Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
22 – 23	
24 – 25	
26 – 27	
28 – 29	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
June 2014

Mathematics (Linear) 4365/2H

Paper 2

H

Friday 13 June 2014 9.00 am to 11.00 am

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

Time allowed
- 2 hours

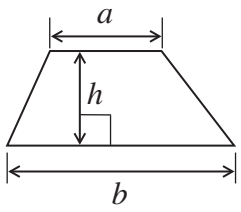
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 105.
- The quality of your written communication is specifically assessed in Questions 3, 10, 13, 17 and 25. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

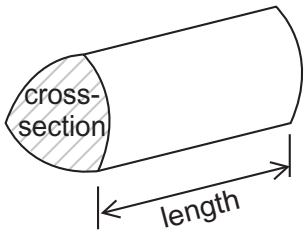
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

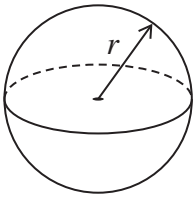


Volume of prism = area of cross section × length



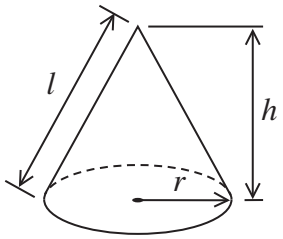
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

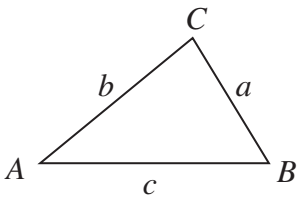
Curved surface area of cone = $\pi r l$



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 Here is a list of what you need to make 20 buns.

180 g	butter
150 g	flour
200 g	sugar
4	eggs

Work out what you need to make 30 buns.

[3 marks]

.....

.....

.....

.....

..... g butter

..... g flour

..... g sugar

..... eggs

3

Turn over ▶

2 In a kettle, there are $1\frac{3}{5}$ litres of water.

A cup holds $\frac{1}{5}$ of a litre of water.

How many cups can be filled with the water in the kettle?

[2 marks]

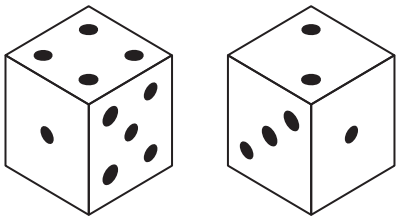
.....

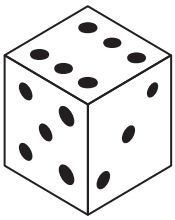
.....

.....

Answer .....

***3** Here are two games that can be played with ordinary six-sided fair dice.





Game A	**Game B**
Roll two dice Add the numbers The total is your score	Roll one dice The number you get is your score

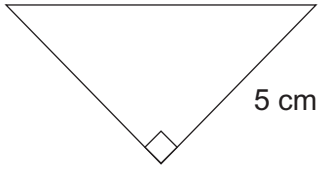
Which game gives a higher chance of scoring **6**?
You **must** show your working.

[5 marks]

Answer .....

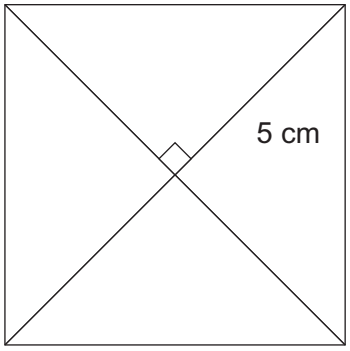
7

4 Here is a right-angled triangle.



Not drawn accurately

Four of these triangles are joined to make a square as shown.



Not drawn accurately

Work out the area of the square.

[3 marks]

.....

.....

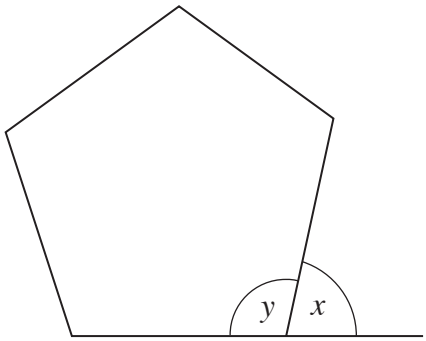
.....

.....

.....

Answer ..... cm^2

5 This is a regular pentagon.



Not drawn accurately

5 (a) Work out the size of angle x.

