GCSE

Applications of Mathematics (Linked Pair)

Higher Tier Paper 1 – Finance and Statistics
Mark scheme

Version/Stage: 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.
Q	Marks awarded for quality of written communication.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded 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.
25.3…	Allow answers which begin 25.3 e.g. 25.3, 25.31, 25.378.
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a candidate has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised.

Questions which ask candidates to show working

Instructions on marking will be given but usually marks are not awarded to candidates who show no working.

Questions which do not ask candidates to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the candidate intended it to be a decimal point.

Q	Answer	Mark	Comments

1(a)	43.66	B1	
	Additional Guidance		
	More than one value circled is B0		

1(b)	= B3*C3	B1	condone missing =
	Additional Guidance		
	D3 = B3*C3 or B3*C3 = D3 B0		

1(c)	= sum(D2 : D4) or = D2 + D3 + D4 or = B2*C2 + B3*C3 + B4*C4	Q2	Q1 for correct formula with no = sign or Q1 for D1 used instead of D2 QWC strand i Q1 correct formula with inclusion of D5 before equals sign eg D5 = D2 + D3 + D4
	Additional Guidance		
	Do not condone 2D, 3D etc = at the end of the formula is B0		

Q	Answer	Mark	Comments
	Alternative method 1		
	272 ÷ 1.36 or (£)200	M1	
	Their (£)200 × 1.03	M1	oe
	(£)206	A1	
	(£) 49	A1ft	ft 255 – their 206 if M2 awarded
	Alternative method 2		
	272 × 1.03 or 280.16	M1	oe
	Their 280.16 ÷ 1.36	M1	
	(£)206	A1	
	(£) 49	A1ft	ft 255 – their 206 if M2 awarded
2	**Alternative method 3**		
	272 ÷ 1.36 or 200	M1	
	200 ÷ 100 × 3 or 6	M1	
	200 and 6	A1	
	49	A1ft	ft 255 – their 206 if M2 awarded
	Alternative method 4		
	(£)255 × 1.36 or 346.8 euros	M1	
	272 × 1.03 or 280.16	M1	
	$\dfrac{\text{their } 346.8 - \text{their } 280.16}{1.36}$	A1	
	(£) 49	A1ft	SC3 66.64 euros (correct units must be stated)

Q	Answer	Mark	Comments
3	**Alternative method 1**		
	$\dfrac{1}{4} + \dfrac{6}{10}$ or $\dfrac{5}{20} + \dfrac{12}{20}$ or $\dfrac{17}{20}$	M1	oe
	$\dfrac{3}{20}$ is 9 or 9 × 20 ÷ 3	M1	oe
	60	A1	
	Alternative method 2		
	0.25 + 0.6 or 0.85 or 25% + 60% or 85%	M1	not 25 + 60 + 9
	0.15 = 9 or 15% = 9 or 9 ÷ 15 (× 100)	M1	oe
	60	A1	
	Alternative method 3		
	15 and 36 seen	M1	
	15 + 36 + 9	M1	
	60	A1	

Q	Answer	Mark	Comments
4(a)	$85n$ seen	M1	
	$85n + 35$	A1	Allow $85 × n + 35$ SC1 for $n85 + 35$
	Additional Guidance		
	Ignore £ signs Ignore C =		

Q	Answer	Mark	Comments
4(b)	**Alternative method 1**		
	Their $85n + 35 = 87.5n + 15$	M1	
	$20 = 2.5n$	M1 Dep	Combining like terms, condone one error
	8	A1ft	ft if equation is linear and answer is an integer
	Alternative method 2		
	One attempt at cost of same number of tables from both companies	M1	6 = 545 and 540 10 = 885 and 890
	An attempt for between 6 and 10 tables from both companies	M1	
	8	A1	

Q	Answer	Mark	Comments
5	**Alternative method 1**		
	1650 × 12 or £19 800	M1	
	(their 19 800 – 10 600) × 0.2	M1	oe
	1840	A1	
	Alternative method 2		
	10 600 ÷ 12 or 883.33(..)	M1	
	(16 500 – their 883.33) × 0.2 (×12)	M1	153.33 scores M2 (monthly tax)
	1840	A1	

