GCSE

Applications of Mathematics (Linked Pair Pilot)

93701H
Unit 1: Higher Tier
Mark scheme

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Version 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer 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 associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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 from 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.
M dep	A method mark dependent on a previous method mark being awarded.
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.
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 $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.

A1 Higher Tier

Q	Answer	Mark	Comments
1(a)	225	B1	If answer line blank check table. 225 in 12 noon is B1
1(b)	152 – (116 – 27) Or 152 - 89	M1	oe
	63	A1	For embedded 63 with different answer on answer line award M1A0 SC1 for correct answer from incorrect times used 8am to 9am → 69 10am to 11am → 77

2(a)	No box for zero/none	B1	
	Values overlapping Or 5 is in 2 boxes	B1	
2(b)	Sample size too small Or Only one age group/biased towards older students	B1	

Q	Answer	Mark	Comments
3	150 × 0.35 or 150 × 35 Or 150 × 0.35 + 20	M1	
	(£)52.5(0) or 5250p or (£)72.5(0)	A1	Answer in pence needs to show the units unless 52.5(0) is seen later in the question
	$\dfrac{4}{5} \times 150$ or 120	M1	oe
	their 120 ×1.4(0) or 168 or their 120 × 140 or 16800	M1dep	Dependent on previous M1
	(150 – their 120) ×(£)1 or (£) 30 used	M1	
	(their 168 +their 30) – their 52.5 (– 20) or (their 168 +their 30) – their 72.5	M1	Oe eg 198 – 72.5 Must be consistent units
	(£)125.50	A1	125.5 is A0

| 4(a) | 1 2 4 4 <br> or
 1 3 5 5 <br> or
 2 3 5 5 <br> or
 1 4 6 6 <br> or
 2 4 6 6 <br> or
 3 4 6 6 | B2 | B1 a set of 4 numbers between 1 and 6 with a single mode
 Or a set of 4 numbers between 1 and 6 with median identified/calculated

 SC1 for 1 1 3 3
      or 2 2 4 4
      or 3 3 5 5
      or 4 4 6 6 <br> or 1 1 1 1 or 2 2 2 2 etc (up to 6 6 6 6) |

| 4(b) | (1×10) + (2 × 7) + (3 × 9) + (4 × 5) + (5 × 8) + (6 ×11)
 Or 10 + 14 + 27+ 20 + 40 + 66 | M1 | Attempt at $\sum fx$. Allow one error. |
| | Their 177 ÷ 50 | M1 | Allow their 50 if clear attempt at $\sum f$ is seen. |

| | 3.54 | A1 | Ignore rounding to 3.5 or 4 if 3.54 seen. |
| | | | 4 with no working is M0A0 |

Q	Answer	Mark	Comments
5	**Alternative method 1**		
	500 × 10 or 5000	M1	
	their 5000 ÷ 1500	M1	or repeated addition of 1500 (at least 3)
			Allow their 5000 from 500 × 10
			or 500 × 11
	$3\frac{1}{3}$ or 3.3(..)	A1	4500 or 6000
			$3\frac{1}{3}$ or 3.3(..)can be implied by an an answer of 4 from correct working
	4 (bottles)	B1 ft	ft their fraction or decimal answer rounded up to nearest integer.
			SC2 for 4 with no working or unsupported

Q	Answer	Mark	Comments
5	**Alternative method 2**		
	1500 ÷ 10 or 150	M1	1 bottle of water is enough for 150ml apple juice
	500 ÷ their 150	M1	or repeated addition of 150 (at least 3)
			Allow their 150 from 1500 ÷ 10
			or 1500 ÷ 11
	$3\frac{1}{3}$ or 3.3(..)	A1	450 or 600
			$3\frac{1}{3}$ or 3.3(..)can be implied by an an answer of 4 from correct working
	4 (bottles)	B1 ft	ft their fraction or decimal answer rounded up to nearest integer.
			SC2 for 4 with no working or unsupported

Q	Answer	Mark	Comments
6(a)	80 − 74 or 6 seen	M1	or $\dfrac{74}{80}(\times 100)$ or 0.925 or 92.5
	$\dfrac{their\,6}{80}$ (×100) or 0.075	M1dep	or 100 – their 92.5 or 1 – 0.925 0.075 implies both method marks
	7.5	A1	SC1 for 8.1(...)
6(b)	11.5 kg	B1	Circled or indicated

