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INTERNATIONAL A LEVEL MATHEMATICS • PURE 1 (WMA11)

Pure 1 Practice Paper 1

Edexcel IAL Pure Mathematics 1

AIMING FOR B

Written in the style of the Pearson Edexcel International Advanced Level paper (WMA11/01) • Calculator allowed

A full 75-mark paper of multi-step exam questions covering every Pure 1 chapter, with a separate mark scheme

Time	Total	You must have
1 hour 30 minutes	**75 marks**	**Mathematical Formulae and Statistical Tables, calculator**

Instructions

- Use black ink or ball-point pen. Pencil may be used for diagrams and sketches.
- Answer **all** questions, in the spaces provided.
- Show enough working to make your method clear. Answers without working may not gain full credit.
- Give inexact answers to **three significant figures** unless the question says otherwise.

Information

- There are 10 questions in this paper. The total mark is 75.
- The marks for each question are shown in brackets.

Advice

- Sit the paper in one go, in 1 hour 30 minutes, with the mark scheme closed.
- Read each question carefully and try every question. Check your answers if you have time.
- Then mark it line by line with the mark scheme and fill in your score.

Track your score

Q	Topic	Marks	Score
1	Indices and surds	7	
2	Completing the square, roots	7	
3	Line and curve, regions	7	
4	Perpendicular bisector, area	7	
5	Sine and cosine rules	8	
6	Tangents and normals	8	
7	Integration, normals	8	
8	Radians: arcs and segments	7	
9	Graph transformations	7	
10	Cubics and the discriminant	9	
	Total	**75**	

Rough grade guide (out of 75): A **54** • B **47** • C **40**

Based on recent WMA11 grade boundaries. Real boundaries change every series, so treat this as a guide, not a grade.

Mark scheme | Exam questions by topic | More practice papers

Name ..... Date .....

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1. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Given that

$$4^x \times 2^y = 16\sqrt{2} \qquad \text{and} \qquad \frac{9^x}{27^y} = \sqrt{3}$$

find the value of x and the value of y.

(4)

(b) Write

$$\frac{\left(3-\sqrt{5}\right)^2}{\sqrt{5}-1}$$

in the form $a+b\sqrt{5}$, where a and b are integers.

(3)

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Question 1 continued

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(Total for Question 1 is 7 marks)

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2. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

$$f(x) = 7 + 12x - 3x^2 \qquad x \in \mathbb{R}$$

(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 C has equation $y = f(x)$.

(b) Sketch C, showing clearly the coordinates of the maximum point and the coordinates of the point where C crosses the y-axis.

(2)

(c) Using your answers to parts (a) and (b), find the set of values of the constant k for which the equation $f(x) = k$ has two distinct **positive** roots.

(2)

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Question 2 continued

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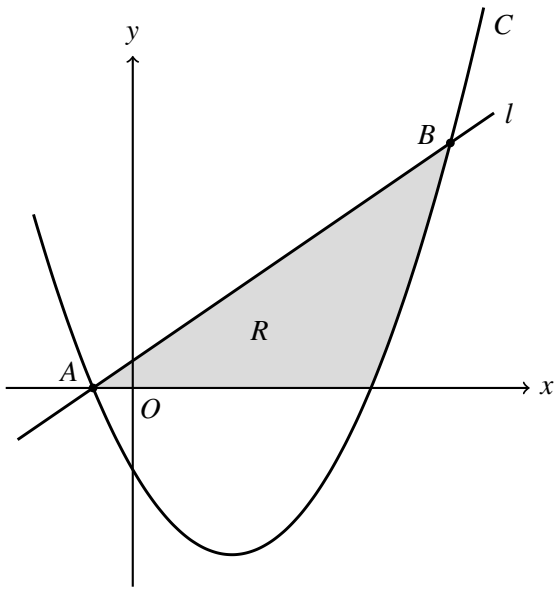

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = 2x^2 - 5x - 3$ and the straight line l with equation $y = 2x + 1$

The line l meets C at the points A and B, as shown.

