

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

Level 2 Certificate FURTHER MATHEMATICS

Paper 2 Calculator

Wednesday 19 June 2024

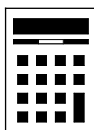
Morning

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	
22–23	
TOTAL	



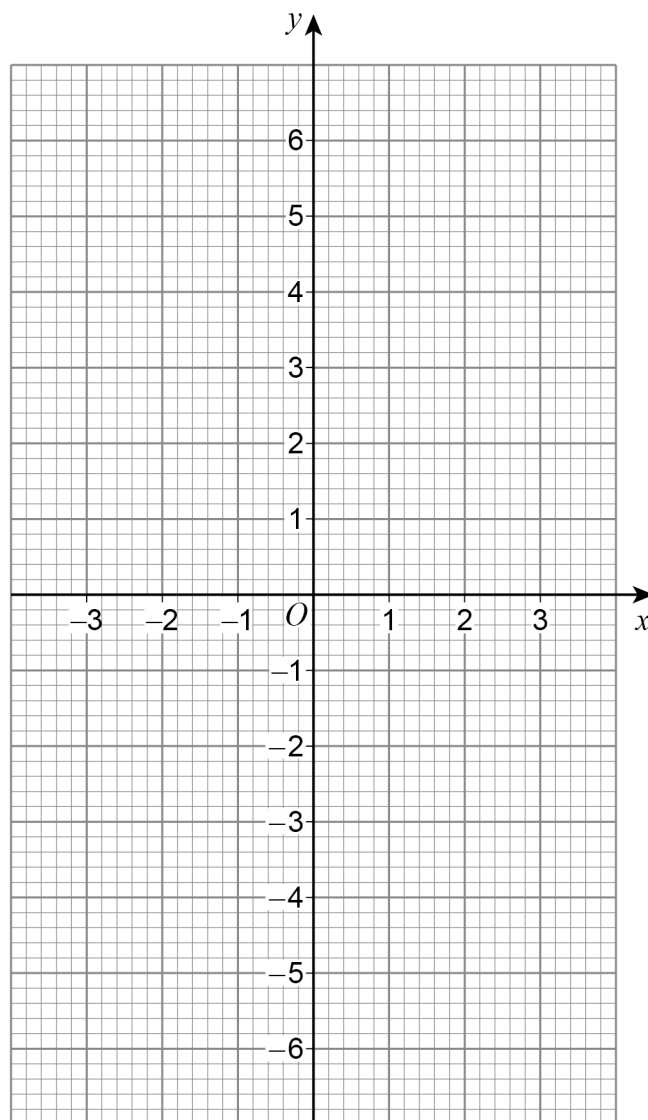
J U N 2 4 8 3 6 5 2 0 1

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

- 1** A straight line
passes through the point $(-1, -1)$
and
has gradient $\frac{3}{2}$

Draw the line for values of x from -3 to 3

[3 marks]



2 $5n^2 + 2 < 38$

Work out all the possible **integer** values of n .

[2 marks]

Answer _____

3 The equation of a curve is $y = x^4 - 3kx^2$ where k is a constant.

When $x = 2$ the rate of change of y with respect to x is 23

Work out the value of k .

[3 marks]

$k =$ _____



- 4 Here is some information about three linear sequences, A, B and C.

$$n\text{th term of C} = n\text{th term of A} + n\text{th term of B}$$

The n th term of C is $42 - 3n$

The first four terms of B are 14 22 30 38

Work out the 20th term of A.

[4 marks]

Answer _____



5 (a)
$$\begin{pmatrix} c & 1 \\ 5d & 3 \end{pmatrix} \begin{pmatrix} -2 & 0 \\ 7 & 3 \end{pmatrix} = \begin{pmatrix} -5 & 3 \\ 0 & 9 \end{pmatrix}$$

Work out the values of c and d .

