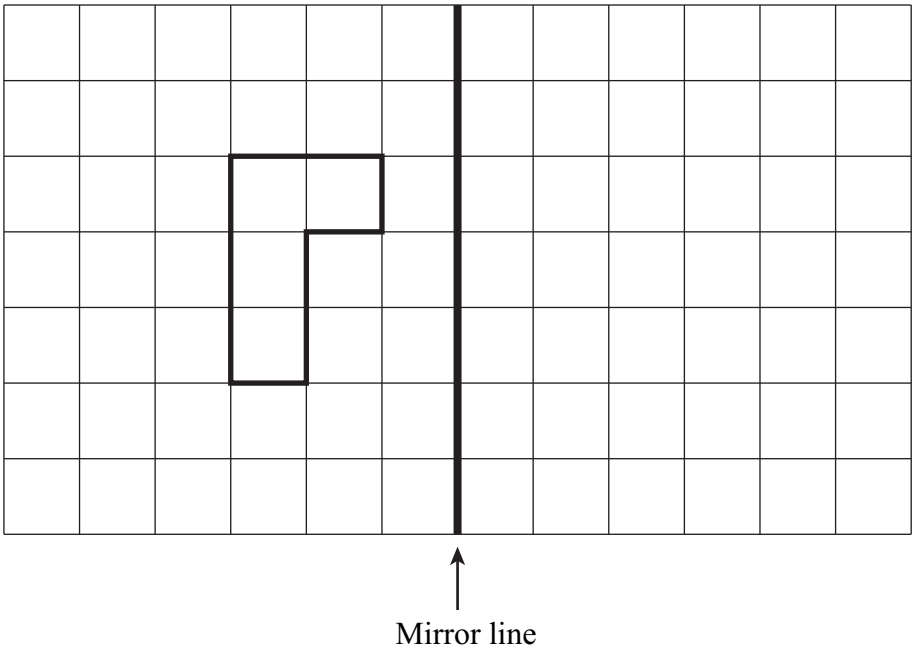
(1 mark)

11 (c) The probability of getting a three is one half.



(1 mark)

12 (a) Draw the reflection of the shape in the mirror line.



(2 marks)

12 (b) The table gives the names of some 4-sided shapes and their symmetries.

Complete the table.

Name of 4-sided shape	**Symmetries**	
Square	Number of lines of symmetry	4
	Order of rotational symmetry	4
.....	Number of lines of symmetry	2
	Order of rotational symmetry	2
Parallelogram	Number of lines of symmetry	.....
	Order of rotational symmetry	.....

(3 marks)

8

Turn over ▶

13 Four people play each other at tennis.
The table shows who won each game.

Adam	**X**			
Beth	Adam	**X**		
Chris	Adam	Beth	**X**	
Dan	Dan	Beth	Dan	**X**
	Adam	**Beth**	**Chris**	**Dan**

13 (a) How many games did Adam win?

.....

Answer ..... *(1 mark)*

13 (b) Who lost all their games?

.....

Answer ..... *(1 mark)*

13 (c) Why is there an **X** in some boxes in the table?

.....

.....

(1 mark)

14 (a) Complete the following table.

$x = 7$	$4x = 28$
$y =$	$5y = 30$
$3z = 15$	$4z =$ .....

.....

.....

.....

(3 marks)

14 (b) Solve the equation $7x - 2 = 19$

.....

.....

Answer $x =$ ..... *(2 marks)*

15 (a) Calculate $\frac{4.5}{0.6^2}$

.....

.....

Answer ..... *(1 mark)*

15 (b) Calculate 36% of £420

.....

.....

.....

Answer £ ..... *(2 marks)*

11

Turn over ▶

16 The table shows some exchange rates.

£1 is worth 1.82 American dollars
£1 is worth 194 Japanese yen

Joanne buys a camera in America and pays 200 dollars.
Jack buys a similar camera in Japan and pays 20 370 yen.

In which country is the camera cheaper?
You **must** show your working.

.....

.....

.....

.....

.....

Answer ..... *(3 marks)*

17 The table shows the favourite soap operas of students in year 11.

Soap Opera	Number of students
East Enders	35
Coronation Street	50
Emmerdale	25
Hollyoaks	70
Total	**180**

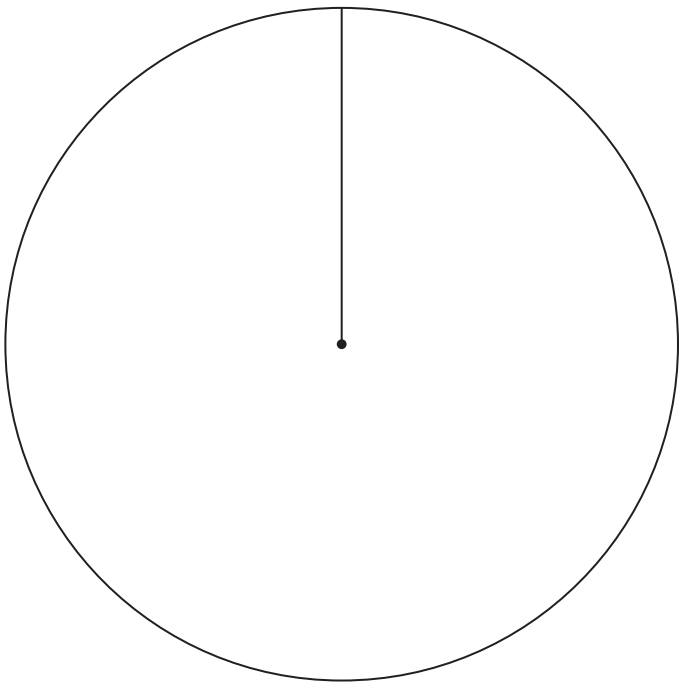
Draw and label a pie chart to show this data.

.....

.....

.....

.....

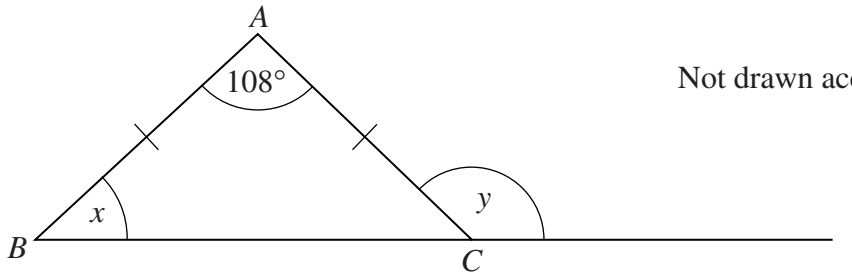


(4 marks)

7

Turn over ▶

18 The diagram shows an isosceles triangle *ABC*.
Angle *BAC* = 108°



Not drawn accurately

18 (a) Calculate the size of angle *x*.

.....

.....

Answer ..... degrees *(2 marks)*

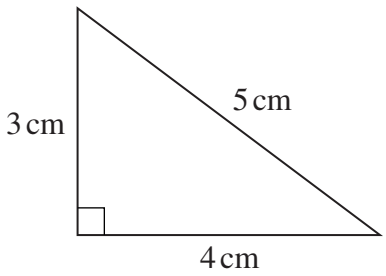
18 (b) Calculate the size of angle *y*.

.....

.....

Answer ..... degrees *(1 mark)*

19 A right-angled triangle has sides of 3 cm, 4 cm and 5 cm.



19 (a) Work out the area of the triangle.

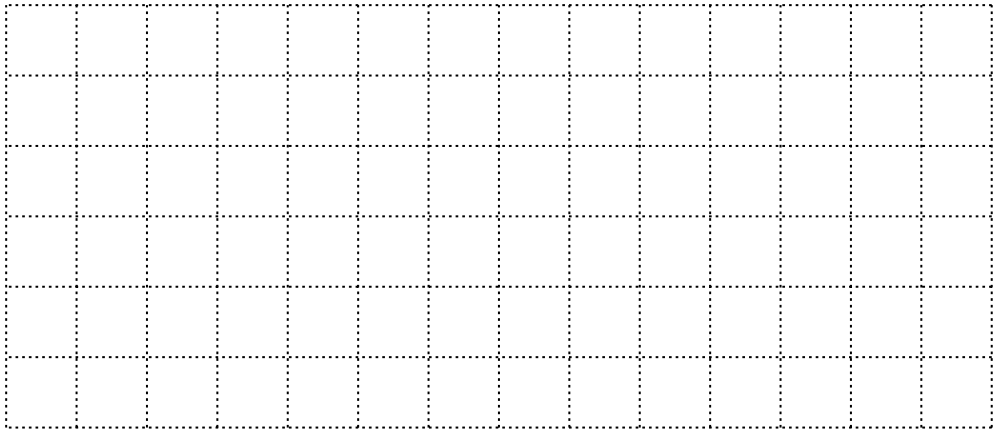
.....

