Version 1.0

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Mathematics 3301

Specification A

Paper 1 Higher

Mark Scheme

2007 examination - November series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
ft	Follow through marks. Marks awarded following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$

Paper 1H

Q	Answer	Mark	Comments
1	2000, 3, 0.5	M1	2 out of 3 correct… Accept 2040 at this stage
	4000 × 3 or 2000 × 6 or 6000 ÷ 0.5	A1	Accept 4080 × 3 or 2040 × 6 or 6120÷ 0.5
	12 000	A1	12240 scores A0… Must be rounded to 12000 for A1
2	$xy + 2x$	B1	
	$xy + 2x - xy - 2$	B1	or $x(y + 2) - xy - 2$
	$2x - 2 \leftrightarrow 2(x - 1)$	B1	or $2x + 2 \leftrightarrow 2(x + 1)$
3(a)	3.14×10^2 or 314	M1	
	2 × (Their 314)	M1dep	SC1 1256 (from 3.14×20^2)
	628	A1	SC2 2512 (from $2 \times 3.14 \times 20^2$)
3(b)	0.628	B1ft	
4(a)	125	B1	
4(b)	$5^6 \times 5^7$	M1	
	13	A1	Allow 5^{13}
4(c)	$5^7 \div (5^4 \times 5)$	M1	or 5^{7-4-1} oe
	25	A1	or 5^2

Q	Answer	Mark	Comments
5(a)	–5, –1, 3, 7	B2	–1 eeoo B1 For 1st incorrect but next three are +4, +8 and +12
5(b)	4	B1	
5(c)	$4n - 9 = 391$	M1	$(391 + 9) \div 4$
	$(n =)$ 100	A1	SC1 for 99 from $[391 - (-5)] \div 4$
5(d)	$4n - 9 = 29$ or $4n = 38$	M1	$9^{th} = 27$ **and** $10^{th} = 31$ $29 + 9 = 38$
	$(n =) 9\frac{1}{2}$, which is impossible	A1	29 lies between these so is not in the sequence 38 is not a multiple of 4
6(a)	Centre (6, 2)	B1	
	90° clockwise or 270° anticlockwise	B1	$\frac{1}{4}$ turn clockwise or $\frac{3}{4}$ turn anticlockwise, –90 or +270
6(b)	Correct position at (0, 2) (0, 3) (–2, 3)	B2	Correct size **and** orientation anywhere scores B1
7(a)	–2 **and** 1	B1	
7(b)	7 correct plots from Their table	B1ft	Allow one error or omission
	$y = x^2 - 4x + 1$ plotted between $x = -1$ and $x = 5$	B1	Smooth curve within $\pm \frac{1}{2}$ square of **correct** points
7(c)	Graph intersects x-axis twice	B1	oe
8(a)	480×0.2 or 520×0.3	M1	oe
	96 or 156	A1	
	Their (480×0.2) + Their (520×0.3)	M1	
	252	A1	SC2 For 248 (from $480 \times 0.3 + 520 \times 0.2$) SC1 For 144 or 104
8(b)	0.252	B1ft	oe eg, $\frac{63}{250}$ or 25.2%

Q	Answer	Mark	Comments
9(a)	$180 - (18 + 29)$	M1	oe
	133	A1	
9(b)	$(3.6 \times) \frac{3}{2}$	M1	oe eg, $(3.6 \div) \frac{2}{3}$
	5.4	A1	
10(a)	$4x - 3y = 13$ or $4x - 3y = 13$ $4x + 2y = 8$ $\quad 6x + 3y = 12$	M1	Allow error in one term
	$5y = -5$ or $10x = 25$	M1	Correct elimination from Their equations
	$x = 2.5$ **and** $y = -1$	A1	SC1 Correct with no working or from T&I
10(b)(i)	$(x - 3)(x - 10)$	B2	B1 for: $(x \pm 3)(x \pm 10)$ or $(x - 5)(x - 6)$ or $(x \pm 2)(x \pm 15)$ or $(x - 1)(x - 30)$
10(b)(ii)	$(x =) 3$ **and** $(x =) 10$	B1ft	
11(a)	300 or 0.03	M1	
	300.03	A1	or 3.0003×10^2
11(b)	10000 or 10^4	B2	B1 for 1000 from $300 \div 0.3$ B1 for 100000 from $300 \div 0.003$ B1 for 3×10^4 or 30000
12(a)	A year is divided into 4 quarters	B1	oe Reference to seasonal variations
12(b)	Their addition **and** $\div 4$ seen	B1	$(33.50 + 27.00 + 19.20 + 16.30) \div 4$ or $96 \div 4$
12(c)	$(27.00 + 19.20 + 16.30 + 27.50) \div 4$	M1	or $(33.50 - 27.50) \div 4$ or $(-33.50 + 27.50) \div 4$ or $\pm 1.5(0)$
	22.50	A1	

Q	Answer	Mark	Comments
13	LCM of 12 used correctly or attempt at LHS multiplied by 12	M1	
	$6x - 3 + 4x + 8$	M1	Allow one error
	$10x + 5 = 24$	A1	$10x + 5 = 2$ scores A0
	$(x =)$ 1.9	A1ft	ft From **one** arithmetic or sign error but not from a conceptual error (such as on the line above)
14	25	B1	
	132	B1	Allow 129 to 135
	198	B1	Allow 195 to 201
			Total of these two must be 330
	33	B1	
15	$1/5^2$ or 1/25	B1	
	$\sqrt{100}$ or 10	B1	
	$(\pm)\ \frac{2}{5}$ or $(\pm)$ 0.4	B1	

