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H

Thursday 4 June 2015 – 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

* J 5 6 7 0 4 *

* 4 3 9 8 4 3 0 3 4 9 *

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.
- 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

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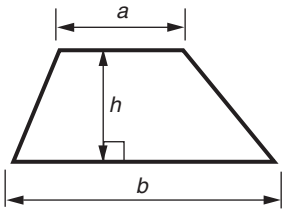
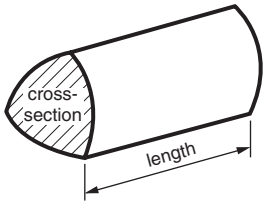
Formulae Sheet: Higher Tier

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



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

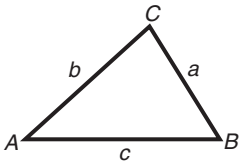


In any triangle *ABC*

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

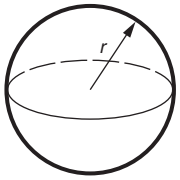
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



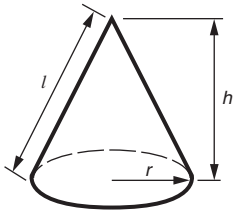
Volume of sphere $= \frac{4}{3}\pi r^3$

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

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Answer **all** the questions.

1 **(a)** Calculate.

$$\frac{4.95 + 1.64}{2.61 \times 1.57}$$

Give your answer correct to two decimal places.

(a) _____ **[2]**

(b) Work out the value of $2m - 4n$ when $m = 1.8$ and $n = {}^{-}0.7$.

(b) _____ **[2]**

(c) Find the cube root of 17576.

(c) _____ **[1]**

(d) Calculate the reciprocal of 2.5.

(d) _____ **[1]**

(e) Write $\frac{7}{9}$ as a recurring decimal.

(e) _____ **[1]**

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2 Kyle is investigating how much he used his mobile phone in one month.

(a) The stem and leaf diagram shows the number of text messages Kyle sent on each of the 30 days.

0	3	3	4	5	7	7	9	9			
1	0	0	1	2	3	4	4	5	5	6	7
2	3	5	5	6	9						
3	1	4	8								
4	2	6	9								

Key: 4 | 2 represents 42 texts

(i) Write down the largest number of texts Kyle sent in one day.

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

(ii) Find the median number of texts he sent in one day.

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

(iii) On what fraction of the days did Kyle send more than 40 texts?
Give your answer in its simplest form.

(iii) _____ **[2]**

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(b) The table below summarises the lengths of Kyle's phone calls during the month.

Length of call (t minutes)	**Frequency**		
$0 < t \leq 2$	19		
$2 < t \leq 4$	12		
$4 < t \leq 6$	8		
$6 < t \leq 8$	7		
$8 < t \leq 10$	4		

Calculate an estimate of the mean length of a call.

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

(c) Kyle has an allowance of 500 MB of data each month.
This month he used 158.66 MB.

What percentage of his allowance did he use?
Give your answer correct to three significant figures.

(c) _____ % **[3]**

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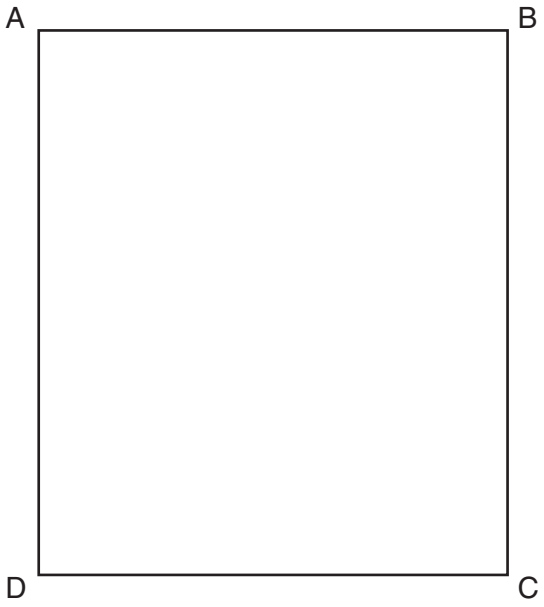
3 **(a)** The scale drawing represents a garden ABCD.

Scale: 1 cm represents 2 m



Anna will plant a tree in the garden.

