Cambridge Assessment

GCSE

Mathematics A

Session: 2010 June
Type: Question paper
Code: J512
Units: 01; 02; 03; 04

OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS SYLLABUS A

J512/01

Paper 1 (Foundation Tier)

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Geometrical instruments
- Tracing paper (optional)

Monday 7 June 2010
Afternoon

Duration: 2 hours

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

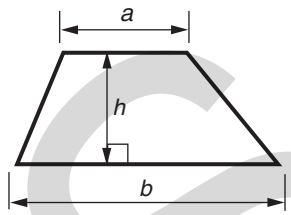
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

WARNING

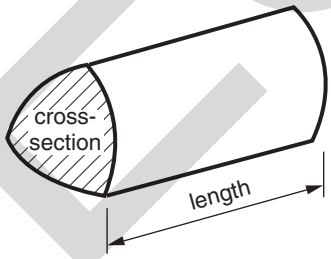
No calculator can be used for this paper

Formulae Sheet: Foundation Tier

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



Volume of prism = (area of cross-section) × length



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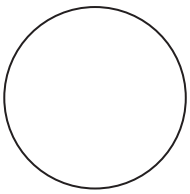
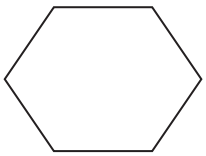
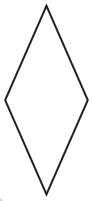
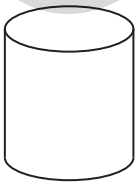
1 Put a ring round the mathematical name for each shape.
The first one has been done for you.

	Kite **Rectangle** Octagon Circle
(a) 	Quadrilateral Rectangle Octagon Circle
(b) 	Quadrilateral Hexagon Octagon Circle
(c) 	Pentagon Hexagon Rhombus Triangle
(d) 	Arrowhead Parallelogram Octagon Trapezium
(e) 	Cylinder Cone Sphere Cuboid

[5]

2 **(a)** Write these numbers in order, smallest first.

12 000 100 000 2389 25 490

.....

_____ _____ _____ _____ **[1]**

smallest

(b) Complete this sum.

$$43 + \_\_\_\_\_ = 100$$ **[1]**

(c) **(i)** In 2008 the average cost of a house was two hundred and eighteen thousand, one hundred and twelve pounds.

Write two hundred and eighteen thousand, one hundred and twelve in figures.

(c)(i) _____ **[1]**

(ii) In 2008 the average cost of a terraced house was £173 858.

Write 173 858 correct to the nearest hundred.

(ii) _____ **[1]**

(iii) In 1967 the average cost of a house was £4077.

Write 4077 in words.

_____ **[1]**

3 A number is written on each face of a six-sided dice.
Five different numbers are used and one of these numbers appears twice.
Ravneet rolls the dice 30 times and records the results.

6	0	6	0	6	0
6	7	3	6	4	6
4	3	0	6	6	7
6	0	4	6	3	3
7	7	0	6	0	4

(a) Complete this frequency table to show her results.

Result	Tally	Frequency
0		
3		
4		
6		
7		

[2]

(b) What is the mode of her results?

(b) _____ **[1]**

(c) Which number probably appears twice on her dice?

(c) _____ **[1]**

4 **(a)** Write down three **even** numbers between 1 and 10.

(a) _____ **[1]**

(b) Complete these statements using the words 'odd' or 'even'.
The first one has been done for you.

even	+	even	=	even
odd	+	odd	=	_____
odd	×	even	=	_____
odd	×	odd	=	_____

[3]

(c) **(i)** Find the sum of the first 3 odd numbers, 1 + 3 + 5.

.....

(c)(i) _____ **[1]**

(ii) Find the sum of the first 5 odd numbers.

.....

(ii) _____ **[1]**

(iii) Find the square root of the sum of the first 9 odd numbers.

.....

.....

.....

(iii) _____ **[2]**

5 Write

(a) 50% as a fraction,

(a) _____ **[1]**

(b) $\frac{3}{4}$ as a decimal,

(b) _____ **[1]**

(c) 0.25 as a percentage,

(c) _____ % **[1]**

(d) 0.12 as a fraction in its lowest terms.

.....

.....

(d) _____ **[2]**

6 Ticket prices at the zoo are £6.50 for an adult and £4.50 for a child.
A family ticket costs £18 and can be used for up to two adults and up to four children.
Mr and Mrs Wheat and their three children go to the zoo.

How much cheaper is it to buy a family ticket instead of separate adult and child tickets?

.....

.....

.....

.....

.....

.....

.....

£ _____ **[4]**

7 This is the breakfast menu in a small hotel.

Breakfast	
Choose one from	orange juice (o) apple juice (a) fresh fruit (f)
Followed by one from	cereal (c) scrambled eggs (s) kippers (k)

(a) Complete the table to show all the different choices that can be made by people who choose two items from the menu.
The first one has been done for you.
You may not need all the lines.

o	c

[2]

(b) Adam chooses his breakfast at random from this menu.

What is the probability he chooses apple juice and kippers?

.....

(b) _____ **[1]**

(c) The new chef looks at the menu and prepares the same number of servings of cereal, scrambled eggs and kippers.

Why might this **not** be a sensible decision?

_____

_____ **[1]**

8 **(a)** Simplify.

(i) $e + 7e$

(a)(i) _____ **[1]**

(ii) $2c + 8d + 3c - 6d$

.....

(ii) _____ **[2]**

(iii) $g \times g \times g \times g$

(iii) _____ **[1]**

(b) Solve.

(i) $9x = 45$

.....

(b)(i) _____ **[1]**

(ii) $\frac{y}{7} = 3$

.....

(ii) _____ **[1]**

9 Seth has a badge with his name written on it.

(a) Draw the line of symmetry on this letter T.

[1]

(b) One of the letters on the badge has more than one line of symmetry.

Copy this letter in the space below and draw all its lines of symmetry. **[2]**

(c) Write down a letter that has rotational symmetry of order 2.

(c) _____ **[1]**

10 Work out.

(a) 9^2

(a) _____ **[1]**

(b) $\sqrt{16}$

(b) _____ **[1]**

(c) $\frac{3}{8}$ of 40

.....

.....

(c) _____ **[2]**

(d) 30% of 70

.....

.....

(d) _____ **[2]**

(e) 72×24

You must show your working.

.....

.....

.....

.....

.....

(e) _____ **[3]**

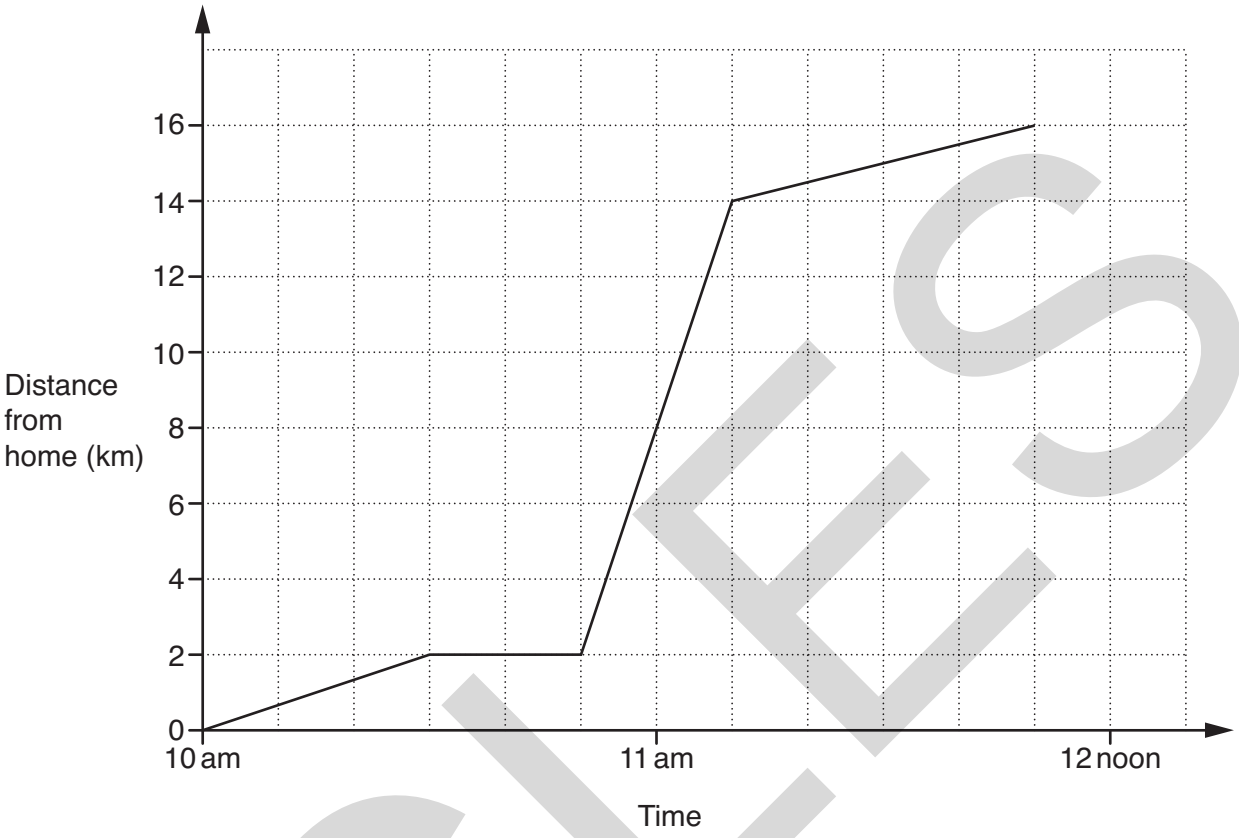
(f) $10^3 + 2^3$

.....