[2 marks]

.....

.....

Answer ..... degrees

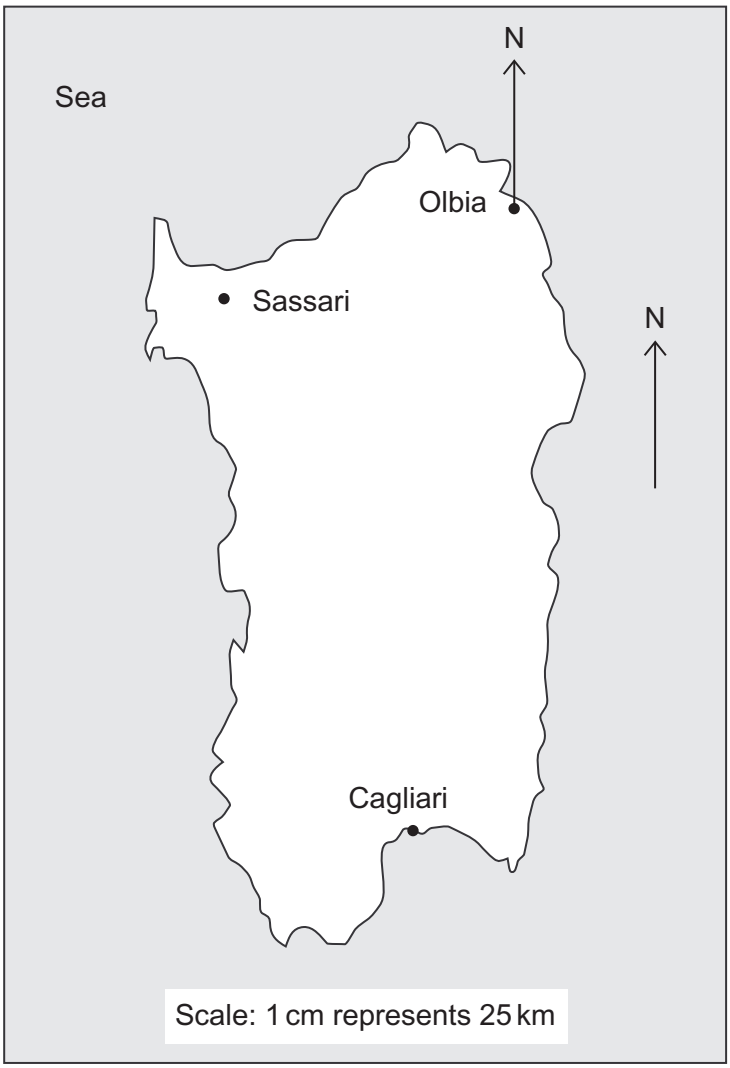
5 (b) Which of the following is correct?
Circle your answer.

[1 mark]

$x + y = 360$ $y = \frac{540}{x}$ $5y = 540$ $y = 2x$ $y = x - 180$

6

6 Here is a map of Sardinia.



6 (a) Work out the **actual** distance between Cagliari and Sassari.

[3 marks]

.....

.....

.....

.....

Answer ..... km

6 (b) Mario's favourite beach is on a bearing of 165º from Olbia.

Draw this bearing and mark with a cross the position of the beach.

