



eClassroom

INTERNATIONAL A LEVEL MATHEMATICS • PURE 1

Pure Mathematics 1

Exam Questions by Topic: Mark Scheme

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

Every question in the booklet, marked line by line the way an examiner marks it

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	3	
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	

Question booklet

Free courses

More worksheets



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

Page 1 of 8

How to use this mark scheme

The same marking rules Pearson examiners use for WMA11.

Mark every line, not just the answer. Method marks are given for a correct method even when the final answer is wrong. If you lost marks, find the *first* line where your working differs from the scheme. That is the thing to fix.

Code	Meaning
M1	Method mark: for knowing a correct method and attempting to apply it. Small slips in the working do not lose this mark.
dM1	Dependent method mark: can only be given if the method mark before it has been given.
A1	Accuracy mark: for a correct answer or line of working. It can only be given if the method mark it depends on has been given.
B1	Independent mark: for a correct result or statement, whatever method was used.
*	The answer is given in the question. Every step must be shown, and the answer must follow from correct working (cso).
cao	Correct answer only.
cso	Correct solution only: no errors anywhere in the working.
ft	Follow through: the mark can be given for correct work using your own earlier (wrong) answer.
oe	Or equivalent: any correct equivalent form is accepted.

“Solutions relying on calculator technology are not acceptable.” When a question says this, a correct final answer with no algebraic working scores **no marks**. The notes under each scheme line say when this applies.



3

Chapter 3: Equations and Inequalities

Mark scheme. Marks are shown on the right of each line.

Question 1

6 marks

Part	Scheme	Marks
	Substitutes $y = 3x - 2$: $x^2 + (3x - 2)^2 = 20$	M1
	$10x^2 - 12x - 16 = 0$ (or $5x^2 - 6x - 8 = 0$)	A1
	Solves their quadratic: $(5x + 4)(x - 2) = 0$	M1
	$x = 2, x = -\frac{4}{5}$	A1
	Substitutes to find y	M1
	$x = 2, y = 4$ and $x = -\frac{4}{5}, y = -\frac{22}{5}$	A1
	<i>Substituting for x instead leads to $10y^2 + 8y - 176 = 0$ and scores in the same way. Answers with no algebra score 0. The final A1 needs the values correctly paired.</i>	
		(6)
Total for Question 1: 6 marks		

Question 2

7 marks

Part	Scheme	Marks
(a)	$5x - 3 > 2x + 12$, so $3x > 15$	M1
	$x > 5$	A1
		(2)
(b)	$(2x + 3)(x - 6) = 0$	M1
	Critical values $-\frac{3}{2}$ and 6	A1
	Chooses the inside region	M1
	$-\frac{3}{2} < x < 6$	A1
		(4)
(c)	$5 < x < 6$	B1ft
		(1)
Total for Question 2: 7 marks		



Question 3

4 marks

Part	Scheme	Marks
	Multiplies by x^2 : $5x^2 - 12x > 2x^2$	M1
	$3x^2 - 12x > 0$ (or $3x(x - 4) > 0$)	A1
	Critical values 0 and 4, and chooses the outside region	M1
	$x < 0$ or $x > 4$	A1
	<i>Multiplying by x gives $x > 4$ only and scores M0 A0 M0 A0, unless the cases $x > 0$ and $x < 0$ are considered separately and correctly.</i>	
		(4)
Total for Question 3: 4 marks		

Question 4

6 marks

Part	Scheme	Marks
(a)	$\cap$ -shaped parabola through $(-2, 0)$, $(2, 0)$ and $(0, 4)$	B1
	Straight line through $(-2, 0)$ and $(0, 2)$	B1
		(2)
(b)	$4 - x^2 = x + 2 \Rightarrow x^2 + x - 2 = 0 \Rightarrow (x + 2)(x - 1) = 0$	M1
	$(-2, 0)$ and $(1, 3)$	A1
		(2)
(c)	The region above the line and below the curve, between $x = -2$ and $x = 1$, shaded	B1
	The curve drawn dashed and the line drawn solid	B1
		(2)
Total for Question 4: 6 marks		

Question 5

5 marks

Part	Scheme	Marks
(a)	$2x^2 - x - 4 > x + 8 \Rightarrow 2x^2 - 2x - 12 > 0$	M1
	$(x - 3)(x + 2)$: critical values 3 and -2	A1
	Chooses the outside region	M1
	$x < -2$ or $x > 3$	A1
	<i>Final A1: accept $\{x : x < -2\} \cup \{x : x > 3\}$. $-2 > x > 3$ or "$x < -2$ and $x > 3$" is A0.</i>	
		(4)
(b)	$-2 \leq x \leq 3$	B1ft
		(1)
Total for Question 5: 5 marks		



