AQA

GCSE

Mathematics

93701F Applications of Mathematics
Unit 1: Foundation Tier
Mark scheme

93701F

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Version 1.0 Final Mark Scheme

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.
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.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
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.
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.
3.14 …	Allow answers which begin 3.14 eg 3.14, 3.142, 3.149.
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.

Q	Answer	Mark	Comments
1(a)	4	B1	
1(b)	10	B1 ft	Follow through their key in part a × 2.5
	Additional guidance		
	If answer space is bank or answer is crossed out and not replaced check table.		
1(c)	Semicircle drawn for 'Very poor'	B3	ft their key throughout this question if key is even B2 for 'Very poor' = 2 B1 for 2 of 10, 6 and 4 seen for Very good, Average and Poor
	Additional guidance		
	Eg key of circle represents 2 will give 8 circles drawn for B3ft 16 for B2 5, 3 and 2 for B1 The frequency column does not have to be completed but check for any working/values there.		

Q	Answer	Mark	Comments
2(a)	1.9(0) + 1.2(0) or 3.1(0) or 10(.00) – 1.9(0) – 1.2(0)	B1	
	6.90	Q1	Strand (i) Correct money notation
2(b)	£2, £1, 50p, 10p, 5p	B2	Accept correct coins in any order B1 for £3.65 using a different number of coins B1 for poor notation eg 2, 1, 50, 10, 5 eg 2.00, 1.00, 50p, 10p, 5p eg 2.00, 1.00, 0.50, 0.10, 0.05
	Additional guidance		
	If coins such as £3 coins are used then award no marks. Correct coins identified in the work with communication error shown in answer, then ISW. Eg 2, 1, 50, 10, 5 in work but 2.00, 1.00, 0.50, 0.10, 0.5 award B1 However, fully correct solution in working £2, £1, 50p, 10p, 5p with an answer such as £2, £1, £50p, £10p, £5p gains only B1 as the answer contradicts the solution in the working due to its poor communication. If in doubt, then escalate the clip.		
2(c)	**Alternative method 1**		
	3 × 1.4(0) + 3 × 1.8(0) or 9.6(0) Or (1.4(0) + 1.8(0)) × 3 or 9.6(0)	M1	Implied by 6.8(0) or 6(.00)
	their 9.6(0) - 3 × 2.75	M1	
	(£)1.35(p)	A1	
	Alternative method 2		
	(1.4(0) + 1.8(0)) - 2.75 or 0.45	M1	Saving on one afternoon tea deal
	3 × their 0.45	M1	
	(£)1.35(p)	A1	

Q	Answer	Mark	Comments
2(d)	10 ÷ 1.2(0) or 8.3(3...)	M1	Or evidence of counting in 1.20's to 9.60
	8	A1	
	Additional guidance		
	Note: an answer of 8 following an arithmetical error does not gain the accuracy mark.		

3(a)	7	B1	
3(b)	'They increased' circled	B1	
3(c)	'England' circled	B1	

3(d)	**Alternative method 1**		
	84 (-) 68	M1	84 and 68 chosen
	16 and No	A1	
	Additional guidance		
	84 and 68 and not other percentages from the bar chart, or 84 – 68, or 68 – 84 If values close to 84 or 68 are being used, check the graph to see if scale is being misread, in which case M mark may be awarded.		
	Alternative method 2		
	68 + 20 or 88	M1	
	88 and 84 and No	A1	
	Alternative method 3		
	68 × 1.20 or 81.6	M1	oe
	81.6 and 84 and No	A1	
	Alternative method 4		
	84 - 20	M1	
	64 and 68 and No	A1	

Q	Answer	Mark	Comments
4(a)	0.05 × 315 + 22.5	M1	
	38.25	A1	
4(b)	**Alternative 1**		
	53.5 − 22.5 or 31	M1	
	Their 31 ÷ 0.05	M1	
	620	A1	SC2 1047.5 SC1 1.55 or 1520 SC1 −396.5
	Alternative 2		
	One trial of any number of units	M1	
	Improved trial of any number of units	M1	
	620	A1	SC2 1047.5 SC1 1.55 or 1520 SC1 −396.5
	Additional guidance		
	One complete trial must involve × 0.05 and +22.50 to find cost of gas bill.		

Q	Answer	Mark	Comments
5	6 paperbacks and 4 hardbacks	B3	Award B2 for a combination of at least 1 paperback and 1 hardback giving a total between £8 and £10 inclusive or £9 ÷ 1.9 = 4.7 **and** 4 hardbacks and 4 paperbacks (cost £7.60) Award B1 for any attempt at combinations of at least 1 paperback and 1 hardback with totals outside the range £8 to £10 but inside the range £4 to £14 or a multiple of either paperbacks or hardbacks giving a total between £8 and £10 inclusive. or £9 ÷ 1.9 or attempt at subtracting costs from £9 (at least 2 items subtracted)
	Additional guidance		
	Note: 4 paperbacks and 6 hardbacks have a cost of £10, so gains B2 Mark the answer lines first. If marks cannot be awarded for the answers on the answer lines then look at the working to see if marks can be awarded. In the working accept amounts to imply the number of books.		