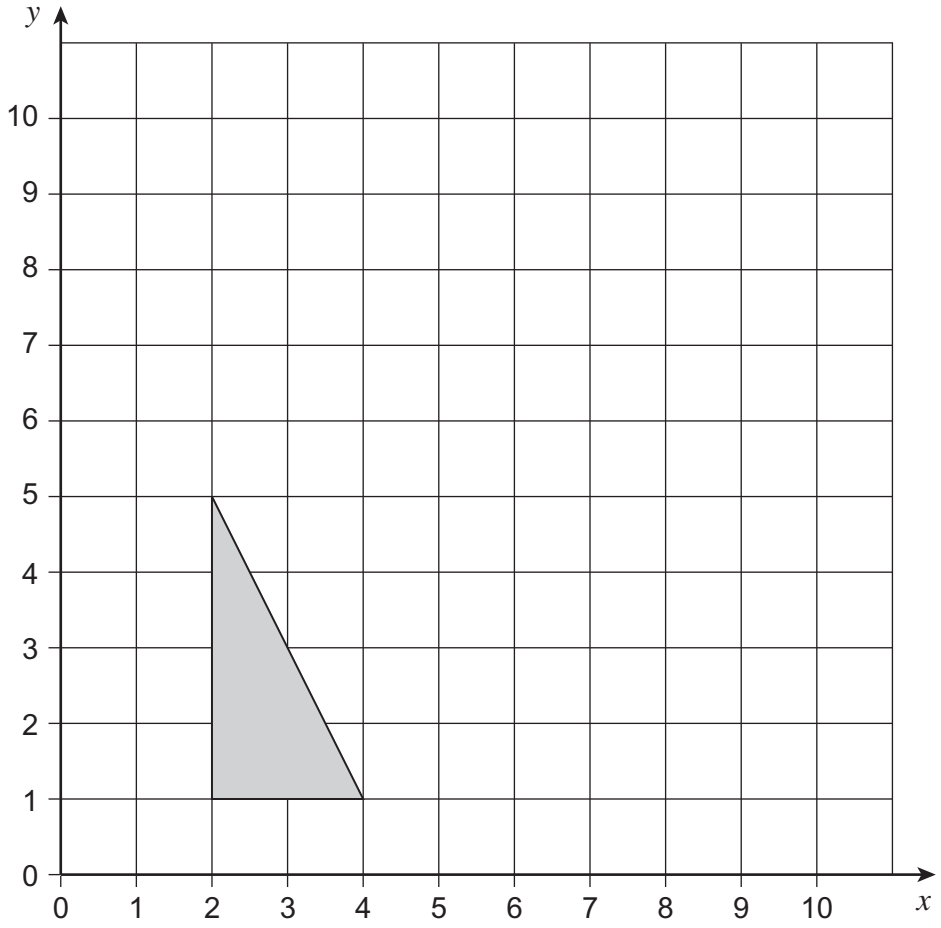
[2 marks]

