General Certificate Secondary of Education
January 2012

Applications of Mathematics (Pilot)   9370

Unit 1 Higher Tier 93701H

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 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.
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)	Plot 5 points correctly	B2	3 or 4 points B1
1(b)	Line of best fit between (40, 77) and (40, 83), and between (70, 50) and (70, 58)	B1	
	Their 74 or 74 to 75 if no line	B1ft	ft Any line
1(c)	Their $74 = \dfrac{100}{f}$	M1	Substitution
	$f = \dfrac{100}{74}$	M1	Rearrange
	1.35	A1 ft	Accept 1.4 ft Their answer to 1(b)

Q	Answer	Mark	Comments
2(a)	$\dfrac{6}{12 + 6}$	B1	$\dfrac{1}{3}$ or 0.33 ...
	$\dfrac{6}{12 + 6} \times 60$	M1	Allow substitution of 2 in place of 6 Penalise if further incorrect method used
	20	A1	
2(b)	Correct substitution of 3 or 12 for any consistent adult dose	M1	
	Correct answer to calculations	A1	12 (ml) (clearly shown to be from 3) or 30 (ml) (from 12)
	NO, stated with no incorrect working	A1 ft	oe ft Their answer to (a)
Alt 1 2(b)	Correct use of two appropriate numbers	M1	2 numbers, one of which is double the other eg, 4 and 8, etc
	Correct calculation for both with correct answers found	A1	
	NO, stated with no incorrect working	A1	
Alt 2 2(b)	$\dfrac{x}{-12 + x} \times n, \qquad \dfrac{2x}{12 + 2x} \times n$	M1	
	$\dfrac{2x}{12 + x} \times n, \qquad \dfrac{2x}{12 + 2x} \times n$	A1	
	NO, stated with no incorrect working	A1	

Q	Answer	Mark	Comments
3(a)	$x + 7$ or $2x$ seen	B1	
	$x + x + 7 + 2x = 29$ or $4x + 7 = 29$	B1	Must be in terms of x
	$4x = 22$	M1	First correct step at solving their linear equation
	$x = 5.5$	A1	SC3 For complete answer from use of only 2 people including Ruth $(x + 7)$ Must be clear use of algebra eg, $x + 7 + 2x = 29$ $\qquad 3x + 7 = 29$ $\qquad 3x = 22$ $\qquad x = 7.3(...)$ SC2 For 7.3(...) or 11 with no working or no algebraic method
Alt1 3(a)	$29 - 7$ or 22	M1	
	4 seen	M1	
	Their $22 \div 4$	M1	
	5.5	A1	
Alt 2 3(a)	A pair of numbers fitting x and $x + 7$ or x and $2x$	M1	eg, 6 and 13 or 6 and 12
	A set of numbers fitting x, $x + 7$ and $2x$	M1	eg, 7, 14, 14
	Correct trial giving total in the range 27 to 31	M1	eg, $5 + 10 + 12 = 27$
	5.5	A1	
3(b)	3 amounts meeting all conditions	B3	$x, x, y,$ with $y = 7x$ B2 $2x + y = 9x$ oe B2 Any set of 3 amounts with a mode and the mean calculated correctly. B1 Any set of 3 numbers with a mode or the mean calculated correctly.

Q	Answer	Mark	Comments
4	$7 \times \frac{3}{4}$ or $2 + 1\frac{1}{2} + \frac{3}{4} + \frac{1}{2}$	M1	oe Can use grams or kg throughout
	$5\frac{1}{4}$ or 21 portions	A1	oe
	$4\frac{3}{4}$ or 19 portions	A1	oe
	No	B1 ft	oe Must have M1 to ft
Alt 1 **4**	Plums $\rightarrow$ 1 day	M1	
	Cherries $\rightarrow$ 2 days	M1	
	Apples $\rightarrow$ 2 days with $\frac{1}{2}$ kg or 2 portions left	M1	
	Rest of apples and grapes $\rightarrow$ 1 day with $\frac{1}{4}$ kg left and No	A1	
Alt 2 **4**	$7 \times \frac{1}{4}$ or 7×250 or $(2 + 1\frac{1}{2} + \frac{3}{4} + \frac{1}{2}) \div 3$	M1	
	1.75 or 1750	A1	oe
	1.58 or 1583.	A1	
	No with 1.58 and 1.75 or No with 1583 and 1750	B1 ft	
Alt 3 **4**	$2 + 1\frac{1}{2} + \frac{3}{4} + \frac{1}{2}$	M1	oe
	Their $4\frac{3}{4} \div 3 \div 7$	M1	oe
	[0.22, 0.23]	A1	
	No with 0.25 or $0.22 < \frac{1}{4}$	B1 ft	
Alt 4 **4**	$2 + 1\frac{1}{2} + \frac{3}{4} + \frac{1}{2}$	M1	oe
	Their $4.75 \div 0.75$	M1	oe
	6.3 ...	A1	
	No only 6.3 days	B1 ft	

