AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE MATHEMATICS

H

Higher Tier Unit 3 Geometry and Algebra

Tuesday 8 November 2016 Morning Time allowed: 1 hour 30 minutes

Materials

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

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- 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. Cross through any work that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- Quality of written communication is specifically assessed in Questions 1 and 5. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Advice

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

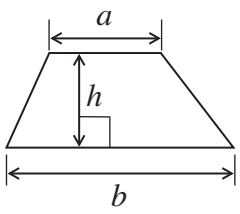
N 0 V 1 6 4 3 6 0 3 H 0 1

WMP/Nov16/E5

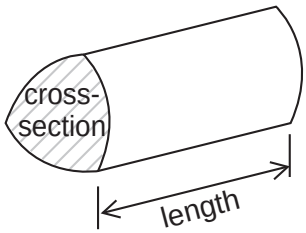
43603H

Formulae Sheet: Higher Tier

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

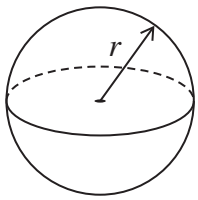


Volume of prism = area of cross-section × length



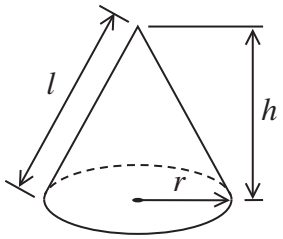
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

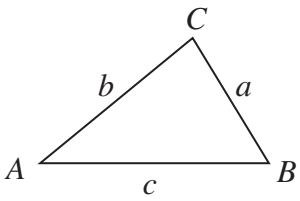
Curved surface area of cone = $\pi r l$



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

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

Do not write outside the box

Answer **all** questions in the spaces provided.

***1** The same type of shirt is sold in two shops.

Shop A

£19.90

Buy one
get second for half price

Shop B

£18

Get a 15% discount
when you buy two

Which shop is cheaper for buying **two** of these shirts?
You **must** show your working.

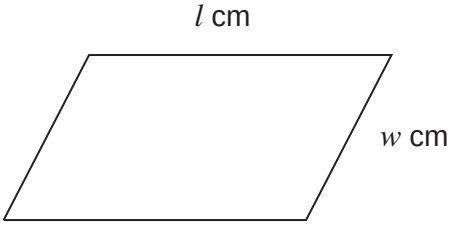
[5 marks]

Answer _____

5

Do not write outside the box

2 (a)



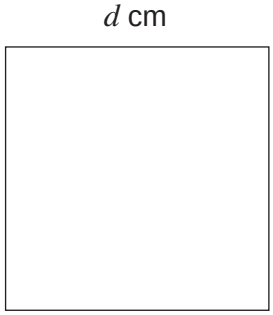
The perimeter of the parallelogram is P cm

Circle the correct formula.

[1 mark]

$P = l + w$ $P = lw$ $P = 2(l + w)$ $P = 2lw$

2 (b)



The area of the square is A cm^2

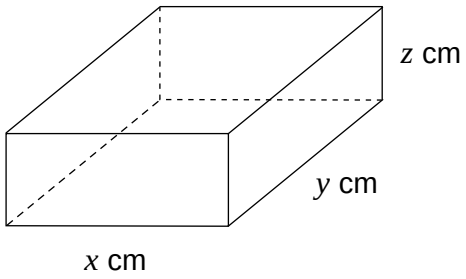
Circle the correct formula.

[1 mark]

$A = 2d$ $A = 4d$ $A = \sqrt{d}$ $A = d^2$

Do not write outside the box

2 (c)



The surface area of the cuboid is S cm^2

Circle the correct formula.

[1 mark]

$S = xyz$ $S = (xyz)^2$ $S = 6xyz$ $S = 2(xy + xz + yz)$

2 (d) The surface area of a **cube** is 150 cm^2

Work out the volume of the cube.

