OCR

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Friday 7 November 2014 – Morning

GCSE MATHEMATICS B

J567/04 Paper 4 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

Duration: 1 hour 45 minutes

J567040

118350192

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- 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).
- Do **not** write in the bar codes.

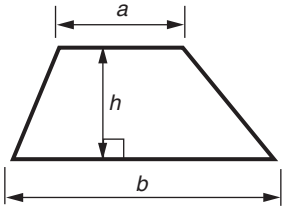
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- Your quality of written communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

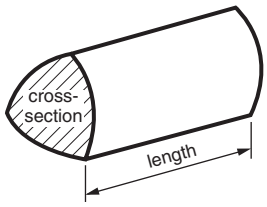
You are permitted to use a calculator for this paper

Formulae Sheet: Higher Tier

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



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

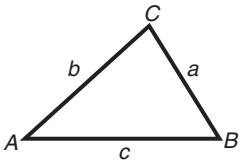


In any triangle *ABC*

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

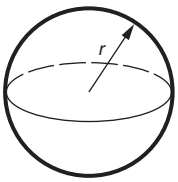
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



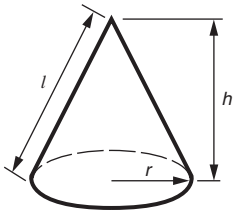
Volume of sphere $= \frac{4}{3}\pi r^3$

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

Answer **all** the questions.

1 **(a)** Work out.

$$\frac{4.8 + 7.1}{1.9 \times 0.3}$$

Give your answer correct to 1 decimal place.

(a) ..... **[2]**

(b) Find the cube root of 729 000.

(b) ..... **[1]**

2 **(a)** Solve this inequality.

$6x + 5 > 23$

(a) ..... **[2]**

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

$p = 3r - 7$

(b) ..... **[2]**

3 Eastfield School held a sponsored swim and a fun run to raise money for the school fund and the local hospice.

(a) Twenty students entered the sponsored swim.
The number of lengths completed by each student is listed below.

34	32	40	38	52	25	45	62	21	42
41	53	48	28	60	45	36	43	57	34

(i) Complete this stem and leaf diagram to represent the data.

2	
3	
4	
5	
6	

Key: 3 | 4 represents 34 lengths

[3]

(ii) Find the median number of lengths completed.

(a)(ii) ..... lengths **[2]**

(iii) What fraction of the group completed fewer than 40 lengths?
Give your answer in its simplest form.

(iii) ..... **[2]**

(b) The times taken by the students who entered the fun run are summarised below.

Time (t minutes)	Frequency		
$15 \leqslant t < 20$	18		
$20 \leqslant t < 25$	34		
$25 \leqslant t < 30$	32		
$30 \leqslant t < 35$	26		
$35 \leqslant t < 40$	10		

Calculate an estimate of the mean of these times.

(b) ..... minutes **[4]**

(c) The amounts raised from the two events are shown below.

Eastfield School Fundraising

Sponsored Swim	£650
Fun Run	£1250

(i) Write the ratio of the amount raised from the swim to the amount raised from the run in its simplest form.

(c)(i) ..... **[2]**

(ii) The **total** amount raised is divided between the school fund and the local hospice in the ratio 2 : 3.

Work out the amount of money given to the local hospice.

