AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Secondary Education

Mathematics 4306
Specification A

Paper 2 Higher

Mark Scheme
2009 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.

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 $\frac{1}{2}$

Q	Answers	Mark	Comments
1	$12 \times 60 \times 10$ (= 7200)	M1	
	32 400 ÷ their 7200	M1Dep	
	4.50	A1	4.5 is A0

Q	Answers	Mark	Comments
2		B2	B1 any enlargement sf 3 or enlargement from (0, 6) with sf 2. B1 for any 2 vertices in correct position **and** any 2 sides the correct length.

Q	Answers	Mark	Comments
3	$\sum x$ for ≥ 14 values 8 + 8 + 9 + 12 + 16 + 18 + 25 + 26 + 30 + 32 + 33 + 37 + 46 + 50 + 56 + 59 (=464)	M1	Allow up to 3 misread errors but must include one of 30 or 50 but any indication that the S&L diagram is misunderstood, eg 0 for 30 10 + 2 + 6 + 8 = 26 for second row is M0
	Their 464 ÷ 16	M1Dep	
	29	A1	

Q	Answers	Mark	Comments
4	Approximate isosceles triangle drawn with angle 90° shown (or right angle sign)	B1	SC1
	At least one 45° angle shown **or** 2 sides adjacent to 90° marked as equal with numbers or a dash	B1Dep	B0 if a side and hypotenuse marked as equal.

5a	Too small a sample	B1	oe eg They are only asking 10 people. 10 people will not tell you how popular the programmes are.
	Biased sample	B1	oe eg Most at school or work. Most don't watch TV during these times.
5b	Not enough choice of programmes Not enough choice of responses Leading question Biased question	B1	oe eg No 'No' box Can't choose between them. What if they don't watch these shows.

6a	$\pi \times 12^2 \div 2$	M1	
	226 to 226.3	A1	72π
6b	100 cm = 1m	B1	oe $1m^2 = 100 \ cm^2$ is B0
	$40\,000 \div 100 \div 100$ $4 \times 100 \times 100$	B1Dep	oe but just $40\,000 \div 10\,000 = 4$ is B0, B0 $10000 \ cm^2 = 1m^2$ so $40\,000 \ cm^2 = 4 \ m^2$ is B0, B0

7a	$5x < 9 - 3 \ (6)$	M1	
	$x < 1.2$	A1	$x < 1\dfrac{1}{5}, \ \dfrac{6}{5}$ no working and $x = 1.2$ is M0, A0 $5x < 6$ and $x = 1.2$ is M1, A0 Do not accept $x \leq 1.2$ but this on its own implies M1.
7b	0, 1, 2, 3	B2	B1 for {–1, 0, 1, 2, 3} or {–1, 0, 1, 2} B1 for $-1 < x \leq 3$
7c	Any non-integer value > –1 and <1.2	B1	

8a	$0.5 + 0.1 \times 1500 \times 0.1$	M1	
	15.50	A1	15.5 is M1, A0
8b	1:8	B1	
8c	$3.5 + 0.02 \times 12\,000 \times 0.1$ (=27.5)	M1	
	their 8 × their 15.5 – their 27.5	M1Dep	
	96.50	A1	96.5 is A0 unless 15.5 seen in part (a) in which case allow A1

| 9a | Any triangle with an area 6cm^2 | B1 | |
| 9b | Area triangle $^1/_2$ base × height. Both rectangles twice the area of the triangle. | E2 | E2 for a full explanation. E1 for a partial explanation (eg explaining for first rectangle only) Or use of $^1/_2$ base × height Or marking altitudes on diagram |

10a	$1.7 \div 5.5 \ (\times 100)$	M1	oe
	30.9….	A1	
	31	B1ft	ft any value or calculation with at least one decimal place rounded to the nearest whole number.
10b	Sight of 1.45	B1	145% = 232 M1
	$232 \div 1.45 \ (= \dfrac{8}{5} \text{ or } 1.6)$	M1	1% = 232 ÷ 145 M1
	160	A1	

| 11 | Any value −infinity $\leq x \leq 1$ stated | B1 | |
| | Showing that for the chosen value of x $x^2 \geq x^3$. Must be evaluated correctly and compared | B1Dep | 1^2 1^3 as 1 < 1 is B1, B0 $1^2 = 1$ $1^3 = 1$, $1^2 > 1^3$ is B1, B0 |

12a	Correct plots	B2	–1eeoo
12b	Line from at least 19 to 65 and passing between (24, 560) and (28, 570) and passing between (54, 360) and (65, 340)	B1	
12c	Older the driver cheaper the insurance	B1	oe. Negative correlation
12d	Value read from their line of best fit.	B1ft	Likely to be 450 – 500 No line of best fit and answer of 490 is B1.