In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Show that the x coordinates of A and B satisfy $2x^2 - 7x - 4 = 0$

(2)

(b) Hence find the coordinates of A and the coordinates of B.

(2)

The region R, shown shaded in Figure 1, is bounded by C, l and the x-axis.

(c) Use inequalities to define the region R.

(3)

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Question 3 continued

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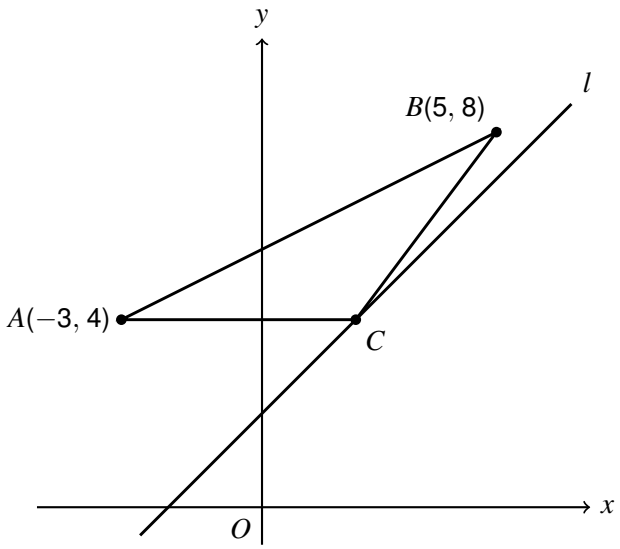

Diagram not drawn to scale

Figure 2

The points A and B have coordinates $(-3, 4)$ and $(5, 8)$ respectively.

In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Show that the perpendicular bisector of AB has equation $2x + y - 8 = 0$

(3)

The line l has equation $y = x + 2$

The perpendicular bisector of AB meets l at the point C, as shown in Figure 2.

(b) Find the exact area of triangle ABC.

(4)

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Question 4 continued

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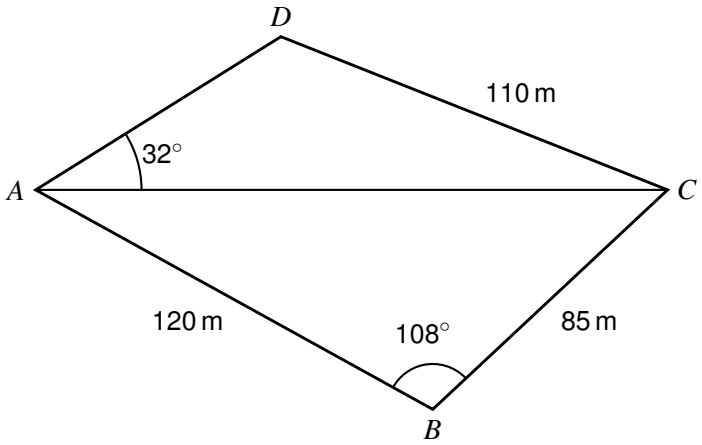

Diagram not drawn to scale

Figure 3

Figure 3 shows the plan of a field $ABCD$.

$AB = 120$ m, $BC = 85$ m, $CD = 110$ m, angle $ABC = 108°$ and angle $CAD = 32°$

Angle ADC is obtuse.

(a) Find the length of AC, in metres to one decimal place.

(2)

(b) Find the size of angle ADC, in degrees to one decimal place.

(3)

(c) Find the area of the field, in m^2 to 3 significant figures.

(3)

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Question 5 continued

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(Total for Question 5 is 8 marks)

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6. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

The curve C has equation

$$y = x\sqrt{x} - \frac{16}{x} - 4\sqrt{x} + 10 \qquad x > 0$$

The point $P(4, 6)$ lies on C.

(a) Find $\frac{dy}{dx}$, giving each term in its simplest form.

(3)

(b) Show that the tangent to C at P has equation $y = 3x - 6$

(2)

The tangent to C at P meets the x-axis at the point R.

