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**Pearson Edexcel International Advanced Level**

**Thursday 9 January 2025**

Morning (Time: 1 hour 30 minutes) **Paper reference** **WMA11/01**

**Mathematics** ☐ ☐

**International Advanced Subsidiary/Advanced Level**

**Pure Mathematics P1**

**You must have:**  
Mathematical Formulae and Statistical Tables (Yellow), calculator

Total Marks

**Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

### Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

**1. Find**

$$\int \left( 8x^3 - 6\sqrt{x} - \frac{2}{5x^3} \right) dx$$

giving your answer in simplest form.

(4)





**In this question you must show all stages of your working. Solutions relying on calculator technology are not acceptable.**

- the point  $A$  has coordinates  $(-2\sqrt{3}, 5)$

- the point  $B$  has coordinates  $(7\sqrt{3}, 8)$

- the straight line  $l_1$  passes through  $A$  and  $B$

(a) show that the gradient of  $l_1$  is  $p\sqrt{3}$ , where  $p$  is a rational constant to be found. You must show each step of your working.

(2)

The straight line  $l_2$  is perpendicular to  $l_1$  and passes through  $A$ .

(b) Find the equation of  $l_2$ , giving your answer in the form  $y = mx + c$ , where  $m$  and  $c$  are constants.

(3)





3. The population of a town was monitored.

Exactly 5 years after monitoring began, the population was 58 000

Exactly 10 years after monitoring began, the population was 65 000

Given that the population of the town,  $P$  thousand,  $t$  years after monitoring began can be modelled by the equation

$$P^2 = a + bt^3$$

where  $a$  and  $b$  are constants,

(a) find the value of  $a$  and the value of  $b$ .

(3)

According to the model, exactly  $T$  years after monitoring began, the population was 85 000

Making your method clear,

(b) find the value of  $T$ , giving your answer to one decimal place.

*(Solutions relying entirely on calculator technology are not acceptable.)*

(2)









**In this question you must show all stages of your working. Solutions relying entirely on calculator technology are not acceptable.**

$$y = a^x \quad \text{where } a \text{ is a positive constant}$$
$$(a) \ a^{3x+1} \qquad \qquad \qquad (1)$$

$$(b) \quad \frac{5}{(3a^{1-x})^{-2}} \quad (3)$$

$$3(3^{4t+2} + 1) = 82 \times 9^t$$
$$27p^2 - 82p + 3 = 0 \quad (2)$$
$$3(3^{4t+2} + 1) = 82 \times 9^t \quad (3)$$
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.



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**In this question you must show all stages of your working. Solutions relying on calculator technology are not acceptable.**

The curve  $C$  has equation

$$y = 4x^3 + \frac{2}{x} + 9 \quad x > 0$$

(a) Find  $\frac{dy}{dx}$ , giving your answer in simplest form.

(2)

Given that

- the point  $P$  lies on  $C$
- the line with equation  $y = k - 5x$ , where  $k$  is a constant, is the tangent to  $C$  at  $P$

(b) show that the  $x$  coordinate of  $P$  satisfies the equation

$$12x^4 + 5x^2 - 2 = 0$$

(2)

(c) Hence find the value of  $k$ .

(4)







**In this question you must show all stages of your working. Solutions relying entirely on calculator technology are not acceptable.**

Given that

- the point  $P(4, -5)$  lies on  $C$
- $f'(x) = \frac{2x^2 + ax + b}{4\sqrt{x}}$ , where  $a$  and  $b$  are constants
- the gradient of the tangent to  $C$  at  $P$  is 7

$$4a + b = 24 \tag{2}$$

(b) find, in simplest form,  $f(x)$

(c) state the coordinates of  $Q$ . (1)







7. **In this question you must show all stages of your working.**  
**Solutions relying entirely on calculator technology are not acceptable.**

The curve  $C$  has equation

$$y = \frac{2}{x} - k$$

where  $k$  is a **positive** constant.

- (a) Sketch the graph of  $C$ .

Show on your sketch

- the coordinates of any points of intersection of  $C$  with the coordinate axes
- the equation of the horizontal asymptote to  $C$

stating each in terms of  $k$ .

