

A



Surname _____

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I declare this is my own work.

Level 2 Certificate

FURTHER MATHEMATICS

Paper 2 Calculator

8365/2

Wednesday 21 June 2023

Afternoon

Time allowed: 1 hour 45 minutes

[Turn over]



J U N 2 3 8 3 6 5 2 0 1

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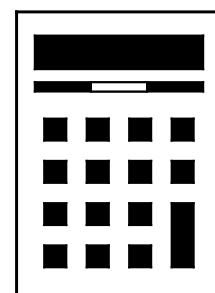


At the front of this book, write your surname and forename(s), your centre number, your candidate number and add your signature.

MATERIALS

For this paper you must have:

- **a calculator**
- **mathematical instruments**
- **the Formulae Sheet (enclosed).**



INSTRUCTIONS

- **Use black ink or black ball-point pen.
Draw diagrams in pencil.**
- **Answer ALL questions.**

[Turn over]



- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**



INFORMATION

- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 80.**
- **You may ask for more graph paper and tracing paper. These must be tagged securely to this answer book.**
- **The use of a calculator is expected but calculators with a facility for symbolic algebra must NOT be used.**

DO NOT TURN OVER UNTIL TOLD TO DO SO



2(a) The first four terms of a linear sequence are

15 18.5 22 25.5

Work out an expression for the n th term. [2 marks]

Answer _____

[Turn over]



$$3 \quad \begin{pmatrix} 3 & 5 \\ u & 2 \end{pmatrix} \begin{pmatrix} 1 \\ 4 \end{pmatrix} = \begin{pmatrix} t \\ 6 \end{pmatrix}$$

Work out the values of t and u .

[2 marks]

$$t = \underline{\hspace{2cm}} \quad u = \underline{\hspace{2cm}}$$

[Turn over]



4 A line passes through $P (1, k)$ and $Q (r, 6)$ where k and r are constants.

The midpoint of PQ has x -coordinate 5

The gradient of the line is 2

Work out the value of k . [4 marks]



- 6 The equation of a circle is
 $(x + 7)^2 + (y - 4)^2 = 36$

Complete these statements. [2 marks]

The coordinates of the centre of the circle are

(_____ , _____)

The radius of the circle is _____

[Turn over]

