

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 _____

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.

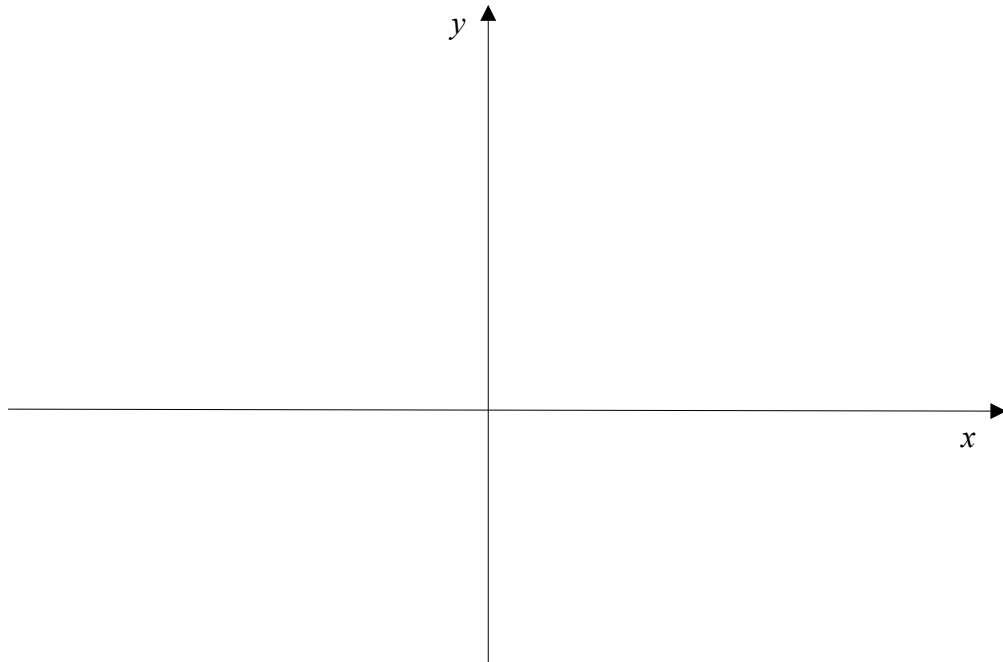
[3 marks]

$y =$ _____



- 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 _____

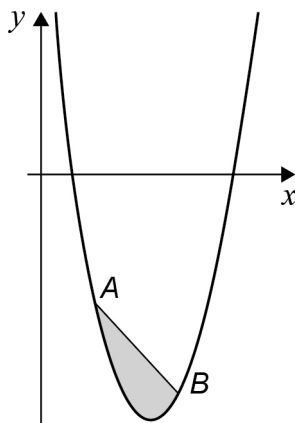
8 (a) (ii) Evaluate $\int_2^5 (x^2 - 8x + \frac{1}{x^2} + 7) dx$

[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.

[illegible]

$$\mathbf{v} =$$



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

[illegible]

[6 marks]

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Answer _____

9

END OF QUESTIONS



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