Version 1.0

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Mathematics 3301

Specification A

Paper 2 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

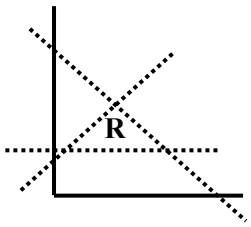
GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

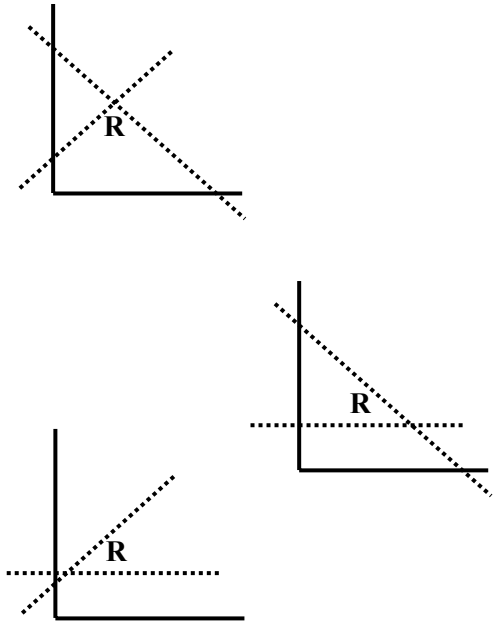
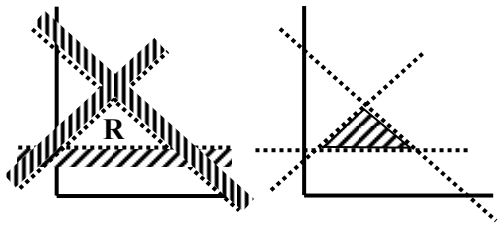
M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
M dep	A method mark dependent on a previous 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 $\frac{1}{2}$

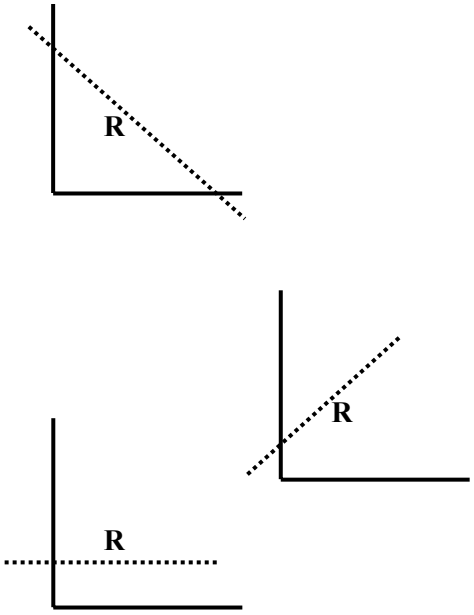
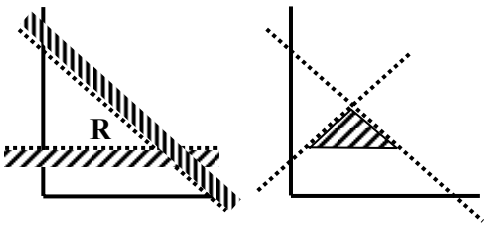
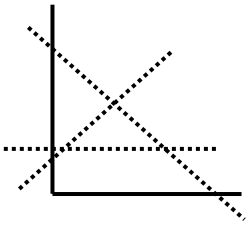
Paper 2H

Q	Answer	Mark	Comments
1(a)	1.25	B1	oe
1(b)(i)	23.76153642	B1	
1(b)(ii)	23.76, 23.8, 24	B1	ft From any value ≥ 4 sf rounded to 2 or 3 sf or any value greater than 3dp rounded to 2dp
2(a)	$8x - 28 = 12 + 3x$	M1	Allow one sign or arithmetic error but not $8x - 7 = 12 + 3x$
	$8x - 3x = 12 + 28$	M1	$5x = 40$ Allow one error
	$(x =)$ 8	A1ft	ft On one error SC $8x - 7 = 12 + 3x$ leading to $(x =)$ 3.8 oe B1
2(b)	$y - 63 = 14$	M1	$\left(\frac{y}{7}\right) = 11$
	$(y =)$ 77	A1	
3(a)	Arc from P cutting road twice	M1	NB If end of road used only one arc may be seen
	Arcs on either side of line or same side above or below P	M1	
	Completion of perpendicular	A1	SC 5.8 – 6.2 only B1
3(b)	0.5 × Their 'perpendicular'	M1	
	2.9 – 3.1 inclusive	A1	
4	Trial above 3.744 and correctly evaluated	M1	$4 \rightarrow 72$, $3.9 \rightarrow 67.119$, $3.8 \rightarrow 62.472$
	Trial below 3.744 and correctly evaluated	M1	$3 \rightarrow 33$, $3.7 \rightarrow 58.053$ $3.6 \rightarrow 53.856$, $3.5 \rightarrow 49.875$
	Testing a value that justifies 3.7 as answer (3.745 – 3.75 inclusive)	M1dep	$3.75 \rightarrow 60.23$, $3.745 \rightarrow 60.01$ Dependent on both M marks
	3.7	A1	All values at least 1 dp rounded or truncated