Q	Answer	Mark	Comments
7(a)	(£) 10 − 6x	B1	Condone equation eg C=10 − 6x or change =10 − 6x
7(b)	**Alternative method 1**		
	10 − 4x = 2 their(10 − 6x)	M1	ft their 7(a) if linear
	10 − 4x = 20 − 12x	M1	or 5 − 2x = 10 − 6x expanding their bracket or dividing through by 2 ft their equation
	8x = 10 or 4x = 5	M1	collecting like terms ft their equation if x on both sides Allow one error
	1.25	A1ft	ft their 7(a) if linear
	Alternative method 2		
	c =10 − 6x **and** 2c=10 − 4x	M1	ft their 7(a) if linear Allow any letter except x for c
	2c = 20 − 12x (and 2c=10 − 4x)	M1	Or c =10 − 6x and c=5 − 2x oe
	0 =10 − 8x or 8x = 10	M1	Or 0 = 5 − 4x or 4x = 5
	1.25	A1	

	Alternative method 3		
	Trial of any price <(£)10 for both Mary and Ben with change calculated	M1	
	Trial of a second price <(£)10 for both Mary and Ben with change calculated	M1	If 1.25 is used as the first trial then a second trial is not required
	1.25	A1	**Note** 3 marks only for a numerical method

8	$\dfrac{16}{64}$ or $\dfrac{12}{40}$ or 4 : 1 or 4 : 1.2 or 3.3(3...) : 1	M1	oe
	Comparing equivalents 0.25 and 0.3 or 25(%) and 30(%) or $\dfrac{10}{40}$ and $\dfrac{12}{40}$ or 4 : 1 and 4:1 . 2 or 4 : 1 and 3.3(3...) : 1 with at least 1 correct	M1	oe Eg $\dfrac{80}{320}$ and $\dfrac{96}{320}$
	Both correct **and** Wet track	A1	

Q	Answer	Mark	Comments
9(a)	Plotted at mid class intervals	B1	±½sq
	Heights correct and joined with straight line	B1	Ignore ends ±½sq SC1 for one point omitted but all the rest fully correct
9(b)	Two valid comparisons about average, spread, distribution of ages.	B2	Examples using means (m = 46.5, f = 43.4) suggests male older using median (male 47.6, female 46.5) suggests male older on average the female club members were older (female mode 50-60, male mode 40-50) there is a wider age range/more variation in age for the male club members the oldest male is older than the oldest female/males have some over 60 but females don't/only the males go over 60 both distributions have more older members/ both distributions have fewer younger members the number of male members decline from about 50 whereas for females the number keeps on increasing

10	0.269 × 54 or 0.143 ×86	M1	
	14.(526)	A1	Allow use of a consistent number of washing machines and cookers Eg risk of cover for 1000 of each
	12.(298)	A1	14526 and 12298 gains A2 If number of units is not stated Q0
	Washing machine	Q1ft	ft their 14.(526) and their 12(.298) if M1 awarded Organised response and conclusion made.

Q	Answer	Mark	Comments
11	2000×1.032^3 or 2000×1.028^3	M1	Allow 3 years of compound interest added one year at a time
	2198.209… or 198.209…	A1	Accept any accuracy up to £2198
	2172.7479… or 172.747 or 2192.7479… or 192.747	A1	Accept any accuracy above 2172 up to £2173 Only accept 2192 from correct method seen (Use of simple interest gives exactly 2192 before the £20 is added)
	Correct method, at least one correct value and a valid conclusion based on their values with 'their bank B + £20' (2192 or 2193 if correct) or 25.46 > 20 Or bank A gives 5.46 more	Q1	Strand (iii). Do not penalise if values not rounded to 2dp.