.....

(f) _____ **[2]**

11 Farrel travelled from his home to a country park.
He walked to the station, took the train and finally walked to the park.
This distance-time graph represents his journey.



(a) Farrel walked the first 2 km.

How long did this take him?

(a) _____ minutes **[1]**

(b) Mark with a cross (**X**) the section of the graph that represents Farrel waiting for his train. **[1]**

(c) (i) How far did Farrel travel by train?

(c)(i) _____ km **[1]**

(ii) Calculate the average speed of the train journey in kilometres per hour.

.....

.....

.....

(ii) _____km/h **[2]**

(d) Farrel thinks he walked more slowly at the end of his journey than at the beginning.

How can you tell that he is correct?

_____ **[1]**

12 This stem and leaf diagram shows the ages in years of all the teachers at a small school.

2	3	8			
3	0	2	4	5	5
4	1	3	4	8	
5	4	7	8		
6	0	1			

Key: 3 | 0 represents 30 years

(a) How many teachers are there at the school?

(a) _____ **[1]**

(b) How old is the youngest teacher?

(b) _____ years **[1]**

(c) What is the range of the ages?

.....

(c) _____ years **[2]**

(d) What is the median age?

.....

(d) _____ years **[2]**

(e) At the end of term a teacher leaves and is replaced by a new teacher.
The modal age goes down by 3 years.

What are the ages of the teacher who left and the new teacher?

.....

.....

.....

(e) Teacher who left _____ years

New teacher _____ years **[3]**

(f) Mr Hibley is 60 years old.
The probability that Mr Hibley will retire this year is 0.83.

What is the probability that Mr Hibley will not retire this year?

.....

(f) _____ **[1]**

13 **(a)** Explain why each answer is incorrect.

(i) $3.7 \times -4.5 = 16.65$

_____

_____

_____ **[1]**

(ii) $\sqrt{67.24} = 7.2$

_____

_____

_____ **[1]**

(iii) $6.3 \div 0.9 = 70$

_____

_____

_____ **[1]**

(b) Work out.

(i) $(16 + 5) \div 3$

.....

.....

(b)(i) _____ **[1]**

(ii) $4 + 6 \times 3$

.....

.....

(ii) _____ **[1]**

(c) Put one pair of brackets into this equation to make it correct.

$$44 - 26 - 3 + 8 = 7$$

[1]

14 Work out the value of $x^2 + 5x$ when

(a) $x = -2$,

.....

.....

(a) _____ **[2]**

(b) $x = \frac{1}{2}$.

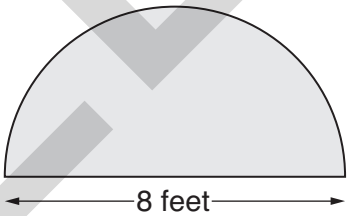
.....

.....

(b) _____ **[2]**

15 *In this question, take the value of π to be 3.*

Emma visited a stately home.
In one of the rooms there was a semi-circular carpet.
The diameter of the carpet was 8 feet.



Work out the area of the carpet.
Give the units of your answer.

.....

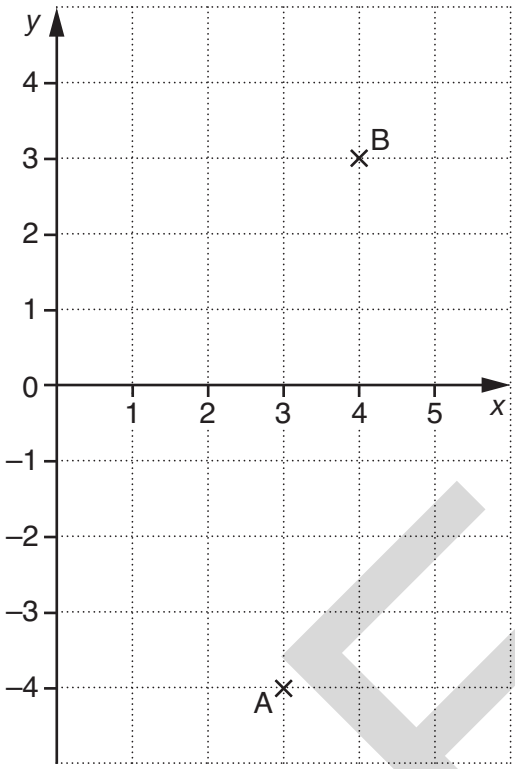
.....

.....

.....

_____ **[3]**

16



(a) An anticlockwise rotation, centre (0, 0), will map point A onto point B.

What is the angle of the rotation?

(a) _____ ° **[1]**

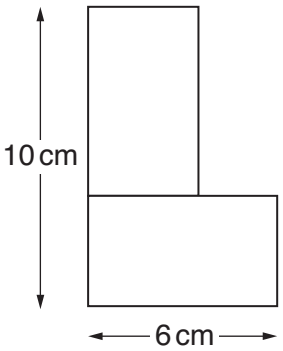
(b) Describe **fully** a different type of transformation which will map point A onto point B.

_____

_____

_____ **[3]**

17 The diagram shows two **identical** rectangles joined to make an L shape.



NOT TO SCALE

Work out

(a) the total area of the L shape,

.....

.....

.....

.....

.....

.....

(a) _____ cm^2 **[3]**

(b) the perimeter of the L shape.

.....

.....

.....

.....

.....

.....

(b) _____ cm **[3]**

18 *Use ruler and compasses only in this question.*

Find and indicate clearly all possible points that are both

- 6 cm from A

and

- equidistant from B and C.

[5]

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS SYLLABUS A

J512/02

Paper 2 (Foundation Tier)

OCE/12201

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Electronic calculator
- Geometrical instruments
- Tracing paper (optional)

Friday 11 June 2010
Morning

Duration: 2 hours

J512/02

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

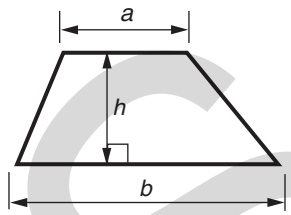
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

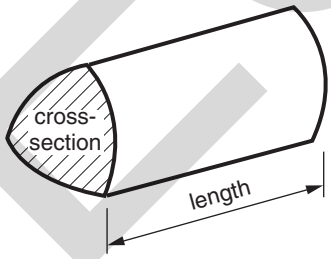
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You are expected to use an electronic calculator for this paper.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

Formulae Sheet: Foundation Tier

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



Volume of prism = (area of cross-section) × length



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1 Here are some of the prices at a cinema.

Ticket Prices	
Adult	£5.50
Child	£3.50

Cola	-	small	£2.30
	-	large	£3.00
Popcorn	-	small	£2.50
	-	large	£3.40
Hot dog	-		£3.30
Ice cream	-		£2.70

Tony takes his two children to the cinema.

Fill in the gaps in his bill.

.....

.....

.....

.....

.....

1 adult ticket and 2 child tickets	£ .
2 small and 1 large cola	£ .
1 small and 1 large popcorn	£ .
1 hot dog and 3 ice creams	£ .
TOTAL	£ .

[5]

2 Here is some information about pizza sales.

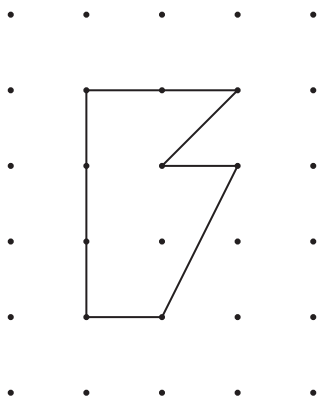
Fill in the four gaps.

Key: ● represents 10 pizzas

Type of pizza	Pictogram	Number sold
Margherita	● ● ●	30
Hawaiian	● ●	
Vegetarian	● ◗	15
Californian		25
Meat Feast	● ● ● ◔	
Pepperoni		42

[4]

3 This shape is drawn on 1 cm square dotty paper.



(a) Work out the area of the shape.

.....

.....

(a) _____ cm^2 **[2]**

(b) Here are some statements about the perimeter of this shape.
Put a tick (✓) next to any that are correct and a cross (✘) next to any that are incorrect.

The perimeter is greater than 10 cm. ☐

The perimeter is equal to 10 cm. ☐

The perimeter is less than 12 cm. ☐

The perimeter is equal to 12 cm. ☐

[2]

4 Complete the sentences below.

Use words from this list.

likely	impossible	certain	unlikely	evens

(a) It is _____ that everyone will die eventually. **[1]**

(b) It is _____ that I will eat some food tomorrow. **[1]**

(c) It is _____ that when I roll an ordinary dice I will get an odd number. **[1]**

(d) It is _____ that tomorrow will be Sunday. **[1]**

5 **(a)** What is the place value of the figure 4 in the number 324 876?

(a) _____ **[1]**

(b) Arrange the figures 3, 2, 4, 8, 7, 6 to make the largest number possible.

(b) _____ **[1]**

(c) Which of the numbers 3, 2, 4, 8, 7, 6 are factors of 12?

(c) _____ **[1]**

(d) Which one of the numbers 3, 2, 4, 8, 7, 6 is a square number?

(d) _____ **[1]**

(e) Use the figures 3, 2, 4, 8, 7, 6 once each to fill in the gaps to make this addition sum correct.

	3	□	7	4	6	□
+	8	□	2	□	□	□
1	1	6	0	2	1	4

[2]

(f) Select two of the numbers 3, 2, 4, 8, 7, 6 to make a fraction that is equivalent to $\frac{1}{3}$.

(f) $\frac{\square}{\square}$ **[1]**

6 **(a)** Solve.

(i) $x + 2 = 9$

.....