.....

.....

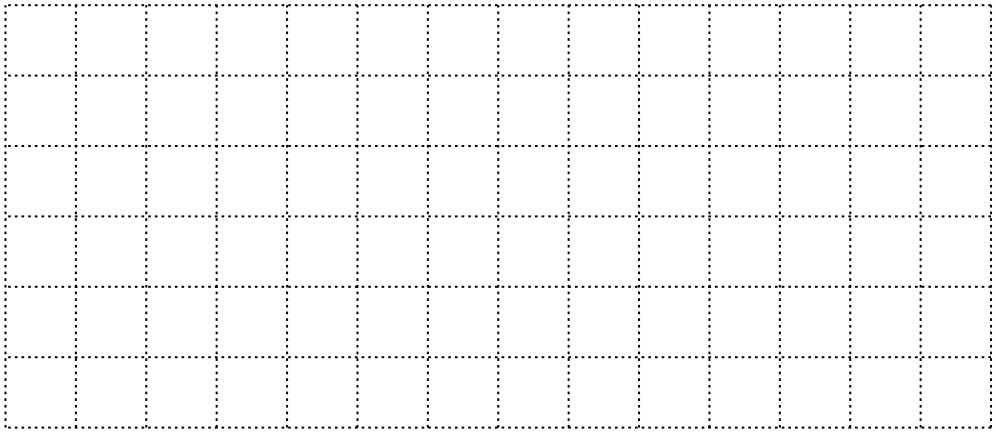
Answer ..... cm^2 *(2 marks)*

19 (b) On the grid below show how two of these triangles can be put together to make an isosceles triangle.



(1 mark)

19 (c) On the grid below show how two of these triangles can be put together to make a parallelogram.



(1 mark)

7

Turn over ▶

20 Carol earns £36 000 per year.
The first £5000 is tax free.
She pays 22% of the remaining salary in tax.

How much tax does she pay?

.....

.....

.....

.....

Answer £ ..... *(3 marks)*

21 Abi, Ben and Charlie are aged 11, 8 and 6 respectively.
They share £4000 in the ratio of their ages.

How much does each receive?

.....

.....

.....

.....

Answer Abi £ .....

Ben £ .....

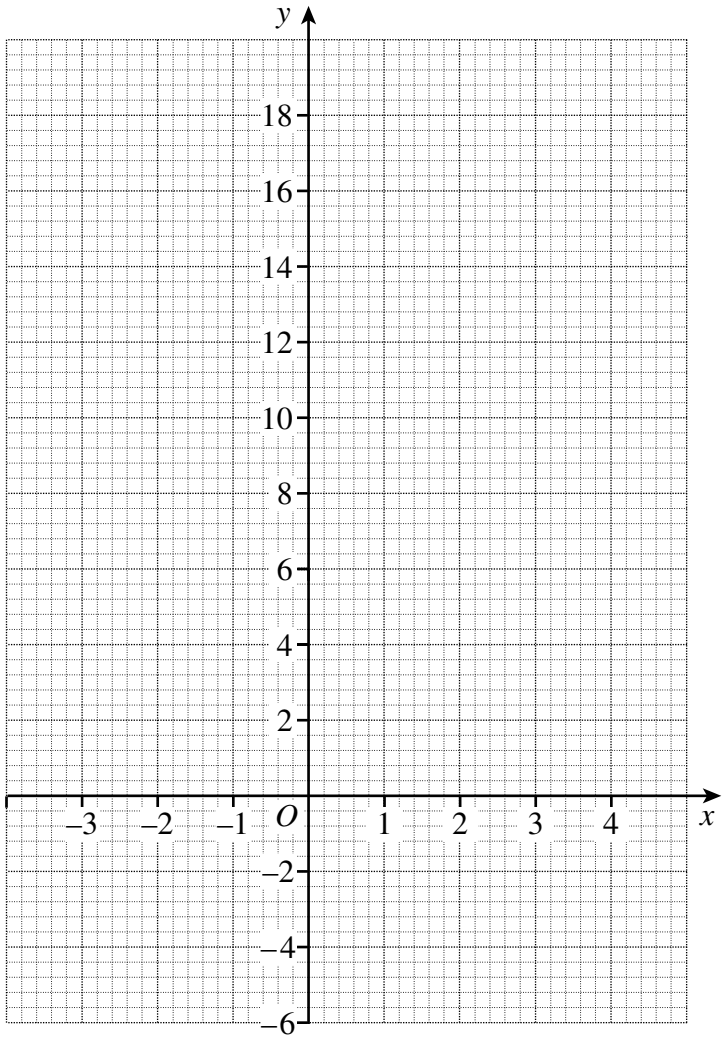
Charlie £ ..... *(3 marks)*

22 (a) Complete the table of values for $y = x^2 - 3x$

x	–3	–2	–1	0	1	2	3	4
y	18		4	0	–2	–2		4

(1 mark)

22 (b) On the grid below, draw the graph of $y = x^2 - 3x$ for values of x between –3 and +4



(2 marks)

22 (c) What are the values of x when $y = 3$

.....

.....

Answer ..... *(2 marks)*

11

Turn over ▶

23 Ten members of a running club run a 10 kilometre race.
Each runner is given a handicap.
The times taken by the runners and their handicaps are shown in the table.

Runner	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Time taken (minutes)	43	39	32	35	47	38	35	42	48	38
Handicap (minutes)	7	15	19	17	0	12	14	5	2	8

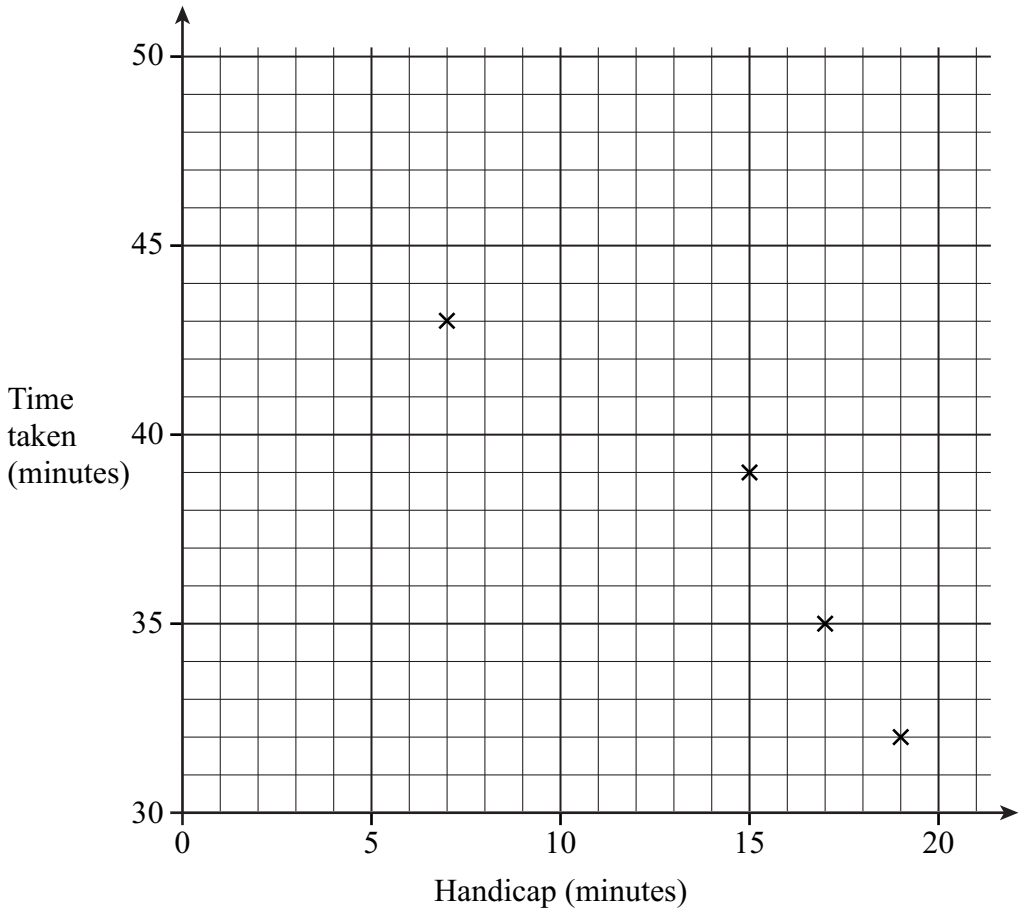
23 (a) To decide the winner the time taken is added to their handicap.