The tree must be

- closer to A than to D
- less than 9 m from C.

Construct and shade the region where Anna can plant the tree.
Leave in all your construction lines. **[4]**

(b) Anna digs a circular flower bed in the garden.
The radius of the flower bed is 0.75 m.

Calculate the circumference of the flower bed.

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

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(c) Anna makes a patio using concrete slabs.
Each slab is a regular hexagon.

Explain why Anna can fit three of these slabs together at a point.

_____

_____ **[2]**

4 Rick asked a random sample of 160 students from his school what they did for lunch.
The table shows the results of Rick's survey.

School lunch	Packed lunch	Go to shops	No lunch
43	61	38	18

(a) Work out the relative frequency of eating a school lunch.

(a) _____ **[1]**

(b) There are 1200 students in the school.

Estimate the number of students in the school who go to the shops for their lunch.

(b) _____ **[2]**

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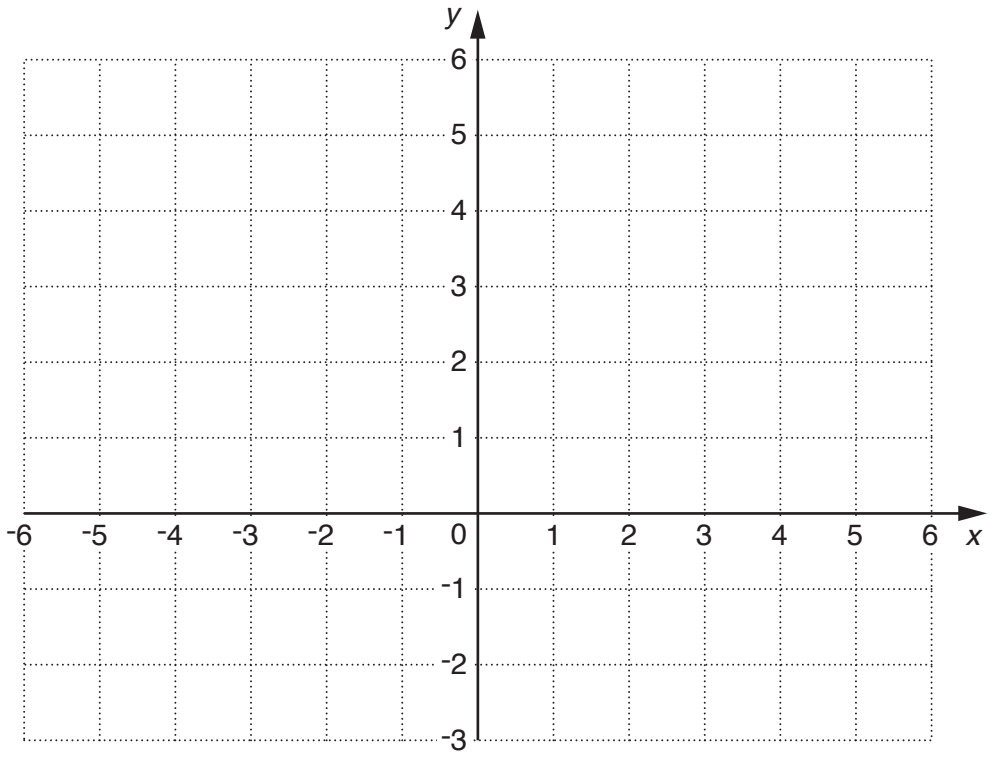
5 Draw the graph of $2y - x = 5$ on the grid below.



[3]

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6 The number P can be written as a product of prime factors in the form $P = 2 \times 3^k \times 5$.

The number Q can be written as a product of prime factors in the form $Q = 2^k \times 3 \times 5$.

The lowest common multiple of P and Q is 180.

Find the values of P, Q and k.

$P =$ _____

$Q =$ _____

$k =$ _____ **[3]**

7 **(a)** Rearrange this formula to make f the subject.

$e = 7f - 5$

(a) _____ **[2]**

(b) Solve this inequality.