Q	Answer	Mark	Comments
Alt 5 **4**	$3 \times \frac{1}{4}$ or 3×250 or $(2 + 1\frac{1}{2} + \frac{3}{4} + \frac{1}{2}) \div 7$	M1	
	0.75 or 750	A1	oe
	0.678... or 0.679 or 678... or 679	A1	
	No with 0.75 and 0.678... or 0.679 or 750 and 678 or 679	B1 ft	
Alt 6 **4**	$7 \times \frac{3}{4}$	M1	
	$5\frac{1}{4}$ or 21 portions	A1	$(5\frac{1}{4} - 2 - 1\frac{1}{2} - \frac{3}{4} - \frac{1}{2} =) \frac{1}{2}$
	$(5\frac{1}{4} - 2 - 1\frac{1}{2} - \frac{3}{4} - \frac{1}{2} =) \frac{1}{2}$	A1	oe
	No and $\frac{1}{2}$	B1	oe

Q	Answer	Mark	Comments
***5**	$\frac{2}{10}$ or 60 prizes in total seen or $300 \div 5$	M1	oe
	Their $(£)60 + (£)90$	M1 Dep	Accept 150 if 60 seen SC Use of $59 + 90$ or $61 + 90$ (eg from attempt at list) $\rightarrow$ M0M1
	Their $150 \div 300$ or their $15\,000 \div 300$	M1	
	£0.50 or 50 p	Q1	Correct answer with correct units

Q	Answer	Mark	Comments
6(a)	One correct mid-point used leading to one correct fx	B1	
	$(7 \times 7.5) + (23 \times 12.5) + (16 \times 17.5) + (4 \times 22.5)$ or $52.5 + 287.5 + 280 + 90$ or 710	M1	Attempt at $\sum fx$ with x's used on or between the boundaries Totals of 585, 685, 735, or 835 can imply M1 (Consistent use of lower / upper class boundaries or midpoint $\pm \dfrac{1}{2}$)
	Their 710 ÷ 50	M1 Dep	Accept incorrect $\sum f$ if clear evidence shown of adding the values
	14.2	A1	Ignore rounding to 14 if 14.2 seen If no working shown award SC2 for 16.7 or 11.7 (Consistent use of upper class or lower class boundaries)
6(b)	Mean is less for the town or on average it is quicker through the town	B1 ft	oe ft From their mean in 6(a) with correct conclusion Must use average or mean, must be comparative
	Quickest time is through the town	B1	or B2 For comparing ranges 8 and a value from 10 to 20, so town more variable / alt more consistent
	Slowest time is through the town	B1	or B1 For 8 and a value from 10 to 20 with no comparison or B1 For correct comparison with no range values given eg, town is more variable
6(c)	**Either** 'Through town' with reason Quicker on average or Can do quicker times thorough town (oe) **Or** 'Alternative route' with reason Never takes more than 19 minutes on alternative route (but sometimes does through town) Or its more consistent	B1 ft	ft Their mean if average used for justification of choice

Q	Answer	Mark	Comments
7(a)(i)	Plots at correct heights	M1	$\pm \frac{1}{2}$ s.s. Condone 1 error Allow 1st plot at (80, 0) or (80, 1)
	Plots at correct hor. position and joined (lines or curve)	A1	All correct
7(a)(ii)	Reading their 113	B1 ft	ft c.f. graph reading off at 24
	Their 124 and their 102	M1	Values for IQ and UQ seen ft Increasing graph
	Their 22	A1 ft	Subtracting their UQ and IQ ft Increasing graph
7(b)	Correct comment on median	B1ft	eg, on average Club B is slower Must be in context and comparative
	Correct comment on IQR	B1ft	eg, times at Club B are more varied Must be in context and comparative

Q	Answer	Mark	Comments
8(a)	Prices have gone up	B1	Must ref prices, not RPI or 'it'. Allow use of word 'costs'
	(By) 4.3%	B1	
8(b)	Reason using the time difference	B1	eg, Mary only uses 1 month not 12 months Accept a reference to sales or discounts.
	Reason using the different items used	B1	Mary will have different things in her shopping bag to the items used to find RPI Accept reference to different shops, geographical location, or only one person.

