OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

B392/02

METHODS IN MATHEMATICS

Methods in Mathematics 2

(Higher Tier)

THURSDAY 20 JUNE 2013: Morning
DURATION: 2 hours
plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	

Centre number						Candidate number				

Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Scientific or graphical calculator
Geometrical instruments
Tracing paper (optional)

You are permitted to use a calculator for this paper

READ INSTRUCTIONS OVERLEAF

DC (NH/JG) 2378814541 81223/1

INSTRUCTIONS TO CANDIDATES

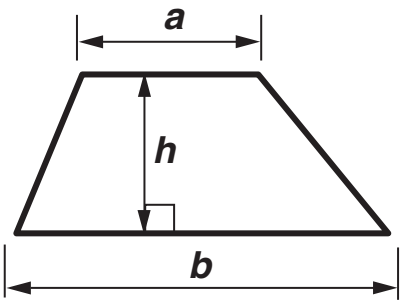
- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **Read each question carefully. Make sure you know what you 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).**

INFORMATION FOR CANDIDATES

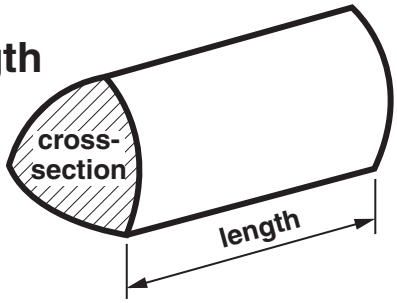
- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **Your Quality of Written Communication is assessed in questions marked with an asterisk (*).**
- **The total number of marks for this paper is 90.**
- **Any blank pages are indicated.**

FORMULAE SHEET: HIGHER TIER

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

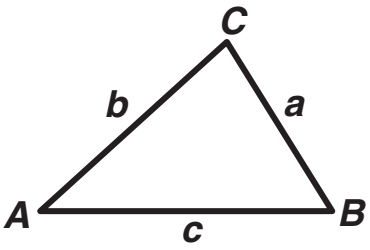


Volume of prism = (area of cross-section) × length



In any triangle ABC

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

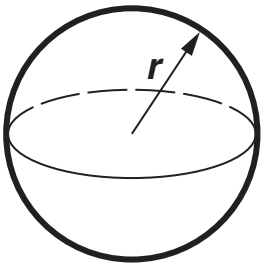


Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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

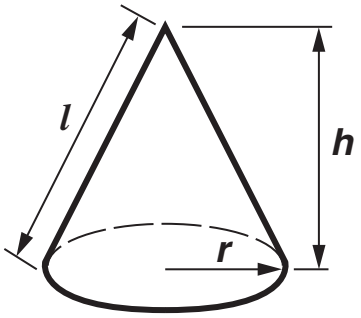
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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



The Quadratic Equation

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

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

1 (a) Use your calculator to work out the following.

(i) $\dfrac{3.2^2}{1.25}$

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

(ii) $\sqrt[3]{6.1 \times 5.3 - 2}$

Give your answer correct to 3 significant figures.

(ii) _____ **[3]**

(b) (i) Write $0.\dot{6}$ as a fraction.

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

(ii) Ali uses a calculator to convert $\frac{317}{333}$ to a decimal.

His calculator gives | 0.951952 | **but this is a rounded value.**

Find the decimal equivalent of $\frac{317}{333}$, writing your answer in the correct form.

(ii) _____ **[1]**

2 (a) Sally makes jam using this list of ingredients.

JAM
2 kg fruit
3 kg sugar
8 tablespoons lemon juice

Sally uses 5 kg of fruit.

How much sugar should she use?

(a) _____ kg [2]

(b) Connor and Dave share some money in the ratio 2:3.
Connor gets £18.

How much money do they share?

