



eClassroom

INTERNATIONAL A LEVEL MATHEMATICS • PURE 2

Pure Mathematics 2

Exam Questions by Topic: Mark Scheme

Pearson Edexcel International Advanced Level (WMA12/01) • 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 Methods Algebraic fractions, the factor and remainder theorems, proof	10	66	own PDF	
2 Coordinate Geometry in the (x, y) Plane Equations of circles, tangents, chords and intersections	10	68	own PDF	
3 Exponentials and Logarithms Laws of logarithms, exponential equations, modelling	10	68	own PDF	
4 The Binomial Expansion Expanding $(a + bx)^n$, coefficients and approximations	10	65	own PDF	
5 Sequences and Series Arithmetic and geometric series, sigma notation, recurrence	10	69	3	
6 Trigonometric Identities and Equations $\tan \theta = \frac{\sin \theta}{\cos \theta}$, $\sin^2 \theta + \cos^2 \theta = 1$, solving equations	10	66	own PDF	
7 Differentiation Increasing and decreasing functions, stationary points, optimisation	10	67	own PDF	
8 Integration Definite integrals, areas under curves, the trapezium rule	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

How to use this mark scheme

The same marking rules Pearson examiners use for WMA12.

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.



5

Chapter 5: Sequences and Series

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

Question 1

5 marks

Part	Scheme	Marks
(a)	$u_2 = 12 - k$ $u_3 = 3(12 - k) - k = 36 - 4k$	B1 B1 (2)
(b)	$36 - 4k = 20$ $k = 4$	M1 A1 (2)
(c)	$4 + 8 + 20 + 56 = 88$	B1 (1)
Total for Question 1: 5 marks		

Question 2

5 marks

Part	Scheme	Marks
(a)	$a + 3d = 23$ and $a + 9d = 53$ Solves: $6d = 30$ $a = 8, d = 5$	M1 M1 A1 (3)
(b)	$S_{20} = \frac{20}{2}(2 \times 8 + 19 \times 5)$ 1110	M1 A1 (2)
Total for Question 2: 5 marks		



Question 3

5 marks

Part	Scheme	Marks
(a)	$81 \times \left(\frac{2}{3}\right)^4 = 16$	B1 (1)
(b)	$\frac{81 \left(1 - \left(\frac{2}{3}\right)^{10}\right)}{1 - \frac{2}{3}}$ 239	M1 A1 (2)
(c)	$\frac{81}{1 - \frac{2}{3}} = 243$	B1 (1)
(d)	4.21 <i>Using the rounded value 239 gives 4 and scores B0: $243 - 238.786 \dots = 4.21$</i>	B1 (1)
Total for Question 3: 5 marks		

Question 4

5 marks

Part	Scheme	Marks
(a)	$S_n = a + (a+d) + \dots + (a + (n-1)d)$ and $S_n = (a + (n-1)d) + \dots + (a+d) + a$ Adds: $2S_n = n(2a + (n-1)d)$ $S_n = \frac{n}{2}(2a + (n-1)d)$ * <i>Both lines must be written with at least the first two and last terms. Each pair adds to $2a + (n-1)d$ and there are n pairs.</i>	M1 M1 A1* (3)
(b)	$a = 5, d = 3, n = 40: \frac{40}{2}(10 + 39 \times 3)$ 2540	M1 A1 (2)
Total for Question 4: 5 marks		



Question 5

5 marks

Part	Scheme	Marks
(a)	$u_2 = -1, u_3 = \frac{1}{2}$	M1
	$u_2 = -1, u_3 = \frac{1}{2}, u_4 = 2$	A1
		(2)
(b)	It is periodic, with period 3 (the terms repeat $2, -1, \frac{1}{2}, \dots$)	B1
		(1)
(c)	Each group of 3 sums to $\frac{3}{2}$; 33 groups plus $u_{100} = u_1 = 2$	M1
	$33 \times \frac{3}{2} + 2 = 51.5$	A1
		(2)
Total for Question 5: 5 marks		