Turn over for the next question

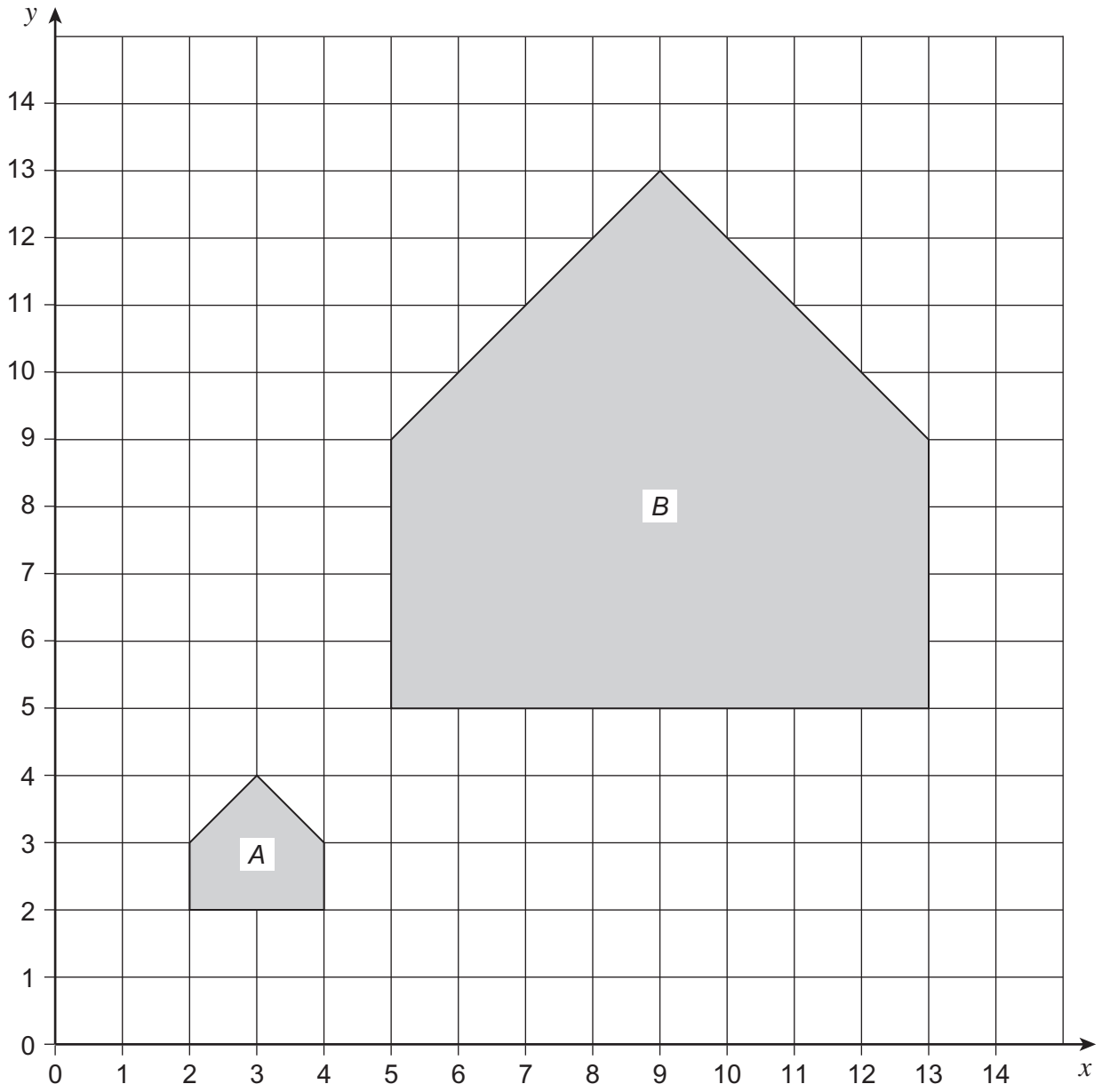
5

7 (a) Reflect the triangle in the line $y = 5$

[2 marks]



7 (b) Describe fully the **single** transformation that takes shape A to shape B.



[3 marks]

.....

.....

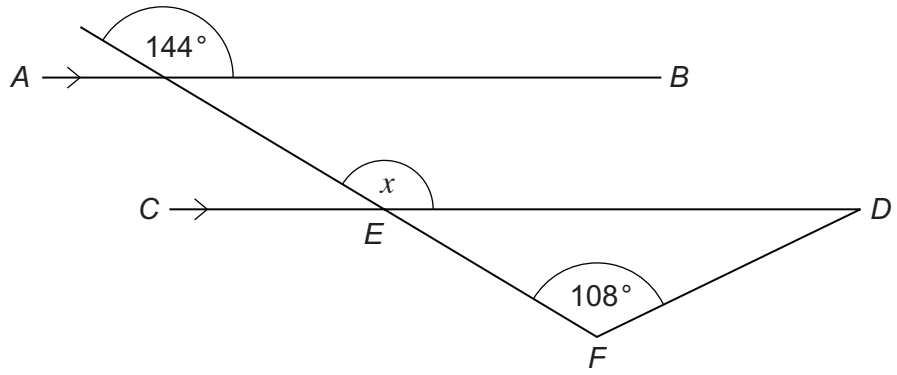
.....

5

Turn over ▶

8 In this diagram, *AB* is parallel to *CD*.

Not drawn accurately



8 (a) Tick **one** correct statement for the angles shown on the diagram.

[1 mark]

Angle x is equal to 144º because they are alternate angles. ☐

Angle x is equal to 144º because they are vertically opposite angles. ☐

Angle x is equal to 144º because they are corresponding angles. ☐

8 (b) Show that triangle *EDF* is isosceles.
You **must** show your working.

[3 marks]

.....

.....

.....

.....

9 (a) Factorise $a^2 - 3a$

[1 mark]

.....

Answer .....

9 (b) Solve $7y + 4 = 3(y + 6)$

[3 marks]

.....

.....

.....

$y =$ .....

Turn over for the next question

8

***10** Jack sees the bicycle he wants to buy in two shops.

Bye-cycles

Price without VAT £130

VAT is 20%

Just Bykes

Normal price £195

Now $\frac{1}{4}$ off

VAT is included

In which shop is the bicycle cheaper?
You **must** show your working.

[5 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Answer .....

11 The table shows the GCSE Mathematics results of the students in a school.

Grade	U	G	F	E	D	C	B	A	A*
Number of students	0	14	30	53	37	41	22	28	17

Work out the percentage of students with grade C or higher.
Give your answer to 3 significant figures.

[5 marks]

.....

.....

.....

.....

.....

.....

.....