Q	Answer	Mark	Comments
9	$£41.80 = 110\%$ or sight of 1.1	B1	
	$41.80 \div 1.1$	M1	oe $\frac{41.80}{110} \times 10 => $ B1 M1
	£38	A1	
	£3.80 and Jane stated	A1	

Q	Answer	Mark	Comments
10	$4x + 3y = 720$ **or** $3x + 2y = 520$	B1	Allow consistent use of different letters or words Accept working in £s or pence throughout
	$8x + 6y = 1440$ **and** $9x + 6y = 1560$	M1	Multiplying to same coefficient for y
	$x = 120$ or $x = 1.2$	A1	
	$y = 80$ or $y = 0.8(0)$	A1	Accept work in £ or pence
	(Jackie pays) (£) 4.80	B1 ft	ft Their values for x and y Answers in pence must have 'p'
	Logical argument with steps shown	Q1	Must gain first 2 marks Strand (ii)
Alt 1 **10**	$4x + 3y = 720$ **or** $3x + 2y = 520$	B1	Allow consistent use of different letters or words. Accept working in £s or pence throughout.
	$12x + 9y = 2160$ **and** $12x + 8y = 2080$	M1	Multiplying to same coefficient for x
	$y = 80$	A1	
	$x = 120$	A1	Accept work in £ or pence
	Jackie pays (£) 4.80	B1 ft	ft Their values for x and y Answers in pence must have 'p'
	Logical argument with steps shown	Q1	Must gain first 2 marks Strand (ii)

Q	Answer	Mark	Comments
Alt 2 **10**	$4x + 3y = 720$ **or** $3x + 2y = 520$ **or** $1x + 1y = 200$	B1	Allow consistent use of different letters or words Accept working in £s or pence throughout
	$4x + 3y = 720$ **and** $3x + 3y = 600$ **or** $3x + 2y = 520$ **and** $3x + 3y = 600$	M1	Multiplying to same coefficient for y
	$x = 120$	A1	
	$y = 80$	A1	Accept work in £ or pence
	Jackie pays (£) 4.80	B1 ft	ft Their values for x and y Answers in pence must have 'p'
	Logical argument with steps shown	Q1	Must gain first 2 marks Strand (ii)

Q	Answer	Mark	Comments
11	Value $\propto 1/\text{age}$ or value $= k/\text{age}$ or value $\times$ age $= k$	M1	
	$12\,000 = k/2$	M1	
	$k = 24\,000$	A1	
	Value $= 4800$	A1	
	$12\,000 \times 0.8^3$	M1	oe Complete method
	6144	A1	
	Difference $= 1344$	A1	
Alt 11	2.5 or $2/5$ or 40%	M1	
	$\dfrac{12000}{2.5}$ or $\dfrac{2}{5} \times 12000$ or $\dfrac{40}{100} \times 12000$	M1	
	Value $= 4800$	A2	
	$12\,000 \times 0.8^3$	M1	oe Complete method
	6144	A1	
	Difference $= 1344$	A1	

Q	Answer	Mark	Comments
12(a)	Attempt at f.d's	M1	At least 1 correct May be implied by one correct rectangle drawn with a scale
	fd's all correct	M1	0.3, 0.8, 0.7, 0.2
	Correct rectangles drawn	A1	Must have a scale or key
12(b)	$3\frac{1}{4}$ hours $= 195$ minutes $\rightarrow \frac{15}{150}$	M1	
	$(30 -)$ their $\frac{15}{150} \times 30$	M1	oe eg, $(30 -)$ their 0.1×30
	27	A1	SC2 96
Alt 12(b)	$330 - 195$ $(= 135)$	M1	
	Their 135×0.2	M1	
	27	A1	
12(c)	$\frac{550}{1150} \times 50$	M1	oe eg $1150 \div 50 = 23$, $550 \div 23$ Accept 23.9 for M1
	24	A1	

Q	Answer	Mark	Comments
13(a)	195 or 205 (kg)	B1	
	2850 or 2750 (kg)	B1	
	2850 ÷ 195	M1	Dep on attempt at max ÷ min (eg, 2845 ÷ 195, 2849 ÷ 195)
	14.6 (…)	A1	
	15	Q1	Stand (iii) - Organised response leading to a correct conclusion from their work including round up Dep on M1
13(b)	Use of 1.035^n for any value $n > 2$	M1	
	$1.035^{20} = 1.989$ and $1.035^{21} = 2.05$	A1	
	21 years	A1	Accept just over 20 years SC2 20
Alt 1 13(b)	Starting with an amount eg, £100 £100 $\times 1.035^n$ attempted (with $n > 2$)	M1	
	£100 $\times 1.035^n$ evaluated with $n = 20$ and $n = 21$	A1	
	21 years	A1	Accept just over 20 years SC2 20
Alt 2 13(b)	$\sqrt[n]{2}$ for any value $n > 2$	M1	
	$\sqrt[20]{2} = 1.0352…$ and $\sqrt[21]{2} = 1.0335…$	A1	Accept 1.0353 and 1.0336
	21 years	A1	Accept just over 20 years SC2 20