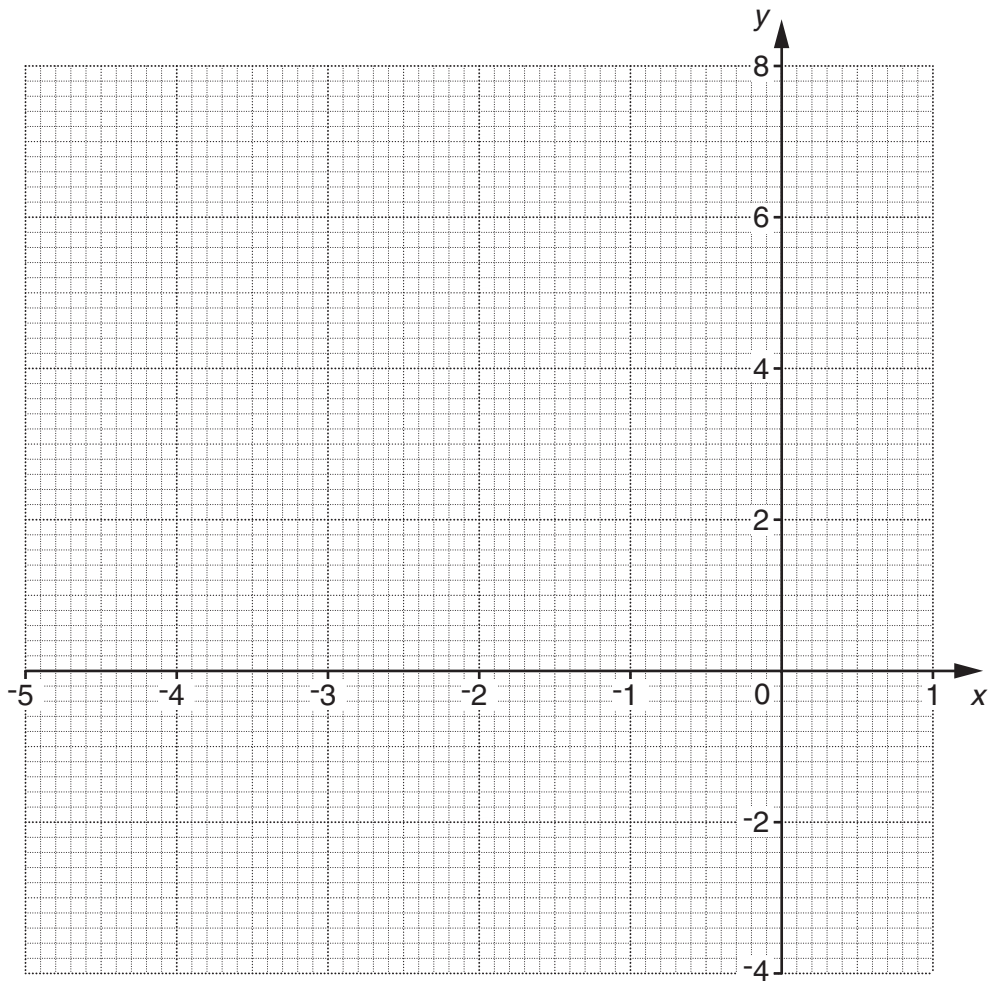
(ii) £ ..... **[2]**

4 **(a)** **(i)** Complete the table for $y = x^2 + 4x + 2$.

x	-5	-4	-3	-2	-1	0	1
y	7	2	-1		-1	2	7

[1]

(ii) Draw the graph of $y = x^2 + 4x + 2$ for values of x from -5 to 1.



[2]

(iii) Use your graph to solve $x^2 + 4x + 2 = 0$.