(b) £ _____ [2]

3 Fill in the missing numbers in these sequences. There are two missing numbers in each sequence.

(a) 1, 2, 4, _____, 16, 32, _____ [2]

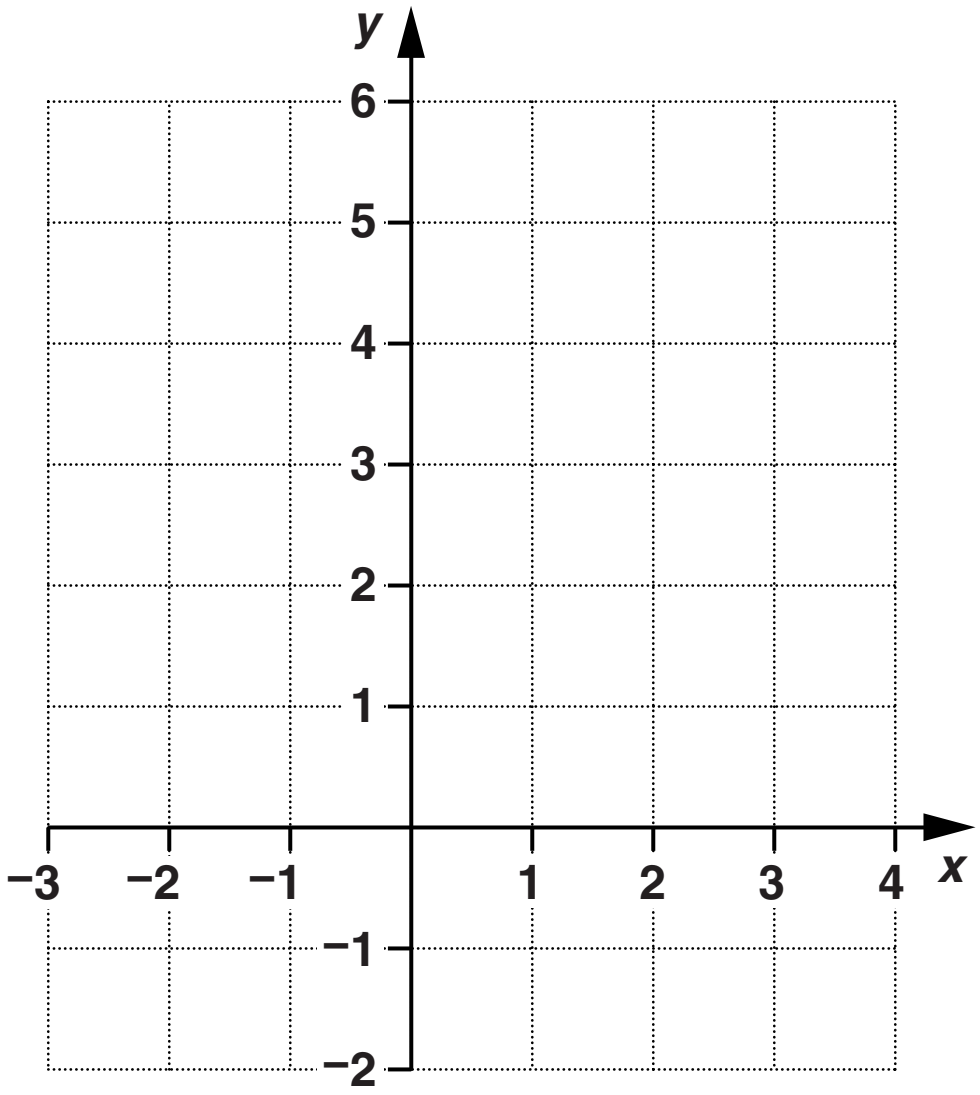
(b) 1, 3, 6, _____, 15, 21, _____ [2]

4 (a) Complete the following table for $y = x^2 - x - 1$ by filling in the four missing values.

x	−2	−1	0	1	2	3
y	5		−1			

[2]

(b) On the following grid draw the graph of $y = x^2 - x - 1$.

