OXFORD AQA

INTERNATIONAL QUALIFICATIONS

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

INTERNATIONAL AS
MATHEMATICS

(9660/MA01) Unit P1 Pure Mathematics

Monday 6 January 2025 07:00 GMT Time allowed: 1 hour 30 minutes

Materials
- For this paper you must have the OxfordAQA Booklet of Formulae and Statistical Tables (enclosed).
- You may use a graphical calculator.

Instructions
- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- 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.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.

Advice
- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- Show all necessary working; otherwise marks may be lost.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

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

1 (a) The expression

$$\left(\frac{25m^2}{16}\right)^{-\frac{3}{2}}$$

can be written in the form

$$am^b$$

where a and b are constants and $m > 0$

1 (a) (i) Find the value of a

Circle your answer.

[1 mark]

$\frac{64}{125}$ $\frac{16}{25}$ $\frac{25}{16}$ $\frac{125}{64}$

1 (a) (ii) Find the value of b

Circle your answer.

[1 mark]

-3 $-\frac{1}{2}$ $\frac{1}{2}$ 3

Do not write outside the box

1 (b) It is given that

$$\frac{27^{2y}}{9^{\frac{1}{2}x}} = \frac{1}{9\sqrt{3}}$$

Express y in terms of x

[3 marks]

$y =$ _____

5

Turn over for the next question

Do not write outside the box

2 The line l_1 has equation $8x - 5y = 14$

2 (a) Verify that l_1 passes through the point $A(8, 10)$

[1 mark]

2 (b) The line l_2 has equation $7x + 2y = -26$

The lines l_1 and l_2 intersect at the point B

Find the exact distance AB

[3 marks]

Answer _____

Do not write outside the box

2 (c) The line l_3 passes through the points $P(-2,5)$ and $Q(3,k+7)$ where k is a constant.

The lines l_1 and l_3 are parallel.

2 (c) (i) Find the value of k

[3 marks]

$k =$ _____

2 (c) (ii) Find the equation of l_3

Give your answer in the form $ax+by+c=0$ where a, b and c are integers.

[2 marks]

Answer _____

9

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3 George is saving money to buy an electric car.

In the first month he saves $240

Each month after the first month he will save $8 more than he did the previous month.

George will save for 36 months.

3 (a) The amount of money George will save each month forms a sequence.

State, with a reason, the name given to this type of sequence.

[2 marks]

Name _____

Reason _____

3 (b) Find the amount of money George will save in the 22nd month.

[2 marks]

Answer _____

3 (c) Find the total amount of money George will have saved at the end of the 36 months.

[2 marks]

Answer _____

Do not write outside the box

3 (d) Mabel is also saving money to buy an electric car.

In the first month she saves $264

Each month after the first month she will save $4 more than she did the previous month.

It will take Mabel n months to save $15 400 in total.

Find the value of n

[3 marks]

$n =$ _____

9

Turn over for the next question

Do not write outside the box

4 It is given that

$$f(x) = x^3 - 4x + 15$$

4 (a) Use the Factor Theorem to show that $(x+3)$ is a factor of $f(x)$

[2 marks]

4 (b) Express $f(x)$ in the form $f(x) = (x+3)(x^2 + bx + c)$ where b and c are constants.

[2 marks]

$f(x) =$ _____

Do not write outside the box

4 (c) Use your answer to **part (b)** to show that the equation $\mathrm{f}(x)=0$ has exactly one real root.