[4 marks]

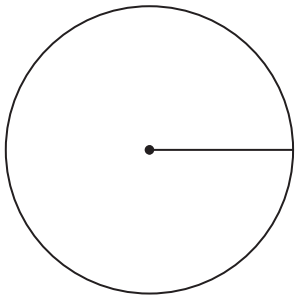
Answer _____ cm^3

7

Do not write outside the box

3 (a) The radius of this circle is 2.5 cm

Not drawn accurately



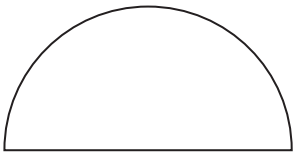
Work out the area.
Give your answer to 1 significant figure.

[3 marks]

Answer _____ cm^2

3 (b) The diameter of this semicircle is 16 cm

Not drawn accurately



Work out the perimeter of the semicircle.

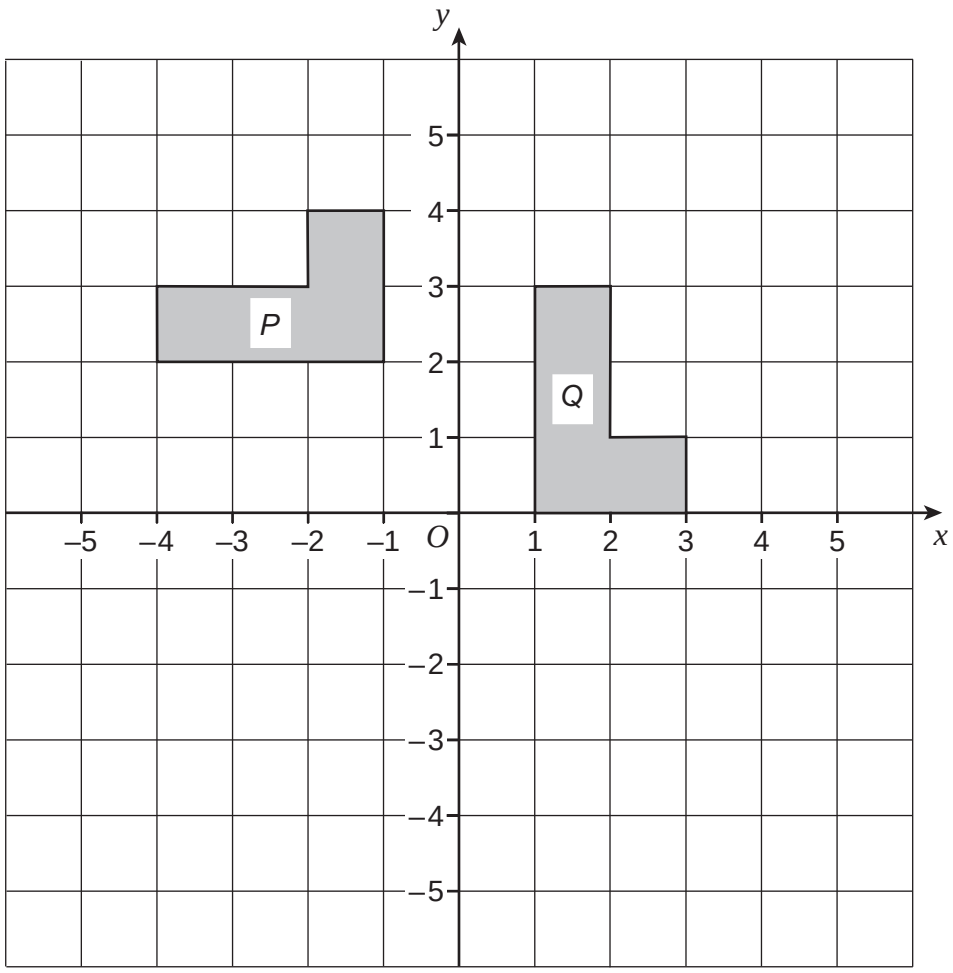
[3 marks]

Answer _____ cm

Do not write outside the box

4 (a) Describe fully the **single** transformation that maps shape *P* to shape *Q*.