(a)(i) _____ **[1]**

(ii) $5y - 1 = 9$

.....

.....

(ii) _____ **[2]**

(iii) $4t + 17 = 19$

.....

.....

(iii) _____ **[2]**

(b) Write down the next two numbers in this sequence.

22 21 18 13 _____ _____ **[2]**

7 Jameel needs to work out the range and the median of this set of nine numbers.

6 9 17 11 14 9 2 25 10

Explain how to do it.
You do not have to do any calculations.

(a) To find the range of this set of numbers you have to _____

_____

_____ **[2]**

(b) To find the median of this set of numbers you have to _____

_____

_____ **[2]**

8 **(a)** Draw a circle with radius 3 cm. **[1]**

(b) **(i)** Mark the midpoint of the line EF with a cross (✘).

E ——————————————————— F

[1]

(ii) In the space above, draw a line which is parallel to the line EF.
Label this line Y. **[1]**

(iii) In the space above, draw a line which is perpendicular to the line EF.
Label this line Z. **[1]**

(iv) Measure the line EF above.

(b)(iv) _____ cm **[1]**

9 **(a)** **(i)** Draw and label an angle of 123°. **[1]**

(ii) Draw and label an angle of 205°. **[2]**

(b) From these types of angles, choose the correct one for each part.

Give a reason for your choice.

acute	reflex	a right angle	obtuse

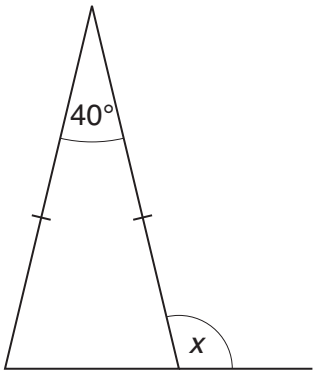
(i) An angle of 123° is _____ because _____

_____ **[2]**

(ii) An angle of 205° is_____ because _____

_____ **[2]**

10 (a)



NOT TO SCALE

Work out the size of angle *x*.

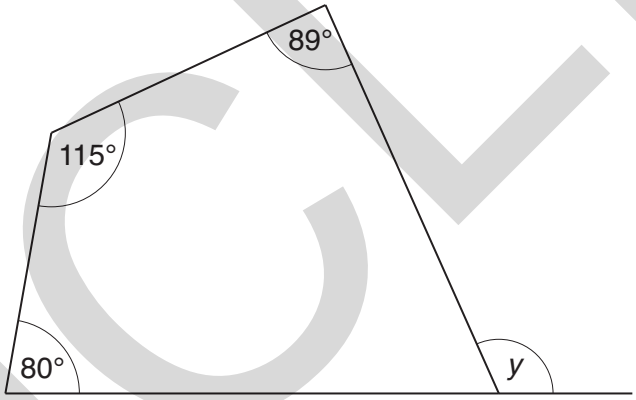
.....

.....

.....

(a) _____ ° **[3]**

(b)



NOT TO SCALE

Work out the size of angle *y*.

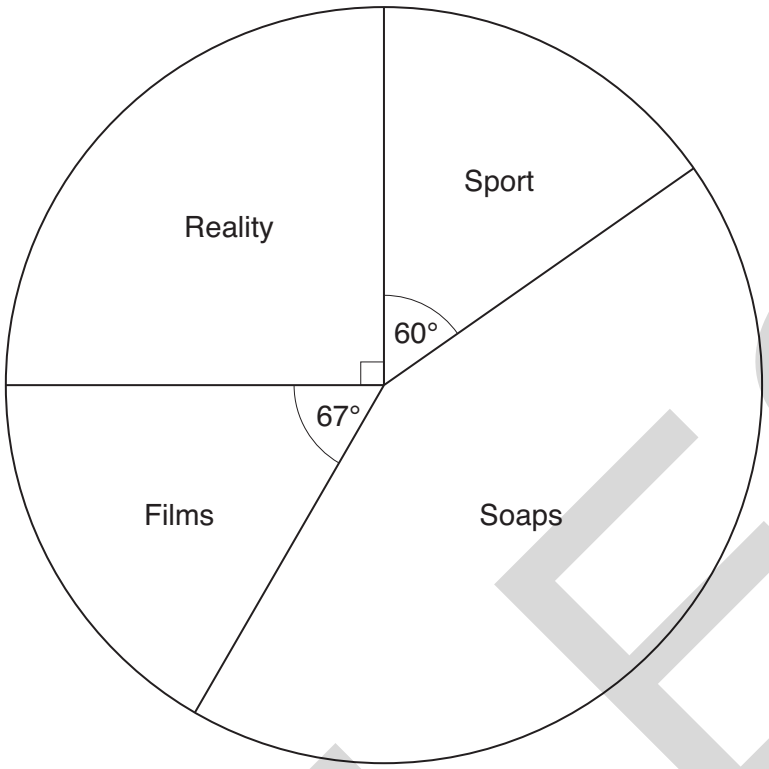
.....

.....

.....

(b) _____ ° **[3]**

11 This pie chart represents the favourite type of television programme of some students.



(a) Which type of television programme was the favourite of exactly $\frac{1}{4}$ of these students?

.....

(a) _____ **[1]**

(b) What **fraction** of these students chose Sport?
Give your answer in its simplest form.

.....

.....

(b) _____ **[2]**

(c) Work out the size of the angle for Soaps.

.....

.....

(c) _____ ° **[2]**

12 A red spinner has the numbers 2, 3, 4 and 5 on it.
A blue spinner has the numbers 4, 5, 6 and 7 on it.
The two spinners are spun together.
The possible totals of the two scores are shown in the table.

Score on the red spinner

Score on the blue spinner	+	2	3	4	5
	4	6	7	8	9
	5	7	8	9	10
	6	8	9	10	11
	7	9	10	11	12

(a) Find the probability that the total is 10.

.....

.....

(a) _____ **[1]**

(b) Find the probability that the total is 7 or 8.

.....

.....

(b) _____ **[1]**

(c) Find the probability that the total is **greater than** 8.

.....

.....

(c) _____ **[2]**

13 (a) (i) What number is 6 more than -4?

.....

(a)(i) _____ **[1]**

(ii) What number is 5 less than -1?

.....

(ii) _____ **[1]**

(b) Work out.

(i) -3×-5

.....

(b)(i) _____ **[1]**

(ii) $-3 + -5$

.....

(ii) _____ **[1]**

(c) Write 28.059 14 correct to

(i) 1 decimal place,

(c)(i) _____ **[1]**

(ii) 2 decimal places,

(ii) _____ **[1]**

(iii) 3 decimal places.

(iii) _____ **[1]**

(d) Here is a list of numbers.

4 9 11 15 22 27 33

From this list select

(i) the prime number,

(d)(i) _____ **[1]**

(ii) the cube number.

(ii) _____ **[1]**

14 Calculate.

(a) $3.1^3 + \sqrt{2.89}$

.....

(a) _____ **[1]**

(b) $\dfrac{31.8 \times 0.4}{5.3 - 2.8}$

.....

.....

(b) _____ **[2]**

15 Reuben bought 2 bars of chocolate and 44 jelly snakes.
The chocolate bars cost 84 pence each and the jelly snakes cost x pence each.

(a) Write down an expression for the total cost, in pence.

.....

(a) _____ **[1]**

Reuben spent £5.20 altogether.

(b) Write down an equation and solve it to find the cost of one jelly snake.

.....

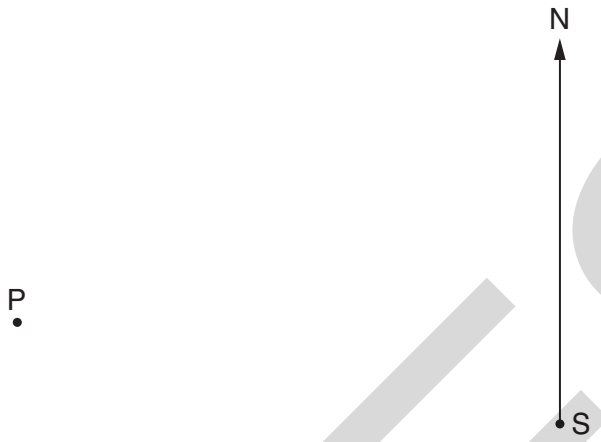
.....

.....

.....

(b) _____pence **[3]**

16 The diagram shows the positions of a phone mast, P, and a school, S.



(a) Find the bearing of the phone mast from the school.

.....

(a) _____ ° **[1]**

(b) Richard cycles from the school, in a straight line, on a bearing of 320°.

(i) Draw a line to show Richard's route. **[1]**

(ii) Mark a point X on the line where Richard is closest to the phone mast. **[1]**

(iii) What should angle PXS be?

.....

(b) (iii) _____ **[1]**

17 **(a)** Draw the graph of $y = 2x + 1$.
You may use the table to help you.

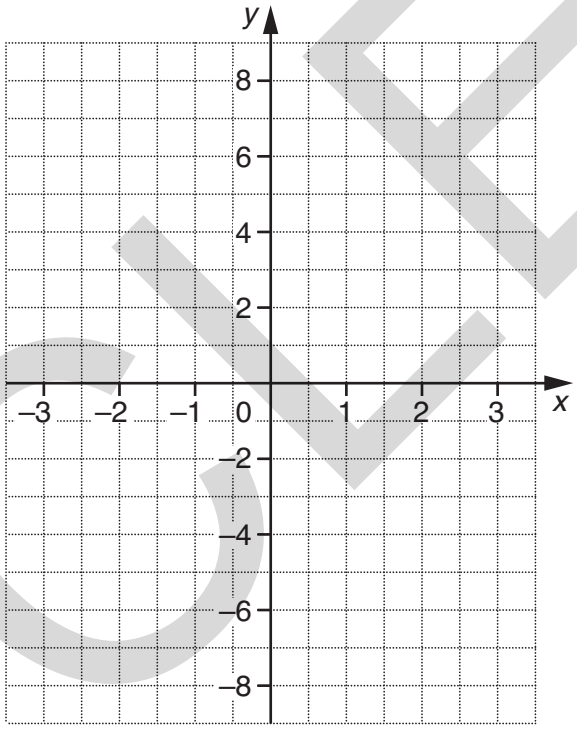
x			
y			

.....