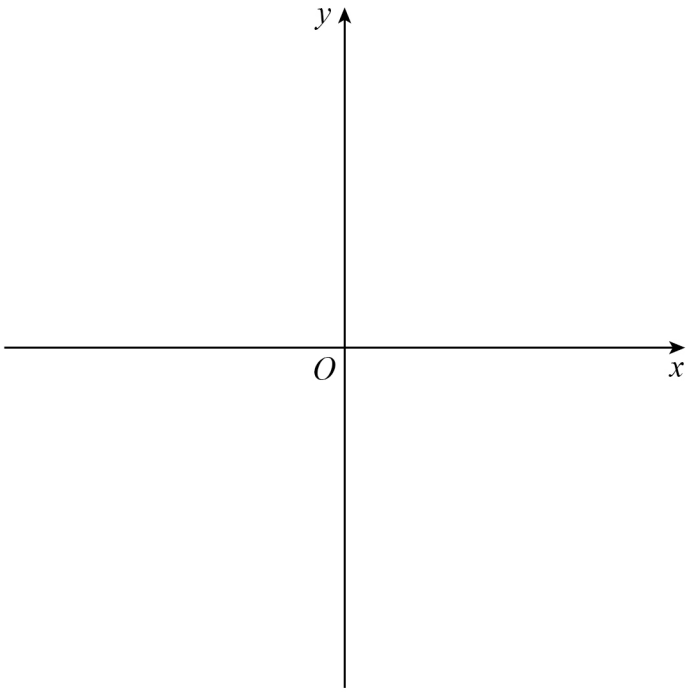
[2 marks]

4 (d) It is given that f is a decreasing function when $x=0$

Sketch the graph of $y=\mathrm{f}(x)$ on the axes below.

Show on your graph the values of any intercepts with the axes.

[3 marks]



9

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5 (a) By rationalising the denominator show that

$$\frac{7x\sqrt{x}+14x-3\sqrt{x}-6}{\sqrt{x}+2}=ax+b$$

where a and b are integers and $x>4$

[5 marks]

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5 (b) Hence find

$$\int \left(\frac{7x\sqrt{x} + 14x - 3\sqrt{x} - 6}{\sqrt{x} + 2} \right) \left(x^2\sqrt{x} - 4 \right) \mathrm{d}x$$

[3 marks]

Answer _____

8

Turn over ►

Do not write outside the box

6 (a) The first four terms of the binomial expansion of $(1+3x)^9$ in ascending powers of x are

$$1+27x+ax^2+bx^3$$

where a and b are integers.

Find the value of a and the value of b

[3 marks]

$a =$ _____ $b =$ _____

6 (b) Use your answer to **part (a)** to show that $\left(\frac{17}{20}\right)^9$ is approximately equal to $\frac{353}{2000}$

[4 marks]

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6 (c) Use the result given in **part (b)** to find an approximate value for $\left(\frac{17}{10}\right)^9$

[2 marks]

Answer _____

9

Turn over for the next question

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7 A curve has equation

$$y = ax^3 + bx^2 + cx^{-\frac{3}{2}} \quad \text{for} \quad x > 0$$

where a, b and c are constants.

7 (a) (i) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$

[2 marks]

$\frac{\mathrm{d}y}{\mathrm{d}x} =$ _____

7 (a) (ii) Find $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$

[2 marks]

$\frac{\mathrm{d}^2y}{\mathrm{d}x^2} =$ _____

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7 (b) In the case where a, b and c are positive constants, the curve has exactly one stationary point P

Determine whether P is a minimum point or a maximum point.

Fully justify your answer.

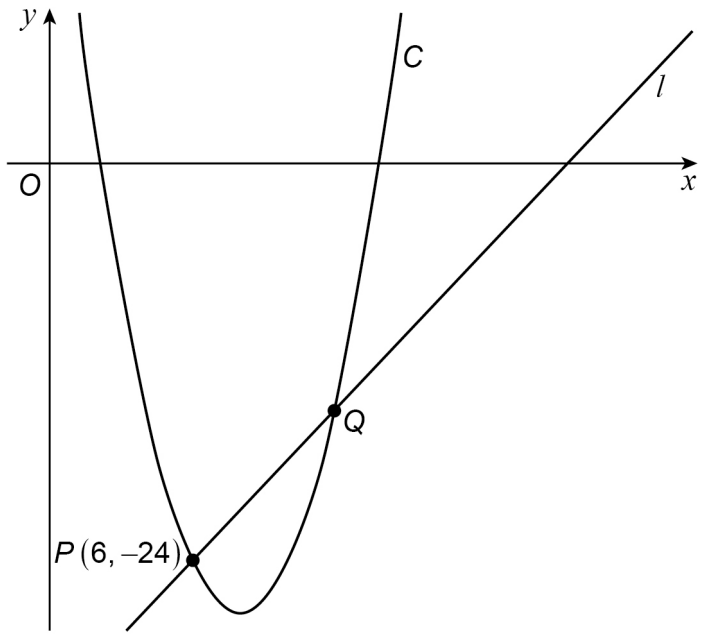
[2 marks]

