Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | Candidate Number

Specimen Paper

(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 10 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 ►

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Answer ALL questions. Write your answers in the spaces provided.

1. The point $P(3, -4)$ lies on the curve with equation $y = f(x)$

State the coordinates of the image of P under the transformation represented by the curve with equation

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

(1)

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

(1)

(c) $2y = f(x)$

(1)

(d) $y = f(x) + 4$

(1)

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

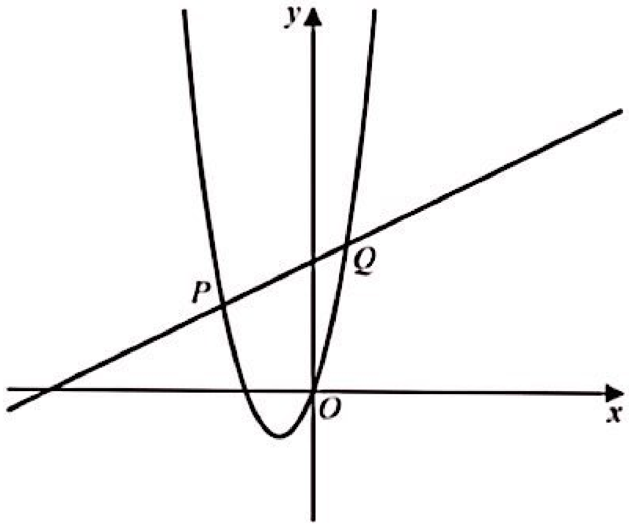

Figure 1

Figure 1 shows a sketch of the curve with equation $y = 2x^2 + 3x$ and the straight line with equation $y = \frac{1}{2}x + 3$

The line meets the curve at the points P and Q, as shown in Figure 1.

(a) Using algebra, find the coordinates of P and the coordinates of Q.

(5)

(b) Hence write down the range of values of x for which $2x^2 + 3x \geqslant \frac{1}{2}x + 3$

(2)

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3. A curve has equation

$$y = \frac{x^3}{16} - 4\sqrt{x} + \frac{8}{x}, \quad x > 0$$

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

(3)

The point $P(4, -2)$ lies on the curve.

(b) Use the answer to part (a) to find the equation of the normal to the curve at P, writing your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found.

(4)

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

(i) Given

$$\frac{4^a}{2^{3b}} = 32\sqrt{2}$$

use the laws of indices to write *a* in terms of *b*.

(4)

(ii) Solve the equation

$$3x = x\sqrt{2} + 14$$

giving your answer as a simplified surd.

(3)

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5.

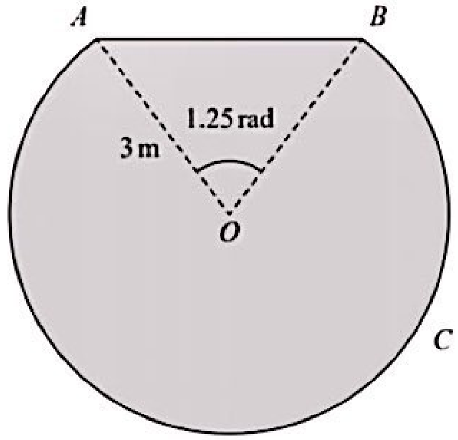

Figure 2

Figure 2 shows the plan view of a design for a garden pond.

The pond consists of a sector, $AOBCA$, of a circle with centre O, joined to a triangle AOB.

Given $AO = BO = 3$ m and angle $AOB = 1.25$ radians,

(a) find the perimeter of the pond, giving your answer, in metres, to 2 decimal places. **(4)**

Given that there is a uniform depth of water in the pond of 1.5 m,

(b) find the volume of water in the pond, in m³, to one decimal place. **(4)**

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6.