**(3)**

The line  $l$  has equation  $y = -kx - 6$

Given that  $l$  intersects  $C$  at 2 distinct points,

- (b) find the range of possible values of  $k$ .

**(5)**

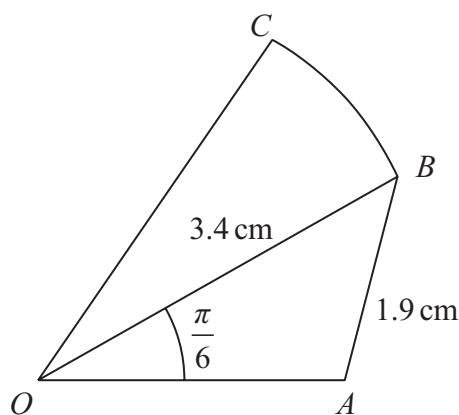








8.



**Figure 1**

Figure 1 shows a sketch of a design for a badge.

The design consists of a triangle  $OAB$  joined to a sector  $OBC$  of a circle with centre  $O$   
In the design

- $OB = 3.4 \text{ cm}$
- $AB = 1.9 \text{ cm}$
- angle  $AOB = \frac{\pi}{6}$  radians
- angle  $OAB > \frac{\pi}{2}$  radians

Making your method clear,

(a) find the size of angle  $OAB$ , giving your answer in radians to 4 significant figures, (3)

(b) find the area of triangle  $OAB$ , in  $\text{cm}^2$ , giving your answer to 3 significant figures. (2)

Given that the ratio of the area of sector  $OBC$  to the area of triangle  $OAB$  is 3 : 2

(c) show that angle  $BOC$  is 0.462 radians to 3 significant figures. (3)

(d) Hence find the perimeter of the badge, in cm, to the nearest integer. (5)

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**(Total for Question 8 is 13 marks)**

9.

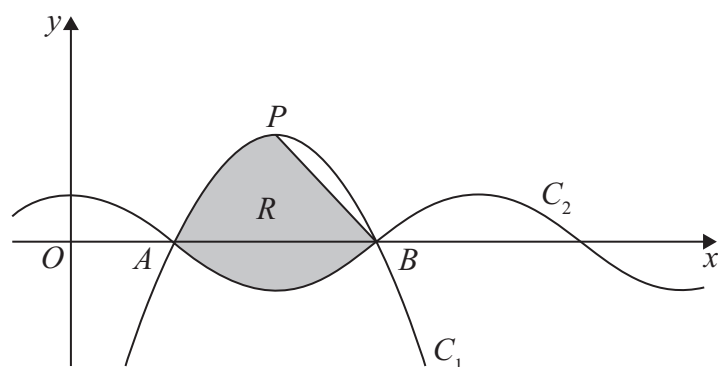


Figure 2

- (a) Express  $6x - \frac{27}{4} - x^2$  in the form  $a + b(x + c)^2$  where  $a$ ,  $b$  and  $c$  are constants to be found.

(3)

Figure 2 shows part of a sketch of curve  $C_1$  with equation

$$y = 6x - \frac{27}{4} - x^2$$

Given that the point  $P$  is the maximum point on  $C_1$

- (b) state the coordinates of  $P$

(2)

Figure 2 also shows part of a sketch of curve  $C_2$  with equation

$$y = \cos(kx)$$

where  $k$  is a constant and  $x$  is measured in radians.

Given that  $C_1$  and  $C_2$  intersect on the  $x$ -axis at point  $A$  and at point  $B$ , as shown in Figure 2,

- (c) (i) state the  $x$  coordinate of  $B$   
 (ii) state the value of  $k$   
 (iii) state the period of  $C_2$

(3)

The line segment  $L$  joins  $P$  and  $B$ .

The region  $R$ , shown shaded in Figure 2, is bounded by  $L$ ,  $C_1$  and  $C_2$

- (d) Use inequalities to define  $R$ .

(5)





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**TOTAL FOR PAPER IS 75 MARKS**