Q	Answer	Mark	Comments
6(a)	The faster the (take-off) speed the greater the distance (jumped)	B1	oe

Q	Answer	Mark	Comments
6(b)	Line of best fit drawn from between (88.7, 96) and (88.7, 97.5) reaching to between (89.6, 103) and (89.6, 104.5) providing at least two points on either side of the line	B1	oe
	Correct reading from their line	B1ft	ft their line of best fit if increasing ± $\frac{1}{2}$ small square SC1 [98.5, 99.5] with no line of best fit

Additional Guidance

Their line must go horizontally from 88.7 to 89.6 minimum

Must be a good attempt at straight but does not have to be ruled.

If any line is drawn the SC does not apply.

Ignore subsequent rounding eg correct value from their line of 99.3 = 99 (ignore the 99)

Q	Answer	Mark	Comments
7	(P:Y) 6:15 or (P:B) 6:8 seen	M1	oe
	(P:Y) 6:15 and (P:B) 6:8 or 6:15:8 or 6 **and** 15 **and** 8	M1	
	29	A1	SC2 any multiple of 29
	Additional Guidance		
	Note multiplying all values by 7 (as 2+5= 7 and 3 + 4 =7) does not gain the first M1		

Q	Answer	Mark	Comments
8	Throw the dice and record the result	B1	Can be implied
	Reference to sample size of at least 30	B1	Must be from a single dice
	Reference to 1/6 or expected outcome from their sample size.	B1	
	Comparison of results with reference to how many / what proportion of sixes would be needed to show bias	B1	

Additional Guidance

Examples

Throw the dice 50 times and record the result. If the six comes up a lot more times than any other number the dice is biased B1B1B0B1

Throw the dice a lot of times and make a tally of the results. If there are more sixes the dice is biased. B1B0B0B0

The 1/6 can be implied by working out the expected number of sixes

eg 1 Uses 100 throws and states that about 16 sixes would be expected. If a lot more than 16 were thrown then the dice may be biased. B4

eg 2 Uses 100 throws and states that if half were 6's and the other numbers had a reasonable spread then the dice may be biased   B4

Q	Answer	Mark	Comments
9(a)	Leading question/tries to make people agree/biased towards the answer 'Yes'	B1	

Additional Guidance

The question is biased B0

Q	Answer	Mark	Comments
9(b)	Question with time frame eg How many hours of television did you watch last week?	B1	
	At least 3 non overlapping boxes covering all possibilities including zero	B1	

Additional Guidance

If the question asks 'How many hours…' allow integer responses eg 0, 1-2, 3-4 more than 4 as covering all possibilities

Q	Answer	Mark	Comments
9(c)	13, 18, 19 or 13, 17, 20 or 12, 18, 20	B2	B1 for 13, 18, 20 (total 51)

Q	Answer	Mark	Comments
10	0.05 × 12 000 or 600	M1	
	0.12 × 3000 or 360	M1	
	960	A1	Allow 961

Q	Answer	Mark	Comments
11	$5s + 2j = 30.95$ and $3s + j = 17.47$	M1	
	$6s + 2j = 34.94$	M1	or $15s + 6j = 92.85$ **and** $15s + 5j = 87.35$ oe Allow one error in totals
	$s = 3.99$ $j = 5.50$	A2	A1 for one correct

Q	Answer	Mark	Comments
12	13 × 25 or 325 or 9 × 80 or 720	M1	
	(Their 325 + their 720) or 1045	M1	
	their1045 ÷ 11 or 95	M1	
	10 fewer trips	A1	

Q	Answer	Mark	Comments
13(a)	$6.46 \times 10^7 \div 2.44 \times 10^5$	M1	
	264.7(....) or 264.8 or 264 or 265 or 2.64(…) $\times 10^2$	A1	

Q	Answer	Mark	Comments
13(b)	1.0054 seen	M1	
	$6.46 \times 10^7 \times (1.0054)^2$	M1	
	65 299 563.(..)	A1	
	6.53×10^7	B1ft	ft their answer given in standard form to 3 sf