Q	Answer	Mark	Comments
16(a)(i)	Opposite angles of cyclic quad (add up to 180°)	B1	
16(a)(ii)	Attempting to solve $3x - 15 = 180$ **and** doubling the answer	M1	eg, $(180 \pm 15) \div 3$ **and then** 65×2 or $58(.3\ldots) \times 2$
	130	A1	
16(b)	Angle $ABC = 57°$	M1	This might come from first finding… Angle $ACB = 49°$, Angle $BCQ = 74°$, Angle $CAB = 74°$
	Angle $OBA = (41°)$	M1	
	Angle $OBC = 57° - 41° = 16°$	A1	
	Alternatively Join OC, angle $PCO = 90°$, angle $ACO = 33°$	M1	*Look for **either** an alternate segment theorem approach **or** a tangent - radius approach*
	Angle $ACB = 49°$	M1	
	Angle OBC (= angle OCB) $= 49° - 33° = 16°$	A1	*Do **not** mix the two*
17	$\sqrt{162} - \sqrt{54} + 3\sqrt{6} - 3\sqrt{2}$	M1	oe eg, $\sqrt{27}\sqrt{6} - \sqrt{27}\sqrt{2} + 3\sqrt{6} - 3\sqrt{2}$… Allow one error in the expansion
	$3\sqrt{6} - \sqrt{54} = 3\sqrt{6} - 3\sqrt{6} = 0$	M1	For simplifying $\sqrt{54}$ or $\sqrt{27}\sqrt{2}$ to $3\sqrt{6}$ then eliminating the terms
	$\sqrt{162} = \sqrt{(81 \times 2)} = 9\sqrt{2}$	M1	For simplification of $\sqrt{162}$...must obtain $9\sqrt{2}$
	$6\sqrt{2}$	A1	
	Alternatively		**Alternatively**
	$3(\sqrt{3} + 1)(\sqrt{6} - \sqrt{2})$	M1	$3(\sqrt{3} + 1)\sqrt{2}(\sqrt{3} - 1)$
	$3(\sqrt{18} - \sqrt{6} + \sqrt{6} - \sqrt{2})$ oe	M1	$3\sqrt{2}(3 - \sqrt{3} + \sqrt{3} - 1)$
	$\sqrt{18} = 3\sqrt{2}$	M1	$3\sqrt{2}(3 - 1)$
	$6\sqrt{2}$	A1	$6\sqrt{2}$

Q	Answer	Mark	Comments
18	$p \times 2p = \frac{9}{32}$	M1	
	$p^2 = \frac{9}{64}$	M1	
	$(p =) \frac{3}{8}$	A1	SC2 For $\frac{3}{4}$ (from $2p^2 = \frac{9}{32}$, $p^2 = \frac{9}{16}$)
19	Identify scale factor for area 4 or 2^2 or $\frac{1}{4}$ or $(\frac{1}{2})^2$	M1	
	(X =) 125	A1	
	Identify scale factor for volume 27 or 3^3 or $\frac{1}{27}$ or $(\frac{1}{3})^3$	M1	
	(Y =) 10 800	A1	10.8 litres
20(a)	Squaring both sides $\frac{a}{x+b} = c^2$	M1	Squaring both sides $\frac{a}{x+b} = c^2$
	Invert $\frac{x+b}{a} = \frac{1}{c^2}$	M1	Multiply $a = c^2 (x + b)$
	Multiply $x + b = \frac{a}{c^2}$	M1	Expand **and** rearrange $a - c^2 b = c^2 x$
	Rearrange $x = \frac{a}{c^2} - b$	A1	Divide $\frac{a - c^2 b}{c^2} = x$
20(b)	$p = -10$	B1	
	$q = -8$	B1	

Q	Answer	Mark	Comments
21(a)(i)	$OC = 4\mathbf{a} + 6\mathbf{b}$	B1	
21(a)(ii)	$AB = -4\mathbf{a} + 3\mathbf{b}$	B1	
21(b)	$AD = \frac{2}{3}$ (Their) AB or $BD = \frac{1}{3}$ (Their) BA	M1	Must be an expression in terms in terms of **a** and **b** $AD = \frac{2}{3}(-4\mathbf{a} + 3\mathbf{b})$ $BD = \frac{1}{3}(4\mathbf{a} - 3\mathbf{b})$
	$OD = 4\mathbf{a}$ + (Their) AD or $OD = 3\mathbf{b}$ + (Their) BD	M1dep	Must be an expression in terms in terms of **a** and **b**
	$\frac{4}{3}\mathbf{a} + 2\mathbf{b}$	A1	
21(c)	($OD = \frac{4}{3}\mathbf{a} + 2\mathbf{b}$, $OC = 4\mathbf{a} + 6\mathbf{b}$) So $\overrightarrow{OC} = 3 \times \overrightarrow{OD}$ ie, ODC is a straight line	B2	Dependant on correct answers to (a)(i) and (b) if no mention of vectors ie, $OC = 3 \times OD$ then award B1 only
22(a)	Reflection in the x-axis	B1	oe eg, Stretch in y-direction of SF –1
	(y) = – cos x	B1	oe
22(b)	Translation $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$	B1	oe eg, Shift in y-direction of –1 Condone translation of (0, –1)
	(y) = cos x – 1	B1	oe
22(c)	Translation $\begin{pmatrix} -90 \\ 0 \end{pmatrix}$ or $\begin{pmatrix} +270 \\ 0 \end{pmatrix}$	B1	oe eg, Shift in x-direction of –90 Condone translation of (–90, 0) or (+270,0)
	(y) = cos (x + 90) or (y) = cos (x – 270) or (y) = – sin x	B1	oe