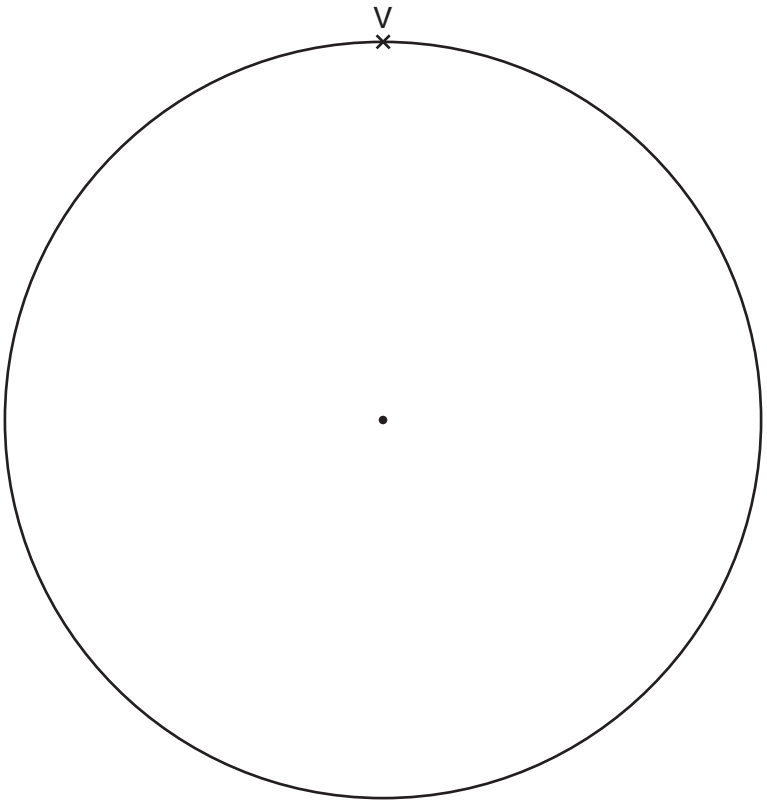
(a)(iii) x = ... or x = ... **[2]**

(b) The equation $x^3 + 5x = 24$ has a solution between 2 and 3.

Find this solution correct to 1 decimal place.
Show all your trials and their outcomes.

(b) $x =$ ..... **[3]**

5 **(a)** Construct a regular octagon with its vertices on the circumference of the circle below.
One vertex, V, is marked for you.