Who won the race?

Answer ..... *(1 mark)*

23 (b) The data for the first 4 runners is plotted on the scatter diagram.

Plot the data for the remaining runners.



(2 marks)

23 (c) Draw a line of best fit on the diagram.

(1 mark)

23 (d) One runner is injured and does not run the race.
Her handicap is 10 minutes.

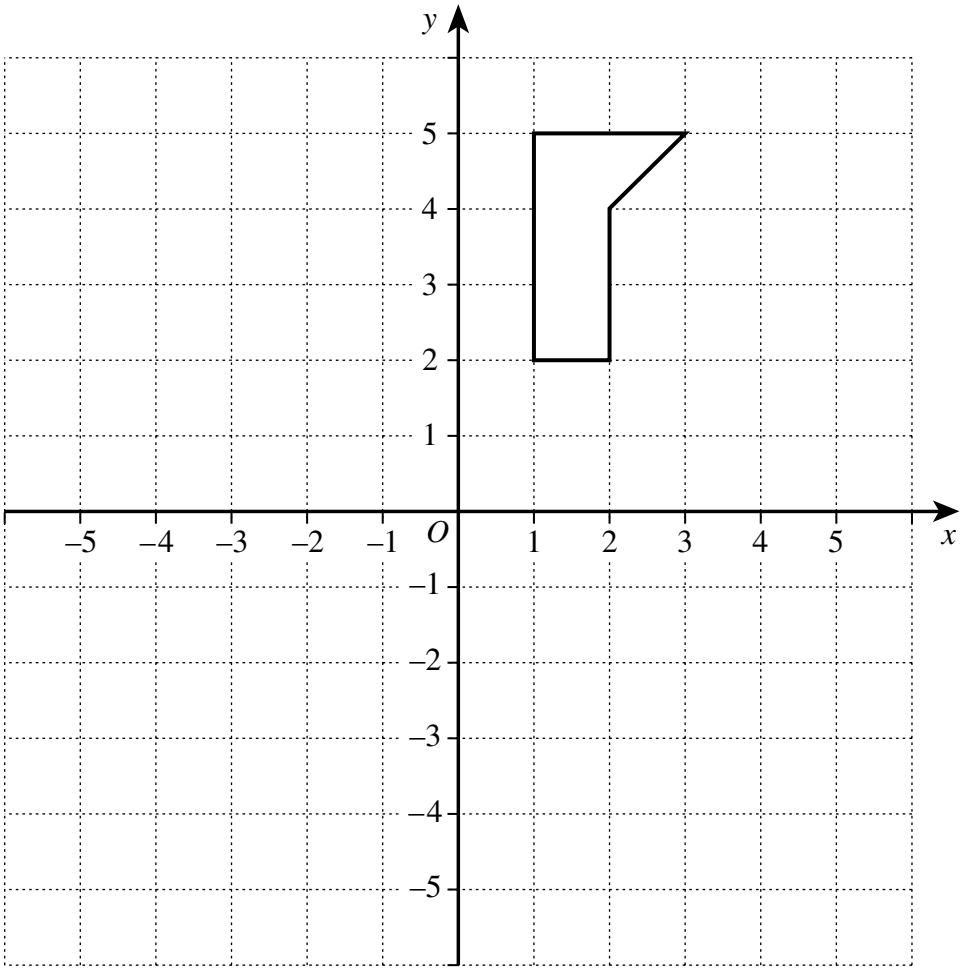
Estimate the time she would have taken to run the race.

.....

.....

Answer ..... minutes *(1 mark)*

24



Rotate the shape 90° clockwise about (–1, 0).

(2 marks)

7

Turn over ▶

25 (a) Expand $2x(x - 4)$

.....

Answer ..... *(1 mark)*

25 (b) Factorise $y^2 - 5y$

.....

Answer ..... *(1 mark)*

25 (c) Solve the equation $5z + 13 = 2(z - 1)$

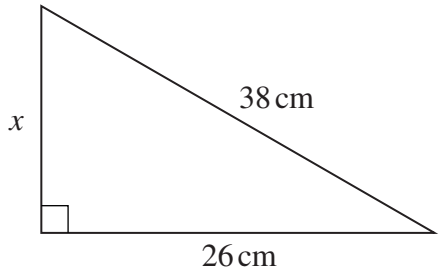
.....

.....

.....

Answer $z =$ ..... *(3 marks)*

26 The diagram shows a right angled triangle.



Not drawn accurately

Calculate the length of the side marked x.

.....

.....

.....

.....

Answer ..... cm *(3 marks)*

27 A box of cereal contains 150 grams, correct to the nearest 10 grams.

27 (a) Write down the minimum weight of the box of cereal.

.....

Answer ..... grams *(1 mark)*

27 (b) Write down the maximum weight of the box of cereal.

.....

Answer ..... grams *(1 mark)*

END OF QUESTIONS

10

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Q	Answers	Mark	Comments
1(a)	Any number > 700 but < 711	B1	
1(b)	$\frac{7}{10}$	B1	
1(c)	0.25(00…..)	B1	25
1(d)	62	B1	62.(000….)
2(a)	4	B1	
2(b)	10	B1	
2(c)	5	B1	
3(a)	Mark at (4,2) to $\frac{1}{2}$ sq accuracy	B1	
3(b)	(4, 2)	B1	
3(c)	Line through P parallel to AB	B1	
4(a)	A Parallelogram B Kite C Trapezium	B3	B1 each
4(b)(i)	Any other quadrilateral	B1	
4(b)(ii)	Correct on ft	B1ft	
5(a)	36 ÷ 25	M1	3600 ÷ 25
	£1.44	A1	144p
5(b)	20 × 35 or 25 × 45	M1	20 × 0.35 or 25 × 0.45
	Their 700 + Their 1125	M1dep	
	£18.25	A1	1825p

Q	Answers	Mark	Comments
6(a)	3	B1	
6(b)	4	B1	
6(c)	3 + 5 + 7 + 3 + 4	M1	
	(3 + 5 + 7 + 3 + 4) ÷ 5	M1dep	
	4.4	A1	
7(a)	Yes, 6 × 5 = 30	B1	oe
7(b)	Any odd factor explained eg, 3 × 10	B1	oe
8(a)(i)	16	B1	
8(a)(ii)	48	B1	
8(b)	No, 19 – 5 = 14	B1	oe
9(a)	1.40 + 2 × 0.75	M1	
	£2.90	A1	290p
9(b)	5.15 – 1.40	B1	
	Their 3.75 ÷ 0.75	M1	
	5	A1	
10(a)	0.299, 0.41, 0.6	B1	
10(b)	96	B2	B1 for 672/7
10(c)	35.73	B1	
11(a)	Any 6 numbers > 4	B1	
11(b)	Any 6 odd numbers	B1	
11(c)	3 3's and 3 other numbers	B1	

Q	Answers	Mark	Comments
12(a)	Correct reflection and position	B2	B1 for reflection in wrong position
12(b)	Rectangle	B1	Rhombus
	0 lines	B1	
	Order 2	B1	
13(a)	2	B1	
13(b)	Chris	B1	
13(c)	Cannot play themselves	B1	oe
14(a)	$y = 6$	B1	
	20	B2	B1 for $z = 5$
14(b)	$7x = 19 + 2$	M1	$x - 2/7 = 19/7$ oe
	3	A1	
15(a)	12.5	B1	oe
15(b)	$36/100 \times 420$	M1	
	£151.20	A1	£151.2 is A0
16	200/1.82 or 20370/194	M1	
	109.89 and 105	M1dep	M2 for $200/1.82 \times 194$ (21318) or $20370/194 \times 1.82$ (191.1)
	Japan and working	A1	
17	Any correct method to calc. angles	M1	180/360 or 2°
	All angles correct	A1	70, 100, 50, 140
	Sectors drawn accurately ± 1°	B1	
	Correct labels according to size	B1	