Q	Answer	Mark	Comments
12	Lower limit 2km	B1	
	Upper limit 8km	B1	SC1 For 2 and 8 the opposite way round Penalise once $2x$ and/or $8x$
	Diagram or explanation showing that $5 - 3 = 2$ and $5 + 3 = 8$ or statement showing that they could live on **same** side of school or on **opposite** sides.	Q1	QWC strand ii Logical argument. Diagram must either clearly show how 2 and 8 apply or should clearly label where Dave and Helen could live

Q	Answer	Mark	Comments
13(a)	$0.4 \div 100 = 0.004$ Or $0.004 \times 100 = 0.4$	B1	
13(b)	[714,717]	B4	B3 for substituting all the correct values but an incorrect evaluation Or B3 for use of $N = -25$ leading to answer of [5263,5265} or B2 for use of $N = -25$ with incorrect evaluation or B2 for N= - 300 but $i = 0.4$ or 0.04 (once or twice) with correct evaluation or B1 for N= - 300 but $i = 0.4$ or 0.04 (once or twice) with incorrect evaluation or B1 for $i = 0.4$ (consistently) and $N = -25$ leading to answer of [50000,50050] or B1 for correct values submitted into either numerator or denominator if no other marks possible SC2 for using +300 with all other values correctly substituted and answer of [-216,-217]

Q	Answer	Mark	Comments
14	$\dfrac{40}{360} \rightarrow 2$ or 1 student = 20°	M1	Oe **Not** 20% = 1 student
	2 × 9 or 360 ÷ 20 or 18	M1	Calculating number failing first time
	their 18 ÷ 40 × 100 or 45 or 40% = their18 or 20% = 9	M1	
	0.6 **×** their 45 Or 18 + 9	M1	
	27	A1	

Q	Answer	Mark	Comments
15	**Alternative method 1**		
	$3f + 4p = 82.97$ Or $5f + 6p = 131.95$	M1	Must be algebraic not word form.
	$9f + 12p = 248.91$ **And** $10f + 12p = 263.90$	M1	or $15f + 20p = 414.85$ **and** $15f + 18p = 395.85$ Condone one error in totals
	$f = 14.99$	A1	
	$p = 9.5(0)$	A1	
	£205.42	B1ft	
	Logical argument with steps shown and correct conclusion made	Q1ft	Must gain method marks and make conclusion QWC strand iii
15	**Alternative method 2**		
	$3f + 4p = 82.97$ Or $5f + 6p = 131.95$	M1	
	$15f + 20p = 414.85$ **and** $15f + 18p = 395.85$	M1	
	$p = 9.5(0)$	A1	
	$82.97 + 131.95$ – their $9.5(0)$ or 214.92 – their $9.5(0)$	M1	Subtracting cost of one post from total of 8 panels and 10 posts
	£205.42	A1 ft	ft their 9.50
	Logical argument with steps shown and correct conclusion made	Q1 ft	Must gain method marks and make conclusion QWC strand iii

Q	Answer	Mark	Comments
16(a)	20 × 0.8 or 10 × 2.6 or 10 × 4.2 or 20 ×1.2	M1	Attempt at class width ×freq density oe
	16 + 26 + 42 + 24	M1	At least 3 correct oe
	108	A1	
16(b)	Bar from 120 to 130 at height 0.6	B1	

Q	Answer	Mark	Comments
17	1/8 or 12.5% seen or sample size 50 Or 51+ sample = 9 **or** 16-25 members = 104	M1	Or ÷ 8
	51+ sample = 9 **and** 16-25 members = 104	A1	
	26-50 members = 168	A1	
	26-50 sample = 21	B1ft	ft their 168 ÷ 8 rounded/truncated to integer or 50 – (7 + 13 + their 9)

Q	Answer	Mark	Comments
18(a)	$3h + 6s \leq 84$ (÷3)	B1	Must be correct inequality sign
18(b)	$h + s \leq 20$	B1	
18(c)	Draws their $h + s = 20$	B1ft	ft their (b)
	Draws $h = 5$	B1	
	Shades or indicates their feasible region	B1	Ft their (b) Must have at least 3 lines
	Tries an integer point close to or on vertex of their correct region	M1	Must have at least 3 lines and a clear region (5,11) = £99.50 (12,8) = £110 (6,11) = £104 (15, 5) = £102.5(0)
	110	A1	Answer of 110 with no graph/incomplete graph or incorrect graph gains M1 A1