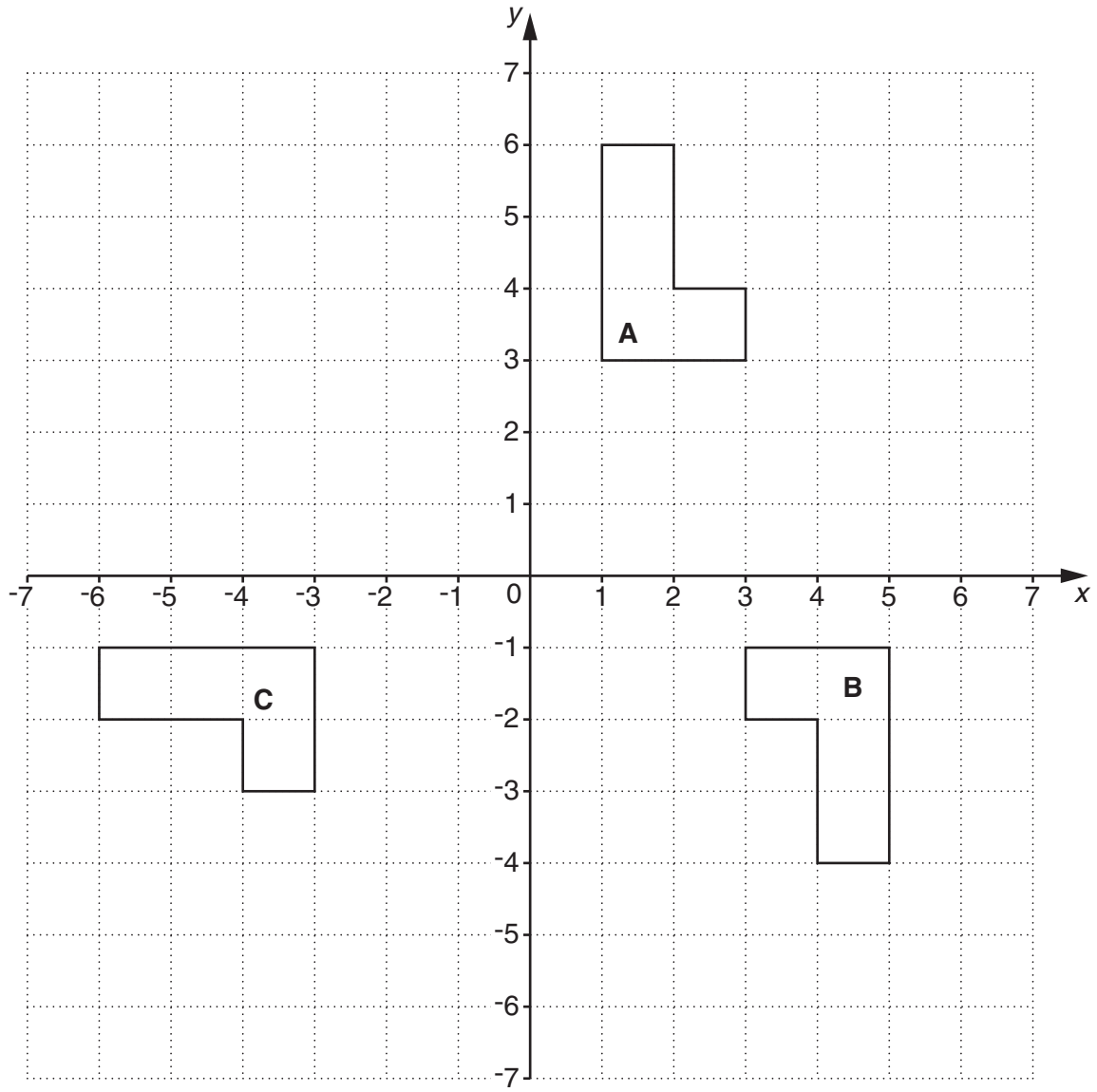


[2]

(b) Work out the size of an interior angle of a regular 12-sided polygon.

(b) ..... ° **[2]**

6 Shapes **A**, **B** and **C** are drawn on the grid below.



(a) Describe fully the **single** transformation that maps shape **A** onto shape **B**.

..... **[3]**

(b) Shape **A** can be transformed onto shape **C** using a combination of two transformations:

- a rotation of 90° anticlockwise about (0, 0), followed by
- transformation T.

Describe fully transformation T.

..... **[3]**

7 **(a)** Irina puts £5340 into a savings account.
The interest rate is 3.3% per year.

Calculate how much is in her account after one year.

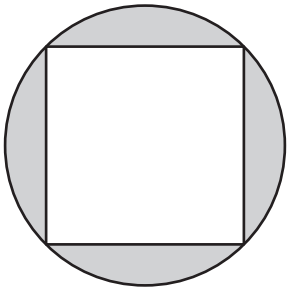
(a) £ ..... **[3]**

(b) Jason is awarded a 6% pay rise.
After his pay rise, he earns £2597 per month.

Work out how much he earned per month before the pay rise.

(b) £ ..... **[3]**

8 The diagram shows a company logo.
It is a square inside a circle of diameter 6 cm.
The vertices of the square lie on the circumference of the circle.



(a) Show that the square has sides of length 4.24 cm, correct to 2 decimal places.

.....

.....

.....

..... **[3]**

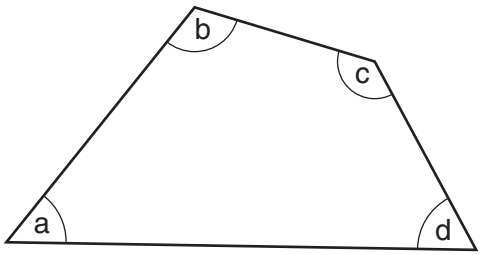
(b) Work out the percentage of the logo that is shaded.

(b) ..... % **[5]**

9 In the quadrilateral below:

- angle b is twice the size of angle a
- angle c is 40° more than angle b
- angle d is half the size of angle c.

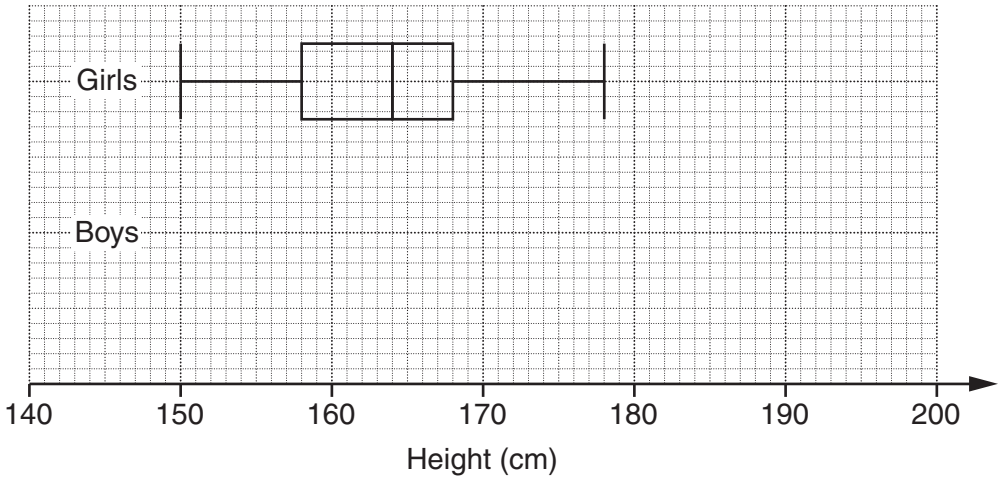
Work out the size of the largest angle in the quadrilateral.