7 (c) In a different case where a, b and c are positive constants **and** $a = b = c$, determine whether the gradient of the curve is positive or negative at the point where $x = 1$

[3 marks]

9

8 A curve C and a line l are shown in the diagram below.



The equation of C is $y = \frac{3}{4}x^2 - 12x + 21$

The equation of l is $y = \frac{3}{2}x - 33$

The line l intersects C at the points $P(6, -24)$ and Q

8 (a) Show that l is **not** the normal to C at P

[4 marks]

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8 (b) (i) Show that the x-coordinates of P and Q satisfy the equation

$$x^2 - 18x + 72 = 0$$

[2 marks]

8 (b) (ii) Hence find the coordinates of Q

[2 marks]

Answer _____

Question 8 continues on the next page

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8 (c) Find $\int\left(\frac{3}{4}x^2 - 12x + 21\right)\mathrm{d}x$

[2 marks]

Answer _____

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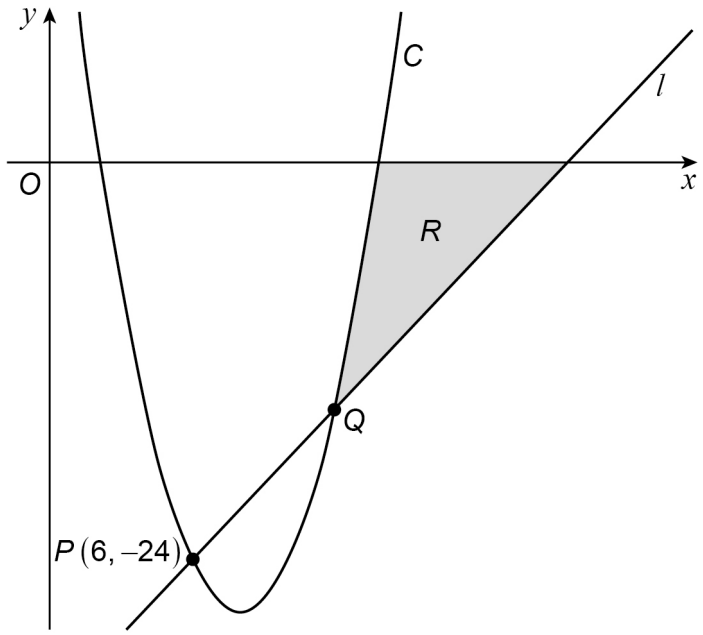
8 (d) The shaded region R is bounded by the curve C, the line l and the x-axis, as shown in the diagram below.



The curve C intersects the x-axis at the points $(2,0)$ and $(14,0)$

Find the area of the shaded region R

[4 marks]

Answer _____

14

Turn over ►

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9 A geometric series has first term a and common ratio r

The second term of the series is -48

The sum to infinity of the series exists and is equal to 200

9 (a) Show that $r = -\frac{1}{5}$ and find the value of a

Fully justify your answer.

[5 marks]

$a =$ _____

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9 (b) The nth term of this series is u_n

Show that for any positive integer k

$$\sum_{n=1}^{2k} \frac{625}{8} u_n = b^c \left(1 - b^{dk}\right)$$

where b, c and d are constants and b is prime.

[3 marks]

8

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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