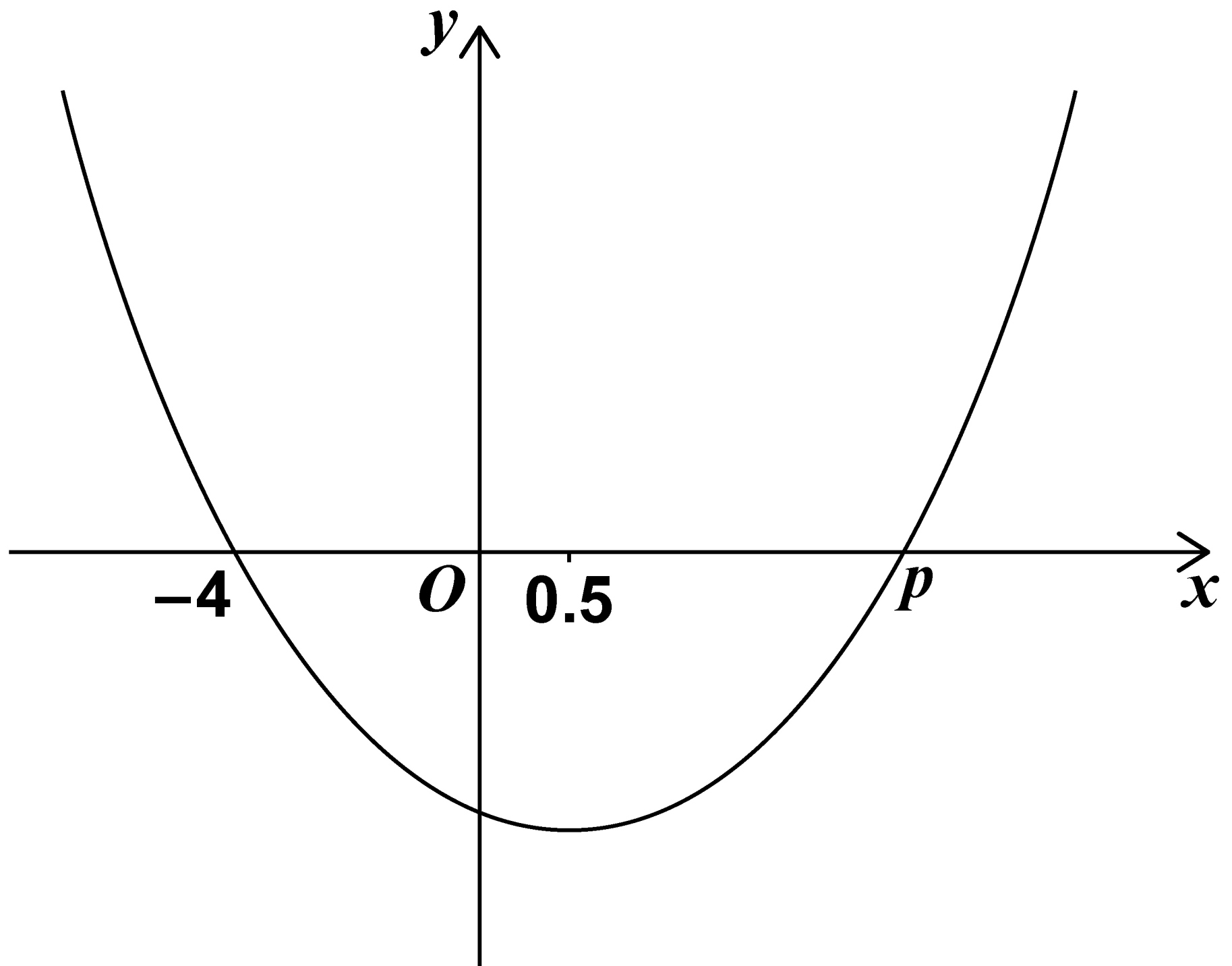
9



- 7 Here is a sketch of the curve $y = ax^2 + bx + c$ where a , b and c are constants.

The curve intersects the x -axis at $(-4, 0)$ and $(p, 0)$

The turning point has x -coordinate 0.5



7(a) Work out the value of p . [1 mark]

$p =$ _____

7(b) Solve $ax^2 + bx + c > 0$ [2 marks]