Q	Answer	Mark	Comments
5	0.85 seen	B1	85% = 12 512 M1
	12 512 ÷ 0.85 or digits '85'	M1	oe 1% = 12 512 ÷ 85 (=147.2) A1
	14 720	A1	Digits 1472 only implies M1 Misread of 75%, say gives £ 16682.67 can score 2/3
6(a)	202 – 205 inclusive	B1	
6(b)	92	B1	
6(c)	197 – 170 (= 27)	B1	197÷ 170 (× 100) M1
	27 ÷ 170 × 100	M1	oe 115.88, 115.9, 160 A1
	15.88…, 15.9, 16 (with working)	A1	T&I at least to 15.9 accuracy seen
7(a)	$x^2 + 2x – 4x – 8$	M1	Allow one arithmetic or sign error but must have x^2, two x terms and a constant term
	$x^2 – 2x – 8$	A1	Allow non contradictory fw but do not award A1 If contradictory fw
7(b)	$2m + 10 – 6m + 3$	M1	Allow one arithmetic or sign error
	$–4m + 13$ or $13 – 4m$	A1	Allow non contradictory fw but do not award A1 If contradictory fw
8(a)	$(x^2 =) 32^2 – 21^2$	M1	$x^2 + 21^2 = 32^2$
	√583	M1dep	Must subtract squares and show intention to square root NB $\sqrt{32^2 – 21^2}$ is M1
	24.1 – 24.2	A1	24 with working
8(b)	Sight of cos	M1	
	18 × cos 35	M1dep	Any alternative method must have a **complete** scheme to get M2
	14.7…	A1	15 with working NB Gradians 15.3

Q	Answer	Mark	Comments
9	$\pi \times 2.2^2$	M1	
	15.1976 to 15.21	A1	
	1000 ÷ 75 or 1000 ÷ 'Their 15.2'	M1dep	Their value × 75
	No with appropriate values eg, 13.3 and 15.2 or 1.9 (needed) or 75 and 65.77	A1	No as 1125 to 1140.75 > 1000
10(a)	A and D	B1	
10(b)	B and C	B1	
10(c)	B and C	B1	
11	Digits 85 cubed	B1	(0.614…)
	Any power of 10 ÷ 'Their 0.85^3'	M1dep	
	1628 – 1629	A1	NB Digits 1628 – 1629 is M2
12(a)	$x > 2$	B1	
12(b)	Fully correct	B3	–1 eeoo (allow solid or dashed lines)
	All lines correct, drawn dashed, R marked  	**3 marks**	NB Solid lines should be considered incorrect for 1 mark loss

Q	Answer	Mark	Comments
	R marked correct relative to two correct dashed lines 3rd line incorrect or missing 	**2 marks**	NB Solid lines should be considered incorrect for 1 mark loss
	All lines correct, drawn dashed, shaded in or out, R not marked 	**2 marks**	NB Solid lines should be considered incorrect for 1 mark loss

Q	Answer	Mark	Comments
	R marked correct relative to one correct dashed line other lines incorrect or missing 	**1 mark**	NB Solid lines should be considered incorrect for 1 mark loss
	Two lines correct, drawn dashed, shaded in or out, R not marked 	**1 mark**	NB Solid lines should be considered incorrect for 1 mark loss
	All lines correct, drawn dashed, no shading, R not marked 	**1 mark**	NB Solid lines should be considered incorrect for 1 mark loss

Q	Answer	Mark	Comments
13(a)	0.3, 0.3, 0.7, 0.3	B1	
13(b)	0.7×0.3 (= 0.21)	M1	oe Multiplication of one of: Their green × one of Their yellow 1 – (Their yellow × yellow) – (Their green × green) M2
	2×0.21	M1dep	oe Addition of both their green × yellow
	0.42	A1ft	oe ft Only if each pair of probs total 1
14(a)	$2.99(4) \times 10^{-23}$ or 3×10^{-23}	B2	Digits 2994 B1 or partial working 0.334×10^{-23} B1 or 26.6×10^{-24} B1
14(b)	1 ÷ Their (a)	M1	Correct answer but not in SF eg, 0.33×10^{-23}
	$3.3\ldots \times 10^{22}$, 3×10^{22} with working	A1	3.33×10^{22}
15	$AB = BC$	B1	
	$AM = MC$ (M midpoint of AC)	B1	Deduct B1 for first non-reason only
	BM (common side)	B1	
	Congruent because of SSS	B1	oe Must mention 3 sides
15 Alt	Angle BAM = Angle BCM (equal angles in isosceles triangle)	B1	Deduct B1 for first non-reason only
	$AM = MC$ (M midpoint of AC)	B1	
	BM (common side) or $AB = BC$	B1	
	Congruent because of SAS	B1	oe Must mention 2 sides and included angle