Not to scale

..... ° **[5]**

10 This box plot shows the distribution of heights of a group of 16-year-old girls.



(a) Here is some information about the heights of a group of 16-year-old boys.

Minimum height	158 cm
Maximum height	186 cm
Median height	174 cm
Upper quartile	180 cm
Interquartile range	14 cm

On the grid above, draw the box plot for the boys. **[3]**

(b) Make two comments comparing the distributions of the heights of the boys and the girls. Use these statistics to justify your comments.

1 .....

.....

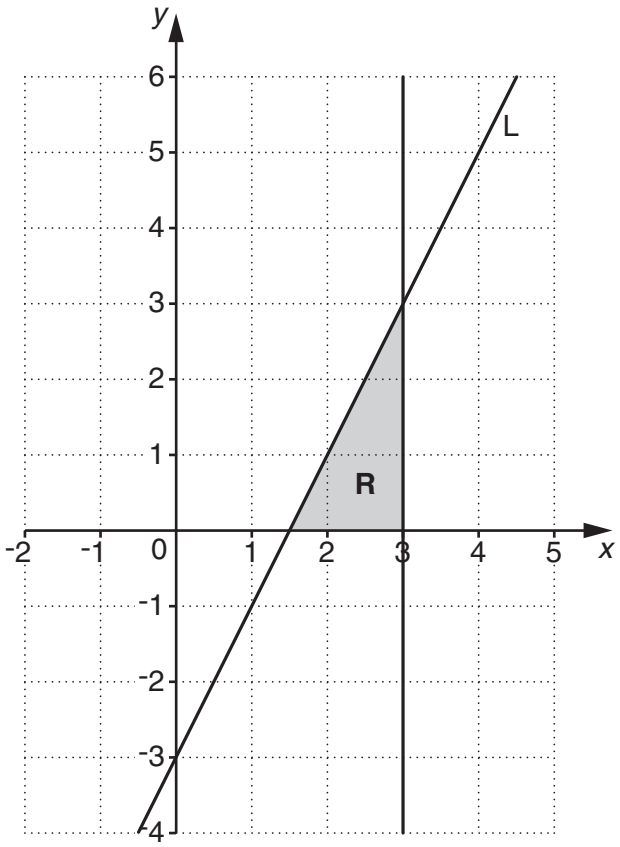
.....

2 .....

.....

..... **[3]**

11 The line L and the region **R** are shown on the grid below.



(a) Write down the equation of the line L.

(a) ..... **[2]**

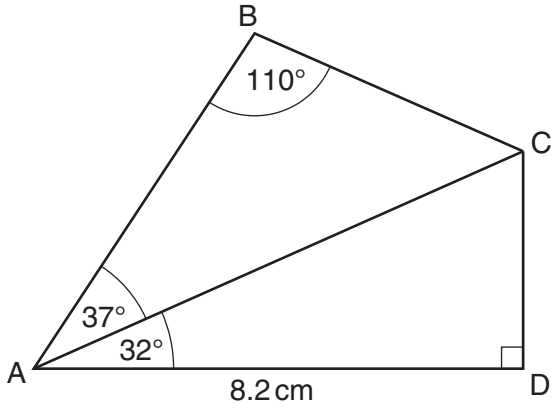
(b) The region **R** is defined by three inequalities.
One of these is $y \geqslant 0$.

Write down the other two inequalities.

(b) .....

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

12 ABCD is a quadrilateral with a right angle at D.
Angle ABC = 110°, angle BAC = 37°, angle DAC = 32° and AD = 8.2 cm.



Not to scale

(a) Show that AC = 9.7 cm correct to 1 decimal place.

.....

.....

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

(b) Calculate BC.