.....

.....

.....



[3]

(b) Use your graph to find the value of x for which $y = 6$.

(b) _____ **[1]**

18 Solve.

(a) $3x - 5 = x + 4$

.....

.....

.....

(a) _____ **[3]**

(b) $5x + 6 > 28$

.....

.....

(b) _____ **[2]**

19 Orange paint is made by mixing red, yellow and white paint in the ratio 5 : 2 : 1.
Vincent makes 12 litres of orange paint.

How much of each colour paint does he use?

.....

.....

.....

.....

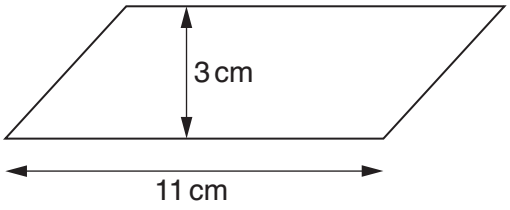
red _____ litres

yellow _____ litres

white _____ litres **[4]**

TURN OVER FOR QUESTIONS 20 AND 21

20 A block of beeswax is made in the shape of a prism.
Its cross-section is a parallelogram as shown.



NOT TO SCALE

The length of the prism is 6 cm.

Calculate the volume of the block of beeswax.

.....

.....

.....

.....

_____ cm^3 **[3]**

21 Write 36 as a product of prime factors.

.....

.....

_____ **[2]**

OCR
RECOGNISING ACHIEVEMENT

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS SYLLABUS A

J512/03

Paper 3 (Higher Tier)

OCE/10494

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Geometrical instruments
- Tracing paper (optional)

Monday 7 June 2010
Afternoon

Duration: 2 hours

J512003

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

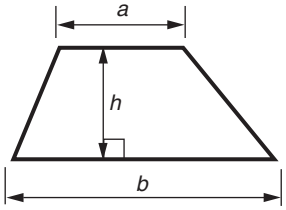
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

WARNING

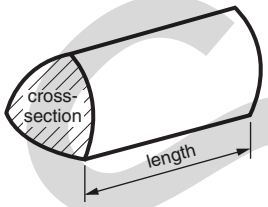
No calculator can be used for this paper

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

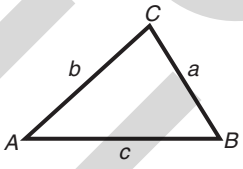


In any triangle *ABC*

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

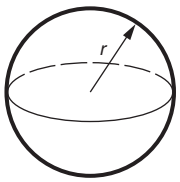
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



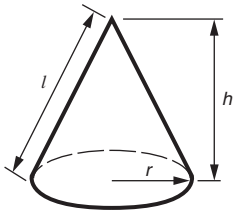
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

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

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

PLEASE DO NOT WRITE ON THIS PAGE

1 **(a)** Explain why each answer is incorrect.

(i) $3.7 \times -4.5 = 16.65$

_____

_____

_____ **[1]**

(ii) $\sqrt{67.24} = 7.2$

_____

_____

_____ **[1]**

(iii) $6.3 \div 0.9 = 70$

_____

_____

_____ **[1]**

(b) Work out.

(i) $(16 + 5) \div 3$

.....

.....

(b)(i) _____ **[1]**

(ii) $4 + 6 \times 3$

.....

.....

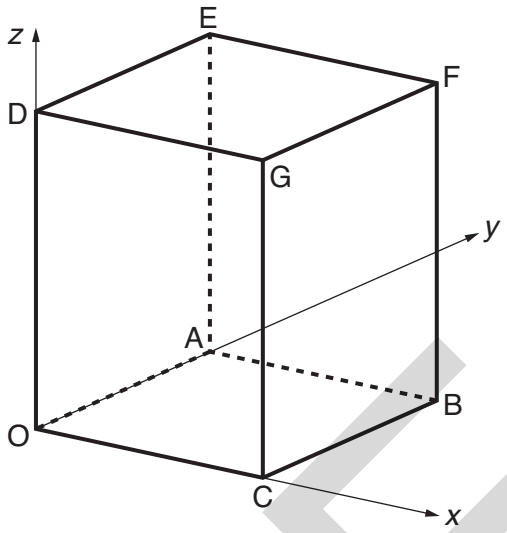
(ii) _____ **[1]**

(c) Put one pair of brackets into this equation to make it correct.

$$44 - 26 - 3 + 8 = 7$$

[1]

2 In the diagram, O is the origin.
Each line is parallel to one of the axes.
OA = 2, OC = 3 and OD = 5 units.



Write down the coordinates of

(a) D,

(a) (____, ____, ____) **[1]**

(b) F,

(b) (____, ____, ____) **[1]**

(c) the midpoint of AB.

(c) (____, ____, ____) **[1]**

3 Solve.

$2(x + 7) = 10$

.....

.....

.....

.....

_____ **[3]**

4 60% of the members of a youth club are girls.
There are 12 boys in the youth club.

How many members are there in the youth club altogether?

.....

.....

.....

.....

.....

.....

_____ **[4]**

5 **(a)** Work out the value of $x^2 + 5x$ when

(i) $x = -2$,

.....

.....

(a)(i) _____ **[2]**

(ii) $x = \frac{1}{2}$.

.....

.....

(ii) _____ **[2]**

(b) The formula for the nth term of a number sequence is $3n + 2$.

Work out the **first three** terms of this sequence.

.....

.....

(b) _____ , _____ , _____ **[2]**

6 A biased spinner is numbered 1, 2, 3 and 4.
The table shows the probability of the spinner landing on each of the numbers.

Number	1	2	3	4
Probability	0.25	0.4	0.15	0.2

(a) Work out the probability that the spinner lands on 3 or 4 on the next spin.

.....

.....

(a) _____ **[2]**

(b) The spinner is spun twice.

Work out the probability that the spinner lands on 2 each time.

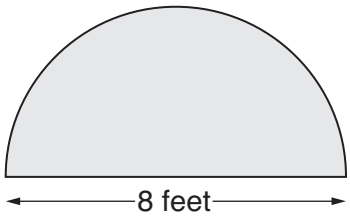
.....

.....

(b) _____ **[2]**

7 *In this question, take the value of π to be 3.*

Emma visited a stately home.
In one of the rooms there was a semi-circular carpet.
The diameter of the carpet was 8 feet.



Work out the area of the carpet.
Give the units of your answer.

.....

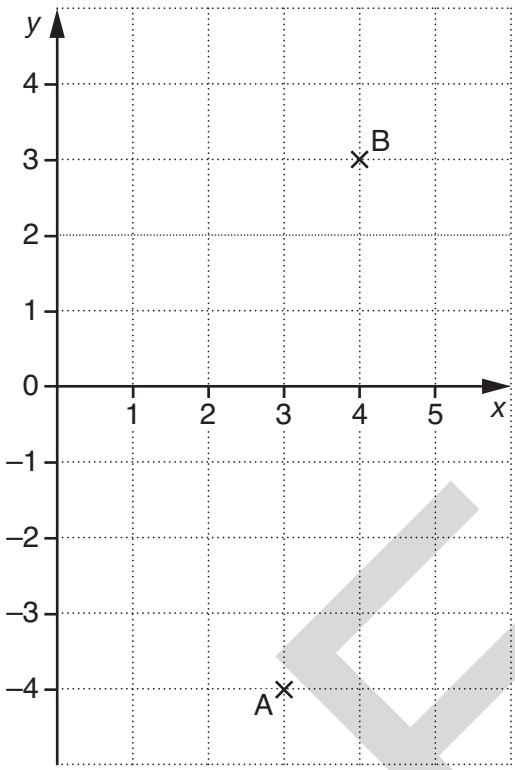
.....

.....

.....

_____ **[3]**

8



(a) An anticlockwise rotation, centre (0, 0), will map point A onto point B.

What is the angle of the rotation?

(a) _____ ° **[1]**

(b) Describe **fully** a different type of transformation which will map point A onto point B.

_____

_____

_____ **[3]**

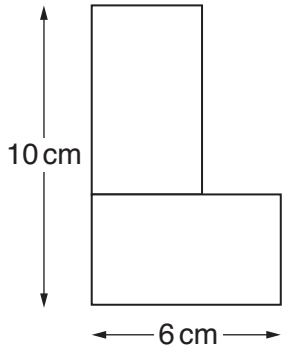
(c) Point A can be mapped onto point B by a reflection in a line parallel to the *x*-axis followed by a reflection in a line parallel to the *y*-axis.

Write down the equation of each of these lines.

.....

(c) _____ and _____ **[2]**

9 **(a)** The diagram shows two **identical** rectangles joined to make an L shape.



NOT TO SCALE

Work out

(i) the total area of the L shape,

.....

.....

.....

.....

.....

.....

(a)(i) _____ cm^2 **[3]**

(ii) the perimeter of the L shape.

.....

.....

.....

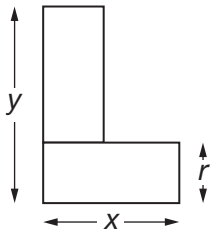
.....

.....

.....

(ii) _____ cm **[3]**

(b) Two other identical rectangles are joined to make an L shape.