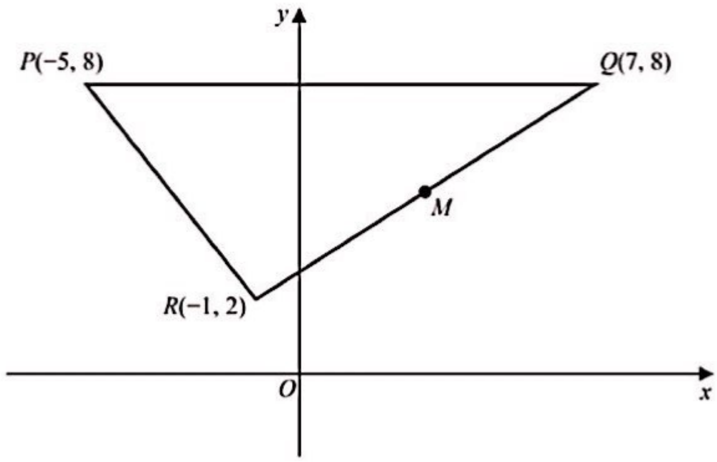

Figure 3

The points $P(-5, 8)$, $Q(7, 8)$ and $R(-1, 2)$ form the vertices of a triangle PQR, as shown in Figure 3. The point M is the midpoint of QR.

The line l passes through M and is parallel to PR.

(a) Find an equation for l, writing your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found.

(4)

The line l cuts PQ at the point N.

(b) Find

(i) the coordinates of N,

(ii) the area of triangle MNQ.

(3)

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7. (a) Sketch, on Diagram 1, the graphs of

(i) $y = 2\cos x, \quad -90° \leqslant x \leqslant 360°$

(ii) $y = \tan x, \quad -90° \leqslant x \leqslant 360°$

(4)

(b) Given that $n \in \mathbb{N}$, deduce, in terms of n, the number of real solutions of the equation

(i) $2\cos x = \tan x, \quad -90° \leqslant x \leqslant (360n)°$

(ii) $\tan x = -\frac{3}{2}, \quad -90° \leqslant x \leqslant (360n)°$

(2)

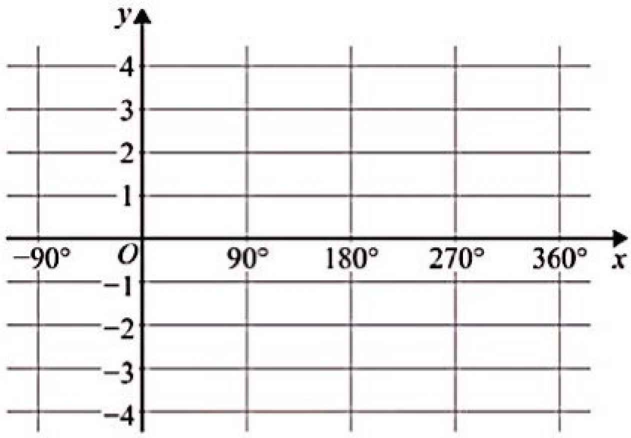

Diagram 1

(If you make an error there is a spare copy of Diagram 1 on the next page.)

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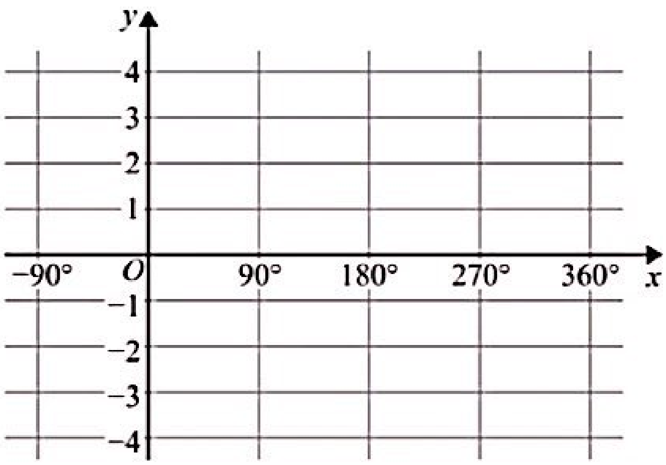
Question 7 continued



Spare copy of Diagram 1

(Only use this diagram if you have made an error on Diagram 1.)