.....

Answer ..... %

Turn over for the next question

10

12 These expressions represent four numbers.
The value of the median of the expressions is 12.

x $2x$ $6x$ $11x$

Work out the value of the mean of the expressions.

[5 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Answer .....

***13** Here are three expressions.

$x^3 - 30$	$x^2 - 12$	$x - 6$

For **one** value of x, all three expressions have the same value.

Use trial and improvement or any other method to work out this value of x.

[3 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

$x =$ .....

Turn over for the next question

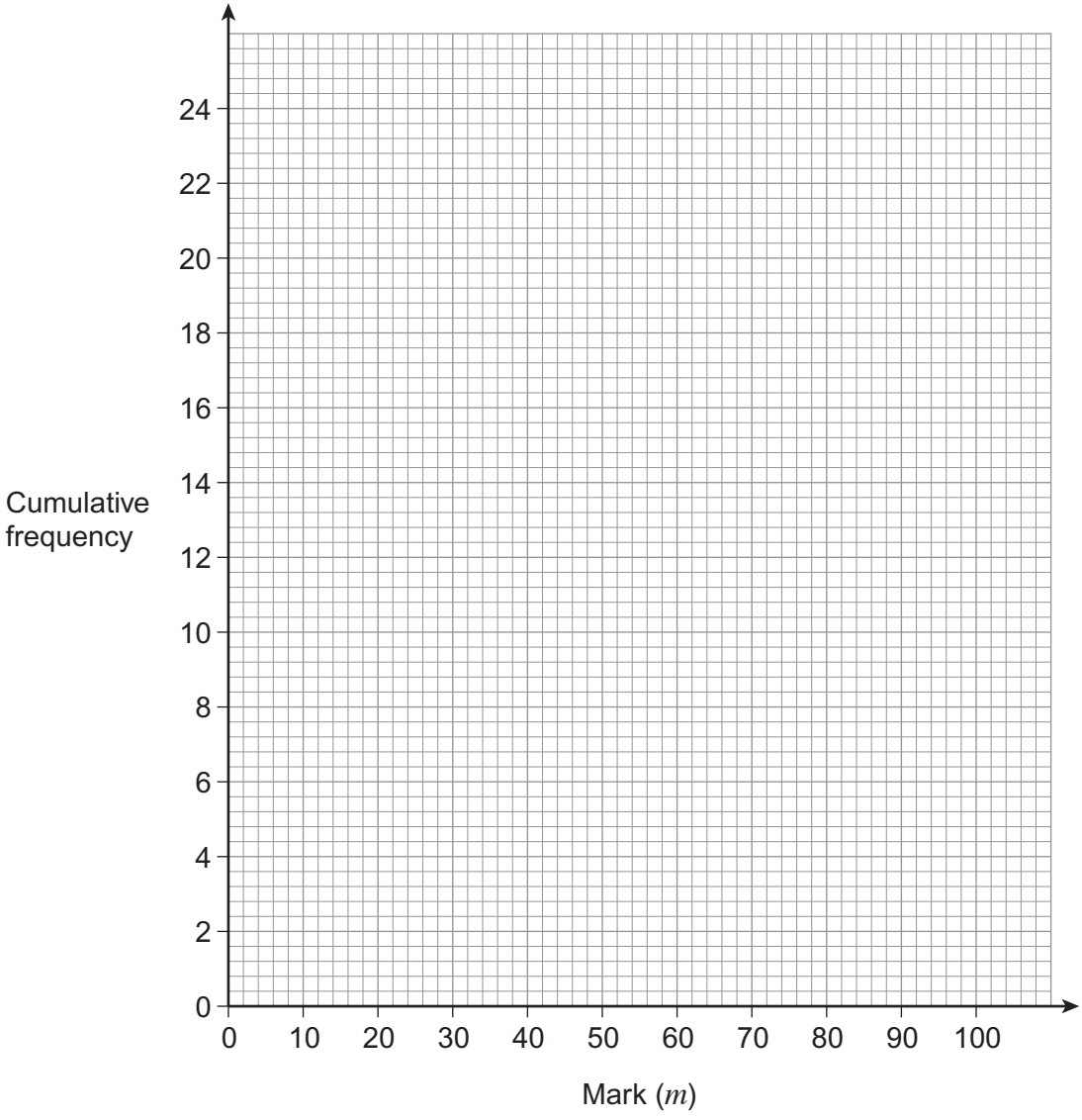
8

14 24 students took a test.
The table shows information about their marks.