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

13 **(a)** Solve.

$$\frac{6x-1}{2} - \frac{2x+1}{3} = 5$$

(a) x = ... **[4]**

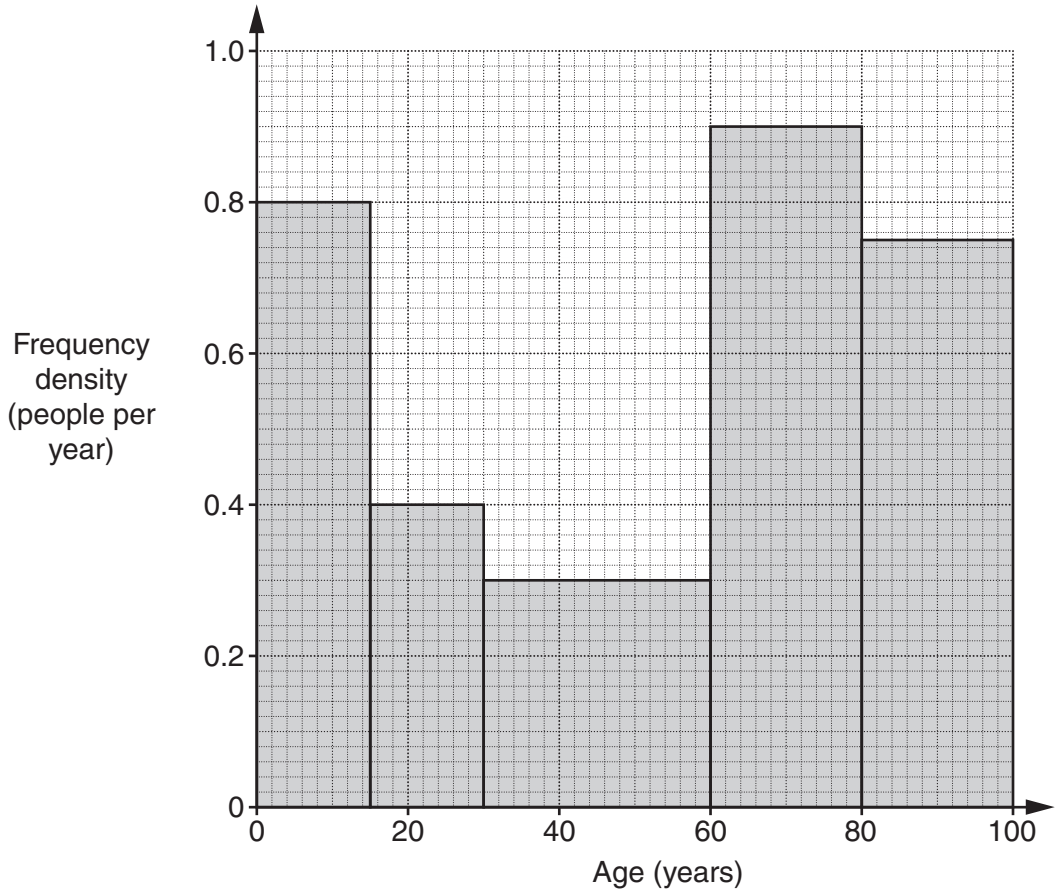
(b) Solve this equation.

$$5x^2 - 3x - 6 = 0$$

Give your solutions correct to 2 decimal places.

(b) x = ... or x = ... **[3]**

14 This histogram summarises the ages of the patients at a surgery one morning.



(a) Use the information in the histogram to complete the frequency table.

Age (a years)	Frequency
$0 < a \leqslant 15$	
$15 < a \leqslant 30$	
$30 < a \leqslant 60$	
$60 < a \leqslant 80$	
$80 < a \leqslant 100$	

[3]

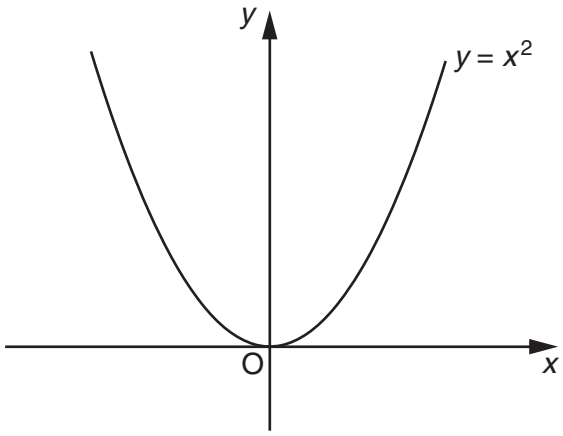
(b) Angus says that the oldest patient at the surgery that morning was 100 years old.

