

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

INTERNATIONAL AS MATHEMATICS

(9660/MA01) – Pure Mathematics Unit 1

Thursday 24 May 2018

07.00 GMT

Time allowed: 1 hour 30 minutes

Materials

- For this paper you must have the Oxford International AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- 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 require extra space, use a supplementary answer book.
- Do all rough work in this book. Cross through any work that 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) The expression $x^2 + 6x + 14$ can be written in the form $(x + a)^2 + b$

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

Circle your answer.

[1 mark]

2

3

5

6

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

Circle your answer.

[1 mark]

2

3

5

6

1 (b) The graph of $y = x^2$ is translated onto the graph of $y = x^2 + 6x + 14$ by a vector.

Find this vector.

[2 marks]

Answer _____



- 2 (a)** Show that $5\sqrt{8} \times 3\sqrt{12}$ can be written in the form $a\sqrt{b}$ where a and b are integers.

Simplify your answer as far as possible.

[2 marks]

- 2 (b)** Show that $\frac{3\sqrt{7} - 4\sqrt{6}}{2\sqrt{7} + \sqrt{6}}$ can be written in the form $\frac{p - \sqrt{q}}{r}$ where p , q and r are integers.

Fully justify your answer.

[4 marks]

Turn over for the next question

Turn over ►



3 The line L has equation $4x - 5y = 8$

3 (a) (i) Find the gradient of L .

[2 marks]

Answer _____

3 (a) (ii) Find the coordinates of the point where L intersects the x -axis.

[2 marks]

Answer _____



3 (b) The point A has coordinates $(4, 9)$ and the point B has coordinates $(2, k)$

The line that passes through A and B is perpendicular to the line L .

3 (b) (i) Find the value of k .

[3 marks]

$k =$ _____

3 (b) (ii) Find the equation of the line that passes through A and B .

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

[3 marks]

Answer _____

10

Turn over for the next question

Turn over ►



4 (a) The n th term of a sequence is u_n

This sequence is defined by

$$u_{n+1} = ku_n + 17$$

where k is a constant.

The first two terms of this sequence are $u_1 = 5$ and $u_2 = 23$

4 (a) (i) Find the value of k .

[2 marks]

$$k = \underline{\hspace{2cm}}$$

4 (a) (ii) Find the values of u_3 and u_4

[2 marks]

$$u_3 = \underline{\hspace{2cm}} \qquad u_4 = \underline{\hspace{2cm}}$$



4 (b) The n th term of a different sequence is t_n

This sequence is defined by

$$t_{n+1} = (t_n)^2 - 12$$

Find, using algebra, all the values of t_1 for which all the terms of this sequence are the same.

[3 marks]

Answer _____

<hr/> 7

Turn over for the next question

Turn over ►



- 5 (a)** The expression $(1 + 2x)^3$ can be written in the form $1 + ax + bx^2 + 8x^3$ where a and b are integers.

Find the values of a and b .

[3 marks]

$a =$ _____ $b =$ _____

- 5 (b)** Given that $y = (1 + 2x)^3$ find $\frac{dy}{dx}$

[3 marks]

$\frac{dy}{dx} =$ _____



- 5 (c)** The curve C has equation $y = (1 + 2x)^3$ and the line L has equation $y = 3 - 10x$

Show that there is **no** point on C at which the tangent to C is parallel to L .

[4 marks]

10

Turn over for the next question

Turn over ►



6 The curve C with equation $y = f(x)$ passes through the point $(3, -45)$

6 (a) Given that $\frac{dy}{dx} = 12x^2 - 26x - 12$, find the equation of C .

[4 marks]

Answer _____

6 (b) Write the equation of C in the form $y = x(ax + b)(cx + d)$, where a , b , c and d are integers.

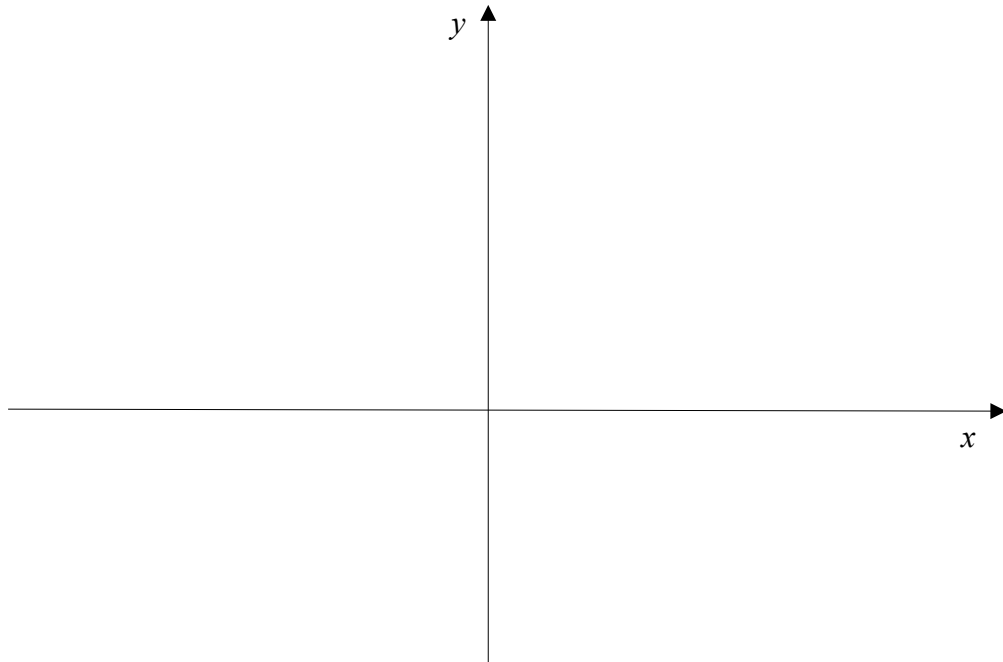
[3 marks]

$y =$ _____



- 6 (c)** Sketch the graph of C showing the coordinates of any points where C crosses the x -axis.

[3 marks]



10

Turn over for the next question

Turn over ►



- 7** The terms of a sequence with first term u_1 are given by

$$u_1 = 672$$

$$u_{n+1} = -\frac{3}{4}u_n$$

- 7 (a) (i)** Find the third term of the sequence.

[1 mark]

$$u_3 = \underline{\hspace{4cm}}$$

- 7 (a) (ii)** State whether this is an arithmetic sequence or a geometric sequence.

[1 mark]

- 7 (b) (i)** State how you know that the series $u_1 + u_2 + u_3 + \dots$ converges.

[1 mark]



7 (b) (ii) Find the sum to infinity of this series.

[2 marks]

Answer _____

5

Turn over for the next question

Turn over ►



8 (a) (i) Find $\int (x^2 - 8x + \frac{1}{x^2} + 7) dx$

[4 marks]

Answer _____

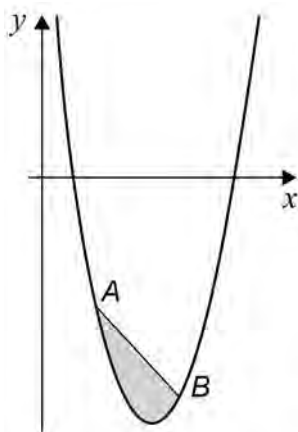
8 (a) (ii) Evaluate $\int_2^5 (x^2 - 8x + \frac{1}{x^2} + 7) dx$

[2 marks]

Answer _____



- 8 (b) The curve with equation $y = x^2 - 8x + \frac{1}{x^2} + 7$ for $x > 0$ is drawn below.



A straight line intersects the curve at the points $A(2, -4.75)$ and $B(5, -7.96)$

Find the exact area of the shaded region bounded by the curve $y = x^2 - 8x + \frac{1}{x^2} + 7$ and the line AB .

[4 marks]

Answer _____

10

Turn over ►



One of the company's trains travels from New York to Chicago at a steady speed of v kilometres per hour.

$$C = \frac{v}{25} + \frac{100}{v}$$

Fully justify your answer.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

$$\mathbf{v} =$$



9 (b) The distance by train from New York to Chicago is 1270 kilometres.

Calculate the minimum total cost of the journey.

[2 marks]

Answer _____

9

Turn over for the next question

Turn over ►



Show that $p = \frac{2n - c}{b + 3m}$

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[6 marks]

[illegible]

Answer _____

9

END OF QUESTIONS



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