$5x - 3 > 17$

(b) _____ **[2]**

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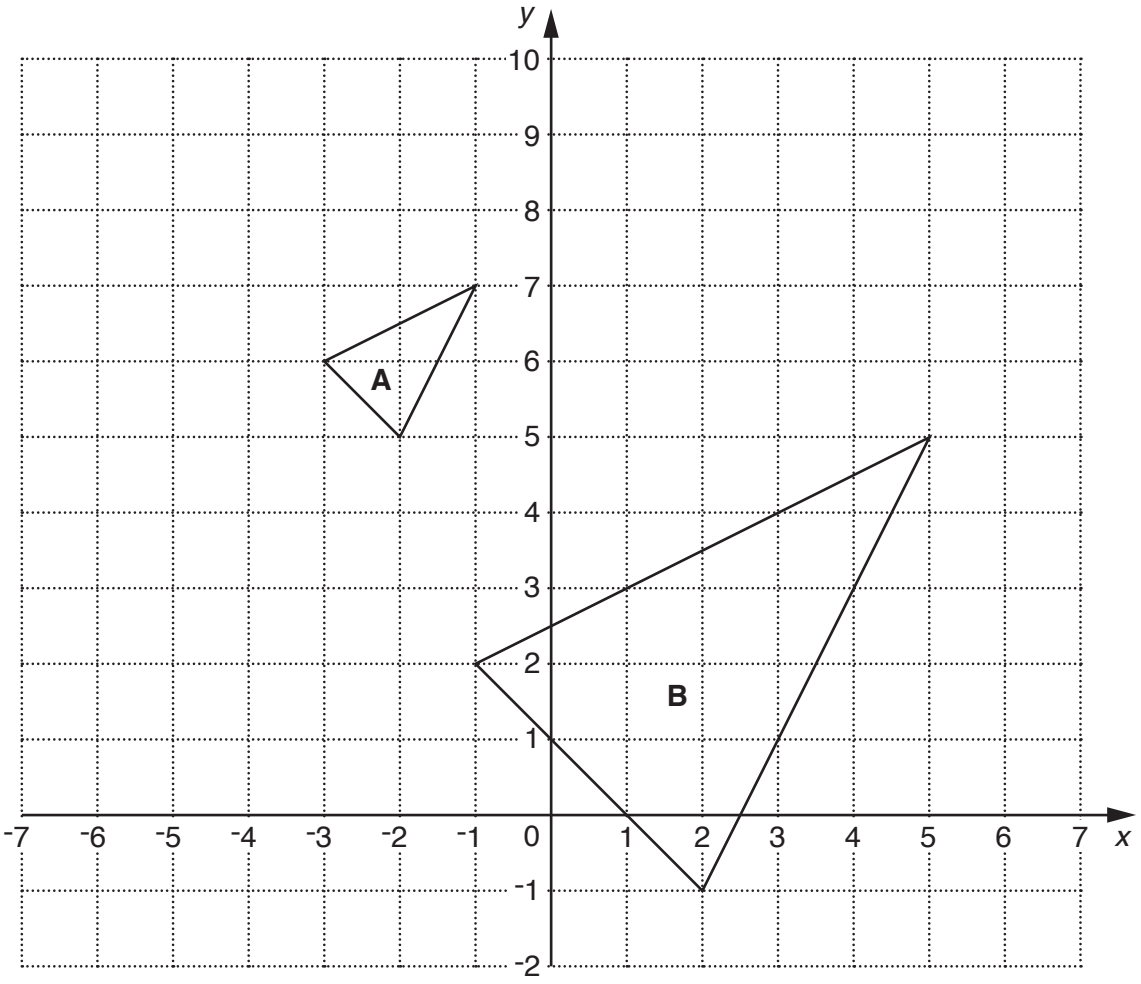
8 **(a)** Triangles **A** and **B** are drawn on the grid.



(i) Translate triangle **A** by $\begin{pmatrix} -3 \\ -1 \end{pmatrix}$.

Label the image **C**. **[2]**

(ii) Describe fully the enlargement that maps triangle **A** onto triangle **B**.

_____ **[2]**

(b) A shape **S** has perimeter 10 cm and area 6 cm^2.
The shape is enlarged with scale factor 4.

(i) Work out the perimeter of the enlarged shape.

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

(ii) Work out the area of the enlarged shape.

(ii) _____ cm^2 **[1]**

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9 Here are the first four terms of a linear sequence, S.