Q	Answers	Mark	Comments
18(a)	(180 – 108) ÷ 2	M1	
	36	A1	
18(b)	144	B1	
19(a)	$\frac{1}{2} \times 4 \times 3$	M1	
	6	A1	
19(b)	Correct combination	B1	
19(c)	Correct combination	B1	
20	36 000 – 5000	M1	31 000
	Their 31 000 × 0.22	M1	
	6820	A1	oe
21	25	B1	
	4000 × (11 or 8 or 6) ÷ 25	M1	
	1960, 1080, 960	A1	
22(a)	10 **and** 0	B1	
22(b)	At least 7 correct points plotted	B1	ft Their points
	Smooth curve	B1	Within ± 1mm tolerance
22(c)	–0.8	B1	B1 if line drawn at $y = 6$
	3.8	B1	
23(a)	J	B1	
23(b)	Correct plots	B2	–1eeoo
23(c)	Line within tolerance	B1	
23(d)	≈40	B1ft	ft Their line of best fit ± 1 mm

Q	Answers	Mark	Comments
24(a)	Correct position	B2	B1 for clockwise 90° rotation about (0, –1) B1 for anti-clockwise 90° rotation about (–1, 0)
25(a)	$2x^2 - 8x$	B1	
25(b)	$y(y - 5)$	B1	
25(c)	$5z + 13 = 2z - 2$	M1	Allow one sign or arithmetic error but not $5z + 13 = 2z - 1$
	$5z - 2z = -2 - 13$	M1	Allow one sign error
	$z = -5$	A1ft	ft on one error only. **SC1** $z = 14/3$ oe
26	$(x^2 =)\ 38^2 - 26^2$	M1	
	$\sqrt{768}$	M1	Must square and add and show square root
	28, 27.7…	A1	28 with no working is no marks
27(a)	145	B1	
27(b)	155	B1	

Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

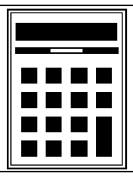
General Certificate of Secondary Education

MATHEMATICS (SPECIFICATION A) **4306/2H**
Higher Tier
Paper 2 Calculator

H

Specimen Paper (Non-coursework Specification) 2009

For this paper you must have:
- a calculator
- mathematical instruments.



Time allowed: 2 hours

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Use a calculator where appropriate.
- Do all rough work in this book.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

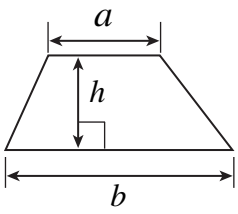
Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You may ask for more answer paper, graph paper and tracing paper. This must be tagged securely to this answer book.

Advice
- In all calculations, show clearly how you work out your answer.

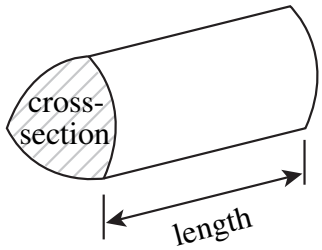
For Examiner's Use	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
TOTAL	
Examiner's Initials	

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

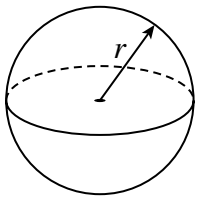


Volume of prism = area of cross-section × length



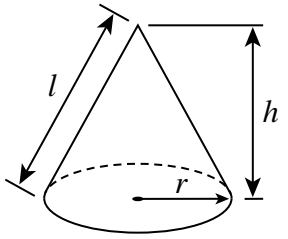
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

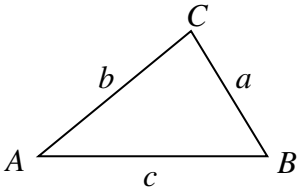
Curved surface area of cone = $\pi r l$



In any triangle ABC

Area of triangle = $\frac{1}{2}ab\sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Answer **all** questions in the spaces provided.

1 80 people were asked which type of program they preferred on TV.
Some of the results are shown in the table.

Type of program	Number of people
News	18
Sport	
Soap Operas	32
Films	4

Calculate the percentage of these people who prefer Sport.

.....

.....

.....

.....

Answer ..... % *(3 marks)*

2 Carol earns £36 000 per year.
The first £5000 is tax free.
She pays 22% of the remaining salary in tax.

How much tax does she pay?

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.....

Answer £ ..... *(3 marks)*

6

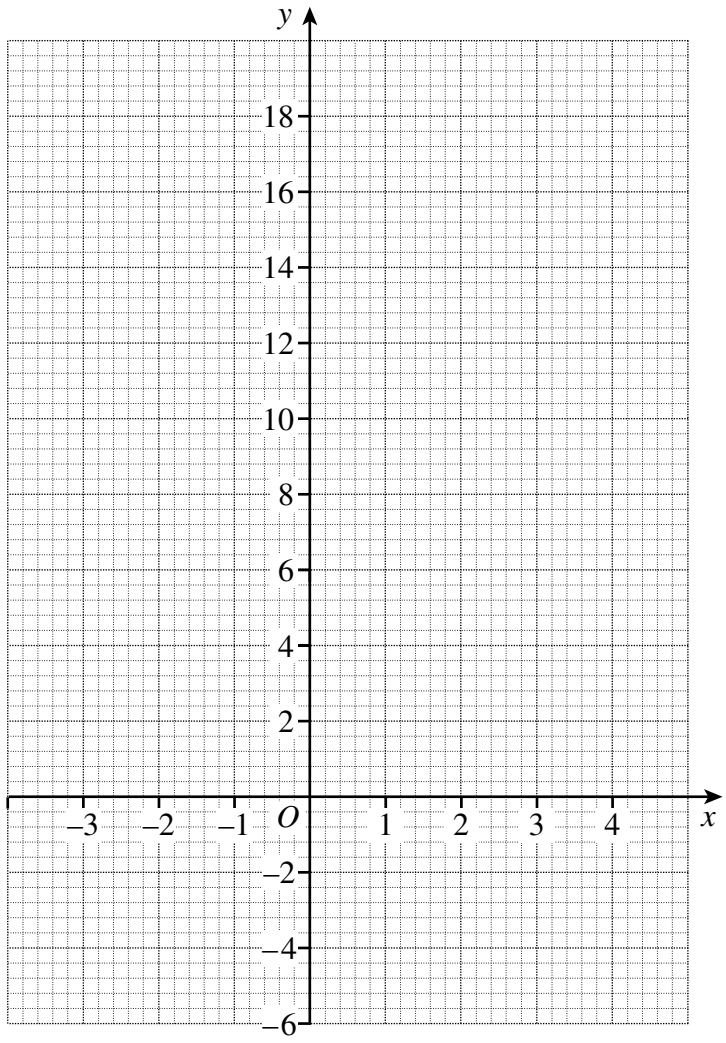
Turn over ▶

3 (a) Complete the table of values for $y = x^2 - 3x$

x	–3	–2	–1	0	1	2	3	4
y	18		4	0	–2	–2		4

(1 mark)

3 (b) On the grid below, draw the graph of $y = x^2 - 3x$ for values of x between –3 and +4



(2 marks)

3 (c) What are the values of x when $y = 3$

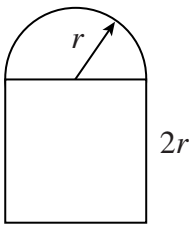
.....

.....

Answer ..... *(2 marks)*

4 This shape has a total area of $100\,\text{cm}^2$.
The value of r is given by

$$\sqrt{\frac{200}{\pi + 8}}$$



4 (a) Use your calculator to work out r.
Write down your full calculator display.
Give your answer as a decimal.

.....

Answer ..... *(1 mark)*

4 (b) Write down the value of r to a suitable degree of accuracy.

.....

Answer ..... *(1 mark)*

5 (a) Expand $2x(x - 4)$

.....

Answer ..... *(1 mark)*

5 (b) Factorise $y^2 - 5y$

.....