Question 6

7 marks

Part	Scheme	Marks
(a)	$x^2 - 2x - 3 = x + 7$ $x^2 - 3x - 10 = 0$ $(x - 5)(x + 2) = 0$, and finds y for at least one value of x $P(-2, 5)$ and $Q(5, 12)$ <i>The factorisation or formula must be seen: the question does not allow a calculator solution.</i>	M1 A1 M1 A1 (4)
(b)	$y < x + 7$ $y > x^2 - 2x - 3$ $x > 0$ <i>Accept all strict or all non-strict inequalities, but not a mixture. Extra inequalities that cut off part of R score B0 for the last mark.</i>	B1 B1 B1 (3)
Total for Question 6: 7 marks		

Question 7

9 marks

Part	Scheme	Marks
(a)	$2x + 2y = 46$ (or $x + y = 23$) $x^2 + y^2 = 17^2 = 289$	B1 B1 (2)
(b)	Substitutes $y = 23 - x$: $x^2 + (23 - x)^2 = 289$ $2x^2 - 46x + 240 = 0 \Rightarrow x^2 - 23x + 120 = 0$ Solves: $(x - 8)(x - 15) = 0$ $x = 15, y = 8$ <i>Final A1: $x = 8, y = 15$ must be rejected because $x > y$.</i>	M1 A1 M1 A1 (4)
(c)	$x(23 - x) \geq 120 \Rightarrow x^2 - 23x + 120 \leq 0$ Critical values 8 and 15 and the inside region, $8 \leq x \leq 15$ Uses $x > y$, so $x > 11.5$: $11.5 < x \leq 15$ <i>The width is $23 - x$, so length greater than width means $x > 23 - x$. $8 \leq x \leq 15$ scores M1 M1 A0.</i>	M1 M1 A1 (3)
Total for Question 7: 9 marks		



Question 8

8 marks

Part	Scheme	Marks
(a)	$kx + 3 = \frac{1}{x}$ and multiplies by x : $kx^2 + 3x = 1$ $kx^2 + 3x - 1 = 0$ *	M1 A1* (2)
(b)	$b^2 - 4ac > 0$: $9 - 4 \times k \times (-1) > 0$, so $9 + 4k > 0$ $k > -\frac{9}{4}, k \neq 0$ <i>The sign of $c = -1$ is the common error. $k \neq 0$ is needed because k is non-zero (when $k = 0$ the line $y = 3$ meets C only once).</i>	M1 A1 (2)
(c)	$2x^2 + 3x - 1 = 0$: $x = \frac{-3 \pm \sqrt{9+8}}{4}$ $x = \frac{-3 \pm \sqrt{17}}{4}$ Finds y using $y = 2x + 3$ (or $y = \frac{1}{x}$ and rationalising) $\left(\frac{-3 + \sqrt{17}}{4}, \frac{3 + \sqrt{17}}{2} \right)$ $\left(\frac{-3 - \sqrt{17}}{4}, \frac{3 - \sqrt{17}}{2} \right)$	M1 A1 M1 A1 (4)
Total for Question 8: 8 marks		



Question 9

7 marks

Part	Scheme	Marks
(a)	$kx = 12 - 2x \Rightarrow x(k+2) = 12$ $x = \frac{12}{k+2}$ *	M1 A1* (2)
(b)	y coordinate $\frac{12k}{k+2}$; base from O to $(6, 0)$; area = $\frac{1}{2} \times 6 \times \frac{12k}{k+2}$ $\frac{36k}{k+2} = 24 \Rightarrow 36k = 24k + 48$ $k = 4$	M1 M1 A1 (3)
(c)	Two of $y \geq 0$, $y \leq 4x$, $y \leq 12 - 2x$ $y \geq 0$, $y \leq 4x$, $y \leq 12 - 2x$ Accept strict inequalities throughout. Follow through their k for the first B1.	B1ft B1 (2)
Total for Question 9: 7 marks		



Question 10

10 marks

Part	Scheme	Marks
(a)	$AP^2 = (p-3)^2 + (2p-1-0)^2$ $= p^2 - 6p + 9 + 4p^2 - 4p + 1 = 5p^2 - 10p + 10$ *	M1 A1* (2)
(b)	$5p^2 - 10p + 10 = 50 \Rightarrow p^2 - 2p - 8 = 0$ $(p-4)(p+2) = 0$, so $p = 4$ or $p = -2$ (4, 7) and (-2, -5)	M1 A1 A1 (3)
(c)	$5p^2 - 10p + 10 > 25 \Rightarrow p^2 - 2p - 3 > 0$ Critical values 3 and -1 and chooses the outside region $p < -1$ or $p > 3$ Using $AP > \sqrt{5}$ or $AP^2 > 5$ scores M0. The inequality must be in AP^2 with $5^2 = 25$.	M1 M1 A1 (3)
(d)	$AP^2 = 5(p-1)^2 + 5$, so the least value of AP^2 is 5 when $p = 1$ $\sqrt{5}$ at (1, 1) Alternative: the perpendicular from A to l (gradient $-\frac{1}{2}$) meets l at (1, 1), then Pythagoras gives $\sqrt{5}$.	M1 A1 (2)
Total for Question 10: 10 marks		