6 11 16 21

(a) Write down an expression for the nth term of the sequence S.

(a) _____ **[2]**

(b) An expression for the nth term of another sequence, T, is $120 - 2n$.
The sequences S and T have one term with the same value, v, in the same position, n.

Find the values of n and v for this term.

(b) $n =$ _____

$v =$ _____ **[4]**

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10 (a) Matteus has a meal out.
The total bill is £34.65.
This includes a 12.5% service charge.

Calculate the cost of the meal without the service charge.

(a) £ _____ **[3]**

(b) Emma invests £5760 in a savings account.
The account pays a fixed rate of 2.4% per year compound interest.

Calculate how much money is in the account at the end of 3 years.

(b) £ _____ **[3]**

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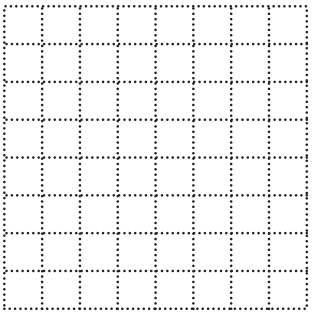
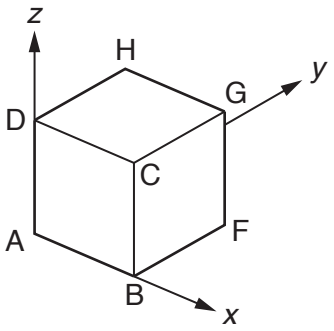
11 **(a)** A triangle ABC has vertices at A (2, 3), B (4, 6) and C (7, 4).

Calculate the length of the longest side of the triangle.
You may use the grid to help you.



(a) _____ **[4]**

(b) A cube ABCDEFGH has sides of length 3 cm.
The cube is placed on axes as shown.



The coordinates of vertex A are (0, 0, 0).

(i) Write down the coordinates of vertex G.

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

(ii) Which vertex has coordinates (3, 0, 3)?

(ii) _____ **[1]**

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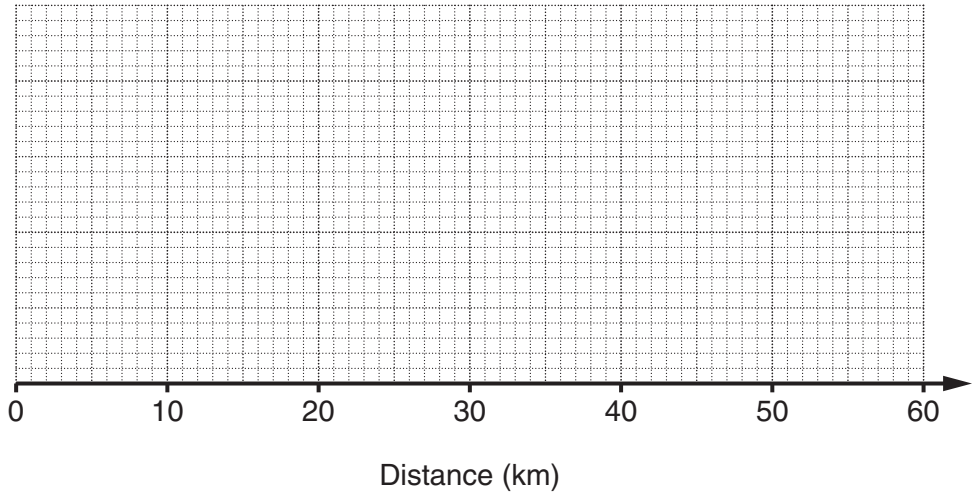
12 Sonia is doing a survey about people's journeys to work.

(a) She asked people who work for one local company the distance they each travelled to get to work.
The table summarises the information she collected.

Minimum distance	0 km
Maximum distance	54 km
Median distance	8 km
Upper quartile	22 km
Interquartile range	17 km

On the grid below draw a box plot to show the distribution of the distances.