Answer ..... *(1 mark)*

5 (c) Simplify fully $(2w^2z) \times (3wz^3)$

.....

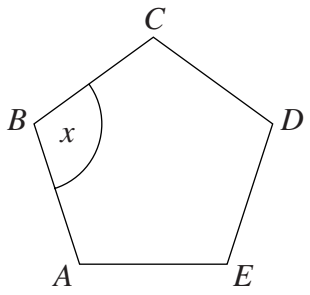
.....

Answer ..... *(2 marks)*

11

Turn over ▶

6 (a) *ABCDE* is a regular pentagon.



Not drawn accurately

Work out the value of the interior angle x.

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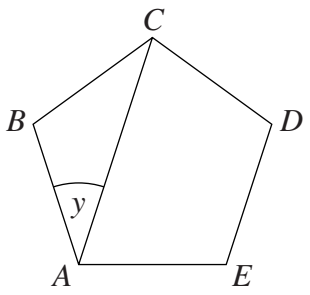
.....

Answer $x =$ ..... degrees *(2 marks)*

6 (b) *ABCDE* is a regular pentagon.



Not drawn accurately

Work out the value of y.

.....

.....

Answer $y =$ ..... degrees *(2 marks)*

7 p is an odd number.
q is an even number.

7 (a) Which **two** of these expressions are always odd?

A $p + q$

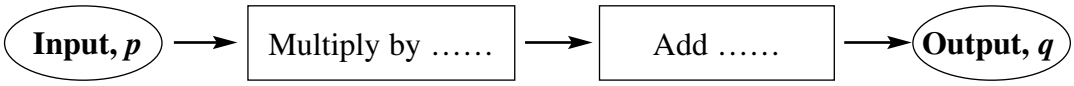
B pq

C $p^2 + q^2$

D $2p + 5q$

Answer ..... and ..... *(2 marks)*

7 (b) A two stage operation is shown



Fill values in the boxes so that when the input is an odd number the output is an even number.

(2 marks)

Turn over for the next question

8

8 Ten members of a running club run a 10 kilometre race.
Each runner is given a handicap.
The times taken by the runners and their handicaps are shown in the table.

Runner	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Time taken (minutes)	43	39	32	35	47	38	35	42	48	38
Handicap (minutes)	7	15	19	17	0	12	14	5	2	8

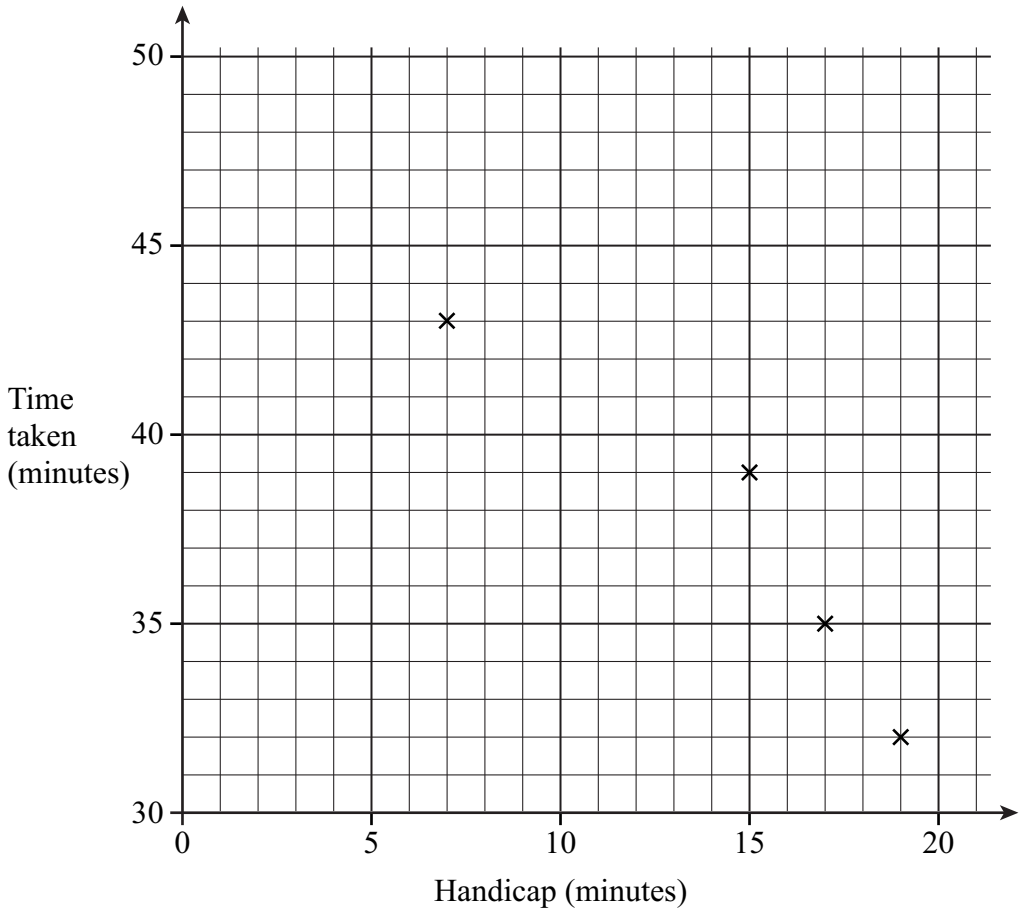
8 (a) To decide the winner the time taken is added to their handicap.

Who won the race?

Answer ..... *(1 mark)*

8 (b) The data for the first 4 runners is plotted on the scatter diagram.

Plot the data for the remaining runners.



(2 marks)

8 (c) Draw a line of best fit on the diagram.

(1 mark)

8 (d) One runner is injured and does not run the race.
Her handicap is 10 minutes.

Estimate the time she would have taken to run the race.

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Answer ..... minutes *(1 mark)*

8 (e) The scatter diagram shows negative correlation.

Describe the relationship between the finishing time and the handicap.

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(1 mark)

9 Solve the equations.

9 (a) $3x + 8 = x + 5$

.....

.....

Answer $x =$ ..... *(2 marks)*

9 (b) $5y + 13 = 2(y - 1)$

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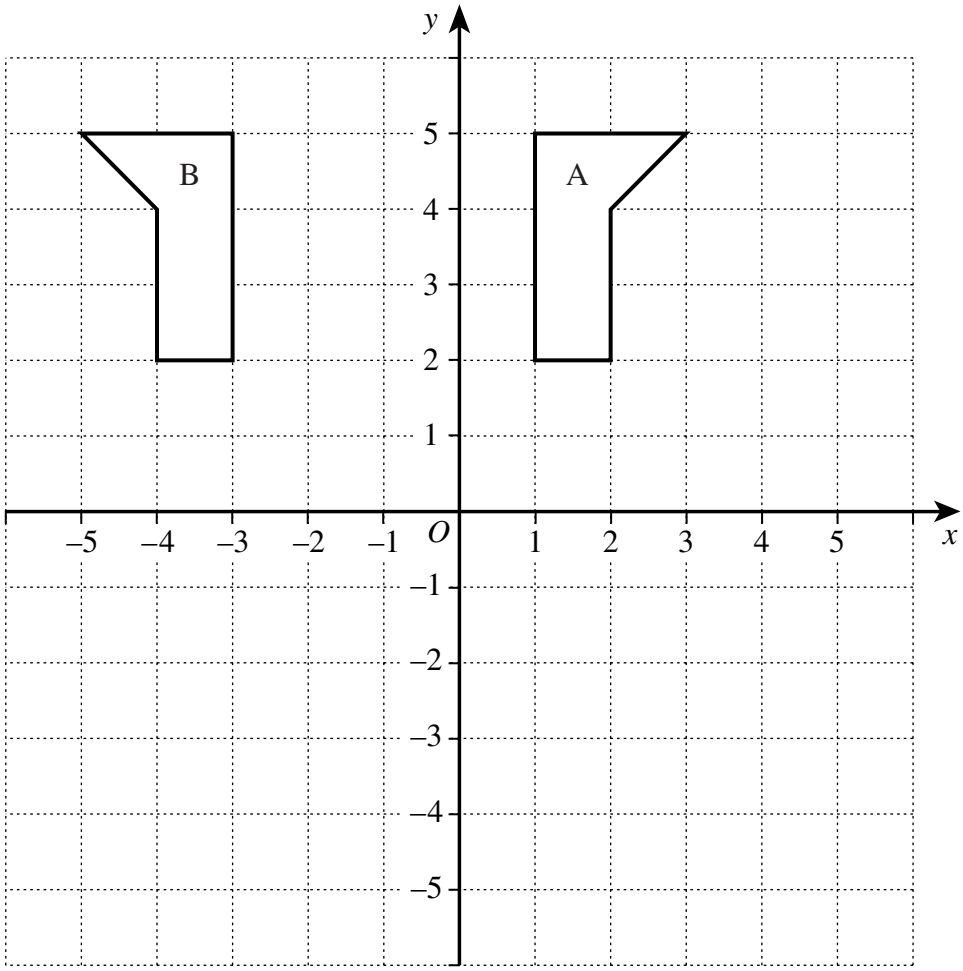
.....

