AQA

General Certificate of Secondary Education
June 2011

Applications of Mathematics (Pilot)　　93701H

(Specification 9370)

Unit 1: Applications of Mathematics
　　　Written Paper (Higher)

Mark Scheme

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised 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.
Q	Marks awarded for quality of written communication. (QWC)
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 $\frac{1}{2}$

A1 Higher Tier

Q	Answer	Mark	Comments
1(a)	(=) B3 + C3	B1	
1(b)	(D3 =) 216	B1	
	(E3 =) 35	B1	Condone both answers seen in reverse cells
1(c)	(C4 =) 40	B1	SC1 For 40 and 140 in reverse cells
	(D4 =) 140	B1	SC1 For C4 and D4 completed with difference of 100

Q	Answer	Mark	Comments
2(a)	1	B1	
2(b)	4 (+) 3 (+) 5 (+)1	M1	Allow 4 (+) 3 (+) 5 (+) 1(+) 2 (+) 4 (+) 2
	13	A1	21
2(c)	12 + 3 + 6 + 1 + 2 + 1 (= 25)	M1	Allow one error or omission
	$\dfrac{\text{their } 25}{60} \times 100$	M1 Dep	
	42	A1	Accept 41.6… or 41.7 or 41

Q	Answer	Mark	Comments
3(a)(i)	No units, "far" is vague, can only answer Yes or No	B1	oe
3(a)(ii)	Suitable question (with units)	B1	eg, 'How many miles would you travel to a hair salon?' Units must be stated in the question unless included in the response section
	Responses section with at least 3 choices, not overlapping, covering all distances > 0	B1	
3(b)	Sample too small / biased Only asked her own clients / does not ask people who go to other hairdressers / prospective clients	B1	One suitable reason

Q	Answer	Mark	Comments

4(a)(i)	$135 < h < 160$
	or $135 < h$ and $h < 160$ oe
		Q2	Q1 For one inequality $135 < h$ or $h < 160$
			    or for $135 \leq h \leq 160$
			    Ignore units
			Strand (i) - Correct notation - inequality
			    signs must be used

4(a)(ii)	Any height greater than 152 cm but less than 155 cm	B1	

Q	Answer	Mark	Comments
4(b)	$x + 2x + 2x + 8 \ (= 423)$ or $5x + 8 \ (= 423)$	M1	
	$5x = 415$	M1	
	83	A1	
Alt 1 4(b)	Finding 3 values that fit criteria with any total	M1	A total between 400 and 450 implies the 1st M1
	Finding improved values that fit criteria with total between 400 and 450	M1	
	83	A1	
Alt 2 4(b)	423 – 8 or 415 seen	M1	
	$\dfrac{\text{their } 415}{5}$	M1 Dep	
	83	A1	

Q	Answer	Mark	Comments
5(a)	A, B, C	B2	B1 For 1 correct
5(b)	You are unlikely to be hit by lightning but if you are it can be fatal / can be very dangerous	B1	oe

Q	Answer	Mark	Comments
6(a)	$\frac{1}{4}$ × 3.8(0) **or** $\frac{3}{4}$ × 5.2(0)	M1	oe Using 25% and 75% or 0.25 and 0.75
	Their 95 p × 5 (= 4.75)	M1 Dep	
	Their 3.90 × 5 (= 19.50)	M1 Dep	Dep On 1st M1
	Their 4.75 + their 19.50	M1 Dep	
	24.25	A1	
Alt 1 6(a)	5 ÷ 4 = 1.25	M1	
	Their 1.25 × 3.80 (= 4.75)	M1 Dep	
	3 × their 1.25 × 5.20 (= 19.50)	M1 Dep	Dep On 1st M1
	Their 4.75 + their 19.50	M1 Dep	
	24.25	A1	
Alt 2 6(a)	$\frac{1}{4}$ × 3.8(0) **or** $\frac{3}{4}$ × 5.2(0)	M1	oe Using 25% and 75% or 0.25 and 0.75
	Their 95 p + their 3.90	M1 Dep	
	Their 4.85 (for 1 kg)	M1 Dep	
	Their 4.85 × 5	M1 Dep	
	24.25	A1	
Alt 3 6(a)	3 × 5.20 = (15.60)	M1	
	3.80 + their 15.60	M1 Dep	
	5 ÷ 4 (= 1.25) or their 19.40 × 5 (= 97)	M1	or $\frac{19.40}{4}$ (= 4.85)
	Their 19.40 × 1.25 or their 97 ÷ 4	M1 Dep	Their 19.40 + their 4.85
	24.25	A1	
6(b)	120(%) = 5.64 or 120% seen or 1.2 seen	M1	oe
	$\frac{5.64}{120}$ (× 100) or 5.62 ÷ 1.2 or $5.64 × \frac{5}{6}$	M1	First M1 can be implied if not already awarded
	£4.70	A1	