[3]

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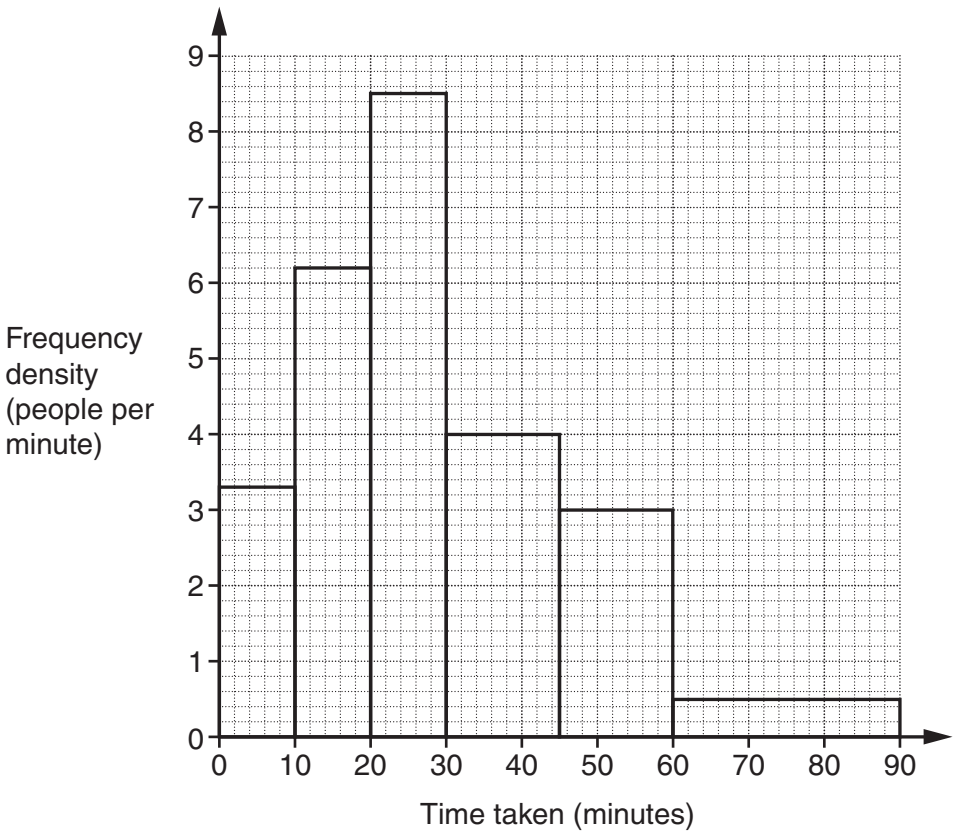
(b) Sonia also surveyed a group of people in her town to find out how long it took each of them to travel from home to work.
Her results are summarised in the histogram.



(i) How many of these people took more than one hour to travel to work?

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

(ii) A national survey showed that 75% of workers took 30 minutes or less to travel from home to work.

How do the results of Sonia's survey compare with the national survey?

_____

_____ **[4]**

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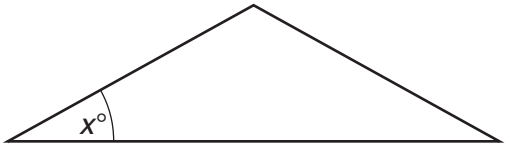
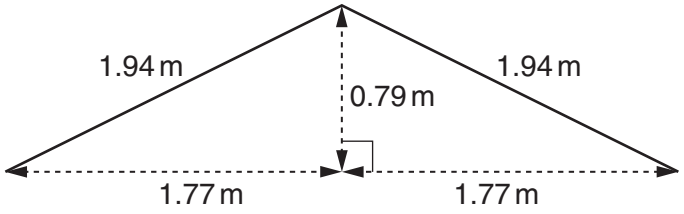
13* The pitch, $x°$, of a roof is the angle between the horizontal and the roof.



The roof of a house is covered with tiles.
The type of tile that can be used depends on the pitch ($x°$) of the roof.
The table below gives information about the range of pitch angles for some types of roof tile.

Type	**Plain**	**Slate appearance**	**Pantile**	**Low profile**
Roof pitch ($x°$)	$x \geqslant 35°$	$x \geqslant 25°$	$x \geqslant 22{\cdot}5°$	$x \geqslant 17{\cdot}5°$

The diagram below shows the end elevation of a roof.



Not to scale

Which of these types of tiles could be used for this roof?

_____

_____

_____ **[5]**

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14 **(a)** Solve.