(i) Work out the length marked *r.*
Give your answer in terms of *x* and *y*.

.....

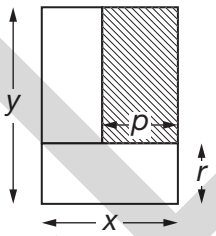
(b)(i) _____ **[1]**

(ii) Use your answer to part **(b)(i)** to explain why $y > x$.

$y > x$ because _____

_____ **[1]**

The L shape is enclosed within an outer rectangle.



(iii) Work out the length marked *p.*
Give your answer in terms of *x* and *y*.

.....

(iii) _____ **[1]**

(iv) Use your answer to part **(b)(iii)** to explain why $y < 2x$.

$y < 2x$ because _____

_____ **[1]**

(v) Work out the shaded area as a fraction of the area of the outer rectangle.
Give your answer in terms of *x* and *y*.

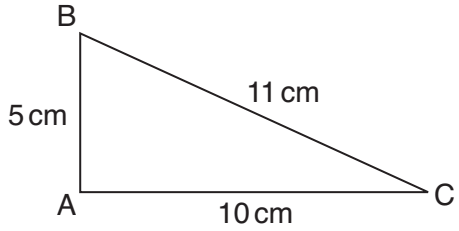
.....

.....

.....

(v) _____ **[2]**

10 Triangle ABC has sides of length 5 cm, 10 cm and 11 cm.



NOT TO SCALE

(a) Show by calculation that angle A is **not** a right angle.

_____

_____

_____

_____

_____ **[3]**

(b) Is angle A greater than or less than 90°?

Use your calculation in part **(a)** to support your decision.

.....

.....

.....

.....

Angle A is _____ than 90° because _____

_____ **[2]**

11 *Use ruler and compasses only in this question.*

Find and indicate clearly all possible points that are both

- 6 cm from A

and

- equidistant from B and C.

[5]

12 Work out.

$$2\frac{2}{3} \times 1\frac{1}{7}$$

Give your answer as a mixed number.

.....

.....

.....

.....

.....

.....

.....

.....

[3]

13 **(a)** Factorise.

$$5x^2 - 10xy$$

.....

.....

.....

.....

(a) **[2]**

(b) Rearrange this formula to make h the subject.

$$A = 2\pi r(r + h)$$

.....

.....

.....

.....

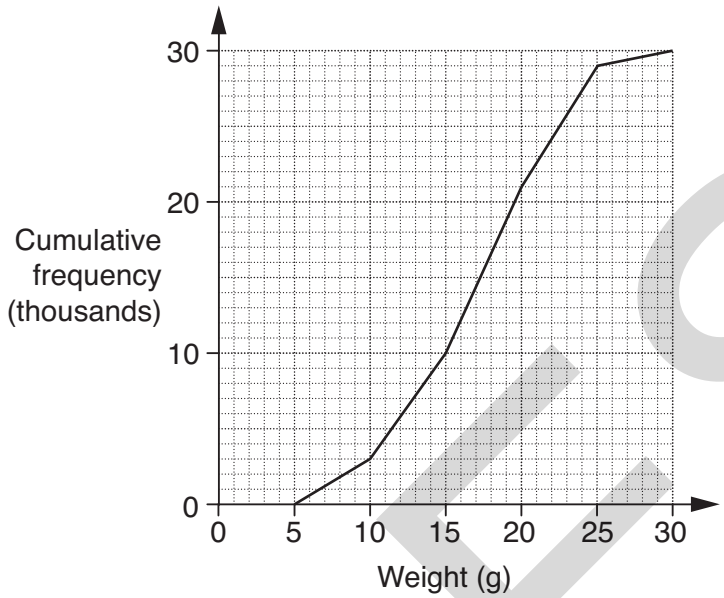
.....

.....

(b) **[3]**

14 A farmer grows strawberries.

(a) The cumulative frequency diagram shows the distribution of the weights of thirty thousand strawberries picked one day.



Use the graph to find

(i) the median weight of the strawberries,

(a)(i) _____ g **[1]**

(ii) the interquartile range of the weights,

.....

.....

(ii) _____ g **[2]**

(iii) the number of strawberries weighing over 20 g.

.....

.....

(iii) _____ **[2]**

(b) One of the strawberries weighs 12 g, correct to the nearest gram.

What is the upper and lower bound of this weight?

(b) Upper bound _____ g

Lower bound _____ g **[2]**

15 A doctor carried out a test on some one-year-old boys and girls.
He timed how long, in seconds, it took each of them to complete a task.

This table shows the distribution of the times for the boys.

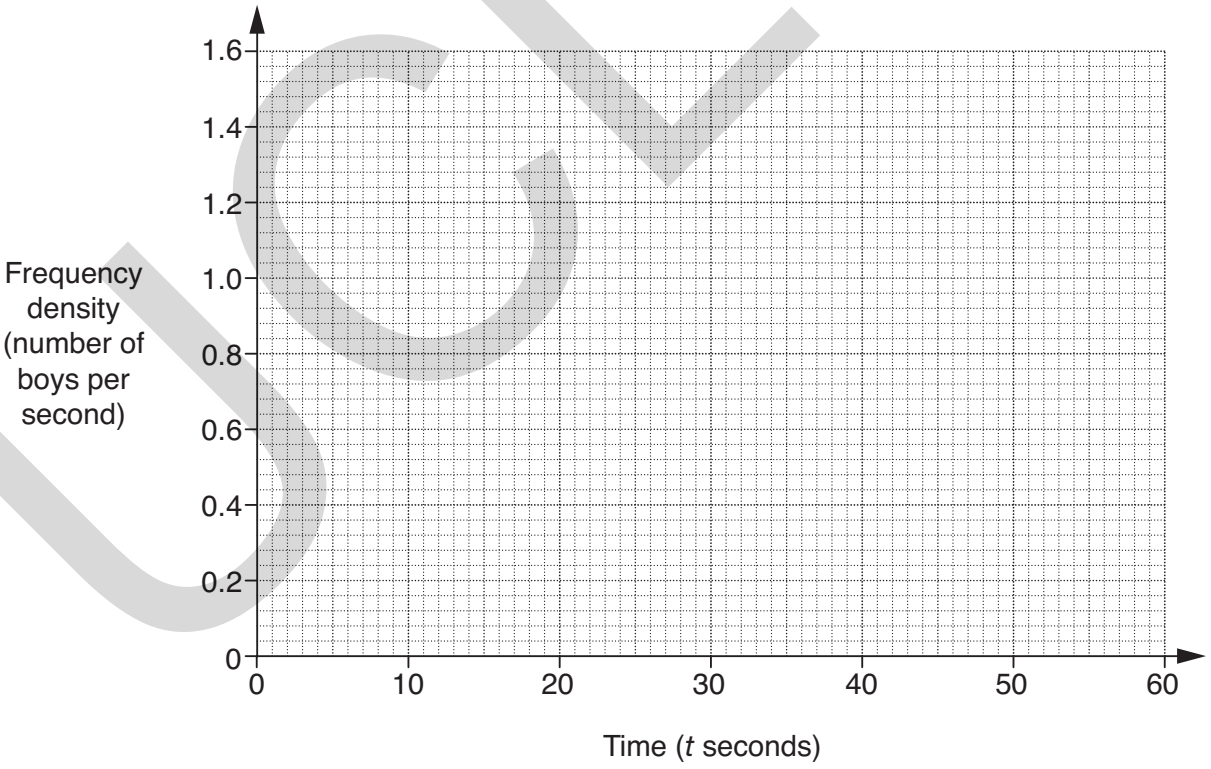
Time (t seconds)	Number of boys
$20 \leqslant t < 30$	4
$30 \leqslant t < 35$	6
$35 \leqslant t < 40$	8
$40 \leqslant t < 60$	12

(a) Estimate the number of boys who took less than 25 seconds.

.....

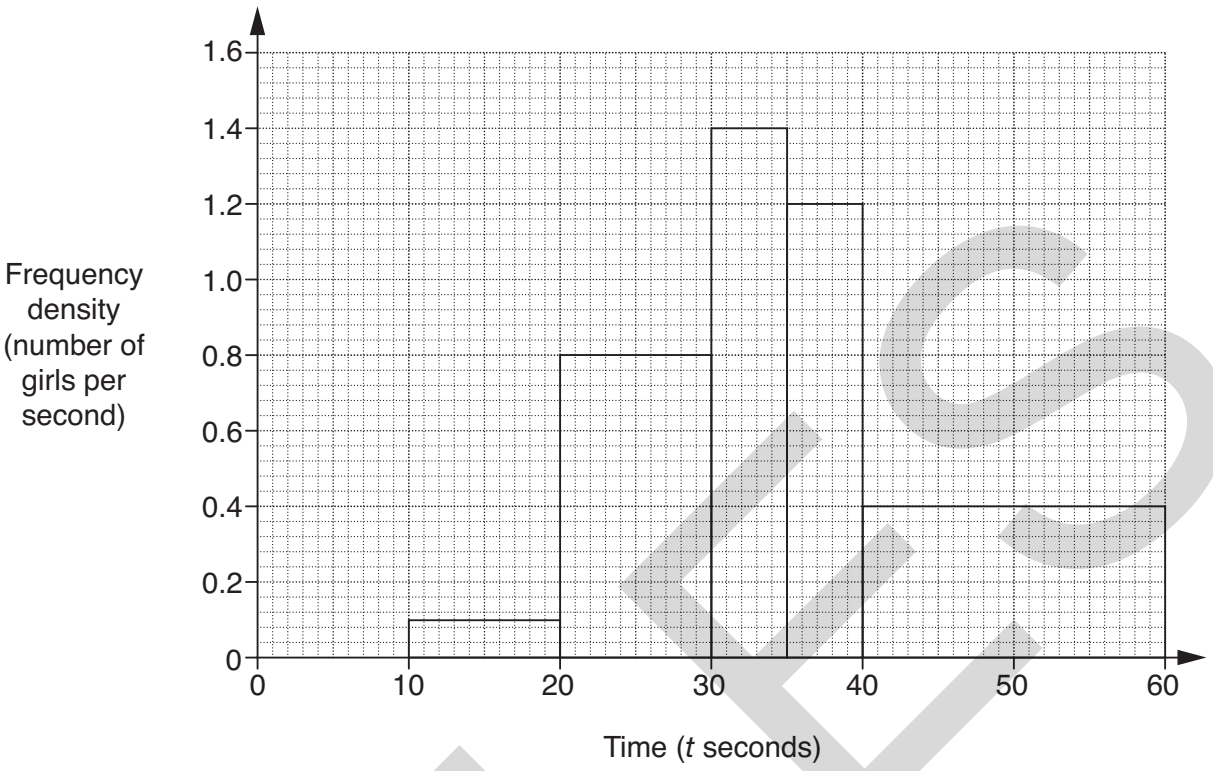
(a) _____ **[1]**

(b) On the grid below, draw a histogram for the boys' times.



