**Pearson Edexcel**
International
Advanced Level

Centre Number

Candidate Number

# Wednesday 13 May 2020

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 (Lilac), 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* ▶

P 6 2 5 9 7 A 0 1 3 2

**Pearson**

1. Given that

$$(3pq^2)^4 \times 2p \sqrt{q^8} \equiv ap^b q^c$$

find the values of the constants $a$, $b$ and $c$.

(3)

**Question 1 continued**

**2.**
$$f(x) = 3 + 12x - 2x^2$$

(a) Express f(x) in the form

$$a - b(x + c)^2$$

where $a$, $b$ and $c$ are integers to be found.

**(3)**

The curve with equation $y = f(x) - 7$ crosses the $x$-axis at the points $P$ and $Q$ and crosses the $y$-axis at the point $R$.

(b) Find the area of the triangle $PQR$, giving your answer in the form $m\sqrt{n}$ where $m$ and $n$ are integers to be found.

**(4)**

**Question 2 continued**

P 6 2 5 9 7 A 0 5 3 2

**Question 2 continued**

P6 2 5 9 7 A 0 6 3 2

**Question 2 continued**

Q2

**(Total 7 marks)**
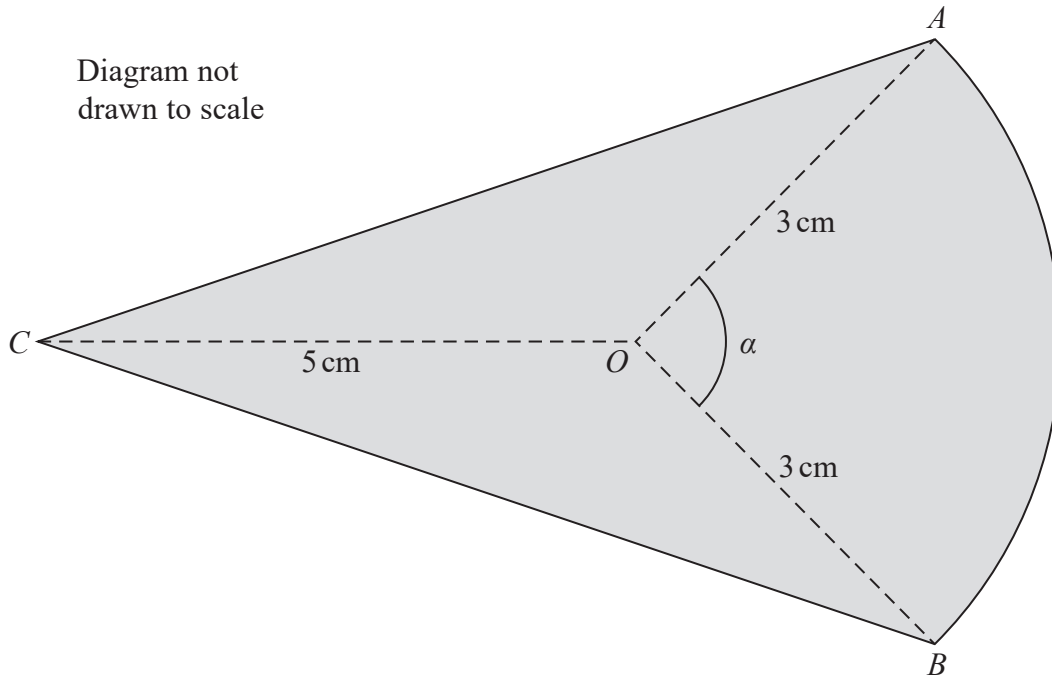
**3.**

Diagram not
drawn to scale



**Figure 1**

Figure 1 shows the design for a badge.

The design consists of two congruent triangles, *AOC* and *BOC*, joined to a sector *AOB* of a circle centre *O*.

- Angle $AOB = \alpha$
- $AO = OB = 3$ cm
- $OC = 5$ cm

Given that the area of sector *AOB* is 7.2 cm$^2$

(a) show that $\alpha = 1.6$ radians.

**(2)**

(b) Hence find

(i) the area of the badge, giving your answer in cm$^2$ to 2 significant figures,

(ii) the perimeter of the badge, giving your answer in cm to one decimal place.

**(8)**

**Question 3 continued**

P62597A0932

**Question 3 continued**

**Question 3 continued**

(Total 10 marks)

**4.** Use algebra to solve the simultaneous equations

$$y - 3x = 4$$
$$x^2 + y^2 + 6x - 4y = 4$$

You must show all stages of your working.