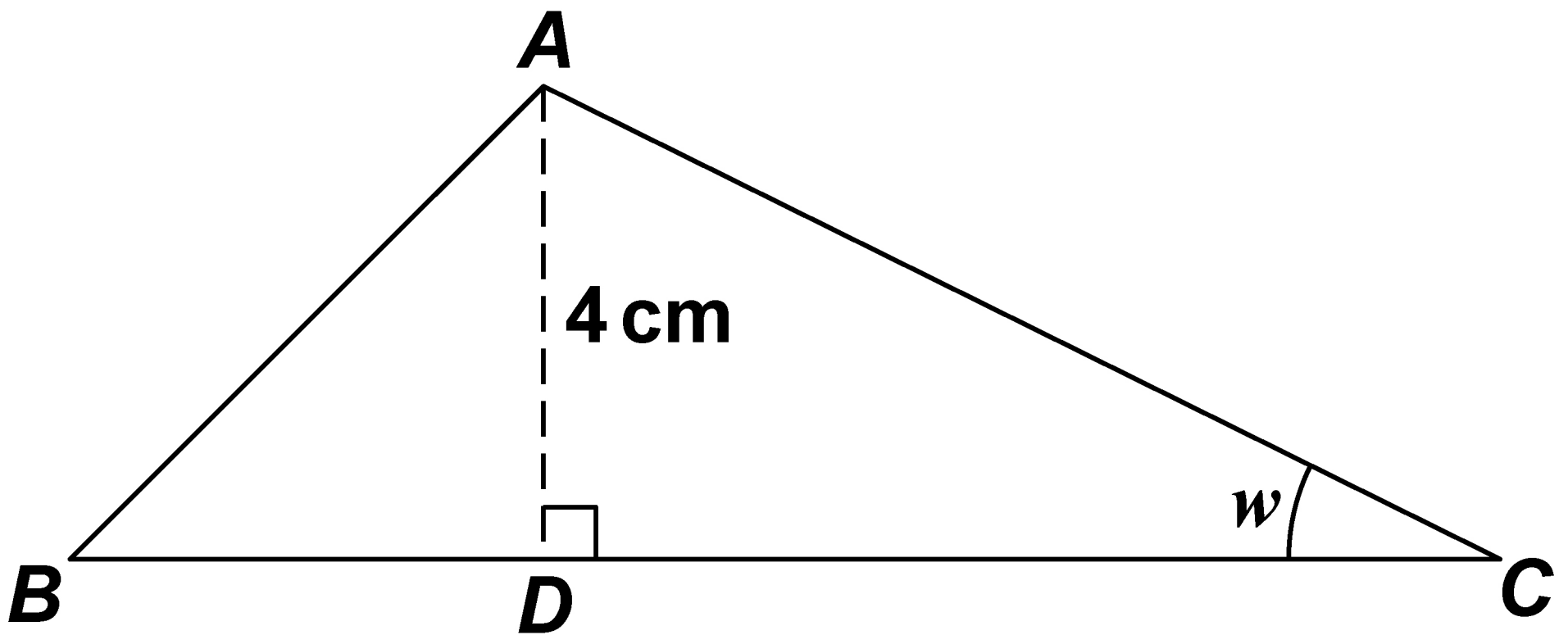
Answer _____

[Turn over]



- 8 ***ABC*** is a triangle with perpendicular height ***AD***.

The diagram is not drawn accurately.



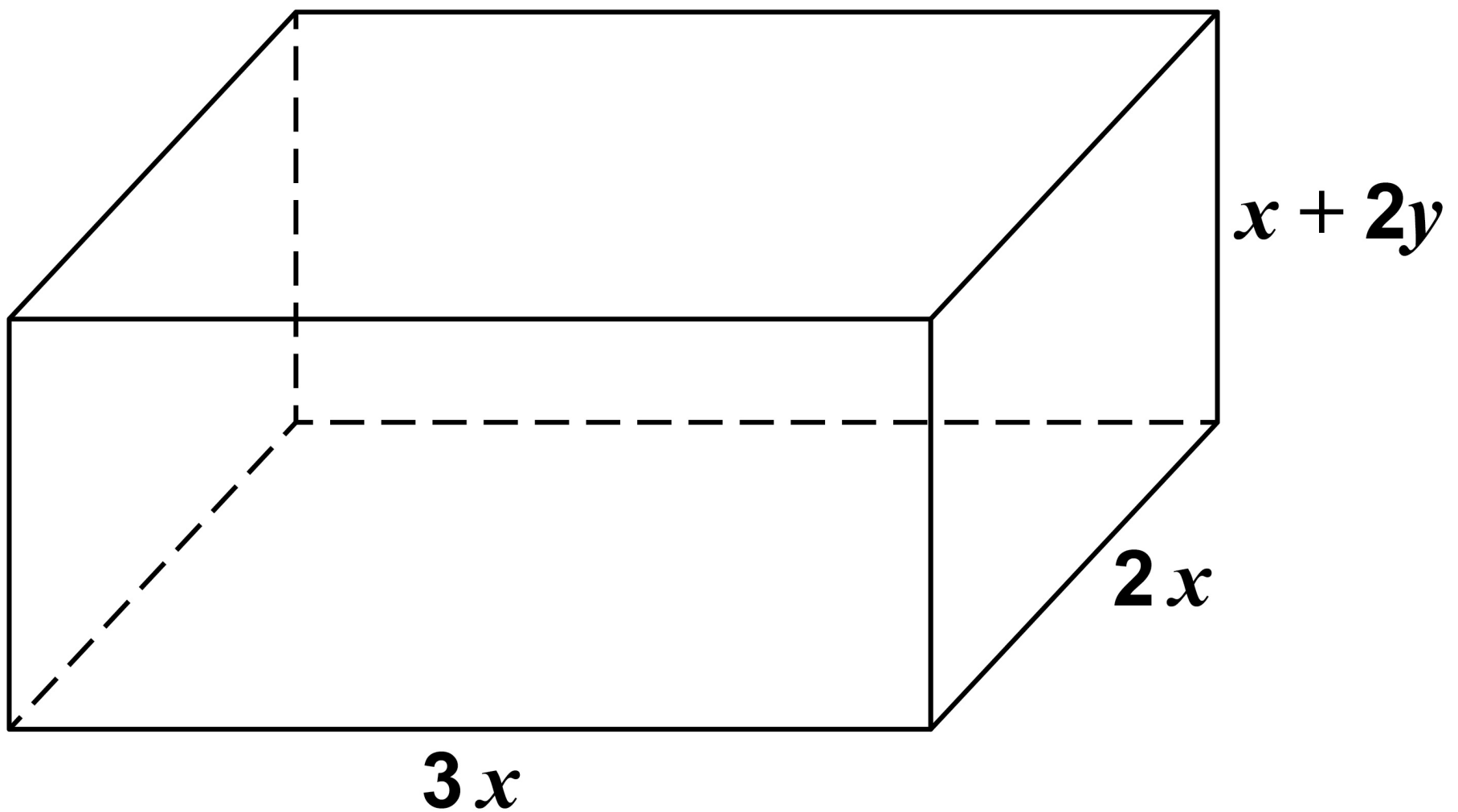
$$\text{Area of } ABC = 25\text{ cm}^2$$

$$BD : DC = 2 : 3$$

Work out the size of angle w .
[4 marks]



- 9 The dimensions of the cuboid are given in centimetres.



The total length of all 12 edges is 300 cm

- 9(a) Show that $y = \frac{75 - 6x}{2}$ [2 marks]



10 Line K has equation $4x - 5y = 17$

Line L passes through the points
(3, 6) and (-5, 16)

Tick (✓) the correct statement about
lines K and L.

The lines are parallel.

The lines are perpendicular.

The lines are neither parallel
nor perpendicular.

Show working to support your
answer. [3 marks]



- 11 Expand and simplify fully
 $(2x^3 - 9)(3x^2 + 4) + x(x - 4)^2$
[4 marks]



Answer _____

[Turn over]

7

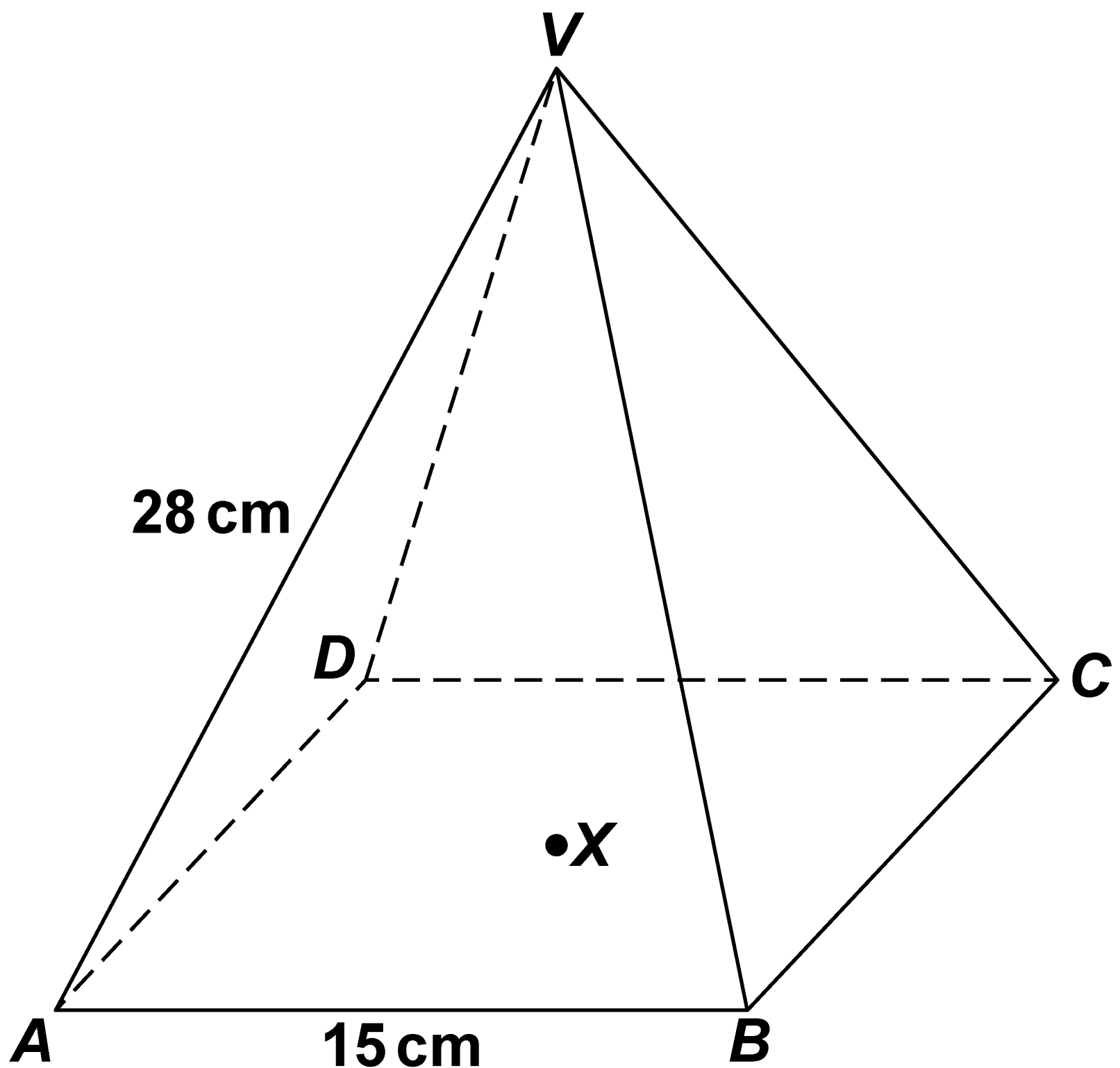


12 $VABCD$ is a pyramid.

The square horizontal base, $ABCD$, has side length 15 cm

V is directly above the centre, X , of the base.

$VA = 28$ cm



13 (a) Circle the expression equivalent to $3x^{-7}$ [1 mark]

$$-\frac{3}{x^7}$$

$$-\frac{1}{3x^7}$$

$$\frac{1}{3x^7}$$

$$\frac{3}{x^7}$$

13 (b) Simplify fully $\frac{12w^8}{(4w^3)^2}$ [2 marks]

Answer _____



13(c) $\sqrt{y} \times \sqrt[3]{y} = \sqrt[c]{y^d}$ where c and d are positive integers.

Work out the LEAST possible values of c and d . [3 marks]

$c =$ _____ $d =$ _____

[Turn over]

9



Answer _____

[Turn over]



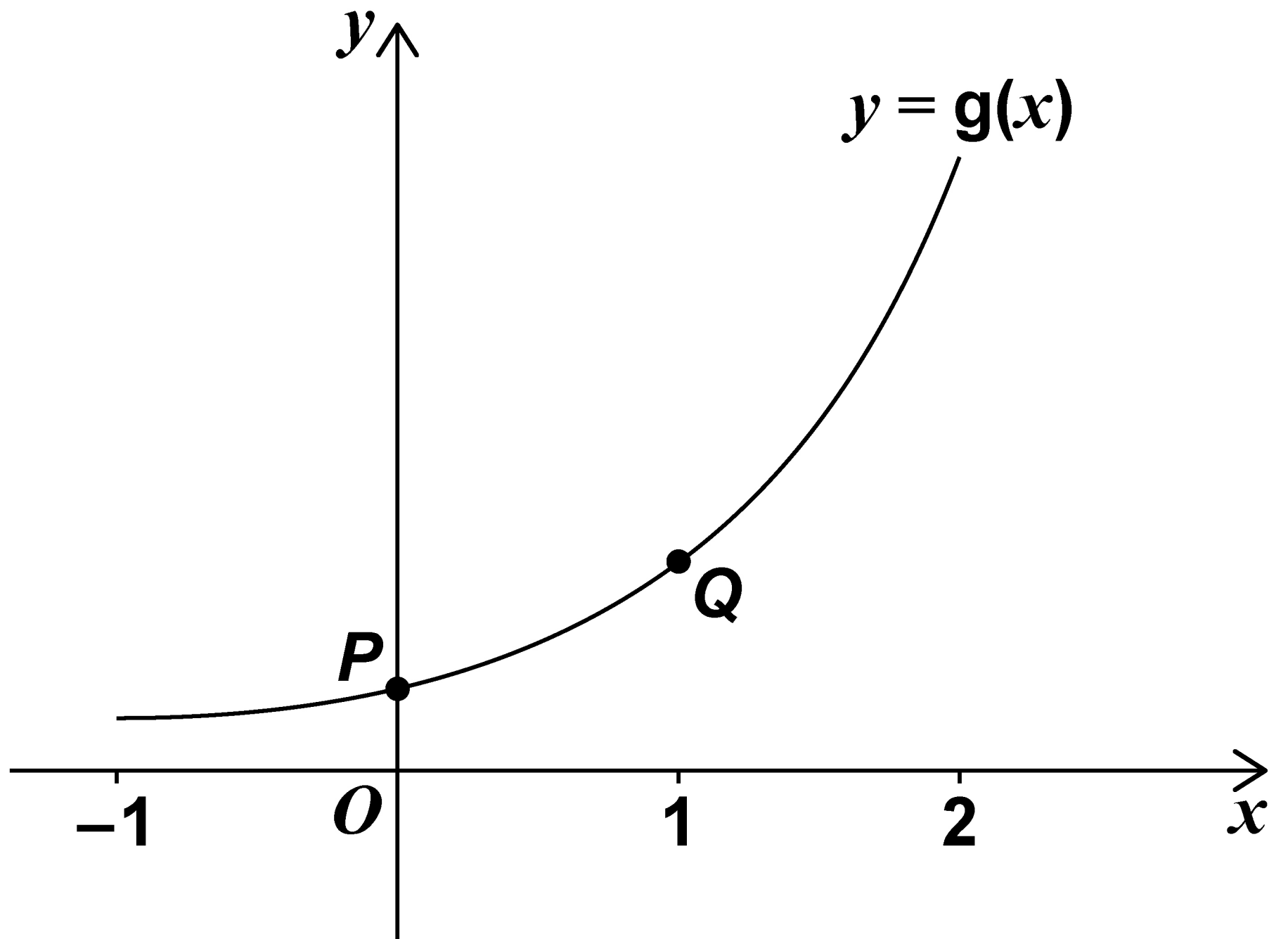
- 15** The function g is given by
 $g(x) = a \times b^x$ where a and b are constants.

The domain of the function is
 $-1 \leq x \leq 2$

$P\left(0, \frac{1}{2}\right)$ and $Q\left(1, \frac{3}{2}\right)$ are points on the graph $y = g(x)$

The diagram, on the opposite page, is not drawn accurately.





Work out the range of the function.
[4 marks]

[Turn over]



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[Turn over]



Answer _____

[Turn over]



- 17** The function h is given by
 $h(x) = ax(3x^2 - 2) + 5x$ where a is a
POSITIVE constant.

h is an **INCREASING** function for all
values of x .

Work out the possible values of a .

**Give your answer as an inequality.
[4 marks]**



Answer _____

[Turn over]

8



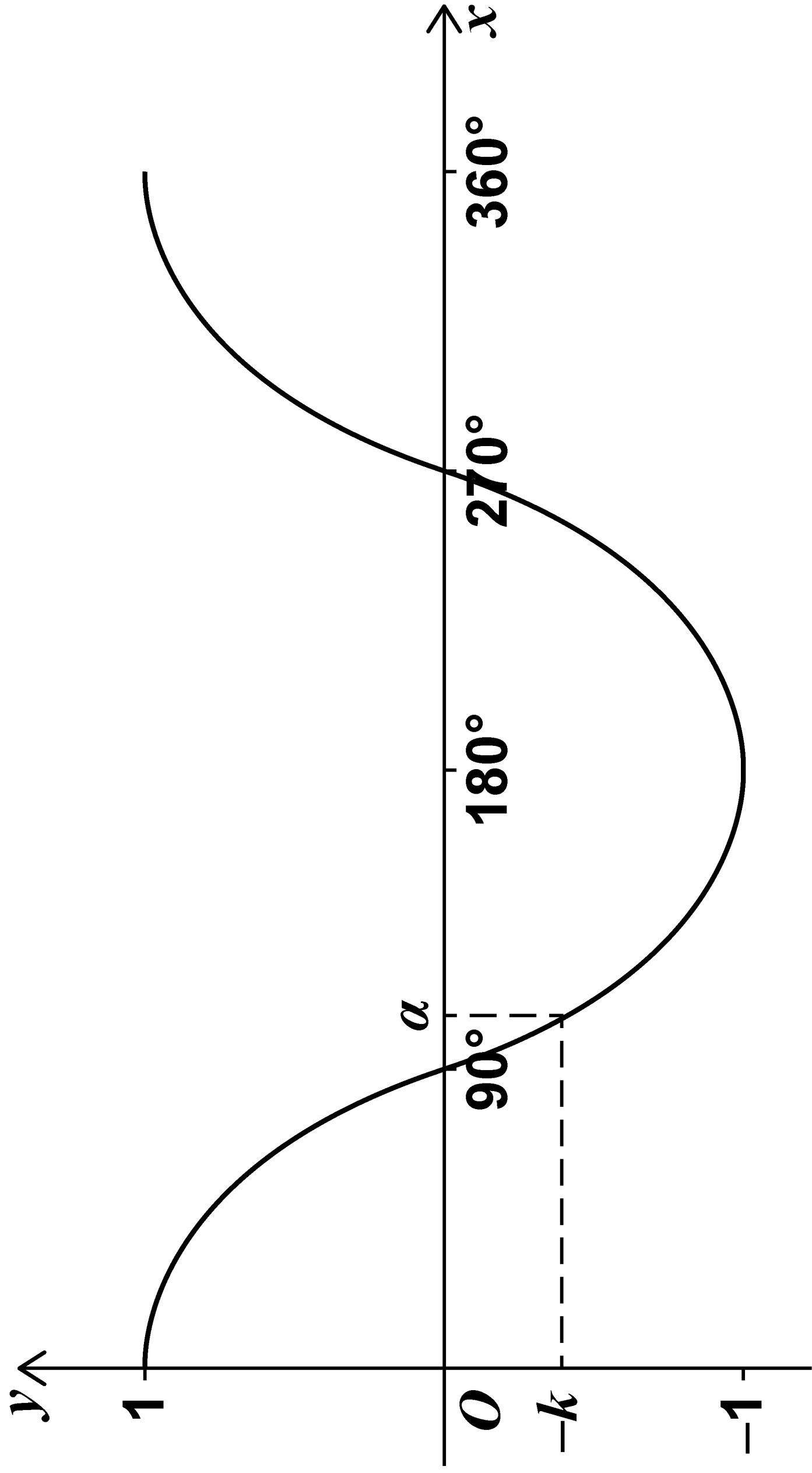


18

Here is a sketch, on the opposite page, of $y = \cos x$ for values of x from 0° to 360°

α is an obtuse angle measured in degrees.

$\cos \alpha = -k$ where k is a positive constant.



[Turn over]

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18 (a) Tick (✓) TWO boxes that show expressions for x
where $\cos x = -k$ [2 marks]

$180^\circ - \alpha$

$180^\circ + \alpha$

$270^\circ - \alpha$

$270^\circ + \alpha$

$360^\circ - \alpha$

$360^\circ + \alpha$

[Turn over]



18(b) Circle the expression for x where $\sin x = -k$
[1 mark]

α $90^\circ + \alpha$ $180^\circ - \alpha$ $180^\circ + \alpha$



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[Turn over]

19 In these simultaneous equations, k is a positive constant.

$$3x + 4y = k$$

$$y = 2kx$$

Solve the simultaneous equations.

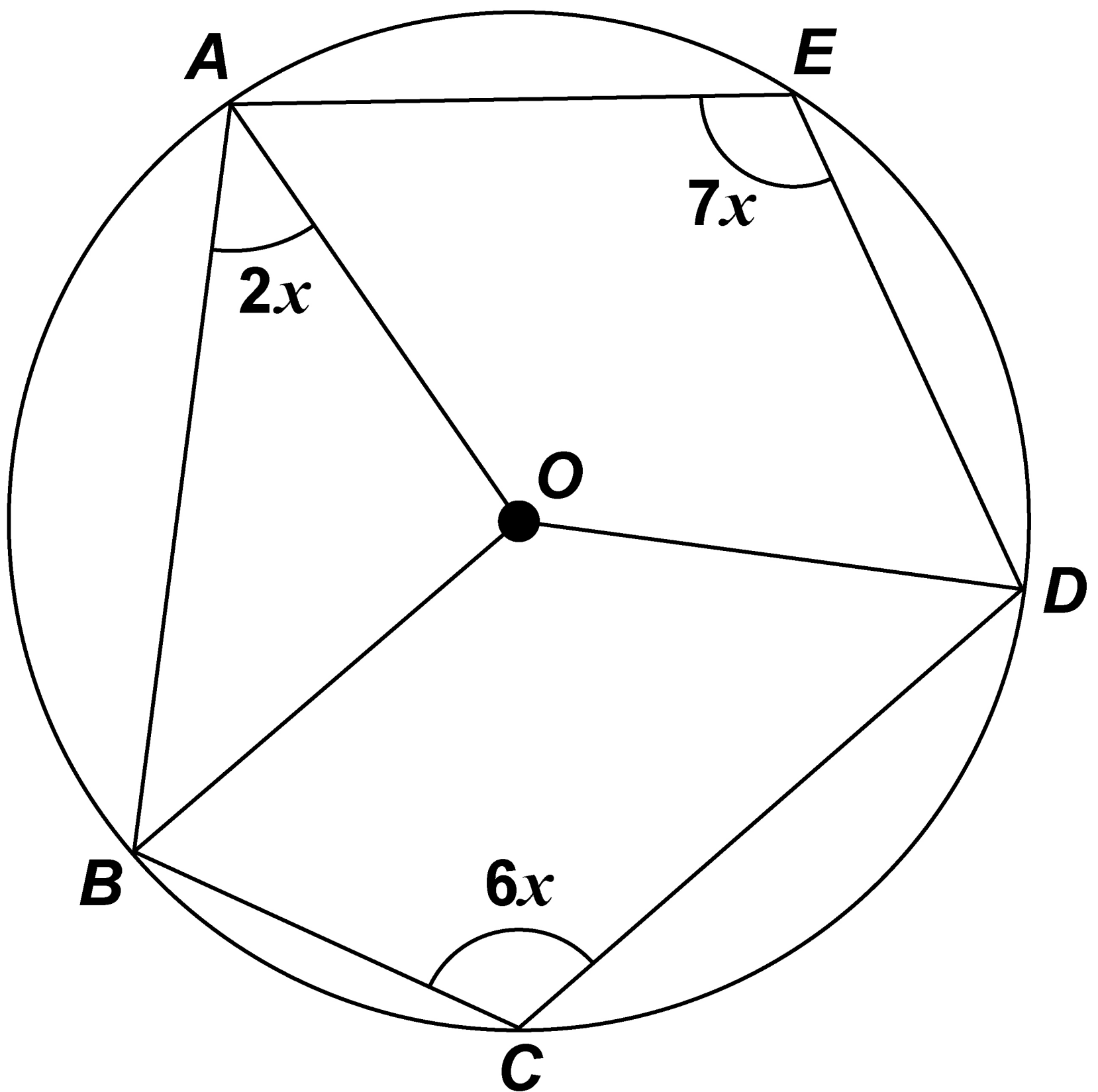
Give the answers in their simplest form in terms of k . [3 marks]



[Turn over]

21 A, B, C, D and E are points on a circle, centre O .

The diagram is not drawn accurately.



22 Five-digit integers are made using

1 2 7 8 9

For each integer, all the digits are used exactly once.

The integers are

greater than 40 000 AND odd.

How many different integers can be made?

You MUST show your working.

[3 marks]

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For Examiner's Use	
Pages	Mark
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10–13	
14–17	
18–21	
22–25	
26–29	
30–34	
36–39	
40–47	
48–51	
52–53	
TOTAL	

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6 G 2 3 8 3 6 5 / 2