OXFORD AQA
INTERNATIONAL QUALIFICATIONS

INTERNATIONAL AS
MATHEMATICS

(9660/MA01) Unit P1 Pure Mathematics

Wednesday 14 May 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	
10	
TOTAL	

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

1 (a) It is given that

$$m = 12p^{\frac{3}{4}} \quad \text{and} \quad n = 3p^{\frac{1}{6}}$$

where p is a positive constant.

1 (a) (i) Find $\left(\dfrac{m}{n}\right)^2$

Circle your answer.

[1 mark]

$$16p^{\frac{7}{6}} \qquad\qquad 81p^{\frac{7}{6}} \qquad\qquad 16p^{\frac{11}{6}} \qquad\qquad 81p^{\frac{11}{6}}$$

1 (a) (ii) Find $\sqrt{mn}$

Circle your answer.

[1 mark]

$$\sqrt{15}\,p^{\frac{1}{16}} \qquad\qquad 6p^{\frac{1}{16}} \qquad\qquad \sqrt{15}\,p^{\frac{11}{24}} \qquad\qquad 6p^{\frac{11}{24}}$$

1 (b) It is given that

$$\left(a - 5\sqrt{7}\right)^2 = b - 30\sqrt{7}$$

where a and b are integers.

Find the value of a and the value of b

[3 marks]

$a =$ _____ $b =$ _____

5

Turn over for the next question

Turn over ▶

2 (a) Express $3x^2 + 24x + 54$ in the form $a(x+b)^2 + c$ where a, b and c are constants.
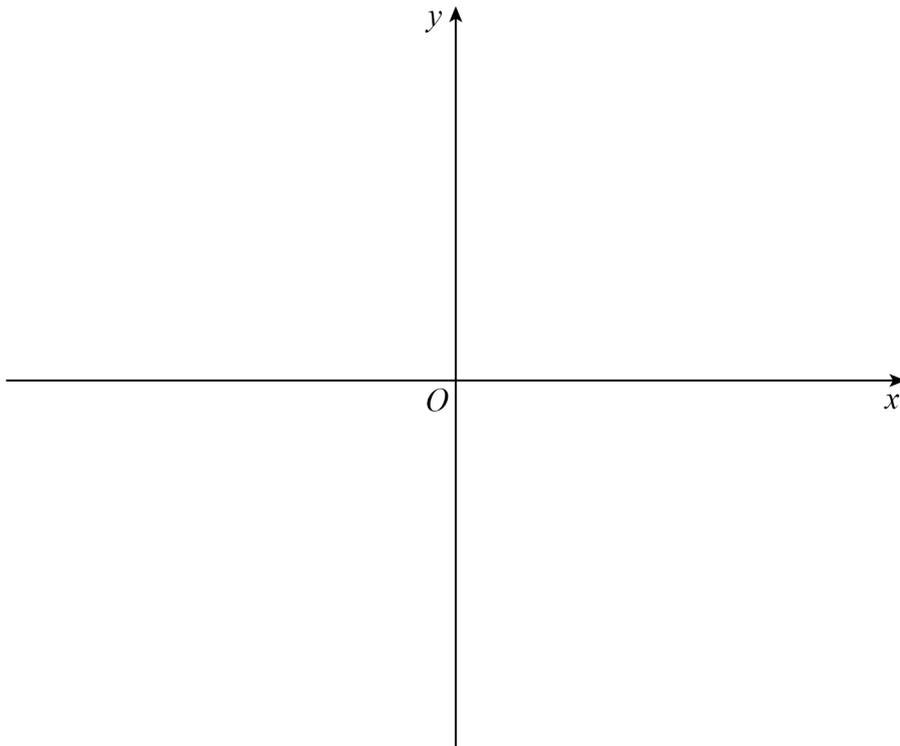
[3 marks]

Answer _____

2 (b) The curve C has equation $y = 3x^2 + 24x + 54$

Sketch the curve C on the axes below.

Show the coordinates of the vertex and the coordinates of any intercepts with the axes.

[3 marks]

2 (c) The curve D has equation $y = 3x^2 + mx + n$ where m and n are constants.

D has reflectional symmetry in the line with equation $x = 5$

The y-coordinate of the vertex of C is equal to the y-coordinate of the vertex of D

Describe the single transformation which maps C onto D

[2 marks]

8

Turn over for the next question

Turn over ▶

3 A rectangle with vertices at the points *A*, *B*, *C* and *D* is shown in the diagram below.
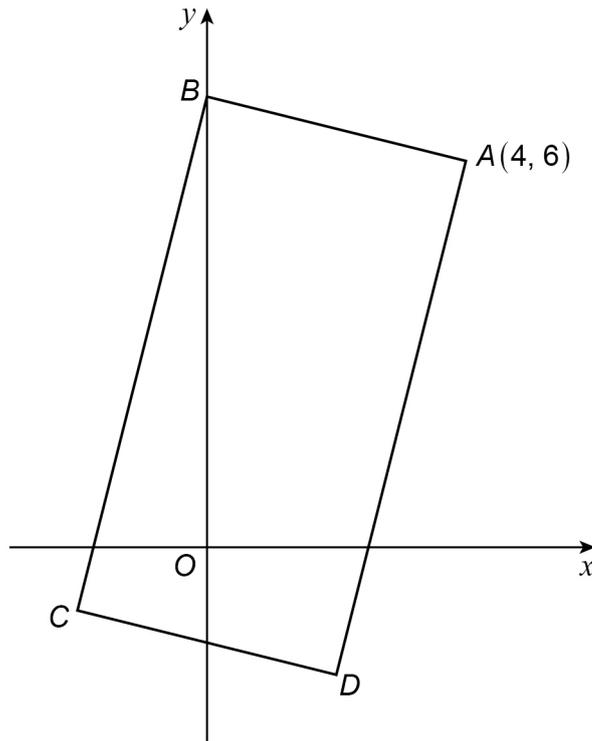
The point *A* has coordinates $(4, 6)$

The point *B* lies on the *y*-axis.

The points *C* and *D* lie on the line with equation $y = -\dfrac{1}{4}x - \dfrac{3}{2}$

3 (a) Show that the *y*-coordinate of *B* is 7

[2 marks]

3 (b) Find the coordinates of *D*

[3 marks]

Answer

3 (c) Find the perimeter of the rectangle.

Give your answer in an exact form.

[4 marks]

Answer

9

Turn over ▶

4 The nth term of a sequence is u_n

The sequence is defined by

$$u_{n+1} = k - \frac{16}{u_n} \quad \text{and} \quad u_1 = 2$$

where k is a constant and $k > 8$

It is given that $3u_3 = 5u_2 + 4$

4 (a) Show that the possible values of k satisfy

$$k^2 - 26k + 168 = 0$$

[5 marks]

4 (b) In the case where k takes its largest possible value, find the exact value of u_4

[4 marks]

Answer

9

Turn over for the next question

Turn over ▶

5 (a) Solve the inequalities

$$x - 2 \leq 3x + 6 \leq x + 34$$

[2 marks]

Answer _____

5 (b) (i) Show that

$$(6x - 5)(x + 14) > 126x - 147$$

can be written in the form

$$(ax - b)(cx - d) > 0$$

where a, b, c and d are prime numbers.

[3 marks]

5 (b) (ii) Hence, or otherwise, solve the inequality

$$(6x - 5)(x + 14) > 126x - 147$$

[1 mark]

Answer

5 (c) Use your answers to **part (a)** and **part (b)(ii)** to find the values of x which satisfy

$$x - 2 \leq 3x + 6 \leq x + 34 \quad \textbf{and} \quad (6x - 5)(x + 14) > 126x - 147$$

[2 marks]

Answer

8

Turn over ▶

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6 The curves with equations

$$y = 2x^2 - 7x + 18 \quad \text{and} \quad y = c + 5x - x^2$$

where c is a constant, touch at exactly one point P

Find the coordinates of P

[6 marks]

Answer _____

7 (a) Use the trapezium rule with six ordinates (five strips) to find an approximate value for

$$\int_0^3 \frac{4^x}{x+7} \, dx$$

Give your answer to two decimal places.

[4 marks]

Answer _____

7 (b) Explain how to obtain an improved approximate value for $\int_0^3 \frac{4^x}{x+7} \, dx$ using the trapezium rule.

[1 mark]

7 (c) (i) Describe the single transformation which maps the graph of

$$y = \frac{4^x}{x+7}$$

onto the graph of

$$y = \frac{4^x}{3x+21}$$

[2 marks]

7 (c) (ii) Use your answers to **part (a)** and **part (c)(i)** to find an approximate value for

$$\int_0^3 \left(\frac{4^x}{x+7} + \frac{4^x}{3x+21} \right) dx$$

Give your answer to two decimal places.

[2 marks]

Answer

9

Turn over for the next question

Turn over ▶

8 The curve C has equation

$$y = 3x^2 - \frac{11}{2}x + \frac{10}{x}$$

The point $P(2, 6)$ lies on C

The line L is the tangent to C at the point P

8 (a) Show that the equation of L is

$$y = 4x - 2$$

[4 marks]

8 (b) The curve D is such that at any point on D

$$\frac{dy}{dx} = x^2 - 4x + a$$

where a is a constant.

The point $Q(3, 10)$ lies on D

The line L is the normal to D at the point Q

8 (b) (i) Find the value of a

[3 marks]

Answer _____

8 (b) (ii) Find the equation of D

[4 marks]

Answer _____

11

Turn over ▶

9 It is given that

$$\mathrm{p}(x) = x^3 + bx^2 - 31x - 52$$

where b is a constant.

When $\mathrm{p}(x)$ is divided by $(x+3)$ the remainder is 77

9 (a) Use the Remainder Theorem to show that $b = 7$

[2 marks]

9 (b) (i) Use the Factor Theorem to show that $(x-4)$ is a factor of $\mathrm{p}(x)$

[2 marks]

9 (b) (ii) Hence find

$$\int \frac{x^3 + 7x^2 - 31x - 52}{x\sqrt{x}\,(x-4)}\,\mathrm{d}x$$

where $x > 4$

[5 marks]

Answer _____

10 A geometric series has nth term u_n

It is given that $u_2 = 96$ and $u_5 = 12$

Show that

$$\sum_{n=1}^{\infty} u_n - \sum_{n=1}^{k} u_n = a \times b^{c-k}$$

where a, b and c are prime numbers.

[6 marks]

6

END OF QUESTIONS

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