

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/MA02) Unit PSM1 Pure Mathematics, Statistics and Mechanics

Monday 22 May 2023

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 (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.
- There are three sections to this paper.
- The maximum mark for this paper is 80. There are 40 marks for **Section A**, 20 marks for **Section B** and 20 marks for **Section C**.

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	
11	
TOTAL	



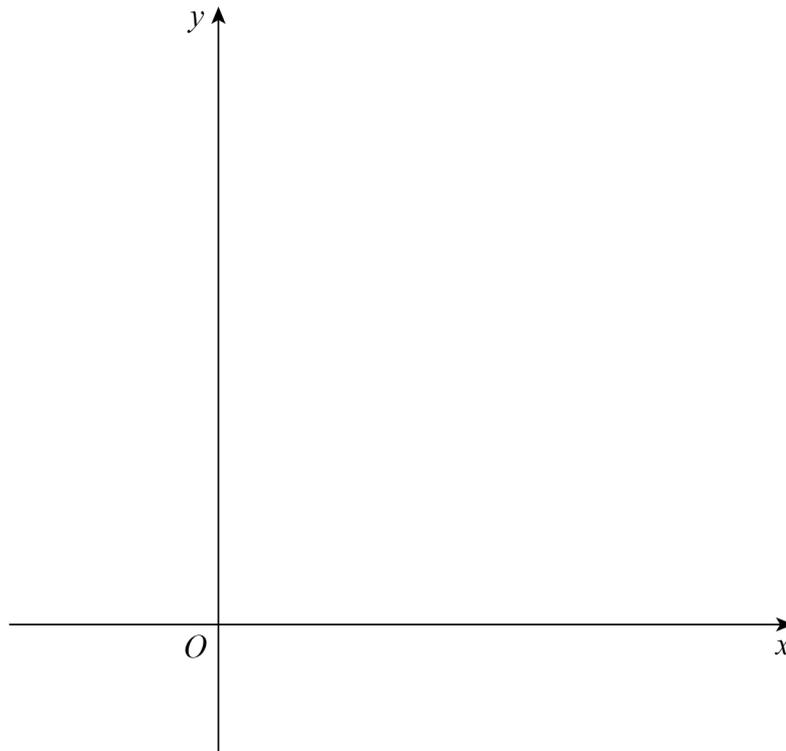
Section A**Pure Mathematics**

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

1 A curve has the equation $y = \frac{1}{g(x-0.5)}$

1 (a) Sketch the graph of the curve on the axes below, showing the value of the y -intercept.

[2 marks]



1 (b) The point P lies on the curve.

The x -coordinate of P is $2 \log_9 a$ where $a > 0$

Find the y -coordinate of P

Give your answer in the form $\frac{m}{a^n}$ where m and n are integers.

[2 marks]

Answer _____

4

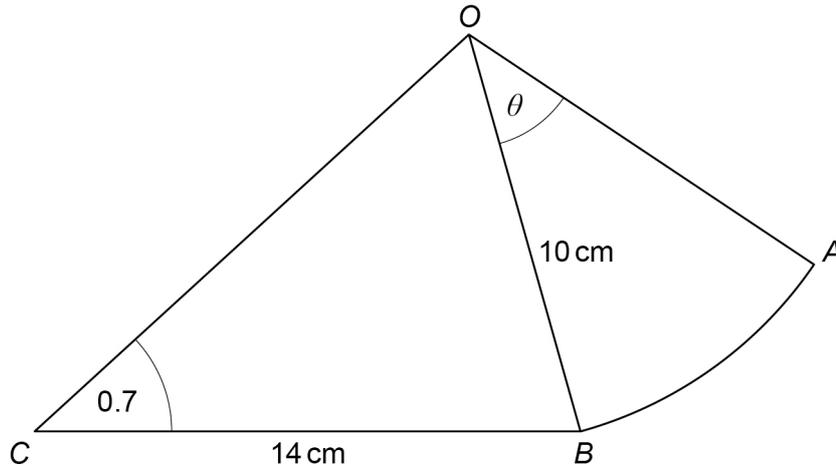
Turn over for the next question

Turn over ►



2 The diagram shows the shape $OABC$

The shape consists of the triangle OBC and the sector OAB of a circle with centre O



The angle $AOB = \theta$ radians

The angle $OCB = 0.7$ radians

The length $OB = 10$ cm

The length $BC = 14$ cm

2 (a) The perimeter of the sector OAB is 26 cm

Show that $\theta = 0.6$

[2 marks]

2 (b) The angle BOC is acute.

Find the angle OBC giving your answer in radians to two decimal places.

[4 marks]



3 (b) (ii) Find the equation of C giving your answer in the form

$$(x-a)^2 + (y+b)^2 = k$$

where a , b and k are positive integers.

[3 marks]

Answer _____

3 (c) Determine whether the point $R(2, -9)$ lies inside C

[2 marks]



4 (a) (i) Use the substitution $Y = 5^p$ to show that the equation

$$25^p - 5^{p+2} = 54$$

can be expressed as

$$(Y + 2)(Y - 27) = 0$$

[2 marks]

4 (a) (ii) Hence explain why the equation $25^p - 5^{p+2} = 54$ has only one real solution.

Find this solution, giving your answer in the form $\log_5 n$ where n is an integer.

[3 marks]

$$p = \underline{\hspace{10em}}$$



Section B**Statistics**

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

6 Customers of a restaurant are asked whether they liked their meal.

One evening, the restaurant had 40 customers.

The number of customers who said that they liked their meal can be modelled by the random variable $L \sim B(40, 0.4)$

6 (a) Find the variance of L

[1 mark]

Answer _____

6 (b) Find the probability that exactly 19 customers said that they liked their meal, giving your answer to three decimal places.

[2 marks]

Answer _____



- 6 (c)** Find the probability that more than 13 customers said that they liked their meal, giving your answer to three decimal places.

[2 marks]

Answer _____

5

Turn over for the next question

Turn over ►



- 7 The discrete random variable X has the probability distribution given in the following table where a , b and c are constants and $a < b < c$

x	a	b	c
$P(X=x)$	0.4	0.3	0.3

The mode of X is 1

The median of X is 4

The mean of X is 3.4

- 7 (a) (i) State the value of a and the value of b

[2 marks]

$a =$ _____ $b =$ _____

- 7 (a) (ii) Find the value of c

[2 marks]

$c =$ _____



8 Claire takes part in a fitness programme.

On any one day:

- the probability that Claire runs is 0.24
- the probability that Claire swims is 0.61
- the probability that Claire swims given that she runs is 0.74

8 (a) Find the probability that Claire runs **and** swims on any one day.

[2 marks]

Answer _____

8 (b) Find the probability that Claire runs **or** swims on any one day.

[2 marks]

Answer _____



8 (c) Find the probability that Claire runs and does **not** swim on any one day.

[2 marks]

Answer _____

8 (d) Find the probability that Claire runs given that she does **not** swim on any one day.

[2 marks]

Answer _____

8

Turn over for the next section

Turn over ►



There are no questions on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



10 (b) The ride is held with its base 7.68 metres above the ground.

The ride is then released and falls freely under gravity until its base is 2 metres above the ground.

At this point brakes are applied causing constant deceleration of the ride.

10 (b) (i) Find the maximum speed of the ride as it falls.

[3 marks]

Answer _____

10 (b) (ii) The ride comes to rest 0.3 seconds after the brakes are applied.

Find the final height of its base above the ground.

[3 marks]

Answer _____



- 11** Two particles A and B are on a smooth horizontal surface.
- Particle A has mass 4 kg and moves with speed 4.8 m s⁻¹ directly towards particle B
- Particle B has mass m kg, where m is a constant, and is at rest.
- The particles collide.
- After the collision:
- particle A moves in its original direction with speed v m s⁻¹
 - particle B moves with speed 3 m s⁻¹

11 (a) Show that $v = 4.8 - 0.75m$

[2 marks]

11 (b) By considering the possible values for v find the range of possible values for m

[4 marks]

Answer _____

END OF QUESTIONS



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



There are no questions printed on this page

*Do not write
outside the
box*

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Copyright information

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from www.oxfordaqaxams.org.uk.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and Oxford International AQA Examinations will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2023 Oxford International AQA Examinations and its licensors. All rights reserved.



2 8



2 3 6 X M A 0 2

IB/G/Jun23/MA02