Mark (m)	Frequency
$20 < m \leqslant 40$	3
$40 < m \leqslant 60$	5
$60 < m \leqslant 80$	12
$80 < m \leqslant 100$	4

14 (a) Draw a cumulative frequency diagram for their marks.

[3 marks]



14 (b) Use the cumulative frequency diagram to estimate the interquartile range.

[2 marks]

.....

.....

Answer .....

Turn over for the next question

5

15 (a) The nth term of a sequence is $n^2 - 3$

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

[2 marks]

.....

.....

.....

Answer ..... , ... , ...

15 (b) The term-to-term rule for another sequence is

Multiply previous term by 2 and add 1

The second term in this sequence is $8x - 5$

Work out an expression for the first term, in terms of x.

[3 marks]

.....

.....

.....

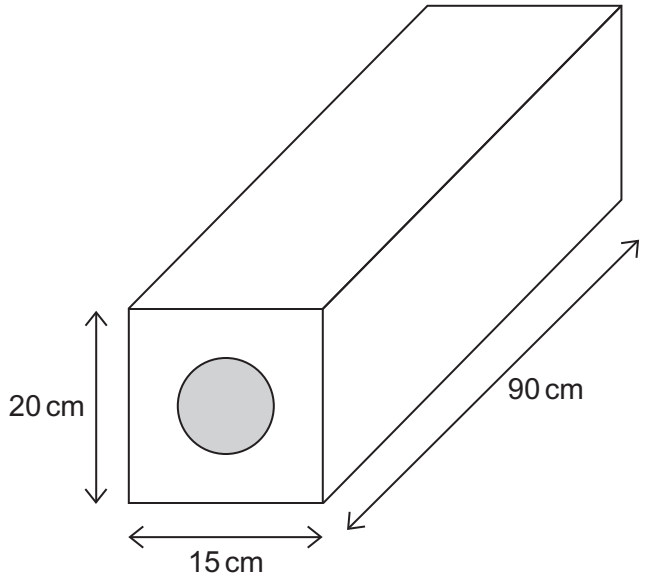
.....

.....

.....

Answer .....

16 This building block is in the shape of a cuboid.



The block contains one steel cylindrical rod of length 90 cm.
The radius of the rod is 4 cm.

The rest of the block is concrete.

Work out the volume of concrete in the block.

[5 marks]

.....

.....

.....

.....

.....

.....

.....

.....

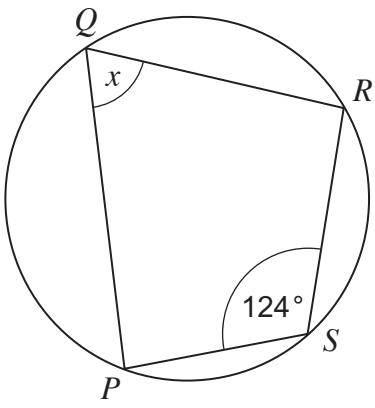
.....

.....

Answer ..... cm^3

10

17 (a) P, Q, R and S are points on the circumference of the circle.



Not drawn accurately

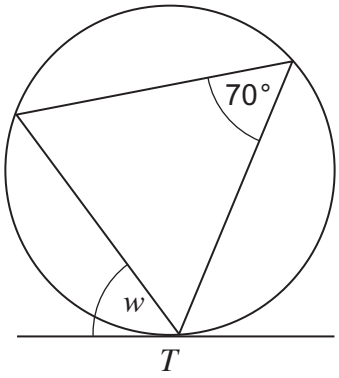
Work out the size of angle x.

[1 mark]

.....

