OXFORD AQA

INTERNATIONAL QUALIFICATIONS

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I declare this is my own work.

INTERNATIONAL AS
MATHEMATICS

(9660/MA02) Unit PSM1 Pure Mathematics, Statistics and Mechanics

Thursday 8 January 2026 07:00 UK Time 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.
- 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**.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
TOTAL	

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

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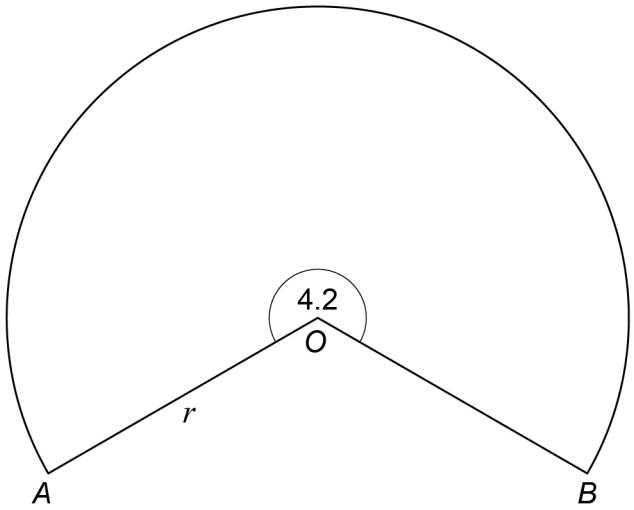
Section A

Pure Mathematics

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

1 **Figure 1** shows the sector OAB of a circle with centre O and radius r cm

Figure 1



The reflex angle AOB is 4.2 radians

The perimeter of the sector is 124 cm

Find the area of the sector in cm^2

[4 marks]

Answer _____

4

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2 (a) Solve the equation

$$2\sin x + 3\cos x = 0$$

in the interval $-90^\circ < x < 270^\circ$

Give your solutions to the nearest 0.1°

[3 marks]

Answer _____

2 (b) Show that

$$5\sin y \cos y\left(\frac{1}{\tan y} + \tan y\right) = a$$

where a is an integer.

[3 marks]

6

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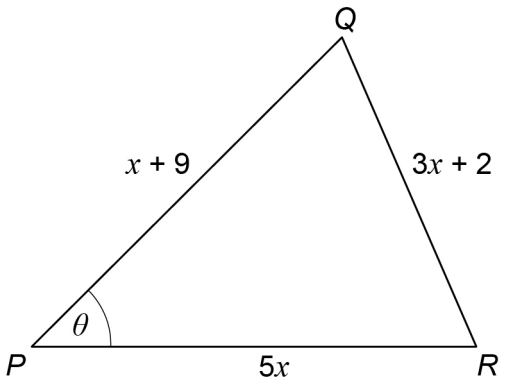
3 **Figure 2** shows a triangle PQR

Figure 2



The length $PQ = (x + 9)$ cm

The length $PR = 5x$ cm

The length $QR = (3x + 2)$ cm

The **acute** angle $QPR = \theta$ degrees where $\sin\theta = \frac{\sqrt{51}}{10}$

3 (a) Use a suitable trigonometric identity to show that $\cos\theta = \frac{7}{10}$

[2 marks]

Do not write outside the box

3 (b) Use the cosine rule to show that the possible values of x satisfy

$$10x^2 - 57x + 77 = 0$$

[3 marks]

3 (c) In the case where x takes its largest value, find the exact area of triangle PQR in cm^2

Give your answer in the form $\frac{a\sqrt{b}}{c}$ where a, b and c are integers.

