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INTERNATIONAL A LEVEL MATHEMATICS • PURE 2 (WMA12)

Pure 2 Practice Paper 1

Edexcel IAL Pure Mathematics 2

AIMING FOR B

Written in the style of the Pearson Edexcel International Advanced Level paper (WMA12/01) • Calculator allowed

A full 75-mark paper of multi-step exam questions covering every Pure 2 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	Binomial expansion	7	
2	Factor and remainder theorems	8	
3	Circles and tangents	7	
4	Exponential graphs, logarithms	7	
5	Recurrence and sigma notation	7	
6	Arithmetic and geometric series	8	
7	Trigonometric equations	7	
8	Optimisation	8	
9	Area between two curves	7	
10	Stationary points, trapezium rule	9	
	Total	**75**	

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

Based on recent WMA12 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. The first three terms, in ascending powers of x, of the binomial expansion of

$$(a+bx)^6$$

where a and b are constants and $a > 0$, are

$$64 - 576x + px^2$$

where p is a constant.

(a) Find the value of a, the value of b and the value of p.

(5)

(b) Hence find the coefficient of x^2 in the expansion of

$$\left(3 - 2x + x^2\right)(a+bx)^6$$

(2)

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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.

$$f(x) = 3x^3 + ax^2 + bx + 4$$

where a and b are constants.

When $f(x)$ is divided by $(x - 1)$ the remainder is -2

Given that $(3x - 2)$ is a factor of $f(x)$,

(a) show that $2a + 3b = -22$

(2)

(b) Find the value of a and the value of b, and hence factorise $f(x)$ completely.

(4)

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

(2)

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Question 2 continued

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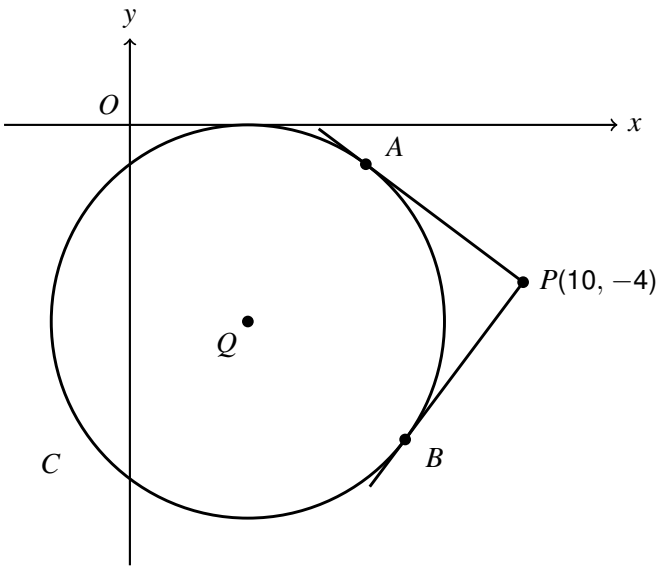

Figure 1

The circle C has equation

$$x^2 + y^2 - 6x + 10y + 9 = 0$$

(a) Find the coordinates of the centre Q of C and the radius of C.

(3)

The point P has coordinates $(10, -4)$.

The two tangents to C from P touch C at the points A and B, as shown in Figure 1.

(b) Show that $PA = 5$

(2)

(c) Explain why $PAQB$ is a square, and write down its area.

(2)

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Question 3 continued

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(Total for Question 3 is 7 marks)

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

Solutions relying on calculator technology are not acceptable.

(a) On the same axes, sketch the curves with equations

$$y = 3^{x+1} \qquad \text{and} \qquad y = 5^{x-1}$$

showing the coordinates of the point where each curve meets the y-axis.

(3)

The curves meet at the point P.

(b) Find the exact x coordinate of P, giving your answer in the form $\log_m n$, where m and n are rational numbers.

(3)

(c) Hence solve the inequality $3^{x+1} > 5^{x-1}$

(1)

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Question 4 continued

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(Total for Question 4 is 7 marks)

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

Solutions relying on calculator technology are not acceptable.

A sequence $u_1, u_2, u_3, \ldots$ is defined by

$$u_1 = 2 \qquad u_{n+1} = \frac{u_n - 1}{u_n + 1} \qquad n \geqslant 1$$

(a) Find the value of u_2, u_3, u_4 and u_5

(2)

(b) Show that, for all $n \geqslant 1$,

$$u_{n+2} = -\frac{1}{u_n}$$

(2)

(c) Find the least value of n for which

$$\sum_{r=1}^{n} u_r < -20$$

(3)

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Question 5 continued

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(Total for Question 5 is 7 marks)

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6. Ali and Bina are training for a long-distance run.

Ali runs 5 km on day 1. On each day after that, he runs 0.4 km more than on the day before.

Bina runs 3 km on day 1. On each day after that, she runs 6% further than on the day before.

(a) Show that Ali runs a total of 176 km over the first 20 days.

(2)

(b) Find the day on which Bina's daily distance first exceeds 15 km.