[3 marks]

$c =$ _____ $d =$ _____

5 (b)
$$\begin{pmatrix} 5 & 2 \\ 1 & 4 \end{pmatrix} \mathbf{M} = \begin{pmatrix} 5 & 2 \\ 1 & 4 \end{pmatrix}$$

Write down matrix $\mathbf{M}$

[1 mark]

$$\mathbf{M} = \begin{pmatrix} \underline{\hspace{2cm}} & \underline{\hspace{2cm}} \\ \underline{\hspace{2cm}} & \underline{\hspace{2cm}} \end{pmatrix}$$



- 6** The function f is given by $f(x) = 3x^2 + 2$ with domain $-1 \leq x \leq 4$

Work out the range of the function.

[2 marks]

Answer _____ $\leq f(x) \leq$ _____

- 7** The equation of a curve is $y = 4 - (x - 3)^2$

- 7 (a)** Circle the coordinates of the point where the curve crosses the y -axis.

[1 mark]

$(-5, 0)$

$(0, -5)$

$(-13, 0)$

$(0, -13)$

- 7 (b)** Write down the coordinates of the maximum point of the curve.

[1 mark]

Answer (_____ , _____)



8

$$y = \frac{1}{2}x^2 + \frac{3}{4x^4}$$

Work out $\frac{d^2y}{dx^2}$

Give your answer in the form $a + bx^n$ where a , b and n are integers.

[3 marks]

Answer _____

9

A set of 4-digit integers each have
a first digit **greater than 6**
and
a second digit **less than 8**

What is the greatest possible number of integers in the set that are multiples of 5?

[3 marks]

Answer _____

10

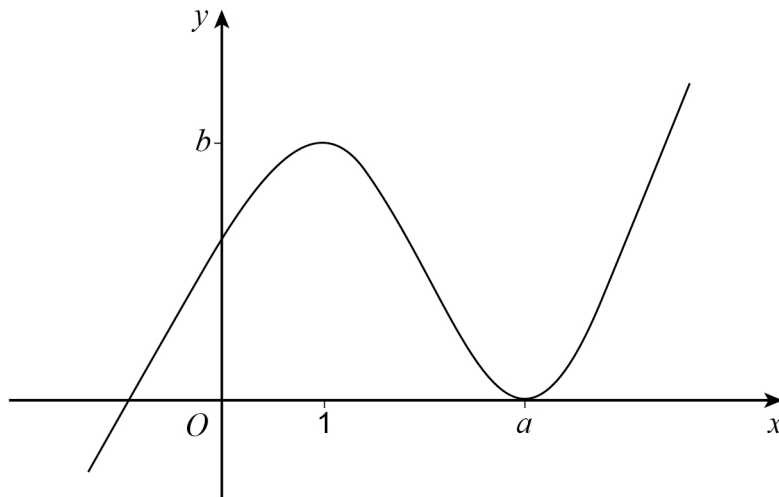
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10

 f is a cubic function.The curve $y = f(x)$ hasa minimum point at $(a, 0)$

and

a maximum point at $(1, b)$ Not drawn
accurately

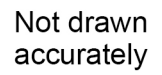
Tick one box for each statement.

[2 marks]

	True	False
The tangent to the curve at $(1, b)$ is parallel to the x -axis	☐	☐
There are three different values of x for which $y = 0$	☐	☐
The function is increasing for $0 < x < 1$	☐	☐



ABC and ACD are triangles.



[4 marks]

Answer _____ cm^2



- 12** The equation of a circle is $(x - 2)^2 + (y + 3)^2 = 16$
The equation of a line is $y = 4 - x$
The circle and line intersect at two points, A and B .

- 12 (a)** Show that the x -coordinates of A and B satisfy the equation $2x^2 - 18x + 37 = 0$

[3 marks]



12 (b) For A , the x -coordinate and y -coordinate are both **positive**.

Work out the coordinates of A .

Give each coordinate to 2 decimal places.

[3 marks]

Answer (_____ , _____)

Turn over for the next question



[3 marks]

Answer _____



14

P is the point on the graph $y = 3^{-x}$ that has x -coordinate -2

Q is a point on the graph $y = 1152 \times \left(\frac{1}{2}\right)^x$

y -coordinate of $P = y$ -coordinate of Q

Work out the x -coordinate of Q .

[3 marks]

$x =$ _____

Turn over for the next question



15

Simplify fully $\frac{2x^2 + 9x - 18}{12x^2 - 8x - 15}$

[3 marks]

Answer _____



16

Simplify $\frac{\sqrt{x^3}(\sqrt{x^3} + x^3)}{\sqrt{x}}$

Give your answer in the form $x^{\frac{a}{b}} + x^c$ where a , b and c are integers.

[3 marks]

Answer _____

Turn over for the next question

Turn over ►



17 (a)

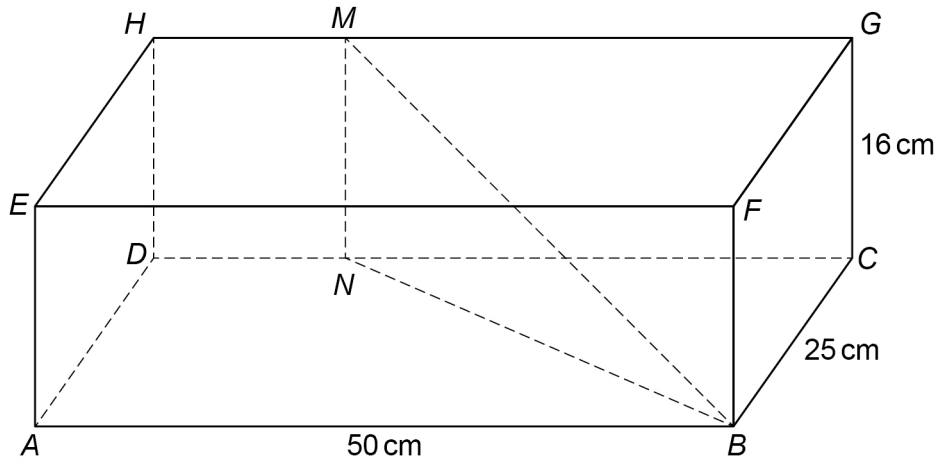


Work out the size of the angle between the slant height and the base.

C



17 (b)

 $ABCDEFGH$ is a cuboid. $ABCD$ is horizontal. MN is vertical.The acute angle between the planes MNB and $HDCG$ is 36° Work out the length CN .**[2 marks]**

Answer _____ cm



Rearrange $m = \frac{2k^3 - 7}{5m - 3k^3}$ to make k the subject.

Answer _____



$$8 \times \text{coefficient of } x^2 = \text{coefficient of } x^4$$

[4 marks]

Answer

Turn over for the next question

8

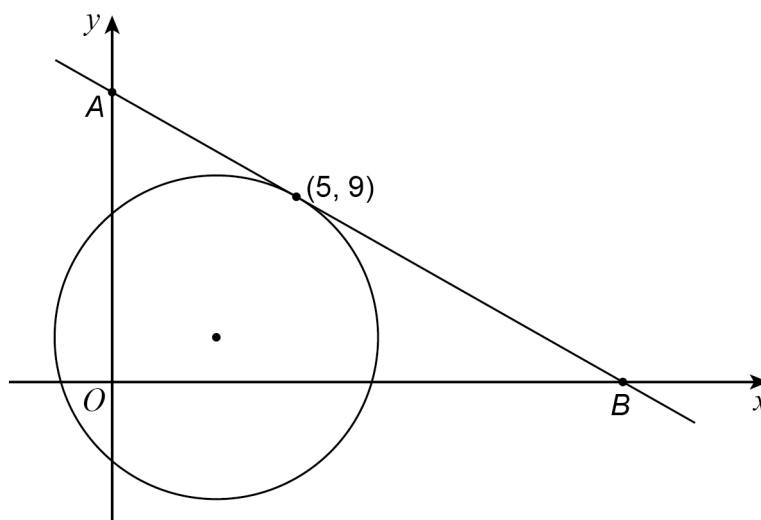
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20

AB is the tangent to the circle $(x-3)^2 + (y-4)^2 = 29$ at the point $(5, 9)$



Work out the area of triangle AOB .

[5 marks]

Answer square units



$$f(x) = \frac{2-x}{3}$$

$$f^{-1}(x) + gf(x) \quad \text{simplifies to} \quad ax^2 + bx + c$$

[6 marks]

$a =$ _____ $b =$ _____ $c =$ _____

Turn over ►



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2 8



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