[3]

This histogram shows the distribution of the times for the girls.



(c) Estimate the number of girls who took more than 50 seconds.

.....

(c) _____ **[1]**

(d) Make one comparison between the distribution of the times of the boys and the girls.

_____

_____ **[1]**

16 A bus company wants to carry out a survey of students' views about its school bus service.

(a) One bus driver suggests asking every 10th student who gets on the bus.

Which word from this list best describes this type of sampling?

Random Systematic Stratified Quota

(a) _____ **[1]**

(b) The company decides to ask a stratified sample of the 170 boys and 230 girls in Year 11.

Given that they will interview a sample of 80 of these students, how many boys and how many girls should there be in the sample?

.....

.....

.....

.....

.....

.....

(b) boys _____

girls _____ **[3]**

17 **(a)** Write this expression as a single power of 2.

$$\frac{2^{3x+2}}{2^{x+5}}$$

.....

.....

.....

(a) _____ **[2]**

(b) You are given that $\frac{2^{3x+2}}{2^{x+5}} = 32$.

By writing 32 as a power of 2, find the value of x.

.....

.....

.....

.....

(b) _____ **[3]**

18 **(a)** Evaluate. $64^{\frac{1}{2}} \times 2^{-4}$

Give your answer as simply as possible.

.....

.....

.....

(a) _____ **[3]**

(b) Multiply out and simplify.

$(4 + 3\sqrt{7})(5 + 2\sqrt{7})$

.....

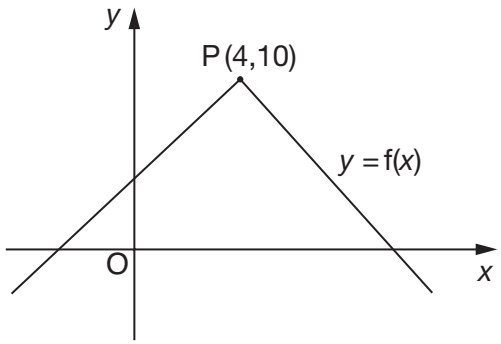
.....

.....

.....

(b) _____ **[3]**

19 Here is the graph of $y = f(x)$.
The point P (4, 10) is a point on the graph.



NOT TO SCALE

What are the coordinates of the new position of P when the graph $y = f(x)$ is transformed to the graph of

(a) $y = 2f(x)$,

.....

(a) (_____ , _____) **[1]**

(b) $y = f(x) - 3$?

.....

(b) (_____ , _____) **[1]**

TURN OVER FOR QUESTION 20

20 Solve algebraically these simultaneous equations.

$y = (x + 5)(x - 7)$
$y = 2x - 3$

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

$x =$ _____ $y =$ _____

$x =$ _____ $y =$ _____ **[5]**

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS SYLLABUS A

J512/04

Paper 4 (Higher Tier)

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Electronic calculator
- Geometrical instruments
- Tracing paper (optional)

Friday 11 June 2010
Morning

Duration: 2 hours

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

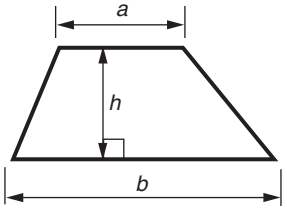
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

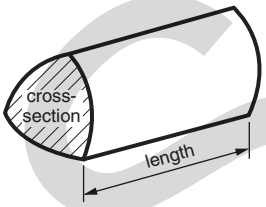
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You are expected to use an electronic calculator for this paper.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

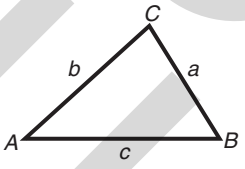


In any triangle *ABC*

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

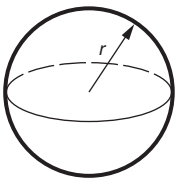
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



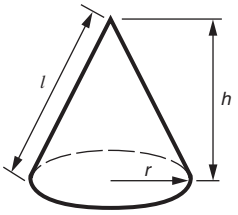
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

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

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

PLEASE DO NOT WRITE ON THIS PAGE

1 Calculate.

(a) $\dfrac{31.8 \times 0.4}{5.3 - 2.8}$

.....

.....

(a) _____ **[2]**

(b) $\sqrt{4.7^3}$

Give your answer correct to 2 decimal places.

.....

.....

(b) _____ **[2]**

2 Reuben bought 2 bars of chocolate and 44 jelly snakes.
The chocolate bars cost 84 pence each and the jelly snakes cost x pence each.

(a) Write down an expression for the total cost, in pence.

.....

(a) _____ **[1]**

Reuben spent £5.20 altogether.

(b) Write down an equation and solve it to find the cost of one jelly snake.

.....

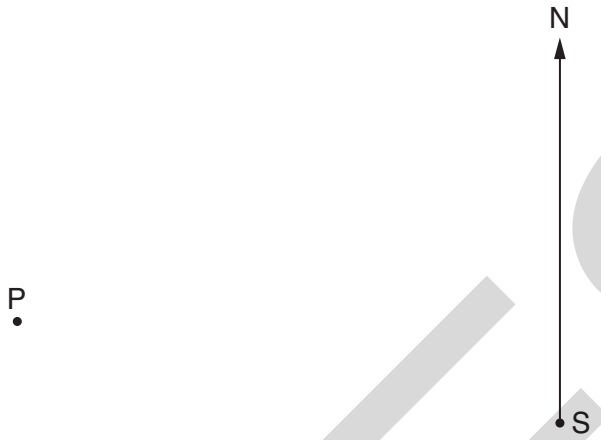
.....

.....

.....

(b) _____pence **[3]**

3 The diagram shows the positions of a phone mast, P, and a school, S.



(a) Find the bearing of the phone mast from the school.

.....

(a) _____ ° **[1]**

(b) Richard cycles from the school, in a straight line, on a bearing of 320°.

(i) Draw a line to show Richard's route. **[1]**

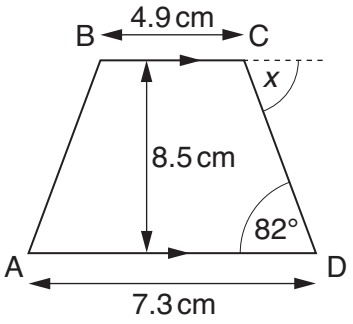
(ii) Mark a point X on the line where Richard is closest to the phone mast. **[1]**

(iii) What should angle PXS be?

.....

(b) (iii) _____ **[1]**

4 **(a)** ABCD is a trapezium.



NOT TO SCALE

(i) Work out the area of ABCD.

.....

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.....

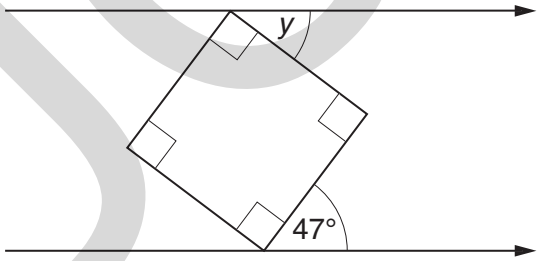
(a)(i) _____ cm^2 **[2]**

(ii) Find the size of angle *x*.
Give a reason for your answer.

x = _____° because _____

_____ **[2]**

(b) This diagram shows a square between two parallel lines.



NOT TO SCALE

Find the size of angle *y*.

.....

(b) _____° **[2]**

5 Josh completed a mini-triathlon in which he swam, cycled and ran.

(a) Josh swam 0.75 km in 15 minutes.

Calculate the average speed for his swim.