Is he definitely correct? Explain your answer.

.....

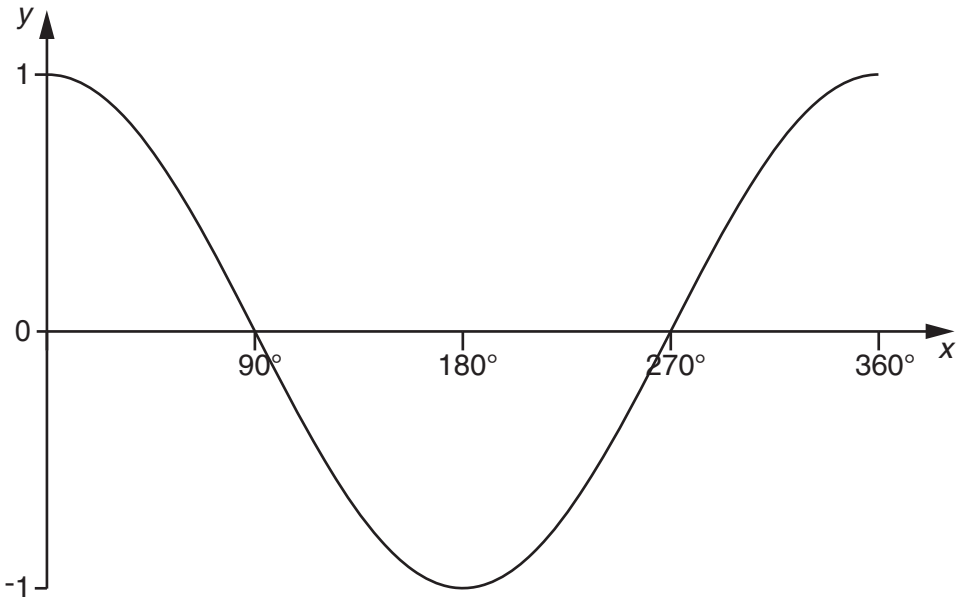
..... **[1]**

15 **(a)** This is a sketch of the graph of $y = x^2$.



On the same axes, sketch the graph of $y = (x+2)^2$. **[1]**

(b) The diagram shows the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.



Find the values of x which satisfy $\cos x = -0.39$ in the range $0° \leqslant x \leqslant 360°$.
Use your calculator and the graph to help you.

(b) x = ...° or x = ...° **[2]**

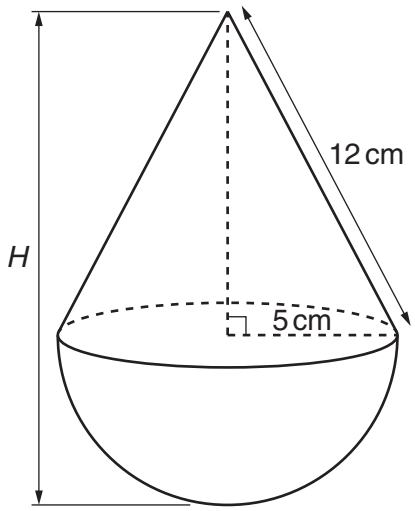
16* The total capacity of an oil tank is 8600 litres, correct to the nearest 100 litres.
The tank should only be filled to 95% of its total capacity.
A pump can deliver oil to the tank at a rate of 740 litres per minute, correct to the nearest 10 litres per minute.

Calculate the maximum possible time it would take to fill the empty tank.
Give your answer in minutes and seconds.

.....minutes .....seconds **[5]**

TURN OVER FOR QUESTION 17

17 A child's toy is made by joining a cone to a hemisphere.
The hemisphere and cone each have radius 5 cm.
The slant height of the cone is 12 cm.



(a) Show that the total height, H, of the toy is 15.9 cm.

.....

.....

..... **[3]**

(b) Calculate the total volume of the toy.

(b) ..... cm^3 **[4]**

END OF QUESTION PAPER