The normal to C at P meets the x-axis at the point Q.

(c) Find the area of triangle PQR.

(3)

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Question 6 continued

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(Total for Question 6 is 8 marks)

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7. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

The curve C has equation $y = f(x)$, $x > 0$, where

$$f'(x) = \frac{5x^2 - 9x - 4}{2\sqrt{x}}$$

The point $(1, -3)$ lies on C.

(a) Find $f(x)$, giving each term in its simplest form.

(5)

(b) Find an equation of the normal to C at the point where $x = 4$

Give your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(3)

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Question 7 continued

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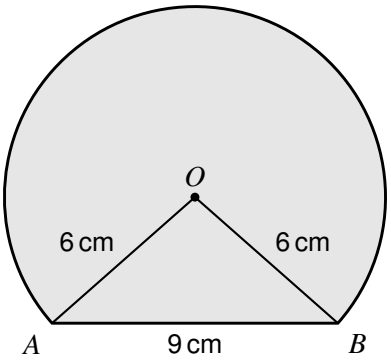

Figure 4

Figure 4 shows the design for a badge.

The badge is the shaded shape bounded by the major arc AB of a circle with centre O and radius 6 cm, and by the chord AB.

$AB = 9$ cm.

(a) Show that the size of angle AOB is 1.696 radians, correct to 3 decimal places.

(2)

(b) Find the perimeter of the badge, in cm to 3 significant figures.

(2)

(c) Find the area of the badge, in cm^2 to 3 significant figures.

(3)

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Question 8 continued

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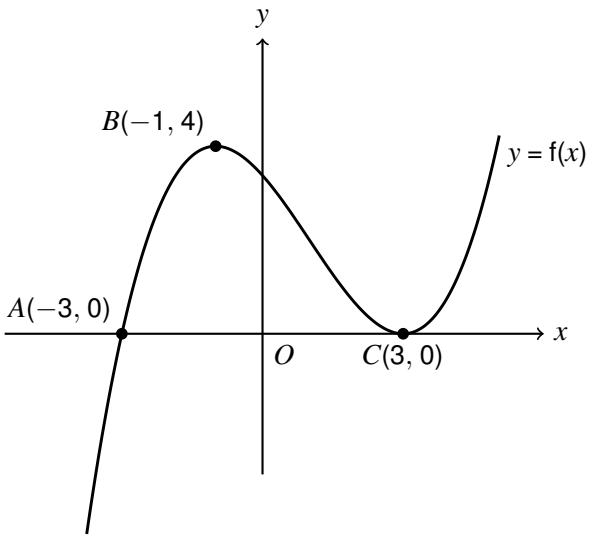

Figure 5

Figure 5 shows a sketch of the curve with equation $y = f(x)$.

The curve crosses the x-axis at the point $A(-3, 0)$, has a maximum point at $B(-1, 4)$ and touches the x-axis at the point $C(3, 0)$.

On separate diagrams, sketch the curve with equation

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

(3)

(b) $y = f\left(\frac{1}{2}x\right)$

(2)

On each sketch, show clearly the coordinates of the maximum point and of any points where the curve meets the x-axis.

(c) The curve with equation $y = f(x) + k$, where k is a constant, meets the x-axis at exactly one point.

Find the set of possible values of k.

(2)

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Question 9 continued

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10. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

$$f(x) = 2x^3 + x^2 - 15x$$

(a) Factorise $f(x)$ completely.

(2)

(b) Sketch the curve with equation $y = f(x)$, showing the coordinates of the points where the curve meets the coordinate axes.

(2)

The line with equation $y = kx$, where k is a constant, meets the curve $y = f(x)$ at the origin.

(c) Show that the x coordinates of any other points where the line meets the curve satisfy

$$2x^2 + x - (15 + k) = 0$$

(2)

(d) Find the set of values of k for which the line meets the curve at three distinct points.

(3)

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Question 10 continued

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Question 10 continued

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TOTAL FOR PAPER IS 75 MARKS

END

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