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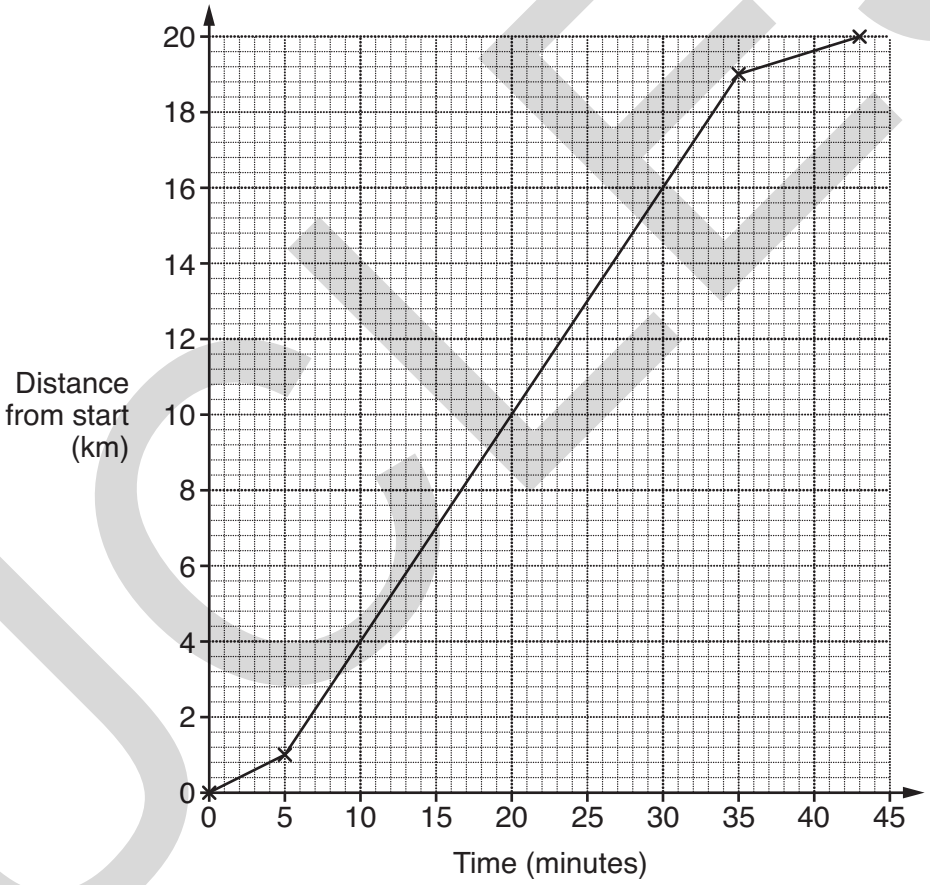
(a) _____ km/h **[3]**

(b) This distance-time graph represents his cycling stage.



Between which times did Josh cycle fastest?

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(b) _____ minutes and _____ minutes **[1]**

(c) Josh completed the 5 km run at an average speed of 12 km/h.

How long altogether did Josh take to complete the mini-triathlon?

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(c) _____ minutes **[4]**

6 In this question, n is an integer.

Which of these statements describes $5n + 1$?

always even always odd sometimes odd, sometimes even

Explain how you decided.

.....

.....

.....

$5n + 1$ is _____

because _____

_____ **[2]**

7 Solve.

(a) $3x - 5 = x + 4$

.....

.....

.....

(a) _____ **[3]**

(b) $\frac{x}{3} - 2 = 70$

.....

.....

(b) _____ **[2]**

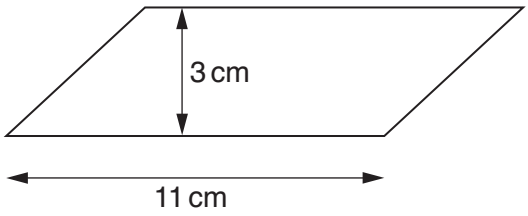
(c) $5x + 6 > 28$

.....

.....

(c) _____ **[2]**

8 A block of beeswax is made in the shape of a prism.
Its cross-section is a parallelogram as shown.



NOT TO SCALE

The length of the prism is 6 cm.

Calculate the volume of the block of beeswax.

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.....

_____ cm^3 **[3]**

9 **(a)** **(i)** Write 36 as a product of prime factors.

.....

.....

(a) (i) _____ **[2]**

(ii) Explain how your answer to part **(a)(i)** shows that 36 is a square number.

_____

_____ **[1]**

(b) What is the smallest whole number you need to multiply 350 by to get a square number?

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.....

.....

(b) _____ **[3]**

10 Lilia kept a record of the number of miles she travelled in her car each day in July, August and September.

The table summarises the data for July.

Miles travelled (m)	Frequency
$0 \leqslant m < 10$	5
$10 \leqslant m < 20$	9
$20 \leqslant m < 30$	11
$30 \leqslant m < 40$	4
$40 \leqslant m < 50$	2

(a) Work out an estimate of the mean daily number of miles travelled in July.

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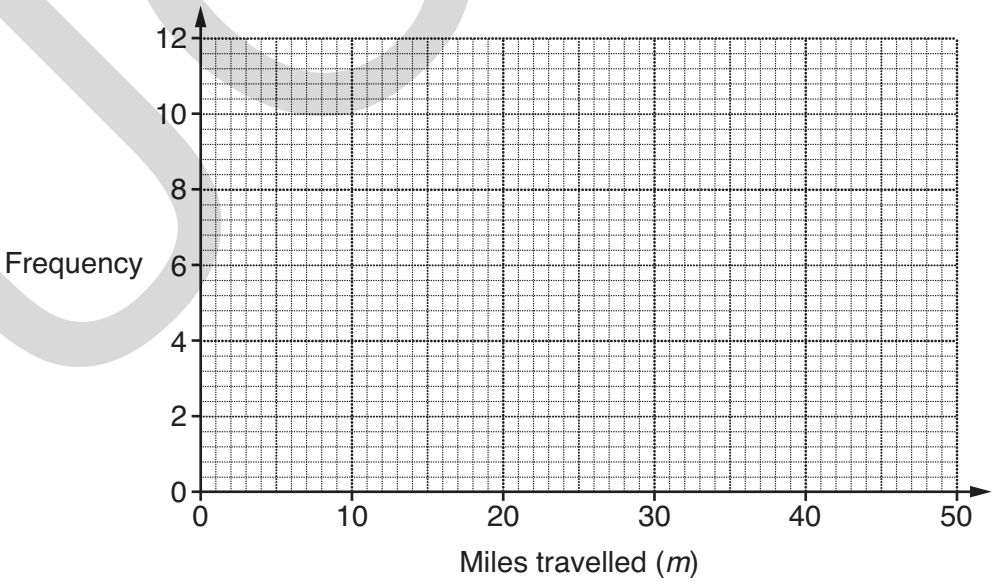
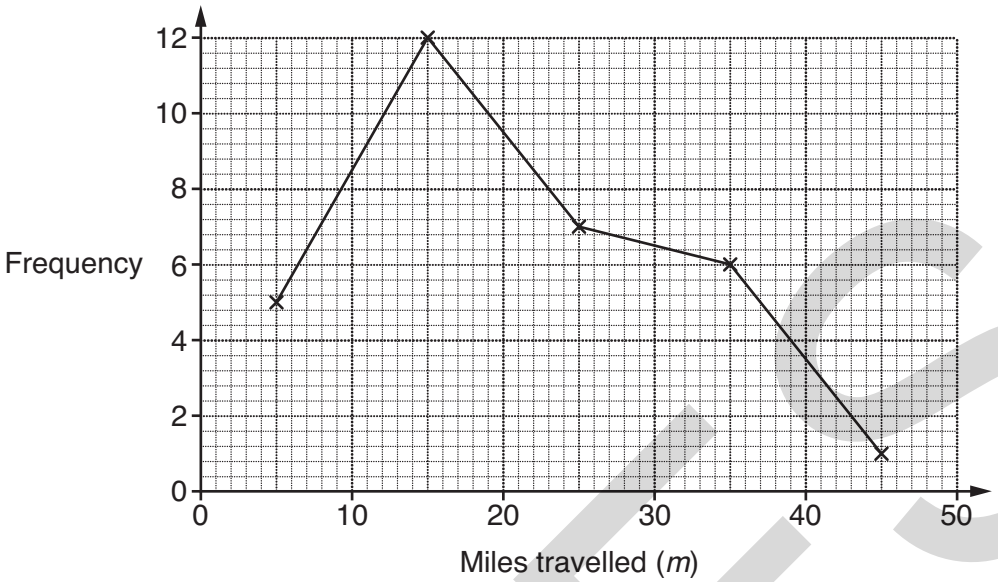
(a) _____ miles **[4]**

(b) Draw a frequency polygon for the data for July.



[2]

(c) This graph summarises the data for August.



(i) What is the modal class interval?

(c)(i) _____ **[1]**

(ii) Which class interval contains the median?

(ii) _____ **[1]**

(d) Write down one difference between the daily number of miles Lilia travelled in July and in August.

_____

_____ **[1]**

(e) This table summarises the data for the first 29 days in September.

Miles travelled (m)	Frequency
$0 \leqslant m < 10$	7
$10 \leqslant m < 20$	8
$20 \leqslant m < 30$	10
$30 \leqslant m < 40$	3
$40 \leqslant m < 50$	1

(i) How many miles could Lilia travel on the 30th day in September so that the class interval in which the median for September lies does not change?
Explain how you worked out your answer.

.....

.....

_____ miles because _____

_____

_____ **[2]**

(ii) In fact, Lilia travelled 40 miles on the 30th day in September.

In which class interval should this distance be recorded?

