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INTERNATIONAL A LEVEL MATHEMATICS • PURE 1

Pure Mathematics 1

Exam Questions by Topic

Pearson Edexcel International Advanced Level (WMA11/01) • Calculator allowed

Multi-step exam questions at the difficulty of the real WMA11 paper, with a full mark scheme

Chapters (tap a chapter to jump to it)	Qs	Marks	Page	My score
1 Algebraic Expressions Indices, surds, expanding and factorising	10	57	own PDF	
2 Quadratics Completing the square, the discriminant, quadratic graphs	10	65	own PDF	
3 Equations and Inequalities Simultaneous equations, inequalities, regions	10	69	2	
4 Graphs and Transformations Cubic and reciprocal graphs, intersections, transformations	10	68	own PDF	
5 Straight-line Graphs Gradients, equations of lines, parallel and perpendicular	10	68	own PDF	
6 Trigonometric Ratios Sine and cosine rules, area of a triangle, trig graphs	10	66	own PDF	
7 Radians Radian measure, arc length, sector and segment areas	10	71	own PDF	
8 Differentiation Gradients, second derivatives, tangents and normals	10	71	own PDF	
9 Integration Integrating x^n , finding $y = f(x)$ from $f'(x)$	10	67	own PDF	

[Full mark scheme](#)

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3

CHAPTER 3 • KEY SKILLS

Equations and Inequalities

Specification P1: 1.6, 1.7, 1.8, 1.9 • 10 questions • 69 marks • about 85 minutes

1 Simultaneous equations

Make one letter the subject of the linear equation and substitute into the other. Pair each x with its y .

e.g. $y = x + 1$, $x^2 + y^2 = 13$ gives (2, 3) and (−3, −2)

2 Linear inequalities

Solve like an equation, but reverse the sign when you multiply or divide by a negative number.

e.g. $3 - 2x > 9$ gives $x < -3$

3 Quadratic inequalities

Find the critical values, sketch the curve, then choose the region.

Inside: $a < x < b$. Outside: $x < a$ or $x > b$.

4 Combining inequalities

Draw a number line to find the values that satisfy *both*. Never write

$-1 > x > 2$.

5 x in the denominator

Multiply by x^2 , which is positive, not by x .

e.g. $\frac{4}{x} < 1$ gives $4x < x^2$, so $x < 0$ or $x > 4$

6 Inequalities as graphs

$f(x) > g(x)$ means the graph of $y = f(x)$ is *above* the graph of $y = g(x)$.

7 Shading regions

Solid line for $\leq$ or $\geq$ (boundary included); dashed line for $<$ or $>$.

e.g. $y > x^2$: dashed curve, shade above

8 Defining a region

One inequality for each boundary, including any vertical boundary such as $x > 0$.

9 Forming equations from a context

Write each fact as an equation or inequality, then check your answers make sense in the context.

Skills map every skill above is tested at least once; interleaved skills come from GCSE or other chapters

Skill	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Marks	6	7	4	6	5	7	9	8	7	10
1 Simultaneous equations	•			•		•	•	•	•	
2 Linear inequalities		•								
3 Quadratic inequalities		•			•		•			•
4 Combining inequalities		•					•			
5 x in the denominator			•							
6 Inequalities as graphs					•	•				
7 Shading regions				•						
8 Defining a region						•			•	
9 Forming equations from a context							•		•	•
Interleaved: quadratic graphs, discriminant, completing the square (Chapter 2)				•				•		•
Interleaved: exact surd answers (Chapter 1)								•		
Interleaved: straight lines and distances (Chapter 5, GCSE)									•	•

Exam difficulty. Questions 1 to 5 check each skill on its own. Questions 6 to 10 are multi-step questions built like the last questions on a real WMA11 paper, where one part leads into the next and skills from different topics are combined.

Must learn. Examiners take marks for $-1 > x > 2$ (write $x < -1$ or $x > 2$), for “and” where you mean “or”, and for leaving out a boundary such as $x > 0$ when you define a region.



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

Solutions relying on calculator technology are not acceptable.

Solve the simultaneous equations

$$y - 3x + 2 = 0$$

$$x^2 + y^2 = 20$$

(6)

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Question 1 continued

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(Total for Question 1 is 6 marks)**Join students already acing their exams.**Book your FREE lesson at www.eclassroom.org.uk

2. Find the set of values of x for which

(a) $5x - 3 > 2(x + 6)$

(2)

(b) $2x^2 - 9x - 18 < 0$

(4)

(c) both $5x - 3 > 2(x + 6)$ and $2x^2 - 9x - 18 < 0$

(1)

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Question 2 continued

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(Total for Question 2 is 7 marks)**Join students already acing their exams.**Book your FREE lesson at www.eclassroom.org.uk

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

Solutions relying on calculator technology are not acceptable.