13a	$3x - x = 5 + 7$	M1	
	6	A1ft	ft on one sign or arithmetic error
13b	$5x - 15 = 3x + 3$	M1	Allow one error including incorrect expansion of one bracket.
	$5x - 3x = 3 + 15$	M1	Allow one error if no errors in expansion
	9	A1ft	ft on one error only for 2/3
13b Alt	$\dfrac{3}{5}x + \dfrac{3}{5}$	M1	Must expand bracket
	$\dfrac{2}{5}x = 3\dfrac{3}{5}$	M1	Allow one error in rearranging
	9	A1	
13c	$5(x + 1) - 2(x - 3)$	M1	
	$3x + 11$	A1	
	Their $3x + 11 = 20$	M1	
	3	A1ft	ft on one error if both Ms awarded.
13c Alt	$\dfrac{1}{2}x + \dfrac{1}{2} - \dfrac{x}{5} + \dfrac{3}{5}\ \left(= 2\right)$	M1	Allow $-\dfrac{3}{5}$
	$\dfrac{3}{10}x + \dfrac{11}{10}\ \left(= 2\right)$	A1	
	$\dfrac{3}{10}x = \dfrac{9}{10}$	M1	
	3	A1ft	ft on one error if both Ms awarded. eg if $-\dfrac{3}{5}$ used answer is $x = 7$

14a	60	B1	
14b	1080 ÷ 8 or 360 ÷ 8	M1	oe 180 – 45
	135	A1	
14c	Their 45 + their 60 or 360 – (their 135 + their 120) or 180 + their *x* – their *y*	M1	
	105	A1ft	ft their *x* and *y* providing answer obtuse.

15	Sight of tan	M1	
	tan *a* = 5 ÷ 8	M1	oe
	32	A1	Radians 0.5586, Grads 35.56 are 2/3 Answer of 32 only, no working is M0.

16	P(R + B + G) = 0.7 or P(B + G + G + W) = 0.85 or P(B + G + W) = 0.75	M1	
	P(W) = 0.3	A1	
	P(G) = 0.1	A1	
	P(B) = 0.35	A1	
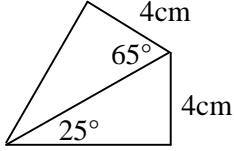
17a	7, 3	B1	
17b	Correct plots	B1	follow through their values
	Smooth curve	B1	
17c	Does not cross *x*- axis (*y* = 0)	B1	oe
17di	–3.8 and 0.8	B1	± 0.05
17dii	$(x^2 + 3x - 3) - (x^2 + 2x - 4)$	M1	oe
	y = *x* + 1 seen or drawn	A1	oe
	–3.2 and 1.2	A1ft	±0.1 ft their line if M1 awarded.

18	$70 \times 5280 \times 3 \div (60 \times 60)$	M1	oe
	308	A1	0.0583333 miles
	$70 + 70^2/20$	M1	
	315	A1	0.05965.. miles
	(their 315 – their 308)/their 315 ($\times$ 100)	M1Dep	Dependent on both Ms (their 315 – their 308)/their 308 ($\times$ 100)
	2.2 %	A1	2.3%

19ai	37	B1	
19aii	53	B1	
19b	$(OA^2) = 14^2 + 6^2$	M1	Angle BAO = 23.2 or BOA = 66.8
	$(OA^2) = \sqrt{232}$	M1Dep	6 $\div$ sin 23.2 or 14 $\div$ cos 23.2 oe
	$(OA) = 15.2\ldots\ldots$	A1	
	$(AF) = 9.2,\ 9.23\ldots$	A1ft	Their OA – 6 OA must come from Pythagoras ie both Ms awarded.

20a	$x^2 + (x + 2)^2 = 16$	M1	$x^2 + x^2 + 4 = 16$
	$x^2 + x^2 + 4x + 4 = 16$	A1	
	$2x^2 + 4x - 12 = 0$ and evidence that factor of 2 cancelled or taken out $2x^2 + 4x - 12 = 0$ followed by $x^2 + 2x - 6 = 0$ is OK for A1	A1	Must put into general quadratic form.
20b	$(x + 1)^2 - 7$	B2	B1 for $a = 1$, B1 for $b = 7$ (or –7) if stated on answer line
20c	$x + 1 = \pm\sqrt{7}$	M1	$$\dfrac{-2 \pm 2\sqrt{7}}{2}$$
	$x = -1 \pm \sqrt{7}$	A1ft	ft their answer in 20(b) eg if 20b $(x - 1)^2 - 5$ and they give $1 \pm \sqrt{5}$ then award 2 marks.

21	C, B, D, A	B3	B2 if two correct, B1 if 1 correct

22	Indicating short side is 4	B1	
	Indicating that one of angles as 65° or 25	B1	
	4 × tan 65 or 4 ÷ tan 25	M1	8.578 implies B1, B1, M1
	4 × 8.578…	M1	oe
	34.3…	A1	34 with working