Answer ..... degrees

***17 (b)** The diagram shows a circle and a tangent at T.



Not drawn accurately

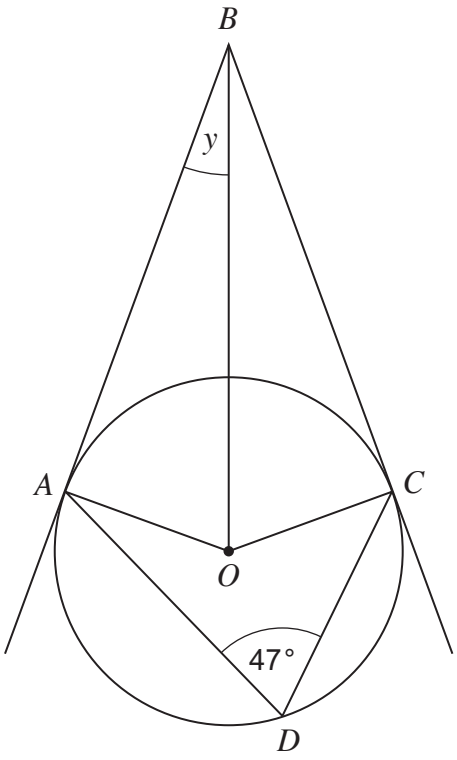
Write down the size of angle w.
Give a reason for your answer.

[2 marks]

Answer ..... degrees

Reason .....

17 (c) A, C and D are points on the circle, centre O.
BA and BC are tangents to the circle.



Not drawn accurately

Work out the size of the angle y.

[3 marks]

.....

.....

.....

Answer ..... degrees

Turn over for the next question

6

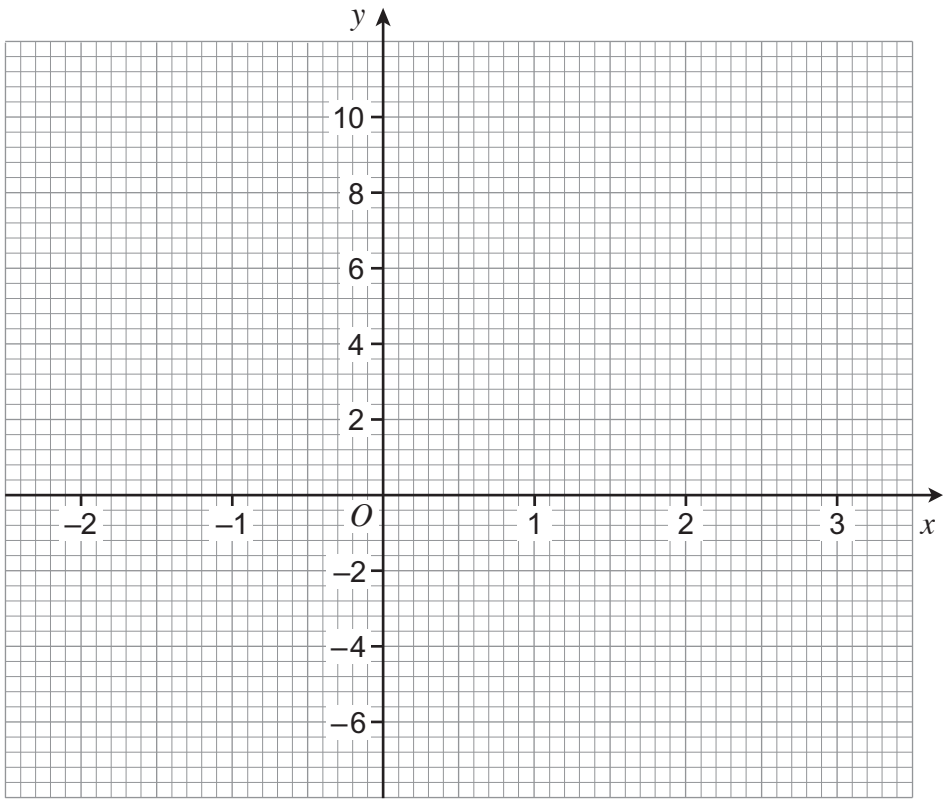
18 (a) Complete the table of values for $y = 2x^2 - x - 6$

x	– 2	– 1	0	1	2	3
y	4		– 6	– 5		9

[2 marks]

18 (b) On this grid, plot the graph of $y = 2x^2 - x - 6$ for values of x from –2 to 3

[2 marks]



18 (c) Use your graph to find the solutions of the equation $2x^2 - x - 6 = 0$

[2 marks]

Answer ..... and .....

19 The probability that Simon passes his driving test is $\frac{3}{5}$

The probability that Kim passes her driving test is $\frac{4}{7}$

Work out the probability that **at least** one of them passes the driving test.

[3 marks]

.....

.....

.....

.....

.....

