

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 19 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.
- 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	
12	
TOTAL	

Section A**Pure Mathematics**

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

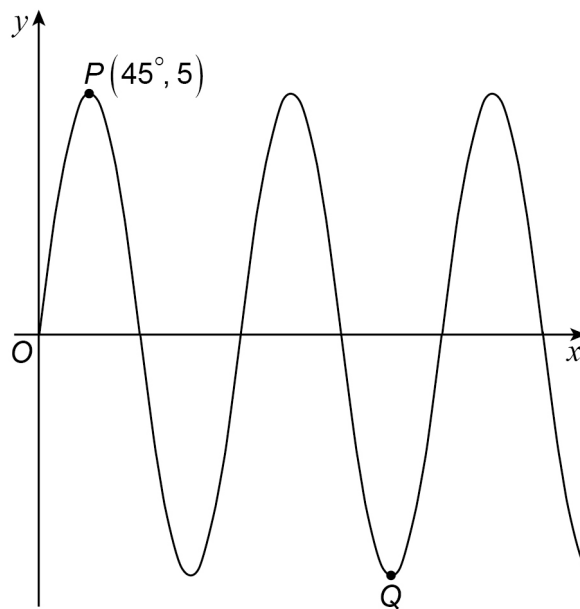
- 1** The diagram below shows part of the curve with equation

$$y = A \sin bx$$

where A and b are positive constants and x is measured in degrees.

The curve has a maximum point at $P(45^\circ, 5)$

The curve has a minimum point at Q as shown in the diagram.



- 1 (a)** Find the value of A and the value of b

[2 marks]

$A =$ _____ $b =$ _____



- 1 (b) The function f is defined by

$$f(x) = A \sin bx$$

Use the value of b found in **part (a)** to find the period of f

[1 mark]

Answer _____

- 1 (c) Find the coordinates of Q

[2 marks]

Answer _____

5

Turn over for the next question

Turn over ►

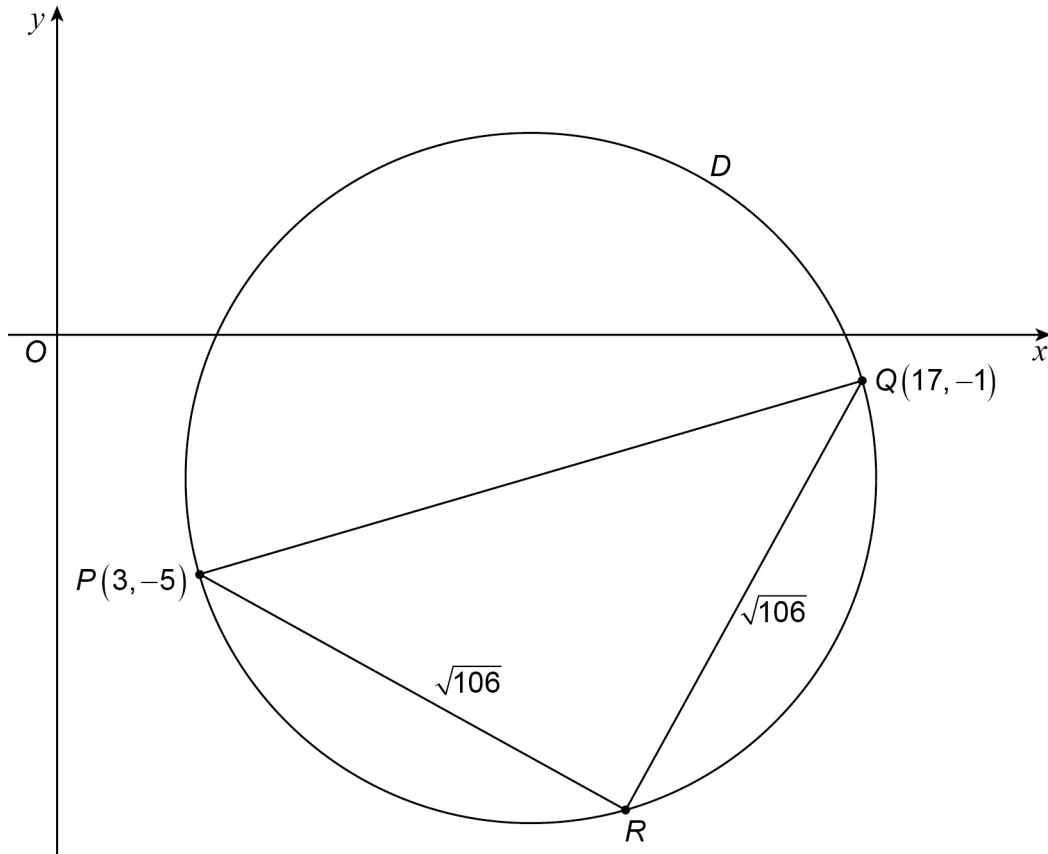


2

A triangle has vertices at the points $P(3, -5)$, $Q(17, -1)$ and R

The points P , Q and R lie on the circumference of a circle D

The triangle and circle D are shown in the diagram below.



The sides PR and QR of the triangle both have length $\sqrt{106}$

2 (a) Show that PQ is a diameter of D

[3 marks]



2 (b) A circle E has the same centre as D

The area of D is four times the area of E

Find the equation of E

Give your answer in the form $(x+a)^2 + (y+b)^2 = k$ where a , b and k are constants.

[3 marks]

Answer _____

2 (c) The point S lies on E

The tangent to E at S has equation $4x + 14y = 51$

Find the equation of the normal to E at S

Give your answer in the form $y = mx + c$ where m and c are constants.

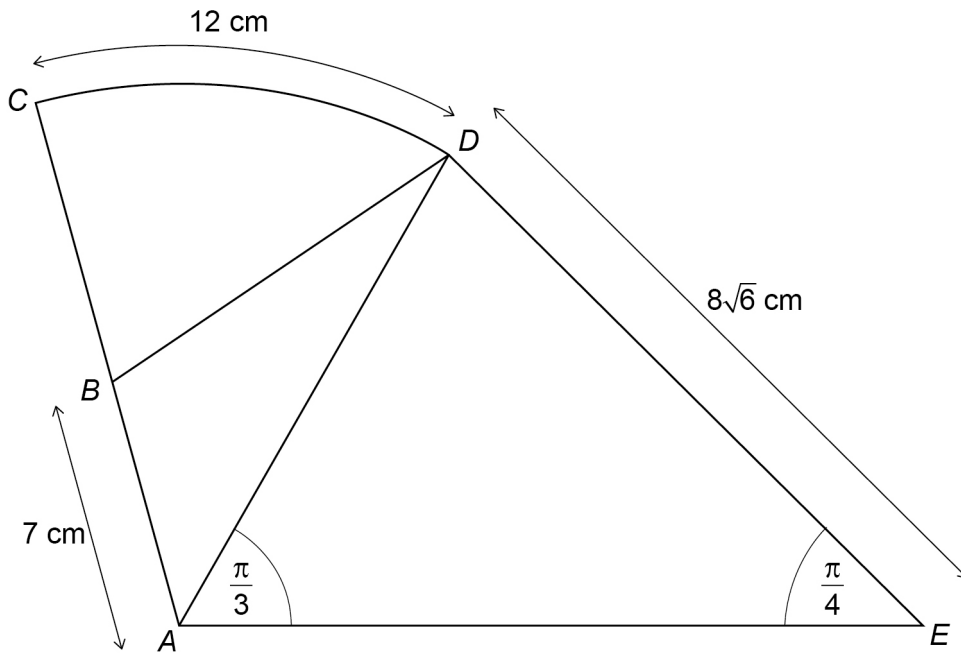
[3 marks]

Answer _____



3

The diagram shows the sector ACD of a circle with centre A , a triangle ADE and the line segment BD where B lies on AC



The length of $AB = 7$ cm

The length of $DE = 8\sqrt{6}$ cm

The length of arc $CD = 12$ cm

The angle $DAE = \frac{\pi}{3}$ radians

The angle $AED = \frac{\pi}{4}$ radians

3 (a) Show that the length of $AD = 16$ cm

[1 mark]



3 (b) Find the area of triangle ABD

Give your answer in cm^2 to one decimal place.

[3 marks]

Answer _____

3 (c) Find the length of BD

Give your answer in cm to one decimal place.

[2 marks]

Answer _____

6

Turn over for the next question

Turn over ►



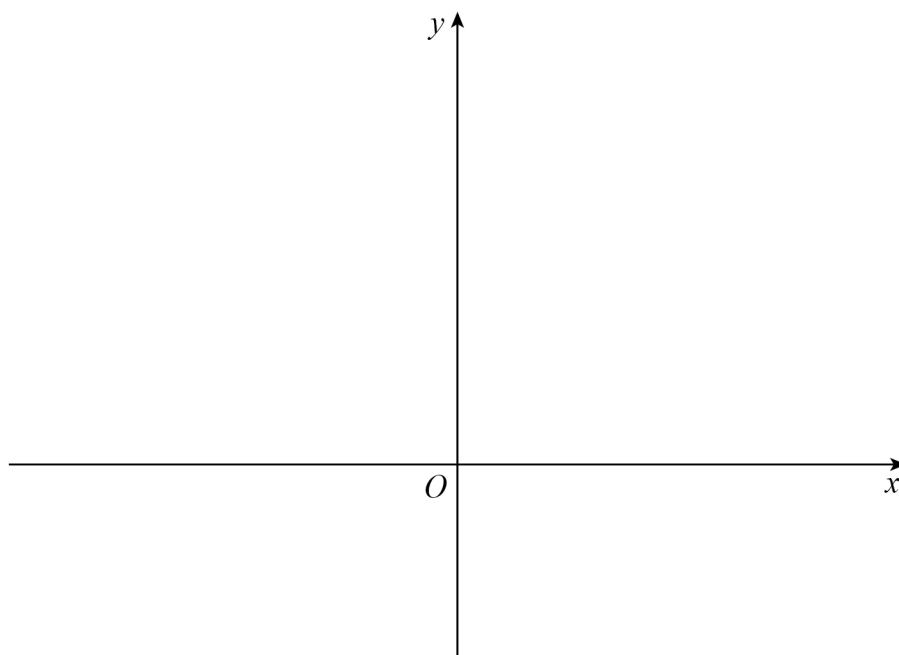
4 A curve P has equation

$$y = 3 + 6^x$$

4 (a) Sketch the graph of P on the axes below.

Show the coordinates of any intercepts with the axes.

[2 marks]



4 (b) (i) By using the substitution $X = 6^x$ and forming a quadratic equation of the form $aX^2 + bX + c = 0$ where a , b and c are integers, show that P and Q intersect at exactly one point.

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.

Simplify your answer.

Answer

Turn over ►



- 5 (a)** Show that the equation

$$\sqrt{3\cos^2\theta + 5\sin\theta} = 3\sin\theta$$

can be written as

$$(4\sin\theta - 3)(3\sin\theta + 1) = 0$$

[2 marks]

- 5 (b)** Solve the equation

$$(4\sin(x - 25^\circ) - 3)(3\sin(x - 25^\circ) + 1) = 0$$

in the interval $0^\circ \leq x \leq 360^\circ$

Give your solutions to one decimal place.

[4 marks]

Answer _____



- 5 (c)** Use your solutions to **part (b)** to solve the equation

$$\sqrt{3 \cos^2(x - 25^\circ) + 5 \sin(x - 25^\circ)} = 3 \sin(x - 25^\circ)$$

in the interval $0^\circ \leq x \leq 360^\circ$

Give your solutions to one decimal place.

[1 mark]

Answer _____

7

Turn over for the next question

Turn over ►



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**



This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

5

Turn over ►



Section B**Statistics**

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

- 7** A group of 269 students is asked what their favourite sport is and what their favourite colour is.

The results are shown in the table.

		Favourite sport			
		Basketball	Football	Hockey	Netball
Favourite colour	Blue	21	15	14	22
	Purple	12	18	9	19
	Red	16	9	8	13
	Yellow	13	31	19	30

A student is chosen at random.

- 7 (a)** Find the probability that the student's favourite sport is **football** and their favourite colour is **yellow**.

[1 mark]

Answer _____

- 7 (b)** Find the probability that the student's favourite sport is **basketball** or their favourite colour is **red**.

[2 marks]

Answer _____



- 7 (c)** Find the probability that the student's favourite colour is **purple** given that their favourite sport is **hockey**.

[2 marks]

Answer _____

5

Turn over for the next question

Turn over ►



8 Kara is throwing balls at a target.

The probability that Kara throws a ball which hits the target is 0.4

Kara has 12 attempts at hitting the target.

Assume that the result of each throw is independent of the result of any other throw.

8 (a) Find the probability that Kara hits the target exactly 5 times.

Give your answer to three decimal places.

[2 marks]

Answer _____

8 (b) (i) Find the mean number of times that Kara hits the target.

[1 mark]

Answer _____

8 (b) (ii) Show that the standard deviation of the number of times that Kara hits the target is 1.7 correct to one decimal place.

[1 mark]



- 8 (b) (iii)** Find the probability that the number of times that Kara hits the target is more than one standard deviation away from the mean.

Give your answer to four decimal places.

[3 marks]

Answer _____

7

Turn over for the next question

Turn over ►



- 9** A spinner has two sections numbered 0 and 1

The random variable X represents the number this first spinner lands on when it is spun.

The mean of X is 0.68

- 9 (a)** Find the variance of X

[1 mark]

Answer _____

- 9 (b)** A second spinner has four sections numbered 0, 6, 11 and c , where c is an integer greater than 11

The random variable Y represents the number this second spinner lands on when it is spun.

The probability distribution of Y is given in the table.

y	0	6	11	c
$P(Y = y)$	0.2	0.1	0.6	0.1

X and Y are independent.

- 9 (b) (i)** The two spinners are spun.

Find the probability that the first spinner lands on 1 and the second spinner lands on a number less than 10

[2 marks]

Answer _____



Find the value of c

[5 marks]

This image shows a single 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.

Answer _____

Turn over for the next section

8

Turn over ►



Section C**Mechanics**

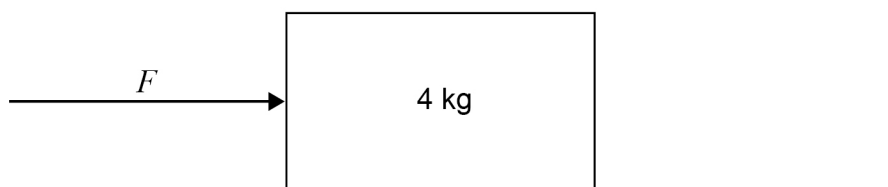
Answer **all** questions in the spaces provided.

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

A block of mass 4 kg is initially at rest on a rough horizontal surface.

The coefficient of friction between the block and the surface is μ

A constant horizontal force of magnitude F newtons acts on the block as shown in the diagram.



10 (a) It is given that the acceleration of the block is 0.1 m s^{-2}

Show that $F = 0.4 + b\mu$ where b is a constant.

[2 marks]



- 10 (b)** When the block has a momentum of magnitude 40 N s , the constant horizontal force no longer acts on the block.