Q	Answer	Mark	Comments
14(a)	$\dfrac{182 + 206 + 90 + 154}{4}$ or $\dfrac{632}{4}$	M1	
	158	A1	

Q	Answer	Mark	Comments
14(b)	All points at correct horizontal position	B1	
	All points at correct height 148, 152, 154, their 158	B1ft	ft their part (**a**)

Q	Answer	Mark	Comments
14(c)	Draws trend line and reads their next moving average as approx. 162	B1ft	ft their trend line
	$\dfrac{206 + 90 + 154 + x}{4} =$ their 162 or $206 + 90 + 154 + x =$ their 162 × 4	M1	oe
	198	A1	160 →190 161→194 163→202

Q	Answer	Mark	Comments
15(a)	One of 1.2, 2, 1.5, 1 or 0.3 seen	M1	oe Implied by one correct height
	Bars correct height and width	A2	± ½ square on height A1 for 3 correct or all fd's seen

Q	Answer	Mark	Comments
15(b)	$30 \times \dfrac{6}{20}$ or 9 or $(146 - 140) \times$ their 1.5	M1	oe
	12 + 20 + their 9	M1	
	41	A1	

16	28 500 or 135 seen	B1	Accept 28 499
	28 500 and 135 seen	B1	Accept 28 499
	Their 28 500 × their 135	M1	Use of their maximum values
	3 847 500 or 3847365	A1	

	Alternative method 1		
17	$\dfrac{2}{5}x + 15$ or $\dfrac{3}{7}(x + 15)$	B1	
	their $\dfrac{2}{5}x + 15$ = their $\dfrac{3}{7}(x + 15)$	M1	Must have term in x on each side of the equation
	$14x + 525 = 15x + 225$ or $\dfrac{60}{7} = \dfrac{1}{35}x$	M1	oe multiplying by 35 or rearranging to $ax=b$
	$(x =)\ 300$	A1	
	Logical algebraic steps with correct solution of their equation	Q1	QWC strand ii

Additional Guidance	
Common incorrect answer	
$\frac{2}{5}x + 15 = \frac{3}{7}x$	B1M1
$15 = \frac{1}{35}x$	M1
$x = 525$	A0Q1

	Alternative method 2		
17 cont	$\dfrac{r}{x} = \dfrac{2}{5}$ or $\dfrac{r+15}{x+15} = \dfrac{3}{7}$	B1	oe
	$\dfrac{r}{x} = \dfrac{2}{5}$ **and** $\dfrac{r+15}{x+15} = \dfrac{3}{7}$	M1	oe
	$7r + 105 = 3\left(\dfrac{5}{2}r\right) + 45$ or $7\left(\dfrac{2}{5}x\right) + 105 = 3x + 45$	M1	Eliminating a variable
	300	A1	
	Logical algebraic steps with correct solution of their equation	Q1	QWC strand ii

Q	Answer	Mark	Comments
17 cont	**Alternative method 3**		
	Tries any value for x in one part of equation eg $x = 100$ $\frac{2}{5} \times 100 + 15$ or $\frac{3}{7} \times 115$	B1	
	Uses both parts of equation and checks if equal eg $\frac{2}{5} \times 100 + 15 = 55$ and $\frac{3}{7} \times 115 = 49.(2…)$ No	M1	
	Tries $x = 300$ $\frac{2}{5} \times 300 + 15 = 135$ and $\frac{3}{7} \times 315 = 135$	M1	
	300	A1	
	Additional Guidance		
	Note that only 4 marks are available for a T&I approach The Q mark cannot be awarded.		

Q	Answer	Mark	Comments
18(a)	$0.5x + 0.25y \leqslant 8$ (× 4)	B1	

Q	Answer	Mark	Comments
18(b)	$2x + y = 32$ drawn on graph	B1	
	$x = 5$ and $y = 5$ drawn	B1	
	Correct feasible region shown using shading	B1	

Q	Answer	Mark	Comments
18(c)	At least one integer point at or closest to corner point of their feasible region tried	M1	(5,22) =£107 (13,5) = £95.50 (13,6) = £99 Note (14,5) is out of the region There must be a clear feasible region
	5 large and 22 small	A1	
	£107	A1	