Answer $y =$ ..... *(3 marks)*

11

Turn over ▶

10



10 (a) Describe the **single** transformation that takes shape A to shape B.

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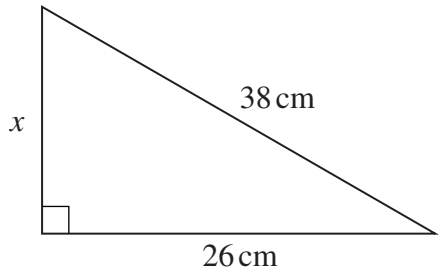
Answer ..... *(2 marks)*

10 (b) Rotate shape A 90° clockwise about (–1, 0)

(2 marks)

11 The diagram shows a right angled triangle.



Not drawn accurately

Calculate the length of the side marked x.

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Answer ..... cm *(3 marks)*

12 A box of cereal contains 150 grams, correct to the nearest 10 grams.

12 (a) Write down the minimum weight of the box of cereal.

.....

Answer ..... grams *(1 mark)*

12 (b) Write down the maximum weight of the box of cereal.

.....

Answer ..... grams *(1 mark)*

9

Turn over ▶

13 Ahmed is x years old.
Benji is 6 years older than Ahmed.
Celia is twice as old as Benji.
In total their ages add up to 38.

How old is Ahmed?

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Answer ..... *(3 marks)*

14 Here is a list of quadrilaterals.

kite rectangle rhombus square trapezium

For each of the following descriptions, choose the correct name from the list.
You may find it helpful to sketch the quadrilaterals in the spaces provided.

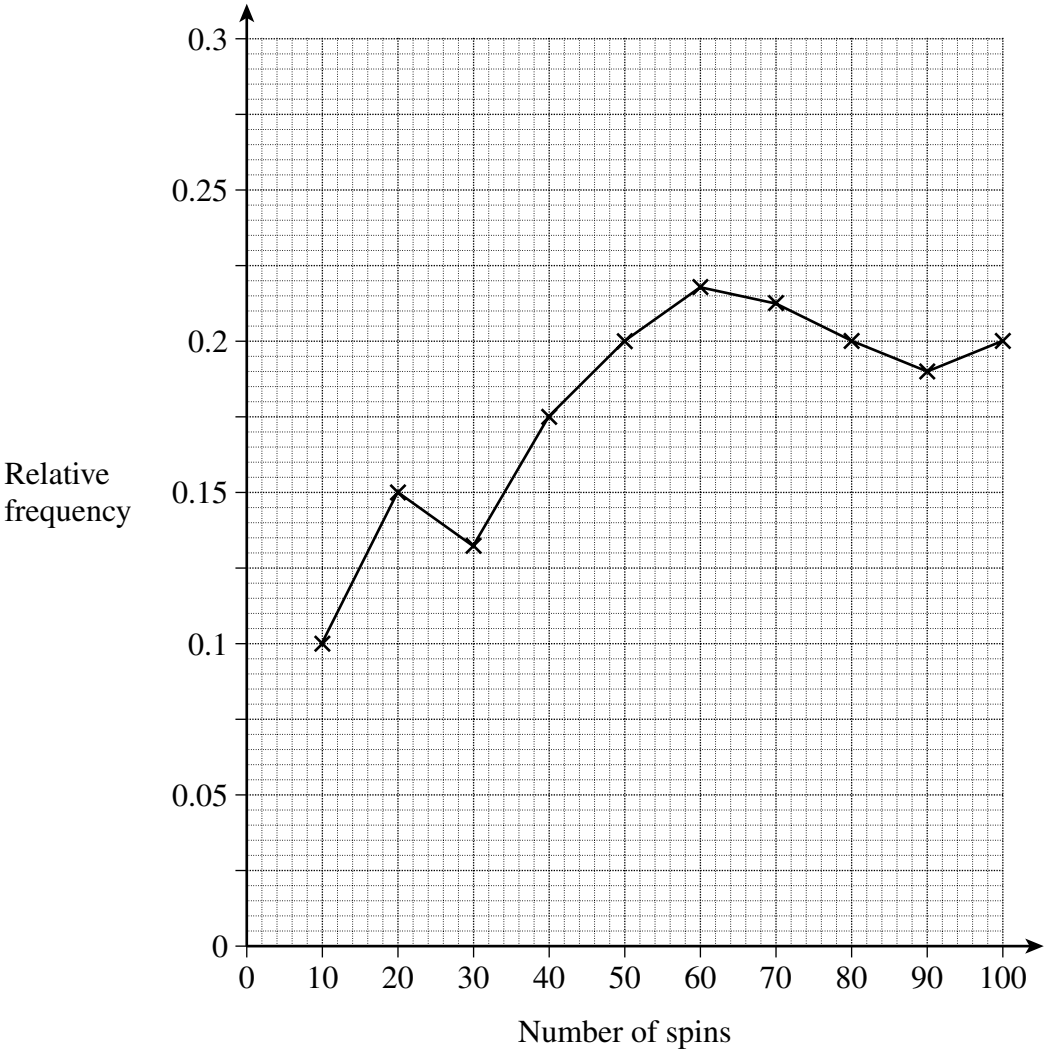
14 (a) Diagonals intersect at right angles.
Sides are not all the same length.

Answer ..... *(1 mark)*

14 (b) One pair of parallel sides.
The other pair of sides are not parallel.

Answer ..... *(1 mark)*

15 A spinner has coloured sections of equal size.
Lynne spins the spinner a 100 times and records the results.
The graph shows the relative frequency of blue after every 10 spins.



15 (a) How many times does the spinner land on blue in the first 40 spins?

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Answer ..... *(2 marks)*

15 (b) Lynne finds that the spinner is fair and that the probability of a blue section is 0.2
Write down a possible number of blue sections and a possible total number of sections.

Blue sections .....

Total sections ..... *(1 mark)*

8

Turn over ▶

16 The table shows the population and land area of four European Countries in 2006.

Country	Population	Land Area (km^2)
United Kingdom	6.1×10^7	241 590
Germany	8.3×10^7	357 021
Switzerland	7.5×10^6	41 290
Italy	5.8×10^7	301 230

16 (a) Which country has the smallest population?

Answer ..... *(1 mark)*

16 (b) Write 6.1×10^7 as an ordinary number.

.....

Answer ..... *(1 mark)*

16 (c) Work out the difference between the populations of Germany and Switzerland.

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Answer ..... *(1 mark)*

16 (d) Work out the population per square kilometre for the United Kingdom.