Q	Answer	Mark	Comments
7(a)(i)	$100 \leq m < 200$	B1	
7(a)(ii)	Use of midpoints	B1	Allow one error
	(50 × 4) + (150 × 23) + (250 × 15) + (350 × 6) + (2 × 450) or 200 + 3450 + 3750 + 2100 + 900	M1	Attempt at $\sum fx$ using x values on or between class boundaries
	Their 10400 ÷ 50	M1 Dep	Condone ÷ by their 50 if clearly from attempt at $\sum f$ eg, totalled under table
	208	A1	If no working shown SC3 For 9518 seen (no brackets used) SC3 For 208.5 (use of midpoints 50.5 etc) SC2 For 158 (use of lower bounds) SC2 For 258 (use of upper bounds) SC2 For 2080 (10400 ÷ 5)
7(b)	Plotted at midpoints	B1	$\pm \dfrac{1}{2}$ square
	Correct heights 4, 23, 15, 6, 2 and joined with straight lines	B1	$\pm \dfrac{1}{2}$ square SC1 For 4 out of 5 completely correct position and joined with straight line
7(c)	One comparison using average	B1	eg, Sally does fewer miles (on average) (or vv)
	One comparison using spread	B1	eg, Sally travels over more varied distances (or vv)

Q	Answer	Mark	Comments
8	Reference to asking mental arithmetic questions / test (and noting number of questions correct)	B1	eg, 'Give a tables test to pupils and see how many each gets correct'
	Sample size of at least 30	B1	oe eg, 1 class of Y11 girls and 1 class of Y11 boys or 10% sample
	Reference to calculating total number of points or average number of points or Draw diagrams to compare	B1	eg, 'Work out the total points scored for girls and for the boys'
	Reference to a comparison	B1	eg, 'See which is the greater total or which average is bigger'
	For communicating that they will interpret the results and then linking it back to the original hypothesis	Q1	eg, If the girls score higher the hypothesis is true' Strand (ii)

Q	Answer	Mark	Comments
9(a)	95 − 72 or 23 seen	M1	or $\dfrac{95}{72}$
	$\dfrac{\text{their } 23}{72}$ × 100	M1 Dep	or 1.319…. or 131.9....
	31.9…	A1	Accept 32 with working
9(b)	0.35 or 35(%) seen	B1	
	0.74 × 0.35	M1	oe
	25.9	A1	Accept 26 with working SC1 For 48.1, accept 48 with working (use of 65%)

Q	Answer	Mark	Comments
10(a)	$\dfrac{720 + 1960 + 2130 + 1190}{4}$	M1	
	1500	A1	
10(b)	Correct horizontal points	B1	$\pm\dfrac{1}{2}$ square ft Their 4th moving average in 10(a) or 3 points plotted if 10(a) is blank
	Correct heights	B1	$\pm\dfrac{1}{2}$ square
10(c)	Reading of next moving average '1580'	B1	Follow through their trend line $\pm\dfrac{1}{2}$ square
	$(1960 + 2130 + 1190 + x) \div 4 =$ their 1580 or $1960 + 2130 + 1190 + x = $ '6320'	M1	ft Their value given with or without trend line seen
	1040	A1 ft	

Q	Answer	Mark	Comments
11(a)	1.03 seen	M1	
	$1.03^4 \times 5000$	M1	oe
	£5627.54	A1	
Alt 11(a)	$\left(\dfrac{3}{100} \times 5000\right) + 5000$	M1	Can be implied by yearly total seen
	5150, 5304 (....), 5463 (....)	M1	Build up method for 1st 3 years seen
	£5627.54	A1	Sight of 5627 (....) implies M2
11(b)	$2518 = 2300(1 + r)^2$ or $2445 = 2100 (1 + r)^3$	M1	Substituting values Allow substitution into their transposed equation
	$\sqrt{\dfrac{2518}{2300}}\ (-1)$ or $\sqrt[3]{\dfrac{2445}{2100}}\ (-1)$	M1	
	0.046… or 4.6….% or 1.046....	A1	
	0.052 or 5.2% or 1.052…. **and** B or Dan	A1	
	Process of attempting to solve equations clearly seen and decision made	Q1	They must attempt to use the formula and make a decision Strand (iii)

Q	Answer	Mark	Comments
12	Car 1625 or 1575 or Max car 2175 or 2225	B1	One of the 'car' limits seen
	Fuel 95 or 85 or Family 255 or 245	B1	One of the 'fuel/family' limits seen
	$2175 - (1625 + 95 + 255)$	M1	Using all their 4 limits correctly
	200	A1	

Q	Answer	Mark	Comments
13(a)	Number of economy chairs sold Number of recliner chairs sold	B1	Accept number of chairs sold **Must** say 'number of' oe
13(b)	$e + r < 25$	B1	
13(c)(i)	Line drawn	B2	B1 If one intercept on either axis is correct and a diagonal line drawn
	Correct side shaded	B1	Must be attempt at correct line implied by at least B1 above
13(c)(ii)	Line drawn	M1	ft Their 13(b) if it is a different inequality in e and r SC1 For correct inequality seen in 13(b) but line drawn with intercepts at 24 and correct side shaded
	Correct side shaded	A1 ft	
13(d)	Correct value of 13 or correct max value that fits the original conditions from their region	B2	ft From 2 diagonal lines and shading giving an enclosed region B1 For any value in or on boundary of their region Allow T & I method with answer 13 for B2