[3 marks]



4 (b) On the grid, translate shape *Q* by vector $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$

[2 marks]

11

Do not write outside the box

***5** Use trial and improvement to find a positive solution to $x^3 - 10x = 6$
Give your answer to 1 decimal place.

[4 marks]

x	$x^3 - 10x$	**Comment**
4	24	Too big

$x =$ _____

Do not write outside the box

6 Ali is going to drive 210 miles.

He has 27 **litres** of petrol in his car.
His car travels 36 miles for each **gallon** of petrol.

Does he have enough petrol for the journey?
You **must** show your working.

[4 marks]

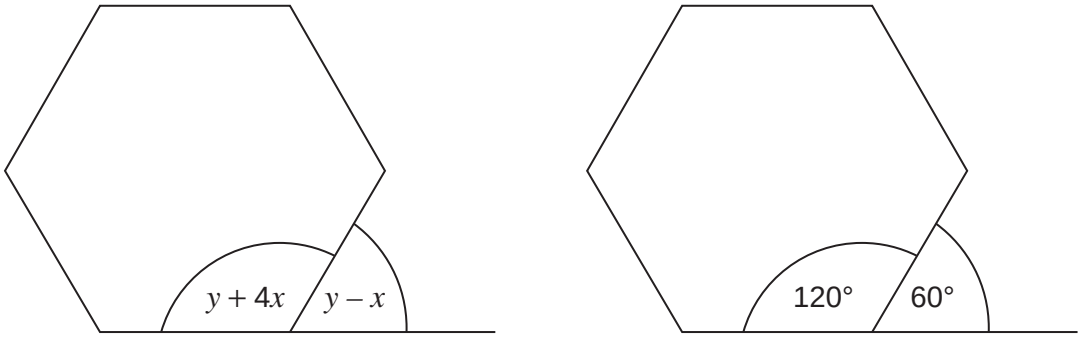
Answer _____

Turn over for the next question

8

Do not write outside the box

7 The diagram shows two regular hexagons with the base lines extended.



Work out the values of x and y.

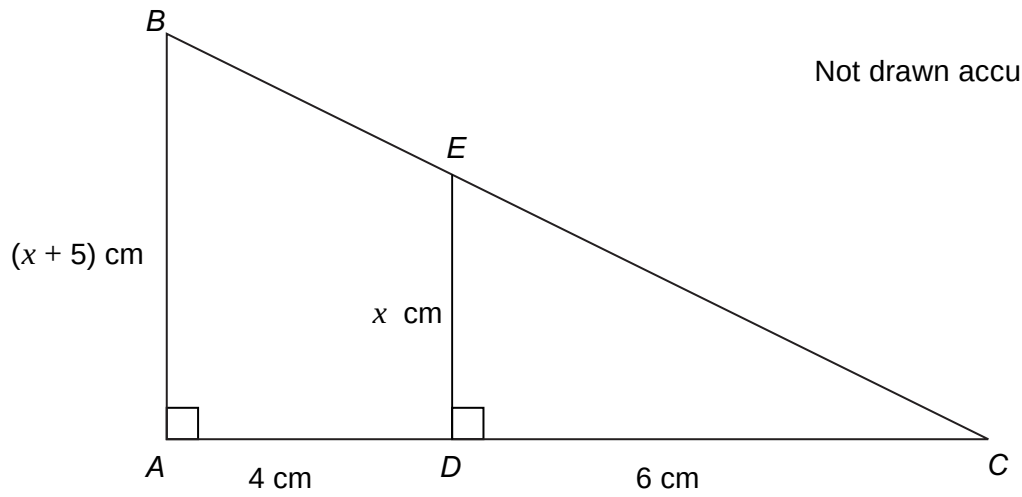
[5 marks]

x = _____ degrees

y = _____ degrees

Do not write outside the box

8 *ABC* and *DEC* are similar triangles.



Not drawn accurately

Work out the value of x.

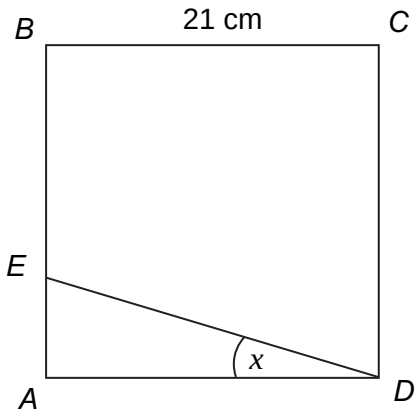
[4 marks]

Answer _____ cm

9

Do not write outside the box

9 *ABCD* is a square.



Not drawn accurately

$AE = \frac{2}{5} EB$

Work out the size of angle x.

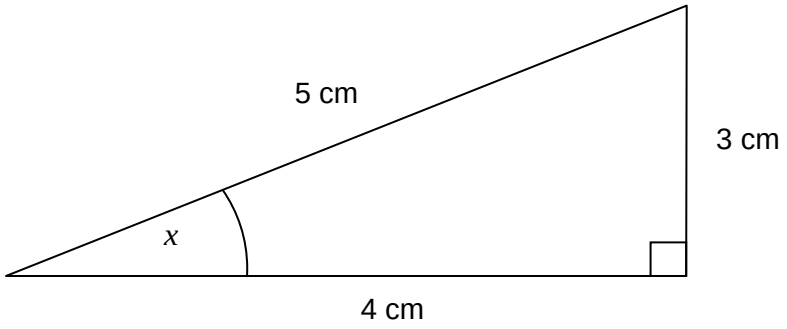
[4 marks]

Answer _____ degrees

Do not write outside the box

10 (a)

Not drawn accurately



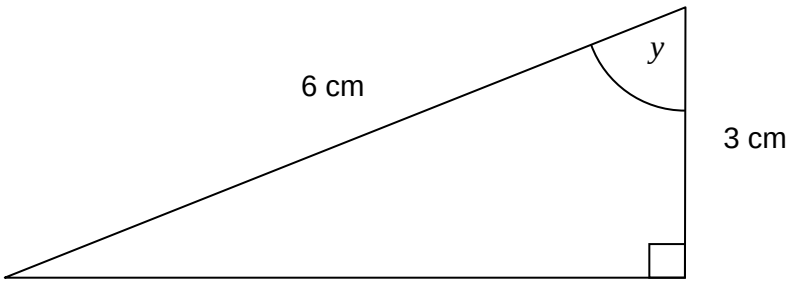
Circle the value of sin x.

[1 mark]

$\frac{3}{5}$ $\frac{3}{4}$ $\frac{4}{5}$ $\frac{4}{3}$ $\frac{5}{3}$

10 (b)

Not drawn accurately



Circle the size of angle y.

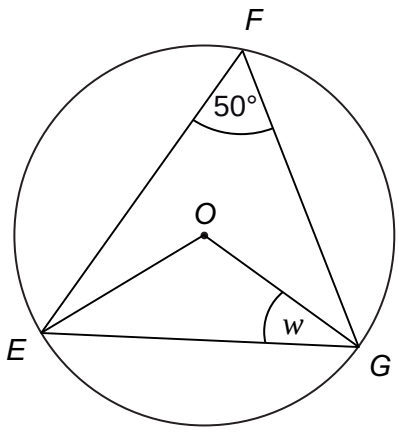
[1 mark]

30° 36° 45° 50° 60°

6

Do not write outside the box

11 (a) *E, F* and *G* are points on a circle, centre *O*.



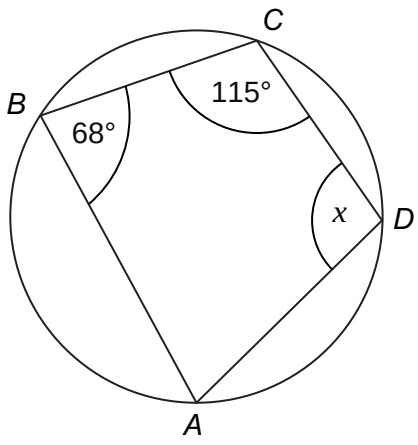
Not drawn accurately

Work out the size of angle w.

[2 marks]

Answer _____ degrees

11 (b) *A*, *B*, *C* and *D* are points on the circumference of the circle.



Not drawn accurately

Work out the size of angle x.
Give a reason for your answer.

[2 marks]

Answer _____ degrees

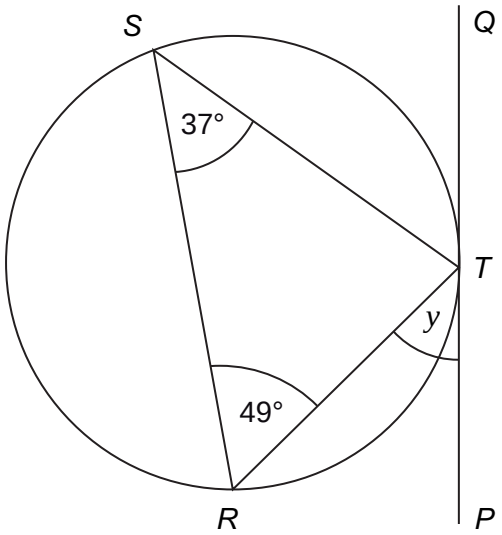
Reason _____

_____

Do not write outside the box

11 (c) *PTQ* is a tangent to the circle.
R, S and *T* are points on the circle.

Not drawn accurately



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

[2 marks]

Answer _____ degrees

Reason _____

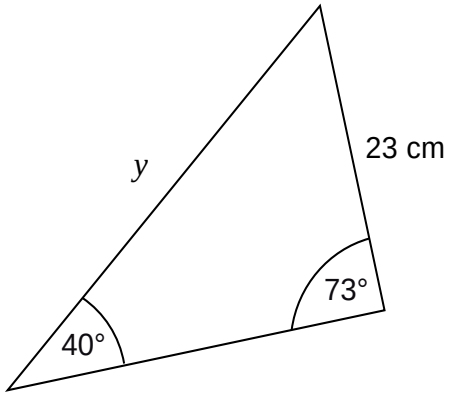
_____

Turn over for the next question

6

Do not write outside the box

12 Work out length y.



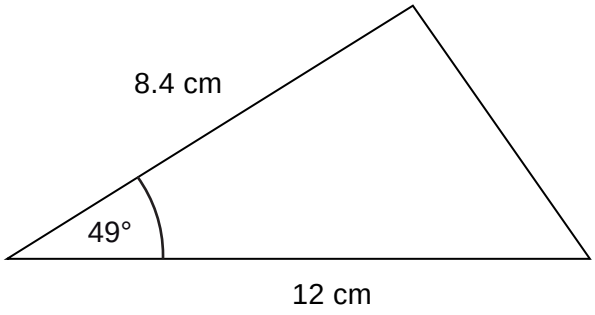
Not drawn accurately

[3 marks]

Answer _____ cm

Do not write outside the box

13 Work out the area of the triangle.



Not drawn accurately

[2 marks]

Answer _____ cm^2

14 Solve $2x^2 + 3x - 6 = 0$

Give your answers to 2 decimal places.

[3 marks]

Answer _____ and _____

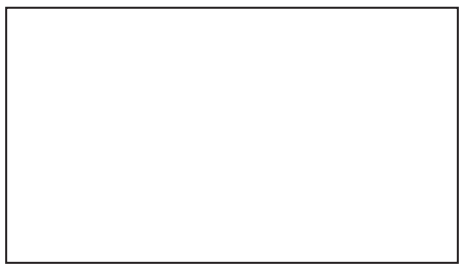
8

Turn over ▶

Do not write outside the box

15 The area of this rectangle is 28 cm^2

Not drawn accurately



$(x + 2)$ cm

$(6x - 1)$ cm

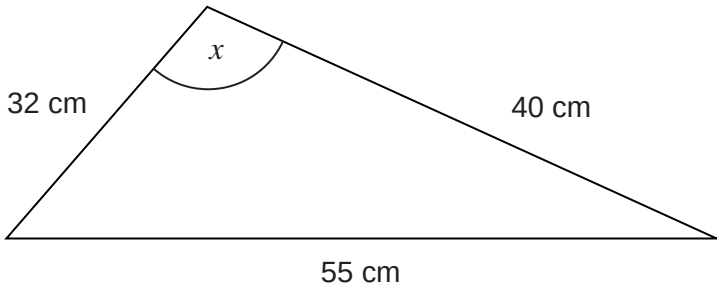
Work out the perimeter of the rectangle.

[7 marks]

Answer _____ cm

Do not write outside the box

16 Work out the size of angle x.



Not drawn accurately

[3 marks]

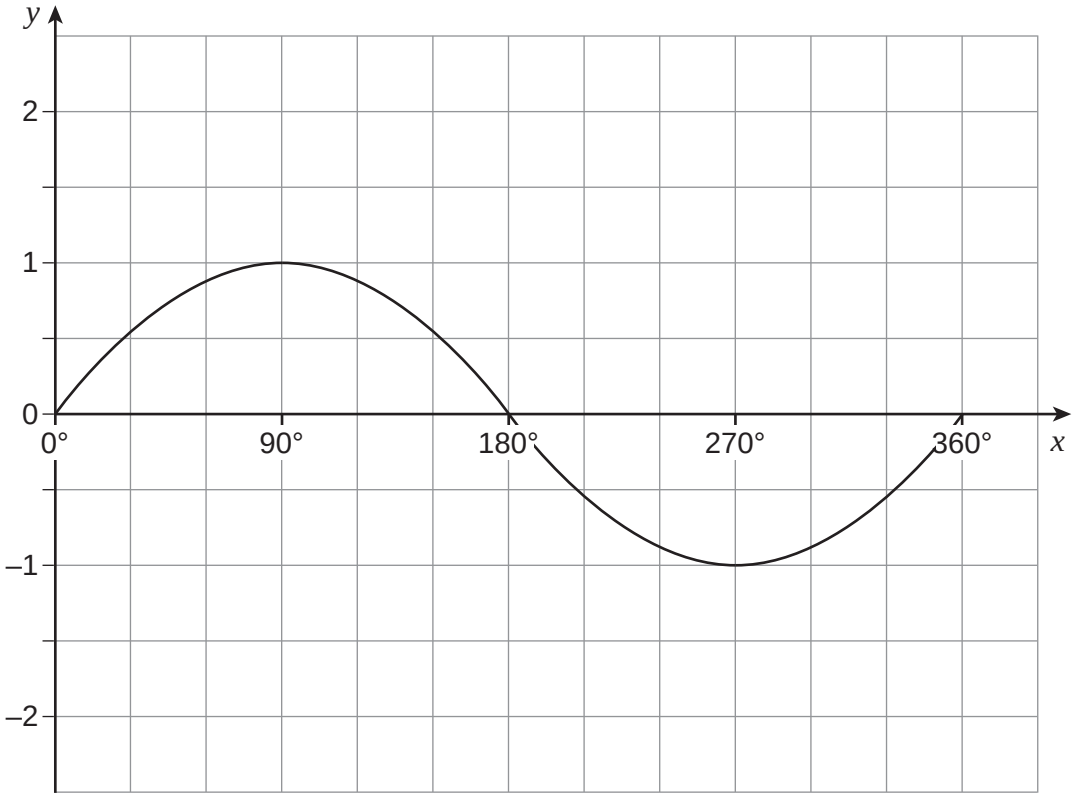
Answer _____ degrees

Turn over for the next question

10

Do not write outside the box

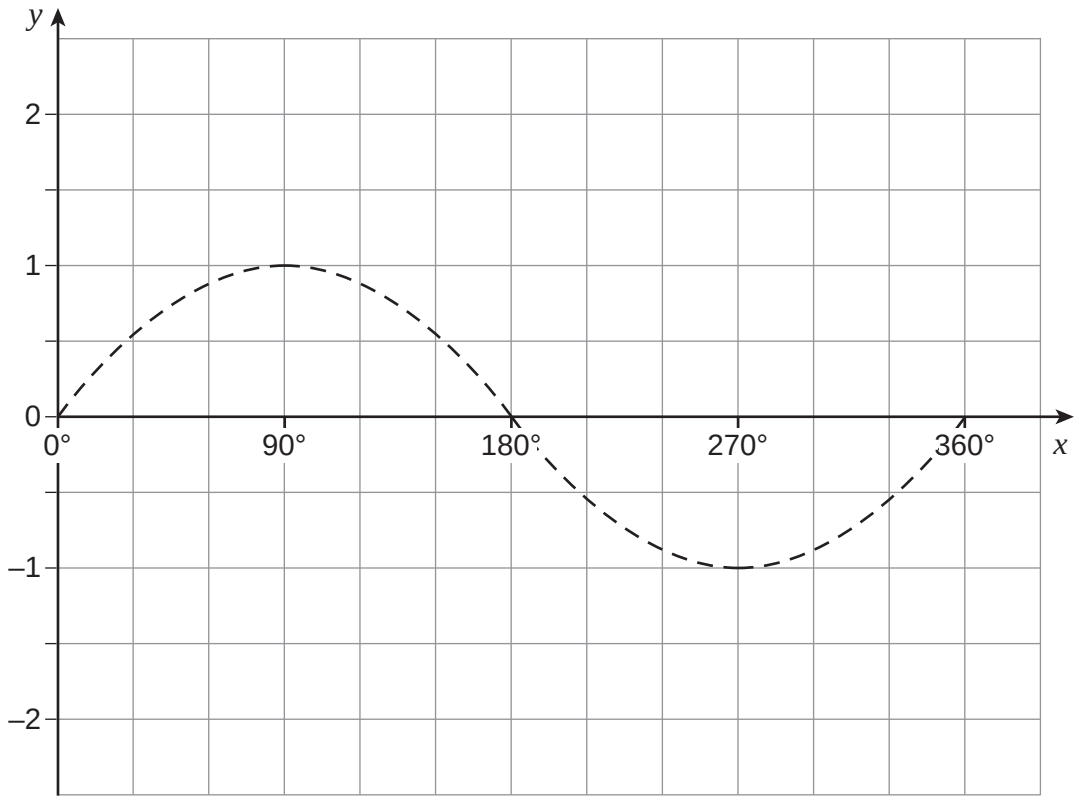
17 The graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$ is shown.



17 (a) On the grid below, draw the graph of $y = 1 + \sin x$ for $0° \leqslant x \leqslant 360°$

The graph of $y = \sin x$ is shown to help you.

[1 mark]

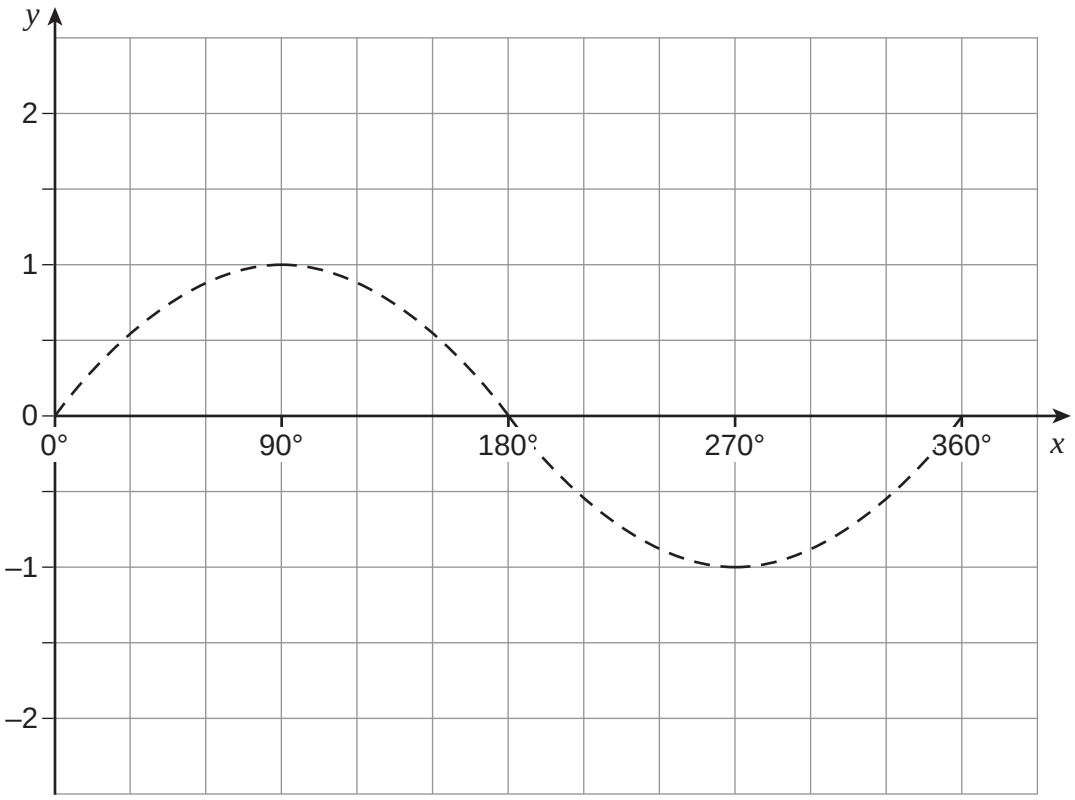


Do not write outside the box

17 (b) On the grid below, draw the graph of $y = \sin(x + 90°)$ for $0° \leqslant x \leqslant 360°$

The graph of $y = \sin x$ is shown to help you.

[1 mark]

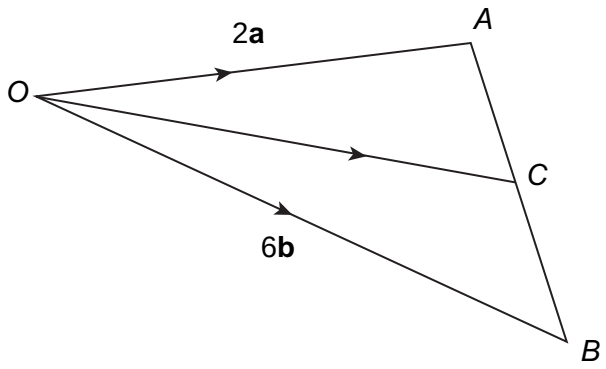


Turn over for the next question

2

Do not write outside the box

18 C is the midpoint of AB.



$\overrightarrow{OA} = 2\mathbf{a}$

$\overrightarrow{OB} = 6\mathbf{b}$

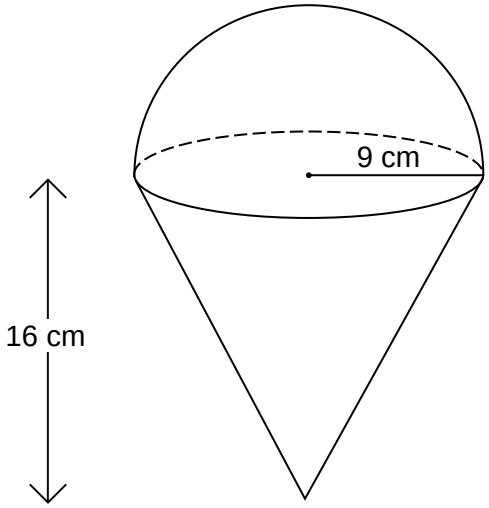
Work out $\overrightarrow{OC}$ in terms of **a** and **b**.
Simplify your answer as far as possible.

[4 marks]

Answer _____

Do not write outside the box

19 A hemisphere and a cone each have radius 9 cm
They are joined together to make a toy.



Work out the total volume of the toy.

[4 marks]

Answer _____ cm^3

END OF QUESTIONS

8

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED