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Candidate number

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INTERNATIONAL AS MATHEMATICS

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

Thursday 23 May 2019 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 graphics 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.
- 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.

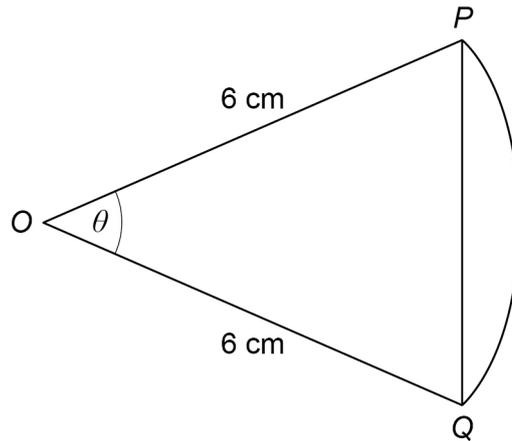
For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
TOTAL	



Section A**Pure Mathematics**

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

- 1** The diagram shows a sector of a circle with radius 6 cm
 PQ is a chord of the circle and the acute angle $POQ = \theta$ radians.



- 1 (a)** The area of the triangle OPQ is 14 cm^2
Show that $\theta = 0.891$ correct to three significant figures.

[3 marks]



1 (b) Find the length of the arc PQ , giving your answer to three significant figures.

[2 marks]

Answer _____ cm

Turn over for the next question

5

Turn over ►



- 2** The diagram below shows a circle and a tangent to the circle at the point $P(6, 12)$
- The centre of the circle has coordinates $(a, 5a)$
- The equation of the tangent is $y = 24 - 2x$

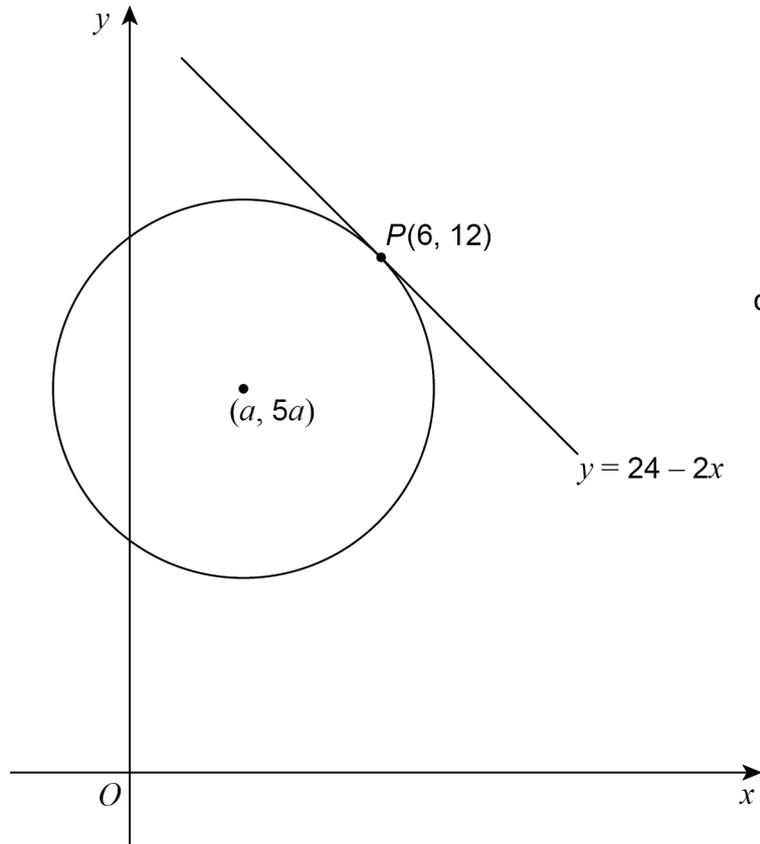


Diagram not
drawn to scale

- 2 (a)** Show that $a = 2$

[3 marks]



2 (b) (i) Find the radius of the circle, giving your answer in the form \sqrt{n} , where n is an integer.

[2 marks]

Radius = _____

2 (b) (ii) Hence express the equation of the circle in the form

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

where b , c and k are positive integers.

[2 marks]

Answer _____

2 (c) Q is a different point on the circle.
The tangent to the circle at Q is parallel to the tangent to the circle at P .
State the coordinates of Q .