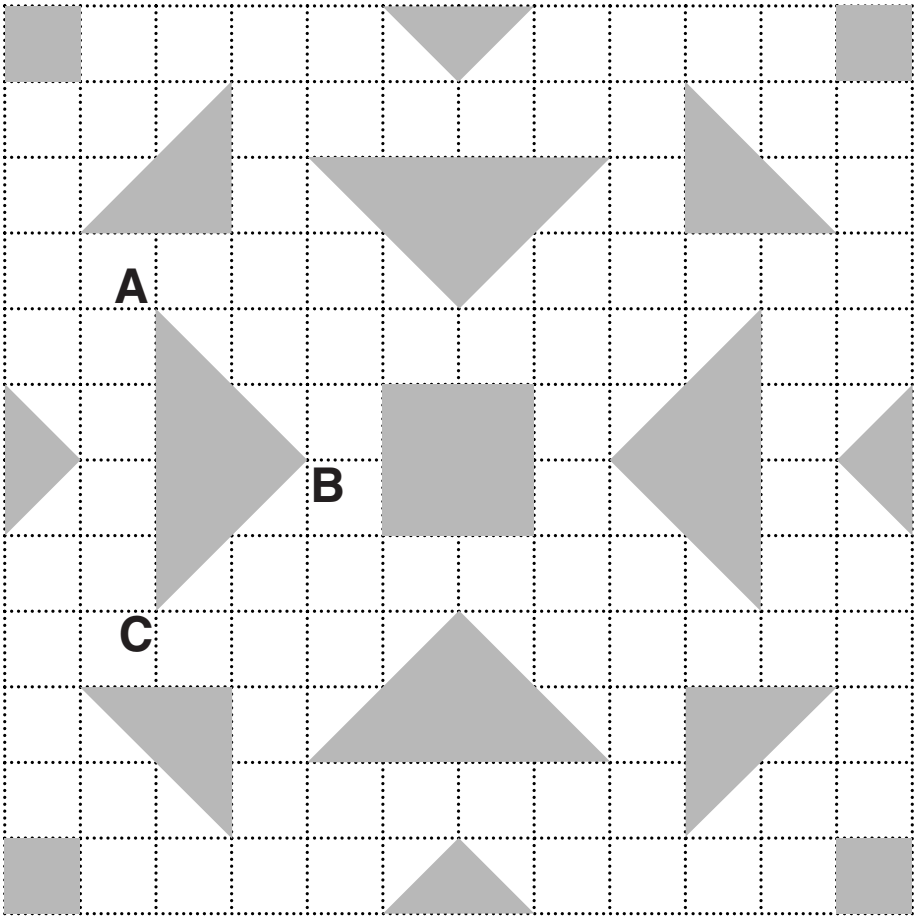


[2]

(c) Use your graph to solve the equation $x^2 - x - 1 = 0$.
Give your answers correct to 1 decimal place.

(c) _____ **[2]**

5 The following design is drawn on a one-centimetre square grid.



(a) In the design, how many OTHER triangles are congruent to triangle ABC?
Do not count triangle ABC as one of them.

(a) _____ **[1]**

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

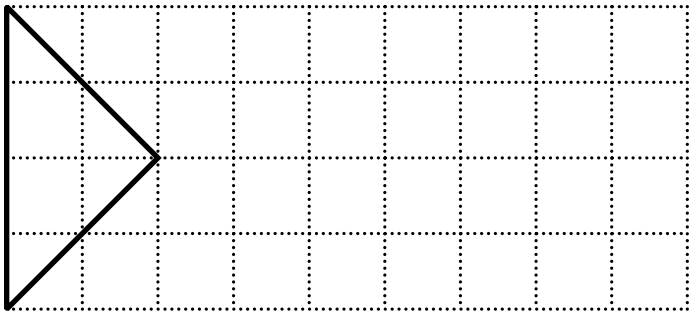
(b) _____ % [4]

(c) Calculate the length AB. Give your answer correct to two decimal places.

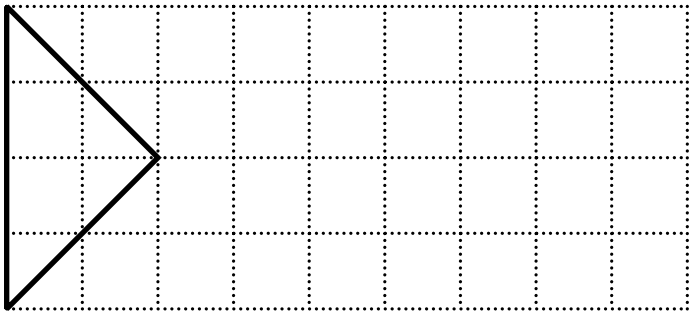
(c) _____ cm [4]

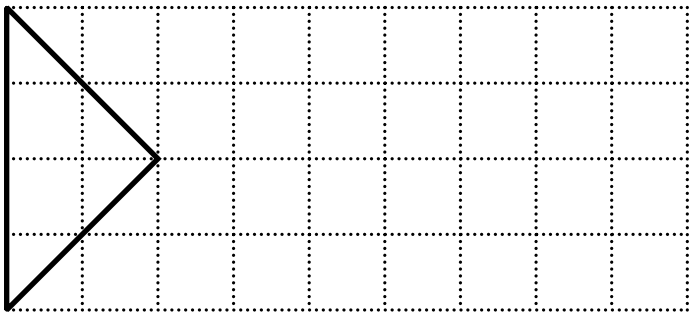
(d) Sameera can fit ALL the shaded shapes from the design into this rectangle shown below.
The shapes do not overlap. There are no gaps between the shapes.

Show how the shapes fit in this rectangle. Triangle ABC has been drawn in already.



You can use the grids below for your rough work.





[3]

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6 (a) Solve.

$$3(x - 2) = 2x - 15$$

(a) _____ **[3]**

(b) Rearrange $3x + 2y = 6$ to make y the subject.

(b) _____ **[2]**

(c) Solve.

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

(c) _____ [3]

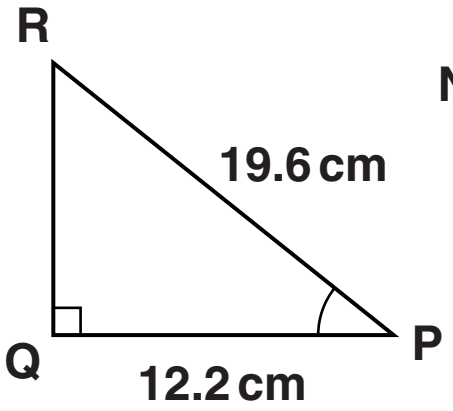
7 The table below shows some sets of positive integers which sum to 8, and the product of each set.

The sum is 8	Product
6 + 2	6 × 2 = 12
4 + 3 + 1	4 × 3 × 1 = 12
2 + 1 + 5	2 × 1 × 5 = 10

Find the maximum possible product for a set of positive integers which sum to 8.
Show your trials in the table. You may not need to use all the lines.

The maximum product is _____ [3]

8 (a) PQR is a right-angled triangle.
RP = 19.6 cm. QP = 12.2 cm. This is shown on the following diagram.

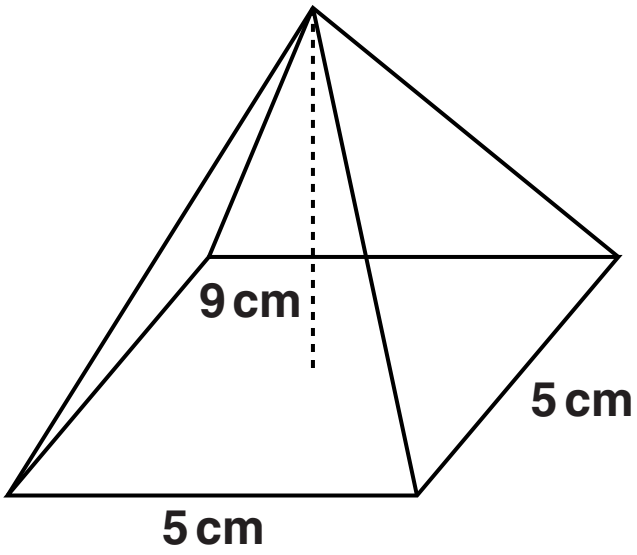


Work out the size of angle RPQ.

(a) _____ ° [3]

(b) A pyramid has a square base with side 5 cm.
The height of the pyramid is 9 cm.
This is shown on the following diagram.

Calculate the volume of the pyramid.



(b) _____ cm^3 [3]

9 (a) A company sets a target of at least 25% of its directors being female.
The company has 9 directors altogether.

What is the minimum number of female directors the company needs to meet its target?

(a) _____ [2]

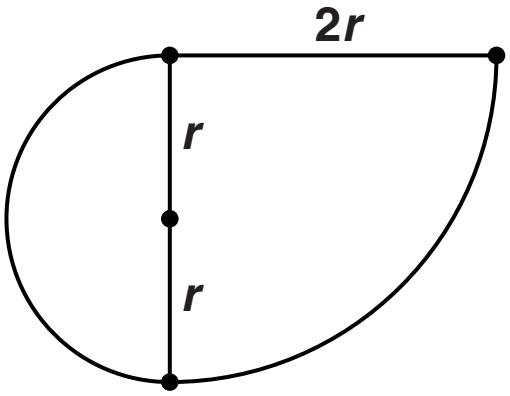
(b) Peter sees the following advert for a book.

70% off usual price **Now £3.99**

What is the usual price of the book?

(b) £ _____ [3]

10* The shape below consists of a semicircle with radius *r* and a quarter circle with radius 2*r*.



Find an expression for the area of the shape, in terms of *r* and π.

Give your expression in its simplest form.

_____

_____

_____

_____

_____

_____ **[4]**

11 (a) Expand and simplify.

$(x + 3)(2x - 1)$

(a) _____ **[3]**

(b) Factorise fully.

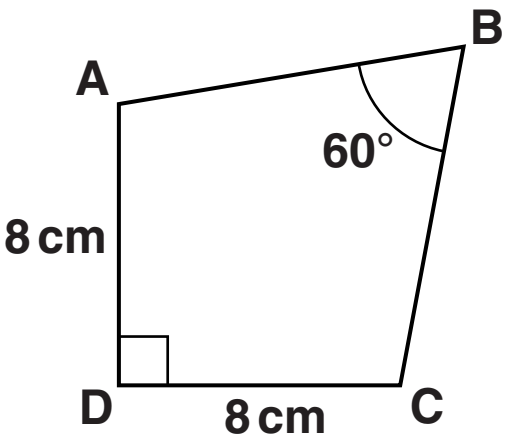
$3x^2 - 12$

(b) _____ **[2]**

(c) Write $\frac{1}{x-3} + \frac{1}{x+3}$ as a single fraction. Give your answer in its simplest form.

(c) _____ **[2]**

12 ABCD is a kite.
Angle D is 90°. Angle B is 60°. AD = DC = 8 cm. This is shown on the following diagram.



NOT TO SCALE

(a)* Show clearly that triangle ABC is equilateral.

_____

_____

_____

_____

_____

_____ **[3]**

(b) Calculate the area of the kite.

(b) _____ cm^2 [5]

13 Solve the following simultaneous equations.

$$y + x^2 = 3$$
$$y - 4x = 7$$

$x =$ _____

$y =$ _____ **[6]**

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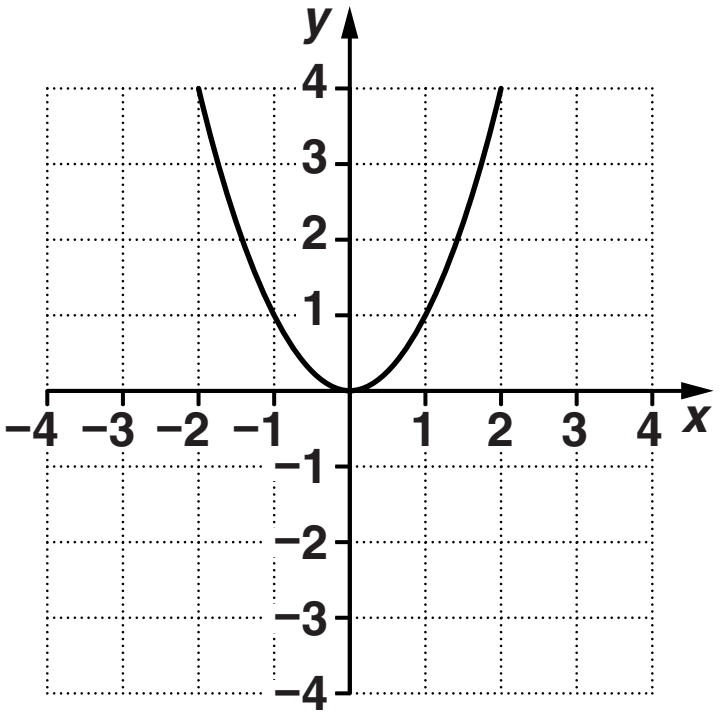
14 (a) The graph of $y = x^2$ is shown on the grid below.

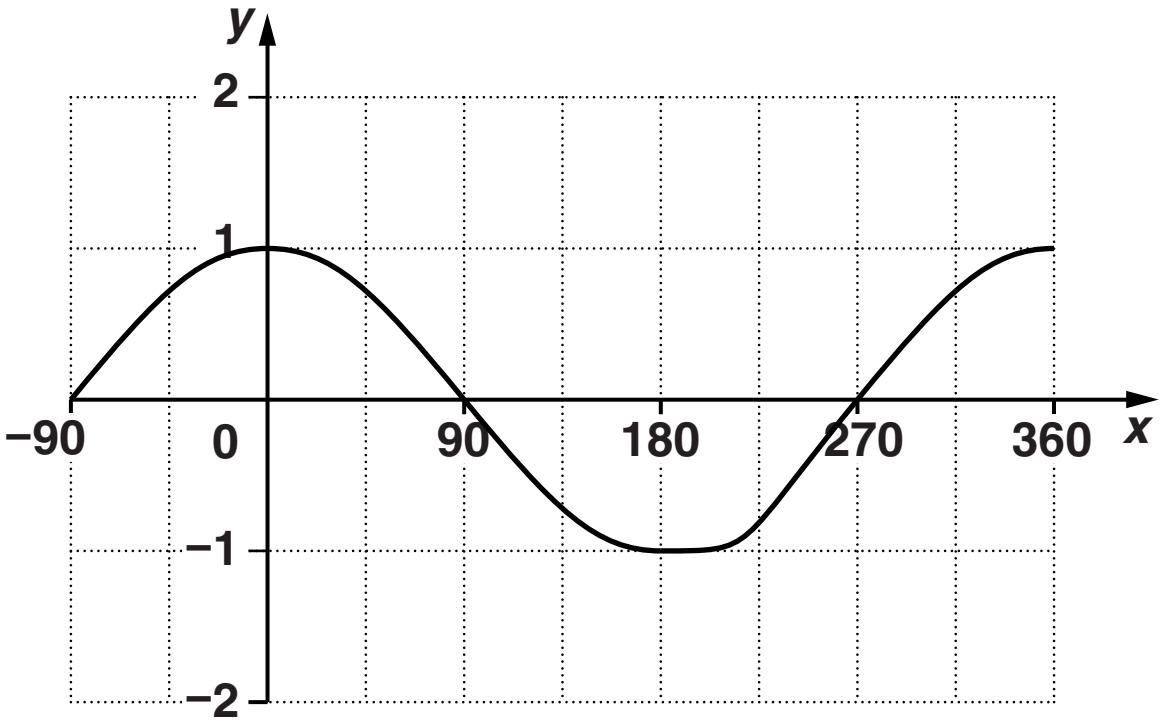
Sketch the graph of $y = (x + 1)^2$ on the same grid.



[2]

(b) The graph of $y = \cos x°$ is shown on the grid below.

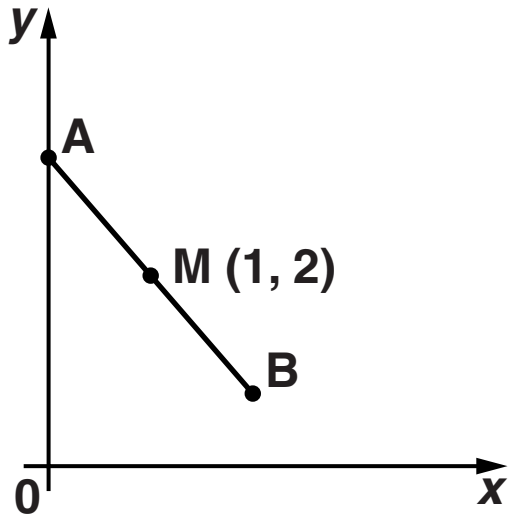
Sketch the graph of $y = 2\cos x°$ on the same grid.



[2]

15 **M is the midpoint of AB.**
M has coordinates (1, 2)
A lies on the *y*-axis.
B does NOT lie on the *x*-axis.
This is shown on the diagram below.

Find possible coordinates for A, and the coordinates of B for this position of A.



NOT TO SCALE

A (_____, _____)

B (_____, _____) [3]

16 **A rectangular picture has width 20 cm and height 25 cm.**
Janice wants to make an enlargement of the picture for a poster.
The area of the poster will be 6 times the area of the original picture.

Calculate the width and height of the poster. Give your answers to an appropriate degree of accuracy.

Width _____ **cm**

Height _____ **cm [4]**

END OF QUESTION PAPER

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