.....

.....

Answer .....

9

Turn over ▶

20 (a) Simplify $(2a^3b)^4$

[2 marks]

.....

.....

Answer .....

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

[3 marks]

.....

.....

Answer .....

21 Use the quadratic formula to solve $x^2 + 2x - 1 = 0$
Give your answers to 2 decimal places.

[3 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Answer ..... and .....

22 You are given that $x^2 - 12x + a \equiv (x - c)^2$

Work out the values of a and c.

[3 marks]

.....

.....

.....

.....

.....

a = ...

c = ...

23 Simplify $\dfrac{5x^2 + 17x - 12}{x^2 - 16}$

[3 marks]

.....

.....

.....

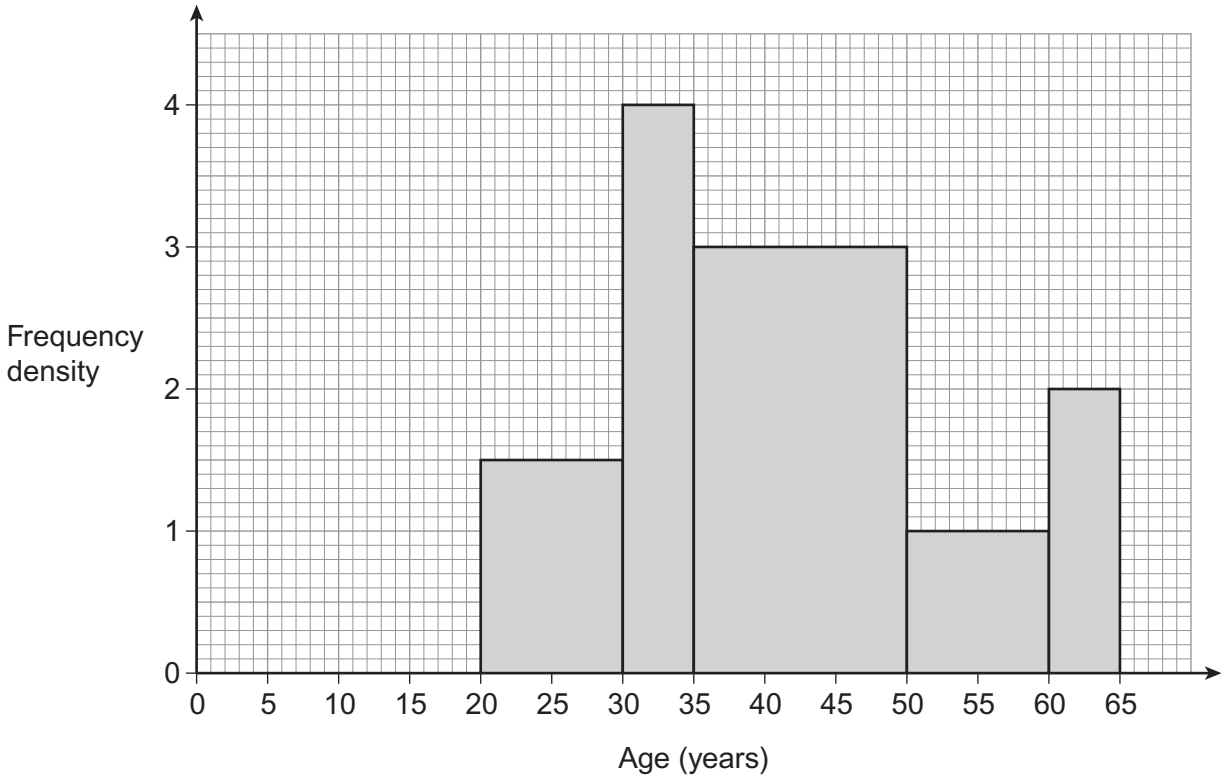
.....

.....

Answer .....

14

24 The histogram shows information about the ages of 100 employees.



Work out an estimate of the median age of the employees.

[4 marks]

.....

.....

.....

.....

.....

.....

Answer ..... years

***25** The maximum safe load of a bridge is 1500 kg to the nearest 10 kg.
An average soldier is 75 kg to the nearest kilogram.

Work out an estimate for the maximum number of soldiers that can **safely** cross the bridge at the same time.

[5 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

Answer .....

END OF QUESTIONS

9

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED