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Level 2 Certificate FURTHER MATHEMATICS

Paper 2 Calculator

Wednesday 21 June 2023

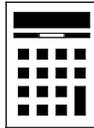
Afternoon

Time allowed: 1 hour 45 minutes

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.
- Fill in the boxes at the top of this page.
- 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.
- 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.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22	
TOTAL	



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

1 Solve $\frac{8d-3}{3d-7} = \frac{5}{2}$

[3 marks]

$$d = \underline{\hspace{10cm}}$$

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]

$$\text{Answer } \underline{\hspace{10cm}}$$



2 (b) A different linear sequence has n th term $318 - 9n$

Work out the value of the first **negative** term in the sequence.

[2 marks]

Answer _____

3

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

Work out the values of t and u .

[2 marks]

$t =$ _____ $u =$ _____



5 $y = 0.5x^4$

Work out the value of x for which the rate of change of y with respect to x is 6.75

[3 marks]

$x =$ _____

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

Complete these statements.

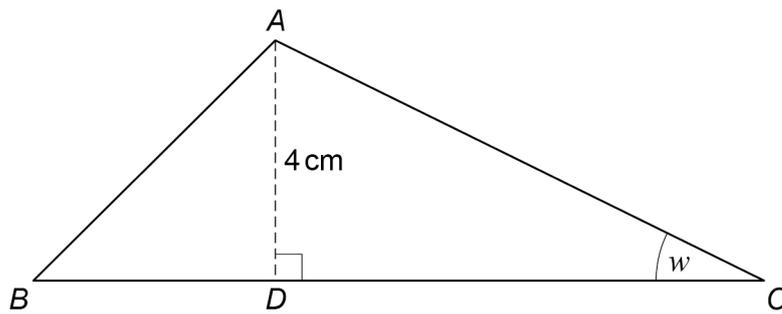
[2 marks]

The coordinates of the centre of the circle are (_____ , _____)

The radius of the circle is _____



- 8 ABC is a triangle with perpendicular height AD .



Not drawn
accurately

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

$$BD : DC = 2 : 3$$

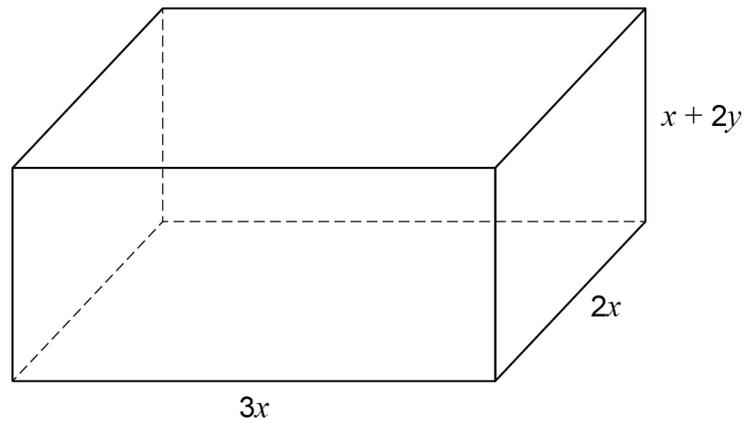
Work out the size of angle w .

[4 marks]

$$w = \underline{\hspace{10cm}}^\circ$$



- 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]



9 (b) The volume of the cuboid is $V \text{ cm}^3$

Show that $V = 450x^2 - 30x^3$

[2 marks]

9 (c) Use calculus to work out the maximum value of V as x varies.

[3 marks]

Answer _____

7

Turn over ►



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.

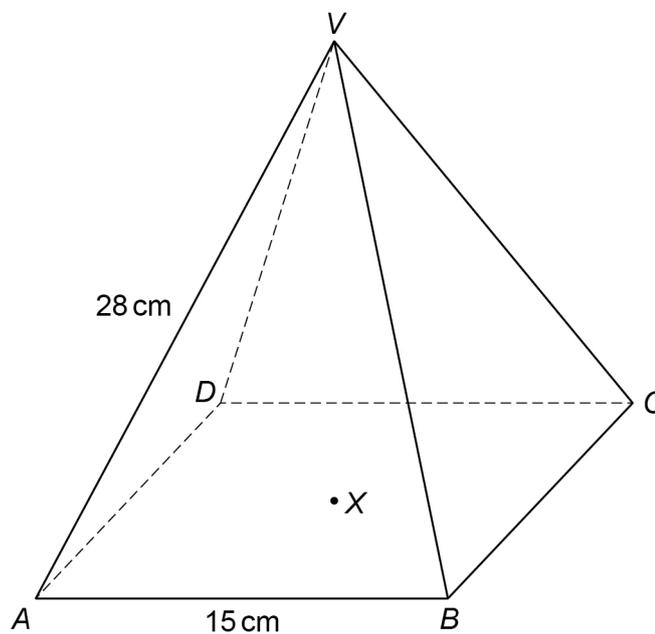
The lines are neither parallel nor perpendicular.

Show working to support your answer.

[3 marks]



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. $VA = 28$ cmWork out the size of the angle that VA makes with $ABCD$.**[3 marks]**

Answer _____ °



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]

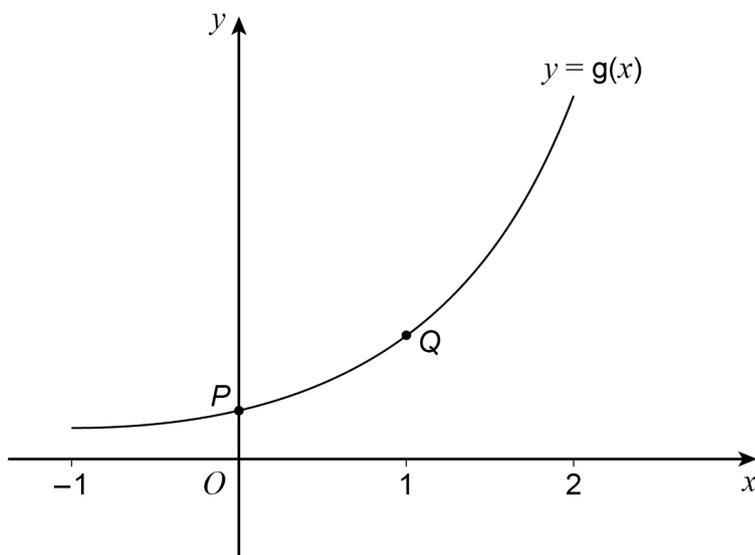
$c =$ _____ $d =$ _____



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 $y = g(x)$



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accurately

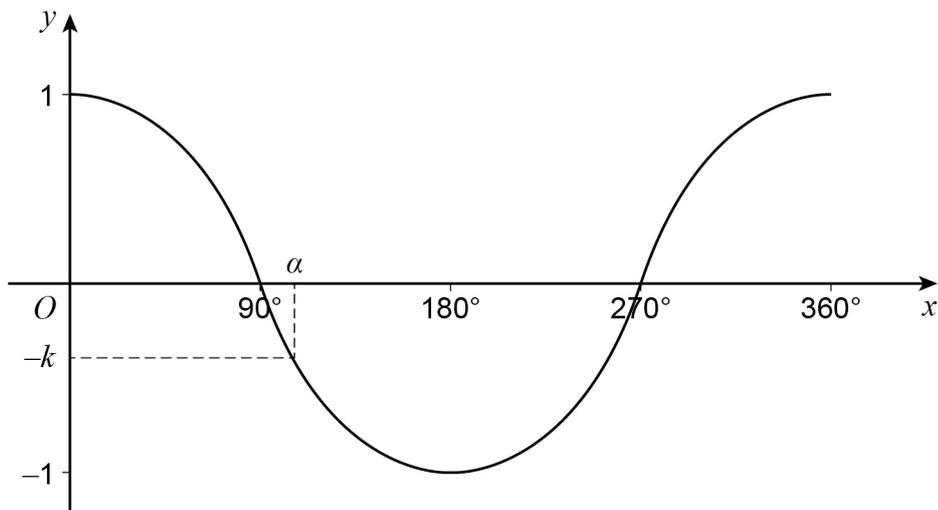
Work out the range of the function.

[4 marks]

Answer _____



- 18** Here is a sketch 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.



- 18 (a)** Tick (\checkmark) **two** boxes that show expressions for x where $\cos x = -k$

[2 marks]

$180^\circ - \alpha$

$180^\circ + \alpha$

$270^\circ - \alpha$

$270^\circ + \alpha$

$360^\circ - \alpha$

$360^\circ + \alpha$

- 18 (b)** Circle the expression for x where $\sin x = -k$

[1 mark]

α

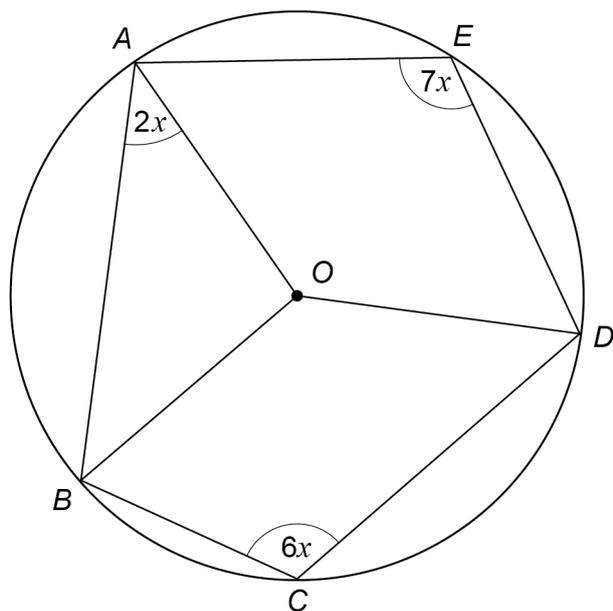
$90^\circ + \alpha$

$180^\circ - \alpha$

$180^\circ + \alpha$



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



Not drawn
accurately

Work out the value of x .

[4 marks]

$x =$ _____

7

Turn over ►



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2 8



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