Q7

(Total for Question 7 is 6 marks)

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8.

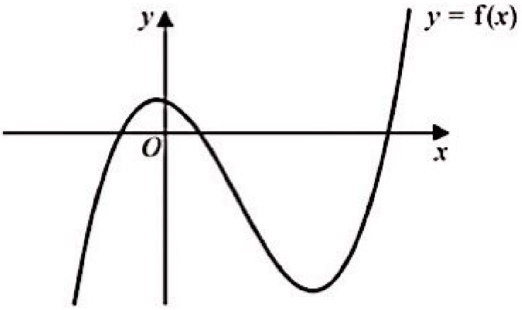

Figure 4

Figure 4 shows a sketch of a curve with equation $y = f(x)$, where

$$f(x) = (x + 2)(x - 10)(2x - 3)$$

(a) Deduce the values of x for which

$$f(x) > 0$$

(2)

(b) Expand $f(x)$ to the form

$$2x^3 + ax^2 + bx + 60$$

where a and b are integers to be found.

(3)

A copy of Figure 4, called Diagram 2, is shown on the next page.

(c) (i) Sketch, on Diagram 2, the curve with equation $y = \frac{k}{x} + 60$, where k is a positive constant. You must show clearly the position and equation of the horizontal asymptote to the curve.

(ii) Hence deduce the number of real roots of the equation

$$f(x) = \frac{k}{x} + 60 \text{ where } k \text{ is a positive constant}$$

(4)

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Question 8 continued

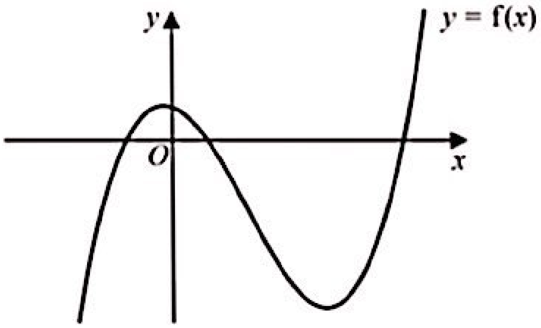

Diagram 2

Q8

(Total for Question 8 is 9 marks)

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9.

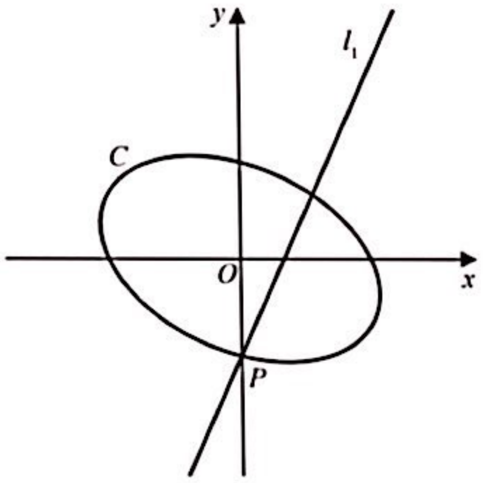

Figure 5

Figure 5 shows a sketch of the curve C with equation

$$4x^2 + 9y^2 + 4xy = 64$$

The curve C crosses the negative y-axis at the point P.

The line l_1 has gradient 2 and passes through P, as shown in Figure 5.

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

(3)

The line l_2 has equation $y = 2x + k$, where k is a constant.

(b) Show that the y coordinate of any points where l_2 meets C are solutions of the equation

$$12y^2 - 4ky + k^2 - 64 = 0$$

(3)

Given that l_2 meets C at two distinct points,

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

(4)

S 6 3 0 1 0 A 0 1 8 2 4

10. (i) Find $\int \frac{2x-1}{4\sqrt{x}}\, dx$ writing your answer in simplest form. (5)

(ii) A curve C has equation $y = f(x)$.

Given

- $f'(x) = ax^2 + b$, where a and b are constants
- The gradient of C at the point (3, 5) is 4
- The y intercept of C is -5

Find $f(x)$

(5)