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Answer ..... *(2 marks)*

17 Factorise $x^2 - 2x - 15$

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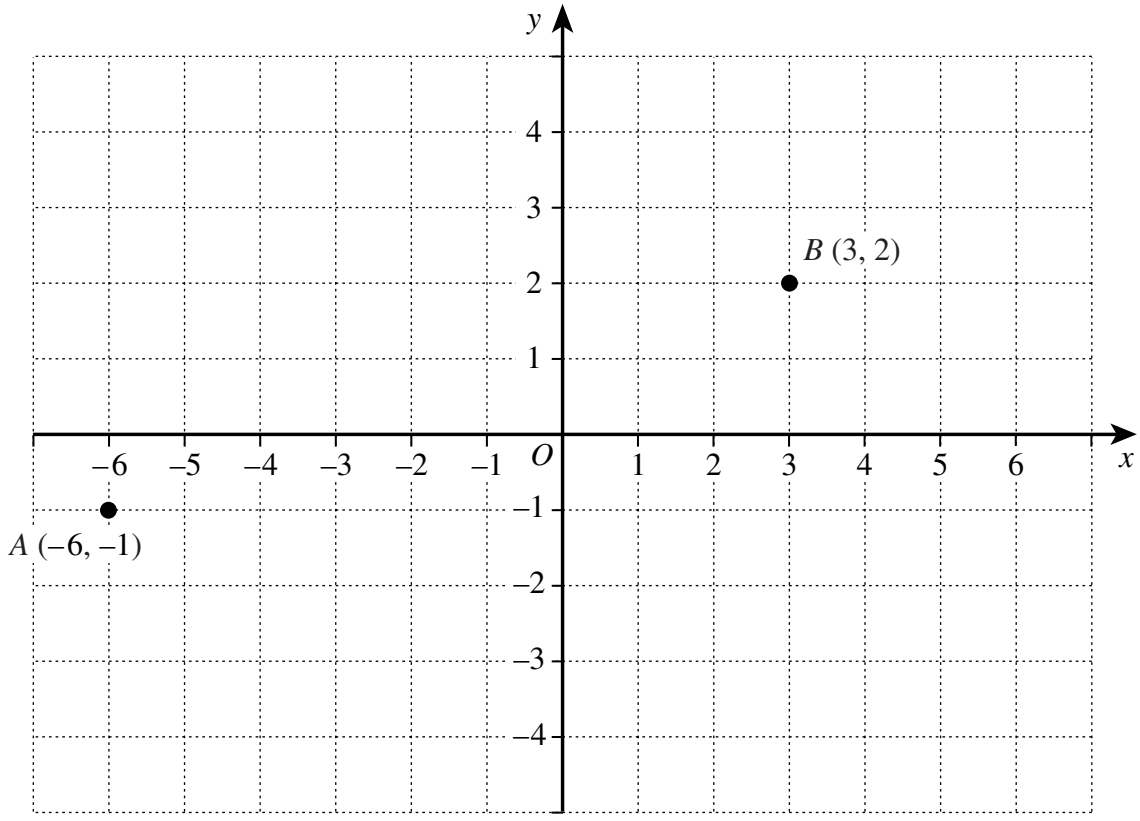
Answer ..... *(2 marks)*

18 The diagram shows the points A (–6, –1), and B (3, 2).



18 (a) Find the equation of the line through A and B.

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Answer ..... *(3 marks)*

18 (b) Write down the gradient of the line perpendicular to AB.

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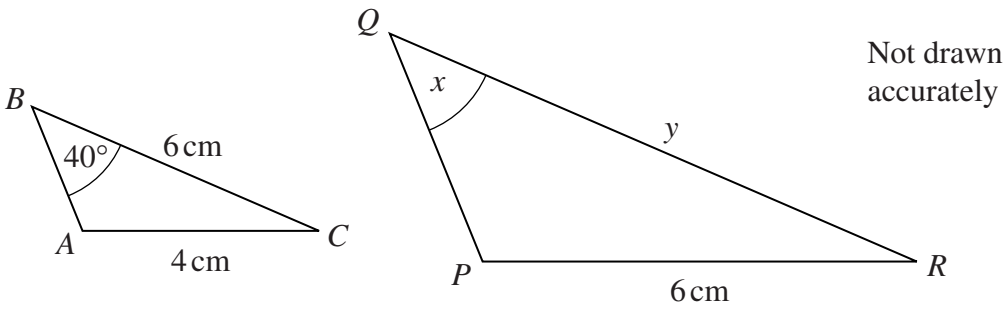
Answer ..... *(1 mark)*

11

Turn over ▶

19 *ABC* and *PQR* are similar triangles.



19 (a) Write down the size of angle *x*.

Answer ..... degrees *(1 mark)*

19 (b) Work out the value of *y*.

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Answer ..... cm *(2 marks)*

20 A formula used in science is $s = ut + \frac{1}{2}at^2$

Work out the values of *t* when $s = 0$, $u = 3.6$ and $a = -0.9$

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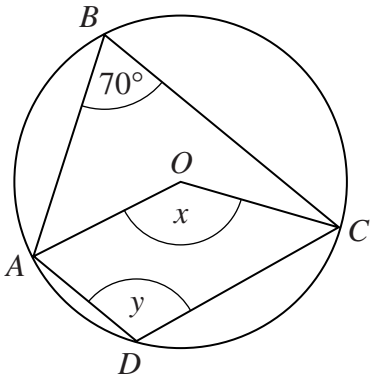
Answer ..... *(3 marks)*

21 (a) A, B, C and D are points on the circumference of a circle centre O.
$\angle ABC = 70°$



Not drawn accurately

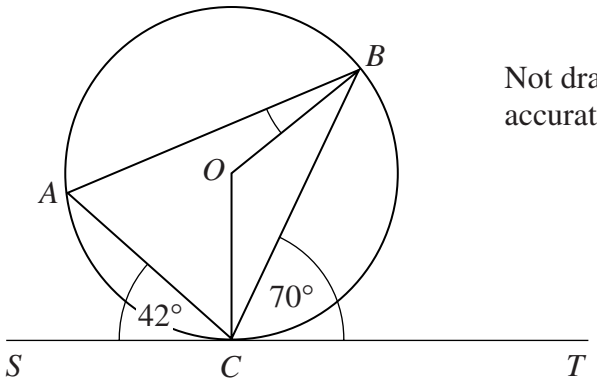
Work out the size of angles x and y.

.....

Answer $x =$ ..... degrees *(1 mark)*

$y =$ ..... degrees *(1 mark)*

21 (b) A, B and C are three points on the circumference of a circle centre O.
SCT is a tangent to the circle.
$\angle BCT = 70°$, $\angle SCA = 42°$



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Find the size of angle OBA.

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$\angle OBA =$ ..... degrees *(4 marks)*

12

Turn over ▶

22 The table shows the number of accidents outside a school in the last six years.

Year	2003	2004	2005	2006	2007	2008
Number of accidents	4	5	9	10	11	15

22 (a) The first three-point moving average is 6.

Calculate the second and third three-point moving averages.

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Answer ..... and ..... *(2 marks)*

22 (b) Use the trend of the moving averages to calculate the likely number of accidents in 2009.
You **must** show your working.

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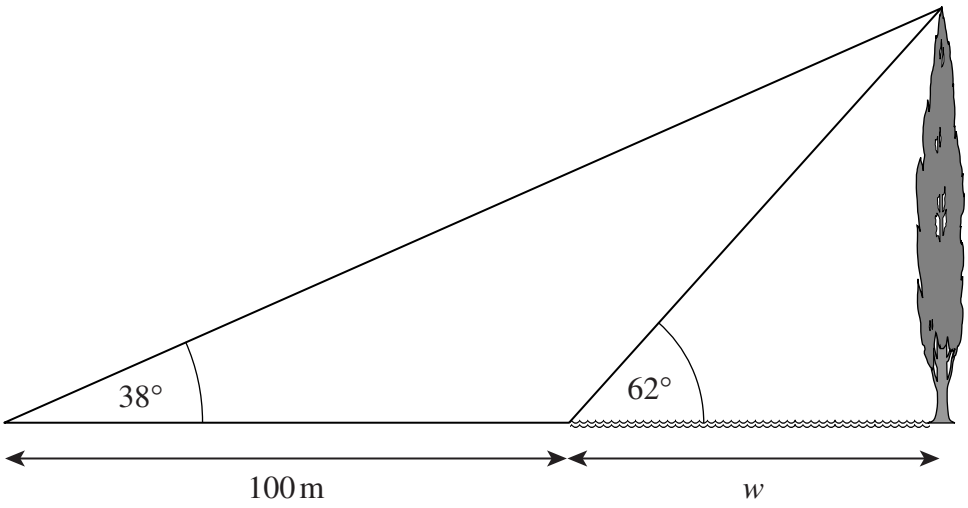
Answer ..... *(3 marks)*

23 Rashid wants to find the width, w, of a river.
He stands at the bank of the river and measures the angle of elevation of a tree on the opposite bank as 62°.
He walks 100 metres directly back from the bank and measures the angle of elevation of the same tree as 38°.



Calculate the width, w, of the river.