**(7)**

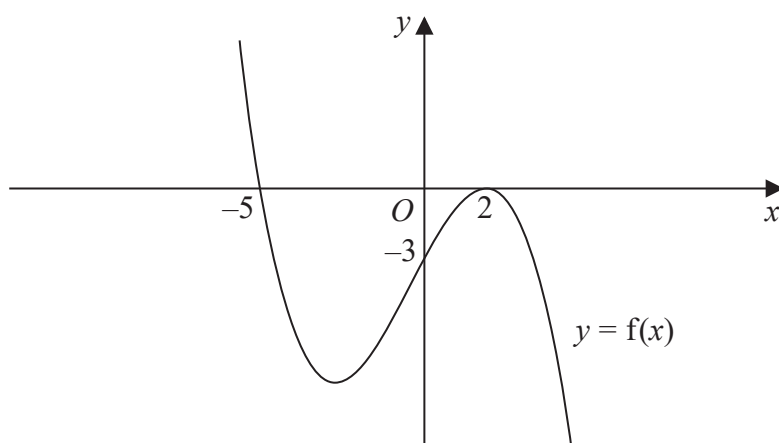**Question 4 continued**

Leave blank

**5.** (i)



**Figure 2**

Figure 2 shows a sketch of the curve with equation $y = f(x)$.

The curve passes through the points $(-5, 0)$ and $(0, -3)$ and touches the $x$-axis at the point $(2, 0)$.

On separate diagrams sketch the curve with equation

(a) $y = f(x + 2)$

(b) $y = f(-x)$

On each diagram, show clearly the coordinates of all the points where the curve cuts or touches the coordinate axes.
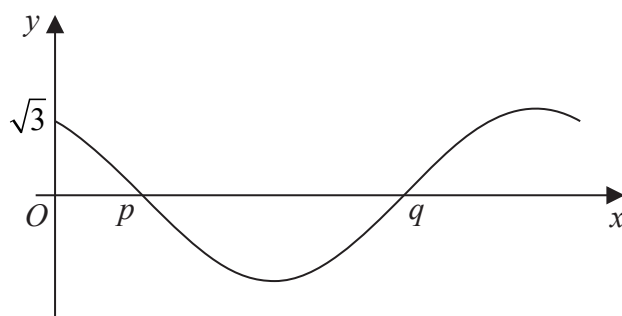
**(6)**

(ii)



**Figure 3**

Figure 3 shows a sketch of the curve with equation

$$y = k \cos\left( x + \frac{\pi}{6} \right) \qquad 0 \leqslant x \leqslant 2\pi$$

where $k$ is a constant.

The curve meets the $y$-axis at the point $(0, \sqrt{3})$ and passes through the points $(p, 0)$ and $(q, 0)$.

Find

(a) the value of $k$,

(b) the exact value of $p$ and the exact value of $q$.

**(3)**

**Question 5 continued**

**Question 5 continued**

P 6 2 5 9 7 A 0 1 6 3 2

**Question 5 continued**

Q5

**(Total 9 marks)**

**6.** The point $A$ has coordinates $(-4, 11)$ and the point $B$ has coordinates $(8, 2)$.

(a) Find the gradient of the line $AB$, giving your answer as a fully simplified fraction.

**(2)**

The point $M$ is the midpoint of $AB$. The line $l$ passes through $M$ and is perpendicular to $AB$.

(b) Find an equation for $l$, giving your answer in the form $px + qy + r = 0$ where $p$, $q$ and $r$ are integers to be found.

**(4)**

The point $C$ lies on $l$ such that the area of triangle $ABC$ is 37.5 square units.

(c) Find the two possible pairs of coordinates of point $C$.

**(5)**

**Question 6 continued**

**Question 6 continued**

**Question 6 continued**

(Total 11 marks)

7. The curve $C$ has equation

$$y = \frac{1}{2-x}$$

(a) Sketch the graph of $C$. On your sketch you should show the coordinates of any points of intersection with the coordinate axes and state clearly the equations of any asymptotes.

(3)

The line $l$ has equation $y = 4x + k$, where $k$ is a constant.

Given that $l$ meets $C$ at two distinct points,

(b) show that

$$k^2 + 16k + 48 > 0$$

(4)

(c) Hence find the range of possible values for $k$.

(4)

**Question 7 continued**

P 6 2 5 9 7 A 0 2 3 3 2

**Question 7 continued**

P 6 2 5 9 7 A 0 2 4 3 2

**Question 7 continued**

Leave blank

8. The curve $C$ has equation

$$y = (x - 2)(x - 4)^2$$

(a) Show that

$$\frac{dy}{dx} = 3x^2 - 20x + 32$$

**(4)**

The line $l_1$ is the tangent to $C$ at the point where $x = 6$

(b) Find the equation of $l_1$, giving your answer in the form $y = mx + c$, where $m$ and $c$ are constants to be found.

**(4)**

The line $l_2$ is the tangent to $C$ at the point where $x = \alpha$

Given that $l_1$ and $l_2$ are parallel and distinct,

(c) find the value of $\alpha$

**(3)**

**Question 8 continued**

**Question 8 continued**

**Question 8 continued**

(Total 11 marks)

P 6 2 5 9 7 A 0 2 9 3 2

**9.** A curve with equation $y = f(x)$ passes through the point $(9, 10)$.

Given that

$$f'(x) = 27x^2 - \frac{21x^3 - 5x}{2\sqrt{x}} \qquad x > 0$$

find $f(x)$, fully simplifying each term.

**(6)**

**Question 9 continued**

P 6 2 5 9 7 A 0 3 1 3 2

**Question 9 continued**

**Q9**

**(Total 6 marks)**

**TOTAL FOR PAPER IS 75 MARKS**

**END**