The block then decelerates uniformly and takes 2 seconds to come to rest.

Find the value of μ

[4 marks]

Answer _____

6

Turn over for the next question

Turn over ►



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

Particle Q is held at rest 35 metres vertically above particle P

Particle P is projected vertically upwards with initial speed 14 m s^{-1}

At the same time, particle Q is released.

Both particles move freely under gravity and collide at a height of y metres above the ground.

Find the value of y

[5 marks]

[illegible]

Answer _____

5

Turn over for the next question

Turn over ►



- 12** A particle accelerates from rest along a straight line.

The acceleration $a \text{ m s}^{-2}$ of the particle at time t seconds is given by the equation

$$a = k(t+1)(3-t) \quad \text{for} \quad 0 \leq t \leq T$$

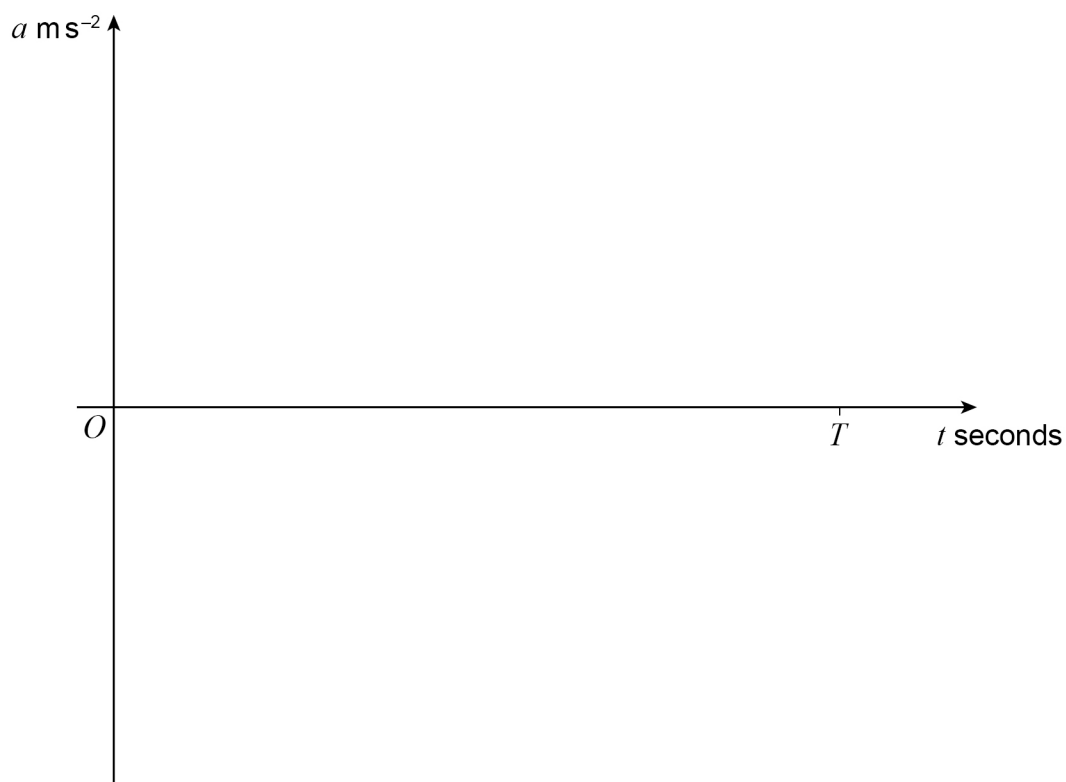
where k is a positive constant and $T > 3$

At time T seconds the particle comes to rest and remains at rest.

- 12 (a)** Sketch an acceleration-time graph for the particle on the axes below.

Show the coordinates of any intercepts with the axes.

[2 marks]



12 (b)

[5 marks]

[illegible]

Answer

12 (c)

[2 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**