[4 marks]

Answer _____

9

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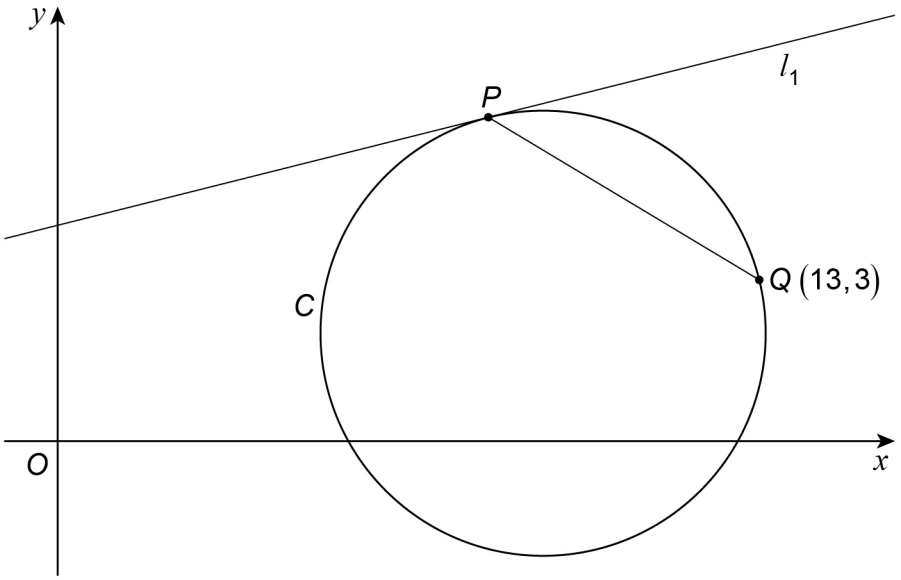
4 The points P and Q lie on a circle C

The coordinates of Q are $(13, 3)$

The line l_1 is the tangent to C at the point P as shown in **Figure 3**

Figure 3



The equation of C is $x^2 + y^2 = 18x + 4y - 68$

The equation of l_1 is $4y - x = 16$

4 (a) Find the coordinates of the centre of C and its exact radius.

[4 marks]

Centre _____ Radius _____

Do not write outside the box

4 (b) The line l_2 is the tangent to C at the point Q

l_1 and l_2 intersect at the point R

The chord PQ has length $\sqrt{34}$

Find the exact shortest distance from R to the chord PQ

[6 marks]

Answer _____

10

Turn over ►

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5 It is given that

$$\frac{9^{5t}}{7^t} = 81$$

Show that

$$t = \frac{a}{b - \log_c d}$$

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

[4 marks]

4

Turn over ►

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6 The first two terms in an arithmetic sequence are

$$u_1 = \log_{10}\left(\frac{b^5}{\sqrt{c}}\right) \quad \text{and} \quad u_2 = \log_{10}\left(\frac{b^5}{c}\right)$$

where b and c are positive constants.

6 (a) Show that the sequence has common difference $-\frac{1}{2}\log_{10} c$

[3 marks]

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6 (b) Find the sum of the first 15 terms of the sequence.

Give your answer in the form

$$\log_{10}\left(\frac{b^m}{c^n}\right)$$

where m and n are integers.

[4 marks]

Answer _____

7

Turn over for the next section

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Section B

Statistics

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

7 Kelly sells cars.

The probability that she sells at least one car on any given day is 0.35

The event that she sells at least one car on any given day is independent of the event that she sells at least one car on any other day.

A random sample of 14 days is taken.

7 (a) Find the probability that Kelly sells at least one car on exactly 5 of the 14 days.

Give your answer to four decimal places.

[1 mark]

Answer _____

7 (b) Find the probability that Kelly sells at least one car on more than 6 of the 14 days.

Give your answer to three decimal places.

[2 marks]

Answer _____

Do not write outside the box

7 (c) Find the probability that Kelly sells at least one car on 2 or more of the 14 days and on less than 8 of the 14 days.

Give your answer to three decimal places.

[2 marks]

Answer _____

5

Turn over for the next question

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8 Aten is shooting at a target.

The probability that he hits the target on his first attempt is 0.75

If he does **not** hit the target on his first attempt, he does **not** score any points and he does **not** shoot at the target again.

If he hits the target on his first attempt, he is given a second attempt to shoot at the target.

The probability that he hits the target on his second attempt is 0.45

If he hits the target on his second attempt, he scores 200 points.

If he does **not** hit the target on his second attempt, he scores 100 points.

Aten then does **not** have any more attempts at hitting the target.

The random variable X represents the number of points that Aten scores.

8 (a) Find the probability distribution of X by completing **Figure 4**

[2 marks]

Figure 4

x	0	100	200
$\mathrm{P}(X = x)$			

Do not write outside the box

8 (b) Find the mean number of points that Aten scores.

[2 marks]

Answer _____

8 (c) The random variable $Y \sim \mathrm{B}(100, 0.27)$ represents the number of points scored in a different game.

The random variables X and Y are independent.

Find $\mathrm{E}(X - Y)$

[3 marks]

Answer _____

7

Turn over ►

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9 The event A is such that $P(A) = k$ where k is a constant.

The event B is such that $P(B) = 2k$

It is given that $P(A \cup B) = 0.6$

9 (a) In the case where the events A and B are mutually exclusive, find the value of k

[2 marks]

Answer _____

9 (b) In the case where the events A and B are independent, find the value of k

Give your answer to three decimal places.

[3 marks]

Answer _____

Do not write outside the box

9 (c) In the case where $P(A \mid B) = 0.5k$, find the value of k

Give your answer to three decimal places.

[3 marks]

Answer _____

8

Turn over for the next section

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Section C

Mechanics

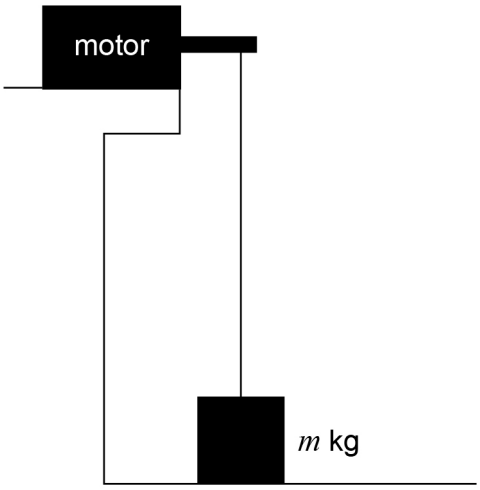
Answer **all** questions in the spaces provided.

10 **The acceleration due to gravity, g, should be taken as 9.8 m s^{-2}**

A block of mass m kg is initially at rest on a horizontal surface.

The block is attached by a light inextensible rope to a motor vertically above it, as shown in **Figure 5**

Figure 5



The motor produces a tension of magnitude 250 newtons in the rope.

10 (a) In the case where the block remains at rest, find the minimum value of m

[2 marks]

Answer _____

Do not write outside the box

10 (b) In the case where $m = 25$ kg, the block initially moves vertically upwards with an acceleration of magnitude a m s^{-2}

10 (b) (i) Show that $a = 0.2$

[1 mark]

10 (b) (ii) The motor raises the block for 3 seconds and then the rope breaks.

The block then moves freely under gravity.

The greatest height above the horizontal surface reached by the bottom of the block is d metres.

Find the value of d

[4 marks]

Answer _____

7

Turn over ►

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11 (a) **The acceleration due to gravity, g, should be taken as 9.8 m s^{-2}**

A coin of mass 0.05 kg is at rest and lying flat on a rough horizontal surface.

A horizontal impulse of magnitude 0.06 N s is then exerted on the coin.

The coin travels a distance of 0.8 metres across the surface before coming to rest.

Find the value of the coefficient of friction between the coin and the surface.

[5 marks]

Answer _____

Do not write outside the box

11 (b) Give a reason why the actual value for the coefficient of friction between the coin and the surface may be different to the value you found in **part (a)**.

[1 mark]

6

Turn over for the next question

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12 A particle is travelling along a straight line.

The velocity v m s^{-1} of the particle at time t seconds is given by

$$v = t^2(t - k)$$

where k is a positive constant.

12 (a) The acceleration of the particle is 0.25 m s^{-2} when $t = k$

Find the value of k

[2 marks]

$k =$ _____

Do not write outside the box

12 (b) The particle is initially at the origin O

The particle passes through O again when $t = T$

Find the average **speed** of the particle between $t = 0$ and $t = T$

[5 marks]

Answer _____

7

END OF QUESTIONS

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