(e)(ii) _____ **[1]**

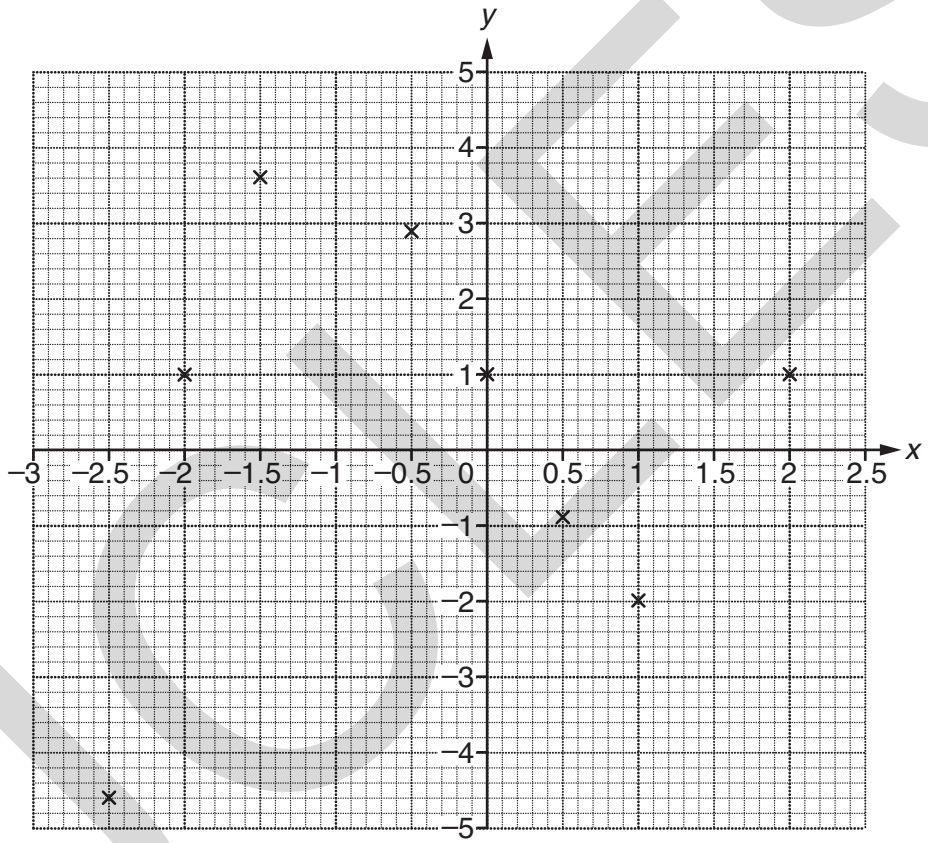
11 **(a)** Complete this table for $y = x^3 - 4x + 1$.

x	−2.5	−2	−1.5	−1	−0.5	0	0.5	1	1.5	2
y	−4.625	1	3.625		2.875	1	−0.875	−2		1

.....

..... **[2]**

(b) Plot the remaining points and draw the graph of $y = x^3 - 4x + 1$ for $-2.5 \leqslant x \leqslant 2$.



[2]

(c) Use your graph to estimate the value of x when $y = -3$.

.....

(c) _____ **[1]**

12 Solve algebraically these simultaneous equations.

$$4x + 3y = 19$$
$$6x + 2y = 11$$

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$x =$ _____ $y =$ _____ **[4]**

13 £1000 was invested for one year at a fixed annual rate of interest.
20% tax was deducted from the interest before it was paid.
The amount of interest paid was £52.

Calculate the rate of interest before tax was deducted.

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_____ % **[4]**

14 **(a)** Simplify.

(i) $\frac{x^6y^4}{x^2}$

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(a)(i) _____ **[1]**

(ii) $(3x^4y)^2$

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(ii) _____ **[2]**

(b) Solve, giving your answers correct to 2 decimal places.

$$x^2 - 25x + 19 = 0$$

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(b) _____ **[3]**

(c) y is inversely proportional to x and $y = 196$ when $x = 4$.

Find an equation connecting x and y.

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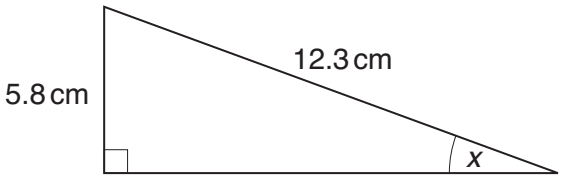
(c) _____ **[2]**

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



NOT TO SCALE

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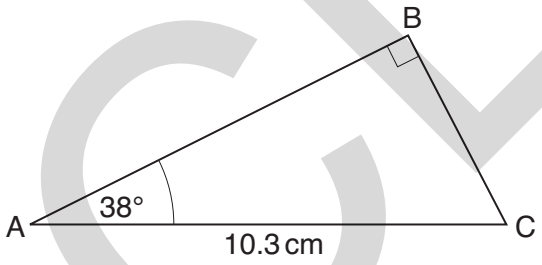
(a) _____ ° **[3]**

(b) Calculate the length AB.



NOT TO SCALE

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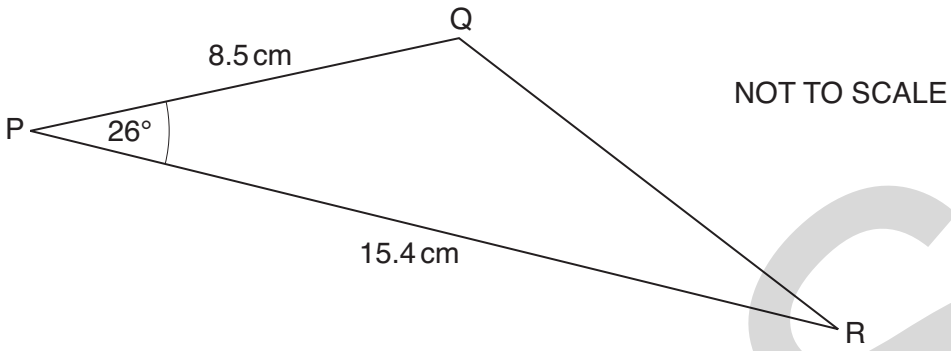
(b) _____ cm **[3]**

(c) Calculate the area of triangle PQR.



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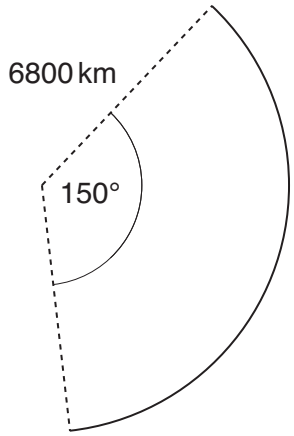
(c) _____ cm^2 **[2]**

16 A satellite travels in a path which is taken to be a circle of radius 6800 km.



NOT TO SCALE

Calculate the distance that the satellite travels when it turns through an angle of 150°.
Give your answer to a suitable degree of accuracy.

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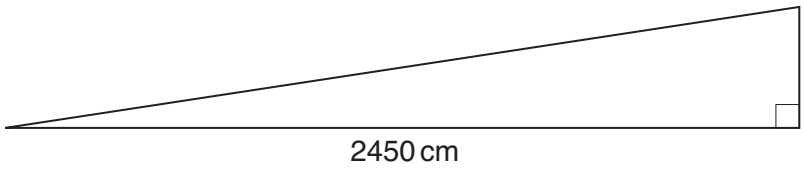
_____ km **[4]**

17 Regulations state that ramps for electric wheelchairs must make an angle with the horizontal of less than 7.2°.

The diagram shows a ramp with dimensions that were measured to the nearest 10 centimetres.

NOT TO SCALE



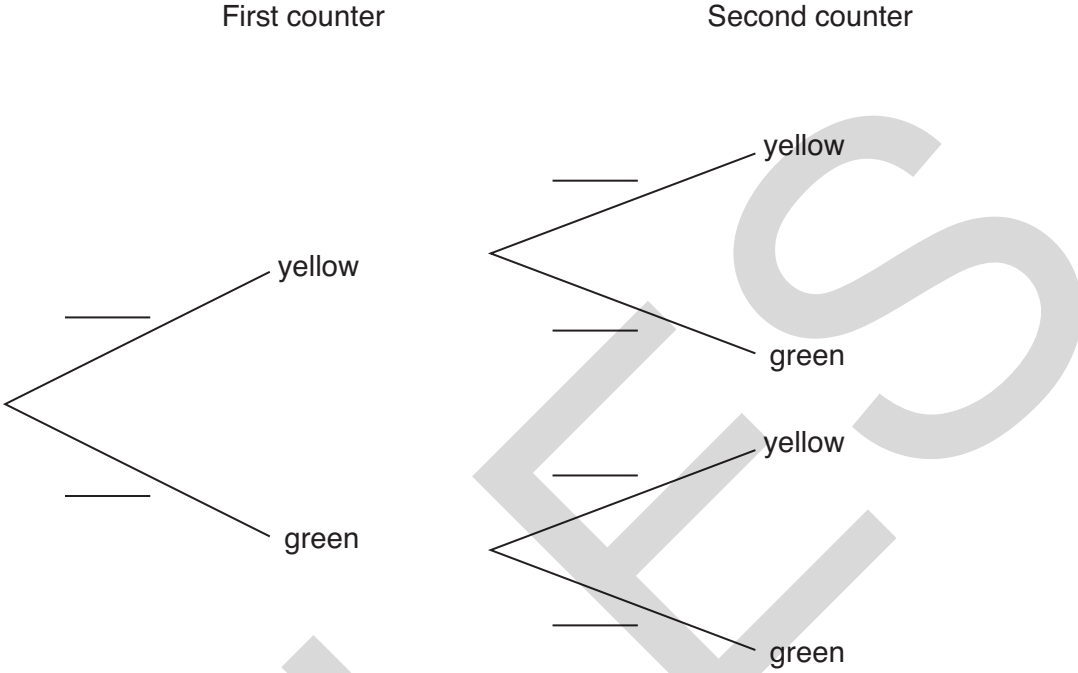
Is it certain that this ramp satisfies the regulations for electric wheelchairs?
You must support your answer with working.

[5]

TURN OVER FOR QUESTION 18

18 A bag contains 3 yellow counters and 5 green counters.
A counter is taken at random from the bag and is not replaced.
A second counter is then taken at random from the bag.

(a) Complete the tree diagram to show the probabilities of taking yellow and green counters.



[3]

(b) Work out the probability that the counters taken are different colours.

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(b) _____ **[3]**