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

(a) $x =$ _____ **[3]**

(b) Express as a single fraction.

$$\frac{3}{2y} - \frac{4}{5y}$$

(b) _____ **[2]**

15 The mass of a sack of rice is 20 kg, correct to the nearest kilogram.
Salma uses this rice to fill small bags with 500 g of rice, correct to the nearest 10 grams.

(a) Write down the maximum possible mass of rice in a small bag.

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

(b) Calculate the minimum number of small bags that Salma can fill.

(b) _____ **[3]**

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16 **(a)** Factorise $15x^2 + x - 2$.

(a) _____ **[2]**

(b) Solve this equation.

$$3x^2 + 5x - 11 = 0$$

Give your solutions correct to two decimal places.

(b) $x =$ _____ or $x =$ _____ **[3]**

17 The mass, in milligrams, of a steel ball bearing is directly proportional to the cube of its diameter, in millimetres.
A 3.5 mm diameter ball bearing has a mass of 170 mg.

Calculate the mass of a ball bearing with a diameter of 5.5 mm.

_____ mg **[3]**

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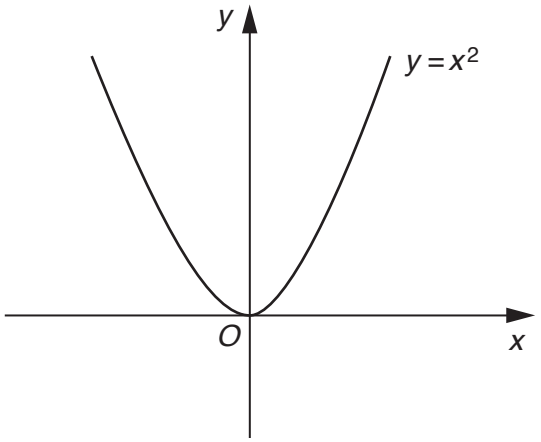
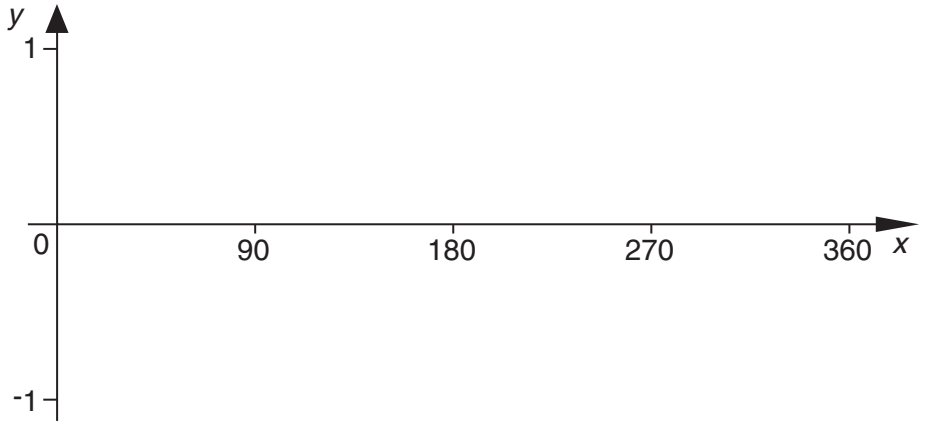
18 **(a)** This is a sketch of the graph of $y = x^2$.



On the same axes, sketch the graph of $y = x^2 + 3$. **[1]**

(b) On the axes below, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.



[1]

Turn over for question 19

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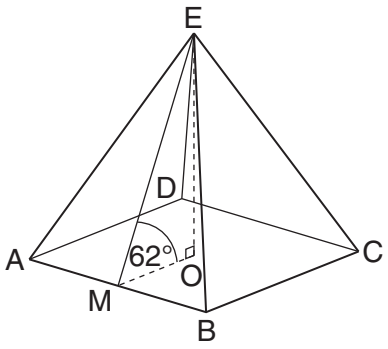
19 The diagram shows a square-based pyramid ABCDE.



The vertex E is vertically above O, the centre of the base, and M is the midpoint of AB. AB = BC = 6 cm and angle OME = 62°.

(a) Show that the height, OE, of the pyramid is 5.64 cm correct to three significant figures.

[2]

(b) Calculate the volume of the pyramid.

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

END OF QUESTION PAPER

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