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Answer ..... m *(5 marks)*

10

Turn over ▶

24 Winston, who lives in London, bought a classic American car from a dealer in New York on the internet for $12 000.
When he bought the car the exchange rate between pounds and dollars was £1 = $1.84
The cost of transporting the car from America to Britain was £450.
The car arrived in Britain six weeks later.
By this time the exchange rate had changed to £1 = $1.95
On the government web site Winston downloaded a form to help him work out the cost of importing the car into Britain.

How much will it cost to bring a car to Britain from the USA?

Step 1: Convert the cost of the car in dollars to pounds using the exchange rate on the day the car arrives in Britain.	**A**	£
Step 2: Calculate the import tax which is 6% of the cost in box A.	**B**	£
Step 3: Write down the transport cost	**C**	£
Step 4: Add up boxes A, B and C	**D**	£
Step 5: Calculate VAT at $17\frac{1}{2}\%$ of box D	**E**	£
Step 6: Add boxes B and E to find out how much the total import duty to pay to customs and excise.	**F**	£

The total cost to Winston will be the original cost (in £) plus the transport cost plus the total import duty.
How much did the car cost Winston **altogether**?

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Answer £ ..... *(5 marks)*

Turn over for the next question

5

25 Solve the equation $\frac{6}{x-1} - \frac{4}{x+3} = 1$

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Answer ..... *(5 marks)*

26 Seth and Beth each own a dog.

The probability that Seth walks his dog on a given day is 0.7
The probability that Beth walks her dog on a given day is x.
These are independent events.

26 (a) Show that the probability that neither of them walks their dog on a given day is $0.3 - 0.3x$

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(2 marks)

26 (b) You are given that $x = 0.6$

Find the probability that they both walk their dog on two consecutive days.

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Answer ..... *(2 marks)*

END OF QUESTIONS

9

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Q	Answers	Mark	Comments
1	80 – (18 + 32 + 4)	B1	oe
	(their 26) ÷ 80 (× 100)	M1	oe
	32.5%	A1	oe
2	36 000 – 5000	M1	31 000
	Their 31 000 × 0.22	M1	
	6820	A1	oe
3(a)	10 **and** 0	B1	
3(b)	At least 7 correct points plotted	B1	ft their points
	Smooth curve	B1	Within ± 1 mm tolerance
3(c)	–0.8	B1	B1 if line drawn at $y = 6$
	3.8	B1	
4(a)	4.23683…..	B1	
4(b)	4.2 or 4.24	B1ft	ft their (a) if 4sf or bigger and rounded to 2 or 3 sf.
5(a)	$2x^2 - 8x$	B1	
5(b)	$y(y - 5)$	B1	
5(c)	$6w^3z^4$	B2	–1eeoo
6(a)	3 × 180 or splitting pentagon into 3 triangles	M1	540
	108	A1	
6(b)	(180 – their 108) ÷ 2	M1	72 ÷ 2 (180 – (360 ÷ 5))
	36	A1	

Q	Answers	Mark	Comments
7(a)	A and C	B2	–1 eeoo 1 correct B1
7(b)	Evidence of testing an odd input with any values	M1	
	Any two values, either First odd, second odd Or first even, second even	A1	
8(a)	J	B1	
8(b)	Correct plots	B2	–1eeoo
8(c)	Line within tolerance	B1	
8(d)	≈40	B1ft	ft their line of best fit ± 1 mm
8(e)	The quicker the finishing time the larger the handicap	B1	oe But must compare finish time and handicap.
9(a)	$3x - x = 5 - 8$	M1	Allow one sign error
	-1.5	A1	oe
9(b)	$5y + 13 = 2y - 2$	M1	Allow one sign or arithmetic error but not $5y + 13 = 2y - 1$
	$5y - 2y = -2 - 13$	M1	Allow one sign error
	$y = -5$	A1ft	ft on one error only **SC1** $y = 14/3$ oe
10(a)	Reflection	B1	
	$x = -1$	B1	
10(b)	Correct position	B2	B1 For clockwise 90° rotation about (0, –1) B1 For anti-clockwise 90° rotation about (–1, 0)

Q	Answers	Mark	Comments
11	$(x^2 =)\ 38^2 - 26^2$	M1	
	$\sqrt{768}$	M1	Must square and add and show square root
	28, 27.7….	A1	28 with no working is no marks
12(a)	145	B1	
12(b)	155	B1	
13	$x + x + 6 + 2(x + 6)$	M1	Allow sum of any two ages for M
	$4x + 18 = 38$	M1	Allow one error collecting terms but at least one of expansion terms, $2x$ or 12 must be correct.
	5	A1ft	ft on one error only.
14(a)	Kite	B1	
14(b)	Trapezium	B1	
15(a)	40×0.175	M1	
	7	B1	
15(b)	Any combination of blue ÷ total = 0.2	B1	
16(a)	Switzerland		
16(b)	61 000 000	B1	
16(c)	75 500 000	B1	7.5×10^7
16(d)	$6.1 \times 10^7 \div (240\ 000 - 241600)$	M1	
	250 – 254	A1	
17	$(x \pm a)(x \pm b)$	M1	$ab = 15$
	(x – 5)(x + 3)	A1	

Q	Answers	Mark	Comments
18(a)	Attempt at gradient	M1	Accept equivalent fractions to $\frac{1}{3}$ (denominator must be seen) as evidence or attempts to subtract coordinates and divide or evidence of a right angled triangle marked on diagram.
	(gradient AB =) $\frac{1}{3}$	A1	
	$y = \frac{1}{3}x + 1$	A1ft	ft their gradient if M1 awarded.
18(b)	$-3(x)$	B1ft	ft The negative reciprocal of their gradient in (a)
19(a)	40°	B1	
19(b)	1.5 or $\frac{2}{3}$ seen	M1	$y/6 = 6/4$
	9	A1	
20	$3.6t - 0.45t^2 = 0$	M1	
	$t(3.6 - 0.45t) = 0$	A1	
	(t =) 0 or 8	A1	
21(a)	140	B1	
	110	B1	
21(b)	$CAB = 70$ or $ABC = 42$	B1	
	$COB = 140$ or COB reflex = 220	B1	
	360 – 220 – 48 – 70	M1	(180 – 140) ÷ 2
	22	A1	
22(a)	(5 + 9 + 10) ÷ 3 or (9 + 10 + 11) ÷ 3	M1	
	8 **and** 10	A1	
22(b)	(8, 10, 12) 14	B1	
	(11 + 15 + x) ÷ 3 = 14	M1	oe
	16	A1	

Q	Answers	Mark	Comments
23	Angle at tree 24	B1	
	$\frac{x}{\sin 38} = \frac{100}{\sin 24}$	M1	$\frac{y}{\sin 118} = \frac{100}{\sin 24}$
	$x = 151.36\ldots$	A1	$y = 217.08\ldots$
	$(w =)\ 151.36 \times \cos 62$	M1	$(w + 100 =)\ 217.08 \times \cos 38$
	71, 71.1, 71.06, 71.059…	A1	
23 Alt	$\tan 38 = T \div (w + 100)$ and and $\tan 62 = T \div w$	M2	
	$w\tan 62 = (w + 100)\tan 38$	A1	
	$w = 100\tan 38 \div (\tan 62 - \tan 38)$	A1	
	71, 71.1, 71.06, 71.059…	A1	
24	Does calculations as described in download	M1	
	Correct values for A, B and C	A1	A 6153.85 B 369.23 C 450 Allow rounding to nearest £ and/or truncation
	Correct values for D, E and F	A1ft	D 6973.08 E 1220.29 F 1589.52 All values can ft
	Original cost 6521.74	B1	Allow rounding or truncation
	(£) 8561.26	B1	ft their F + 6521.74 + 450
25	$6(x + 3) - 4(x - 1)$	M1	LHS ignore any denominators
	$(x - 1)(x + 3)$	M1	RHS
	$6x + 18 - 4x + 4 = x^2 + 2x - 3$	A1	
	$x^2 - 25 = 0$	M1	M1 for collecting terms into general quadratic
	5 **and** –5	A1	

Q	Answers	Mark	Comments
26(a)	$(1 - 0.7)(1 - x)$	M1	
	$0.3(1 - x)$	A1	
26(b)	$0.7 \times 0.6 \times (0.7 \times 0.6)$	M1	
	0.1764	A1	