Find the set of values of x for which

$$5 - \frac{12}{x} > 2 \quad x \neq 0$$

(4)

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(Total for Question 3 is 4 marks)



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4. (a) On the same axes, sketch the curve with equation $y = 4 - x^2$ and the line with equation $y = x + 2$
Show clearly the coordinates of the points where each graph meets the coordinate axes.

(2)

- (b) Using algebra, find the coordinates of the points where the curve and the line meet.

(2)

- (c) On your diagram, shade the region that satisfies the inequalities

$$y < 4 - x^2 \quad \text{and} \quad y \geq x + 2$$

Use a solid line for any boundary that is included in the region and a dashed line for any boundary that is not.

(2)

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Question 4 continued

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(Total for Question 4 is 6 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.

The curve C has equation $y = 2x^2 - x - 4$

The line l has equation $y = x + 8$

(a) Find the set of values of x for which C lies above l .

(4)

(b) Hence write down the set of values of x for which $2x^2 - x - 4 \leq x + 8$

(1)

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Question 5 continued

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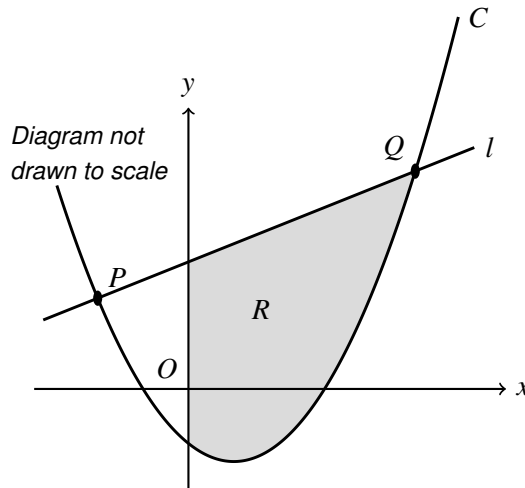
**Figure 1**

Figure 1 shows a sketch of the curve C with equation $y = x^2 - 2x - 3$ and the line l with equation $y = x + 7$

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

- (a) Using algebra, find the coordinates of P and the coordinates of Q .
(Solutions relying on calculator technology are not acceptable.)

(4)

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

- (b) Use inequalities to define R .

(3)

Question 6 continued

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(Total for Question 6 is 7 marks)



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7. A rectangular sheet of card has length x cm and width y cm, where $x > y$

The perimeter of the sheet is 46 cm and the length of a diagonal of the sheet is 17 cm.

- (a) Write down two equations linking x and y .

(2)

- (b) Hence find the value of x and the value of y .

(4)

A second rectangular sheet of card also has a perimeter of 46 cm. Its area is at least 120 cm^2 and its length, x cm, is greater than its width.

- (c) Find the set of possible values of x .

(3)

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Question 7 continued

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Question 7 continued

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Solutions relying on calculator technology are not acceptable.

The curve C has equation $y = \frac{1}{x}$, $x \neq 0$

- (a)** Show that the x coordinates of any points where l meets C satisfy the equation

$$kx^2 + 3x - 1 = 0$$

(2)

- (b)** Find the set of values of k for which l meets C at two distinct points.

(2)

(c) find the exact coordinates of the points where l meets C , giving each coordinate in simplest surd form.

(4)

Question 8 continued

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(Total for Question 8 is 8 marks)



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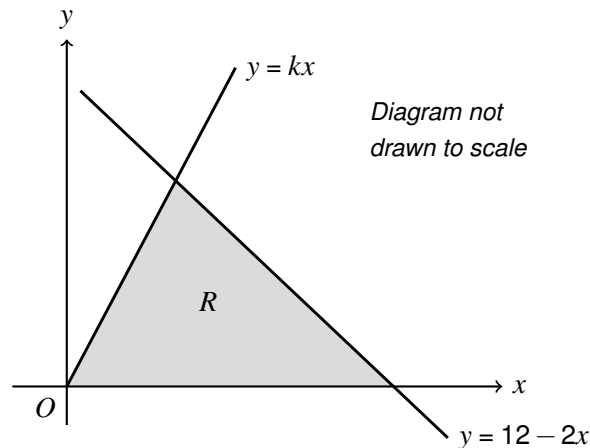
**Figure 2**

Figure 2 shows the line with equation $y = kx$, where k is a positive constant, and the line with equation $y = 12 - 2x$

The region R , shown shaded in Figure 2, is bounded by the two lines and the x -axis.

- (a) Show that the x coordinate of the point where the two lines meet is $\frac{12}{k+2}$ (2)

Given that the area of R is 24 square units,

- (b) find the value of k . (3)
- (c) Hence use inequalities to define R . (2)



Question 9 continued

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(Total for Question 9 is 7 marks)



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Solutions relying on calculator technology are not acceptable.

The point $P(p, 2p - 1)$ lies on l .

- Given that $AP = \sqrt{50}$,

- (c)** Find the set of values of p for which $AP > 5$ **(3)**

- (d) Find the exact shortest distance from A to l , and the coordinates of the point on l where it occurs. (2)



Question 10 continued

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Question 10 continued

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