Q	Answer	Mark	Comments
16(a)	$2(2a - 5)(2a + 5)$	B2	B1 For $(4a - 10)(2a + 5)$ or $(2a - 5)(4a + 10)$ or $8(a - 2.5)(a + 2.5)$
16(b)	$(6x - 3)(2x - 5)$ or $3(2x - 1)(2x - 5)$ or $(2x - 1)(6x - 15)$	M1, A1	Allow M if attempt made to split $12x^2$ or $4x^2$ into 2 factors and 15 or 5 into 2 factors and combine in brackets eg, $12x$ x / 3 5 A1 If correct M1 If factor of 3 cancelled ie, $\frac{4x^2 - 12x + 5}{4x^2 - 1}$ A1 for top factorised to $(2x - 1)(2x - 5)$
	$3(2x - 1)(2x + 1)$ or $(6x - 3)(2x + 1)$ or $(2x - 1)(6x + 3)$	B1	$(2x - 1)(2x + 1)$
	$\frac{2x - 5}{2x + 1}$	A1	Allow non contradictory fw but do not award A1 if contradicting fw
17(a)	Attempt $\sum mf$	M1	If correct 852, 1460, 1050, 1386, 948, 324 (=6020)
	Their $\sum mf \div 40$	M1dep	Must divide by 40
	150.5	A1	Ignore rounding or truncation after correct answer but **must** see working for 150
17(b)	17 and / or 28	B2	B1 Each value
	Correct bars width and height	B2	–1 eeoo Correct heights 1.25, 1.2, 0.8 Gaps between bars 1 error
17(b)Alt	Attempt to find area fd × width	M1	ie, 3.4 × 5 or 5.6 × 5
	17 and 28	A1	
	Calculation of at least 2 fds	M1	ie, 25 ÷ 20, 18 ÷ 15, 12 ÷ 15
	Correct bars width and height	A1	Correct heights 1.25, 1.2, 0.8

Q	Answer	Mark	Comments
18	$\frac{4}{3}\pi \times 3^3 = k \times \frac{1}{3}\pi \times 6^2 \times 8$	M2	oe M1 for both formula with correct values (allow one error with radii) Values 113 to 113.15 and 301 to 301.65 M1 for comparison
	$k = \frac{3}{8}$, 0.375, 37.5%	A1	oe
19(a)	$y = 3 - 2x$	B1	
	$x^2 + (3 - 2x)^2 = 5$	M1	
	$x^2 + 9 - 12x + 4x^2 = 5$	A1	$x^2 + 9 - 6x - 6x + 4x^2 = 5$
19(b)	$(5x \pm a)(x \pm b)$ where $ab = 4$	M1	$\frac{-(-12 \pm \sqrt{(-12)^2 - 4 \times 5 \times 4}}{2 \times 5}$ Allow one error in use of formula from $-b$, $-b^2$, $4ac$, $2a$ Do not accept wrong formula, wrong values, just dividing by 2 or not dividing top line by $2a$
	$(5x - 2)(x - 2)$	A1	$\frac{12 \pm \sqrt{64}}{10}$ or $\frac{12 \pm 8}{10}$
	$x = 2$ or 0.4 (or $\frac{2}{5}$)	A1	ft On –12 to –2 and –0.4 ft On + 80 to 2.6966… and – 0.2966

Q	Answer	Mark	Comments
20	$PR = 13$	B1	
	$\cos PQR = \frac{8^2 + 14^2 - 13^2}{2 \times 8 \times 14}$ or $13^2 = 14^2 + 8^2 - 2 \times 14 \times 8 \times \cos Q$	M1	oe For other angles
	$PQR = 66\ldots°$	A1	$PRQ = 34\ldots$, $QPR = 79.7\ldots$ or 80
	Area = $\frac{1}{2} \times 8 \times 14 \times \sin$ (Their 66)	M1Dep	oe For other angles
	51.158 to 51.2	A1	
20 Alt	$PR = 13$	B1	
	Use of Hero's formula $\sum$ (3 sides) ÷ 2	M1	
	17.5	A1	
	$\sqrt{}(17.5)(4.4)(3.5)(9.5)$	M1Dep	
	51.158 to 51.2	A1	
21	+25 g limit	M1, A1	eg, 2.425, 2.825, 2.775. 1.875 M1 For limit, A1 for at least 2 correct
	Airport scales 9.95 minimum	B1	
	OK as 9.9 < 9.95	B1ft	ft If they compare Their 'maximum' total and airport scale 'minimum' and reach a correct conclusion.
22	P(RR) + 2 × P(RR') Must show all 3 probabilities	M1	1 – P (no red) or 1 – P (all blue)
	$\frac{5}{8} \times \frac{4}{7} + 2 \times \frac{5}{8} \times \frac{3}{7}$	A1	$1 - \frac{3}{8} \times \frac{2}{7}$ oe
	$\frac{25}{28}$	A1	oe $\frac{50}{56}$ decimals at least 3sf for answer 0.893

Q	Answer	Mark	Comments
23	$y = k_1 x^3$	M1	$2 = k \times 8$
	$y = \frac{k_2}{z}$	M1	$2 = k/16$ $\quad x^3 = \frac{k_3}{z}$ M2
	$k_1 = \frac{1}{4}$	A1	$k_3 = 128$ A2
	$k_2 = 32$	A1	
	2	A1	