Question 6

9 marks

Part	Scheme	Marks
(a)	Uses a common ratio: $\frac{2k}{k+3} = \frac{3k-2}{2k}$, so $4k^2 = (k+3)(3k-2)$	M1
	$4k^2 = 3k^2 + 7k - 6 \Rightarrow k^2 - 7k + 6 = 0$ *	A1*
		(2)
(b)	$k = 1$ or $k = 6$	B1
		(1)
(c)	$k = 1$: terms 4, 2, 1, so $r = \frac{1}{2}$ and $ r < 1$	M1
	$S_\infty = \frac{4}{1 - \frac{1}{2}}$	M1
	8	A1
		(3)
(d)	$k = 6$: $a = 9, r = \frac{4}{3}$: $\frac{9((\frac{4}{3})^n - 1)}{\frac{4}{3} - 1} > 1000$	M1
	$(\frac{4}{3})^n > \frac{1027}{27}$, so $n > \frac{\log \frac{1027}{27}}{\log \frac{4}{3}} = 12.6 \dots$	M1
	$n = 13$	A1
		(3)
Total for Question 6: 9 marks		



Question 7

8 marks

Part	Scheme	Marks
(a)	$a + 5d = 340$	B1
	$\frac{10}{2}(2a + 9d) = 3230$, so $2a + 9d = 646$	B1
	Solves simultaneously	M1
	$d = 34$ and $a = 170$ *	A1*
		(4)
(b)	$\frac{N}{2}(340 + 34(N - 1)) > 10000 \Rightarrow 17N^2 + 153N - 10000 > 0$	M1
	Solves the quadratic: $N = \frac{-153 + \sqrt{153^2 + 680000}}{34} = 20.1 \dots$	M1
	Rounds up and checks: $S_{20} = 9860 < 10000$, $S_{21} = 10710 > 10000$	M1
	the 21st month	A1
		(4)
		The negative root is rejected. $N = 20$ is the most common wrong answer.
Total for Question 7: 8 marks		

Question 8

8 marks

Part	Scheme	Marks
(a)	$u_2 = 2a + 2a - 1 = 4a - 1$	B1
	$u_3 = a(4a - 1) + 2a - 1$	M1
	$u_3 = 4a^2 + a - 1$	A1
		(3)
(b)	$2 + (4a - 1) + (4a^2 + a - 1) = 21$	M1
	$4a^2 + 5a - 21 = 0$ *	A1*
		(2)
(c)	$(4a - 7)(a + 3) = 0$, so $a = \frac{7}{4}$ or $a = -3$	M1
	Increasing: $a = -3$ gives 2, -13, 32, ... which is not increasing, so $a = \frac{7}{4}$	A1
	$u_4 = \frac{7}{4} \times 13 + \frac{5}{2} = 25.25$	A1
		(3)
Total for Question 8: 8 marks		



Question 9

9 marks

Part	Scheme	Marks
(a)	$S_n = a + ar + ar^2 + \dots + ar^{n-1}$ and $rS_n = ar + ar^2 + \dots + ar^n$ Subtracts: $S_n - rS_n = a - ar^n$ $S_n(1 - r) = a(1 - r^n)$, so $S_n = \frac{a(1 - r^n)}{1 - r}$ (as $r \neq 1$) *	M1 M1 A1* (3)
(b)	$\frac{a}{1 - r} = 4a$, so $1 - r = \frac{1}{4}$ $r = \frac{3}{4}$ $a\left(1 + \frac{3}{4} + \frac{9}{16}\right) = 74$, so $a = 32$	M1 A1 A1 (3)
(c)	$S_\infty - S_n = \frac{ar^n}{1 - r} = 128\left(\frac{3}{4}\right)^n < 0.01$ $n > \frac{\log\left(\frac{0.01}{128}\right)}{\log 0.75} = 32.87\dots$ (the sign reverses because $\log 0.75 < 0$) $n = 33$	M1 M1 A1 (3)
Total for Question 9: 9 marks		



Question 10

10 marks

Part	Scheme	Marks
(a)	$A: 30\,000 + 4 \times 1500 = \text{£}36\,000$ $B: 28\,000 \times 1.05^4 = \text{£}34\,034$ <i>Year 5 is the 5th term, so the power is 4, not 5.</i>	B1 B1 (2)
(b)	$\frac{10}{2}(2 \times 30\,000 + 9 \times 1500)$ $= 5 \times 73\,500 = 367\,500$ *	M1 A1* (2)
(c)	$\frac{28\,000(1.05^{10} - 1)}{1.05 - 1}$ $\text{£}352\,181$	M1 A1 (2)
(d)	$\frac{28\,000(1.05^n - 1)}{0.05} > 1\,000\,000$ $1.05^n - 1 > \frac{25}{14}, \text{ so } 1.05^n > \frac{39}{14}$ * $n > \frac{\log \frac{39}{14}}{\log 1.05} = 20.998\dots$ $n = 21$	M1 A1* M1 A1 (4)
Total for Question 10: 10 marks		