[2 marks]

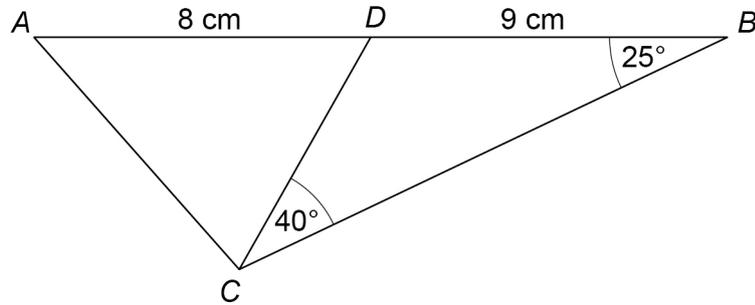
Answer _____



3 The diagram shows the triangle ABC and the line segment CD .

The point D lies on AB such that $AD = 8$ cm and $BD = 9$ cm

Angle $BCD = 40^\circ$ and angle $CBD = 25^\circ$



3 (a) Show that the length of CD is 5.92 cm correct to three significant figures.

[2 marks]



3 (b) Find the length of AC , giving your answer to three significant figures.

[3 marks]

Answer _____ cm

3 (c) Find the shortest distance between the point A and the line CD , giving your answer to three significant figures.

[3 marks]

Answer _____ cm

8

Turn over ►



4 (a) Show that the equation

$$10\cos^2x = 7\sin x - 2$$

can be written as

$$10\sin^2x + 7\sin x - 12 = 0$$

[2 marks]

4 (b) A student, Megan, solves the equation

$$10\cos^2x = 7\sin x - 2$$

She claims that the only real solutions of the equation satisfy

$$\sin x = \frac{4}{5}$$

Determine whether or not Megan is correct.

[4 marks]



4 (c) Solve the equation

$$10\cos^2(\theta + 40^\circ) = 7\sin(\theta + 40^\circ) - 2$$

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

Give your answers to the nearest degree.

[2 marks]

Answer _____

Turn over for the next question

8

Turn over ►



Section B**Statistics**

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

- 6** A housebuilder sells three types of houses which have two, three or four bedrooms. Each house is bought by a single person, a family, or a company.

- 6 (a)** The table shows some information about the type of house sold and the type of buyer. Complete the table.

[1 mark]

		Type of house			
		2 bedroom	3 bedroom	4 bedroom	Total
Type of buyer	Single person	12	18	3	33
	Family	13		7	
	Company	5	2	0	7
	Total		30	10	

- 6 (b)** A house is chosen at random.

- 6 (b) (i)** Find the probability that the house is bought by a family and it contains four bedrooms.

[2 marks]

Answer _____



- 6 (b) (ii)** Find the probability that the house is bought by a company or it contains three bedrooms. **[2 marks]**

Answer _____

- 6 (b) (iii)** Find the probability that the house is bought by a single person given that it contains two bedrooms.

[2 marks]

Answer _____

7

Turn over for the next question

Turn over ►



7 (b) Let Y be the random variable such that $Y = X^2 + 4$

Find $E(6Y - 9)$.

[2 marks]

Answer _____

Turn over for the next question

6

Turn over ►



8 David has an unbiased dice with six faces which are numbered '1' to '6'.

8 (a) He rolls the dice ten times.

Find the probability that he rolls a '6' exactly four times.

[2 marks]

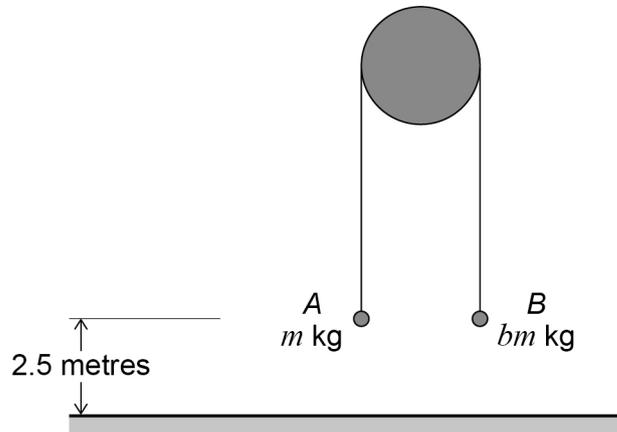
Answer _____



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

Two particles, A and B , are connected by a light inextensible string that passes over a smooth light pulley.

Particle A has mass $m \text{ kg}$ and particle B has mass $bm \text{ kg}$, where $b > 1$



The particles are held at rest at a height of 2.5 metres above horizontal ground with the string taut.

When the particles are released, they begin to move vertically and the magnitude of the acceleration of each particle is 1.4 m s^{-2}

11 (a) By forming an equation of motion for each particle find the value of b .

[6 marks]



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