(3)

(c) Find the day on which Ali's total distance first reaches 500 km.

(3)

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Question 6 continued

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

Solutions relying on calculator technology are not acceptable.

(a) Show that the equation

$$3\sin\theta\tan\theta = 2 + 5\cos\theta$$

can be written in the form

$$8\cos^2\theta + 2\cos\theta - 3 = 0$$

(2)

(b) Hence solve, for $0 \leqslant x < 180^\circ$,

$$3\sin 2x\tan 2x = 2 + 5\cos 2x$$

giving your answers to one decimal place where appropriate.

(5)

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Question 7 continued

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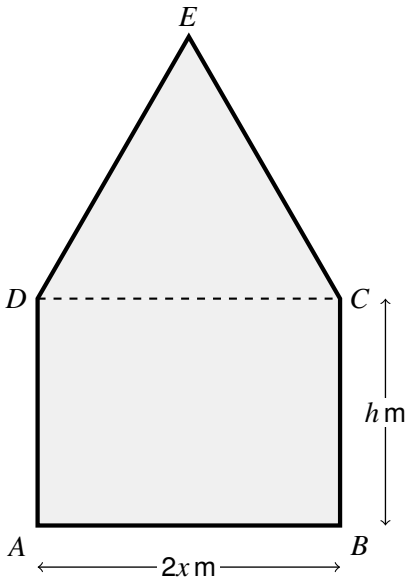

Figure 2

Figure 2 shows the design for a window $ABCDE$.

The window is a rectangle $ABCD$ with an equilateral triangle DCE on top.

$AB = 2x$ m and $BC = h$ m.

The total area of the window is 12 m^2.

A frame is fitted around the outside edge $ABCED$ of the window. The length of the frame is P metres.

(a) Show that

$$P = \frac{12}{x} + \left(6 - \sqrt{3}\right)x$$

(3)

(b) Use calculus to find the minimum value of P, giving your answer to 3 significant figures.

(3)

(c) Justify that the value you found in part (b) is a minimum.

(2)

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Question 8 continued

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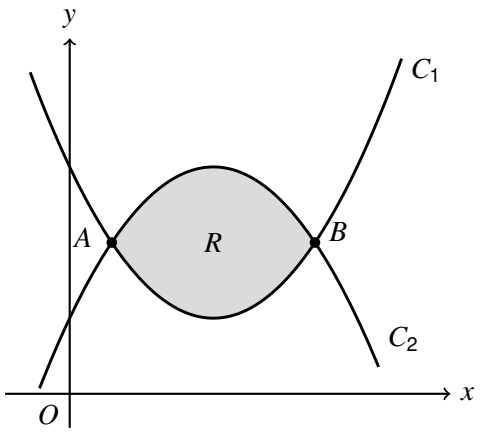

Figure 3

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

Solutions relying on calculator technology are not acceptable.

Figure 3 shows the curves C_1 and C_2 with equations

$$C_1 : \ y = x^2 - 4x + 6 \qquad C_2 : \ y = 2 + 4x - x^2$$

The curves meet at the points A and B.

(a) Show that the x coordinates of A and B are $2 - \sqrt{2}$ and $2 + \sqrt{2}$

(3)

The region R, shown shaded in Figure 3, is bounded by C_1 and C_2.

(b) Use algebraic integration to find the exact area of R.

(4)

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Question 9 continued

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(Total for Question 9 is 7 marks)

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

Solutions relying on calculator technology are not acceptable.

The curve C has equation

$$y = 2x + \frac{8}{x^2} \qquad x > 0$$

(a) Using calculus, find the coordinates of the stationary point of C and determine its nature.

(4)

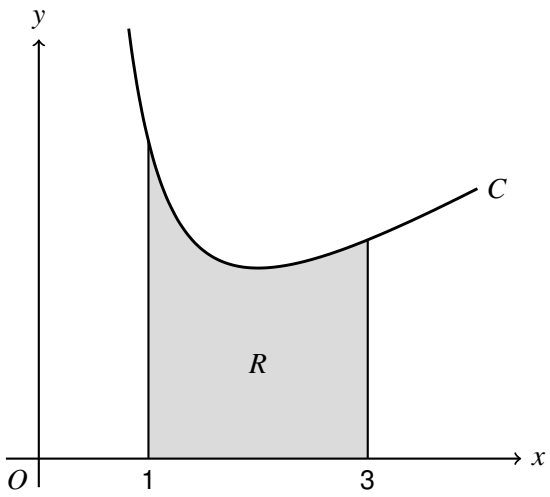

Figure 4

Figure 4 shows part of the curve C.

The region R, shown shaded in Figure 4, is bounded by C, the x-axis and the lines $x = 1$ and $x = 3$

(b) Use the trapezium rule with four strips of equal width to find an estimate for the area of R, giving your answer to 3 significant figures.

(3)

(c) Use algebraic integration to find the exact area of R.

(2)

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Question 10 continued

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Question 10 continued

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(Total for Question 10 is 9 marks)

TOTAL FOR PAPER IS 75 MARKS

END

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