Q	Answer	Mark	Comments
6(a)	Music and work	B1	Either order
6(b)	$\frac{80}{360}$	M1	oe
	$\frac{2}{9}$	A1	
6(c)	0.2 × 360 or 72(°) or 70 ÷ 360 or 0.19(4...) or (70 ÷ 360) × 100 or 19.(4...)(%)	M1	oe
	72(°) and Phil Or 0.19(4...) and 0.2 and Phil or 19.(4...)(%) and Phil or 0.6 (%) and Phil	A1	
7(a)	950	B1	
7(b)	300	B1	
7(c)	Athens is more expensive on average	B1ft	oe ft their (a)
	Prices for Rhodes are less variable	B1ft	oe ft their (b)
	Additional Guidance		
	Examples for B1 **Median comment** Median price is less so Rhodes holidays are cheaper Median difference = 45 so Rhodes is cheaper Median price is lower so Rhodes is cheaper Rhodes is cheaper Athens is more expensive **Range comment:** Range is smaller which mean the prices are closer together (less spread) **Examples for B0** Median diff = 45 Range diff = 24 Rhodes is cheaper (we do not know whether the comment is ref. the median or range)		

Q	Answer	Mark	Comments
8(a)	2	B1	
8(b)	11 × 5 + 2 × 9	M1	
	73	A1	
8(c)	107 = 7 × 11 + 2*D*	M1	Implied by 107 – 7×11 or 30
	(D=) 15 (miles)	A1	
	Additional guidance		
	Note: 15 may come from incorrect working, eg 107 ÷ 7 = 15.28, so answer = 15 This gains M0 A0		

9(a)	7	B1	
9(b)	31	B1	
9(c)	15	B1	
	15 does not appear in the stem-and-leaf diagram	B1ft	Oe ft their 15
	Additional guidance		
	For oe Accept 15 and no one scored between 8 and 17 in the stem and leaf diagram		
9(d)	8	B1	
	$\frac{their\ 8}{25}(\times 100)$	M1	
	32 (%)	A1ft	Ft their 8

Q	Answer	Mark	Comments
10	**Alternative method 1**		
	2.50 ÷ 3 or 3.40 ÷ 4	M1	Attempt to find cost per carton
	83(.3...)(p) **and** 85(p)	A1	
	Offer 1	Q1ft	Strand (iii) ft conclusion based on their 2 values provided M1 awarded.
	Alternative method 2		
	4 × £2.50 or 3 × £3.40	M1	oe Attempt to find cost for 12 cartons or a multiple of 12 cartons
	£10 **and** £10.20	A1	
	Offer 1	Q1ft	Strand (iii) ft conclusion based on their 2 values provided M1 awarded.
	Additional guidance		
	In Alt 2 they may use a multiple other than 12 cartons. They may be awarded M1 for any multiple that could be useful, for example 24. They then gain A1 for both values for their multiple found correctly.		
	Alternative method 3		
	3 ÷ 2.50 Or 4 ÷ 3.40	M1	Oe Attempt to find number of cartons per £1
	1.2 **and** 1.17(6..)	A1	Accept 1.17 or 1.18
	Offer 1	Q1 ft	Strand (iii) ft conclusion based on their 2 values provided M1 awarded.
	Alternative method 4		
	2.50 ÷ 3	M1	Cost of 4 pack at 3 carton offer price
	83(.3...)(p) × 4 = (£) 3.33(3...)	A1	Accept (£)3.33 or (£)3.32
	Offer 1	Q1ft	Strand (iii) ft conclusion based on their value provided M1 awarded.

10	**Alternative method 5**		
	3.40 ÷ 4	M1	Cost of 3 cartons at 4 pack price
	85(p) × 3 = (£) 2.55	A1	
	Offer 1	Q1ft	Strand (iii) ft conclusion based on their value provided M1 awarded.
	Alternative method 6		
	2.50 ÷ 3	M1	
	83(.3...)(p) and 90(p)	A1	
	Offer 1	Q1ft	Strand (iii) ft conclusion based on their value provided M1 awarded.

Q	Answer	Mark	Comments
11	**Alternative method 1**		
	(12 + 10 + 5) × 6 or 162	M1	
	Their 162 + 50 + 60 or 272	M1	
	Their 272 ÷ 1.18	M1	
	230(.5 ...) and No	A1	Accept 231
	Additional guidance		
	For the third M1 allow any relevant conversion from euros to pounds eg 12 euros, 10 euros, 5 euros 50 euros Their 162 must be from an attempt at a total for their daily costs. This could be 27 (12 + 10 + 5)		
	Alternative method 2		
	220 × 1.18	M1	
	(12 + 10 + 5) × 6 or 162	M1	
	Their 162 + 50 + 60 or 272 Or Their 259(.6) – their 162	M1	
	259(.6) and 272 and No Or 97(.6) and No	A1	Accept 260
	Alternative 3		
	220 × 1.18	M1	
	Their 259(.6) – (50 + 60)	M1	
	Their 149(.6) ÷ (12 + 10 + 5)	M1	
	5.54 days and No	A1	Accept 5.5 days and No

Q	Answer	Mark	Comments
12(a)	Line of best fit drawn from between (5,22) and (5,26) reaching to between (10,29) and (10,33) providing there are at least 2 points on each side of their line	B1	Intention to be straight
	Correct reading from their line.	B1ft	ft their line of best fit if increasing ±½ square SC1 [28,29] with no line of best fit
	Additional Guidance		
	The line therefore must go horizontally from 5 to 10 minimum Must be a good attempt at straight but does not have to be ruled. Must be the whole of their line. For B1 ft they must give the reading from their line. This line may be curved, zig,zag (points joined) If any line is seen then the SC does not apply. If they join the points **and** draw a line of best fit then ft the reading from the line of best fit only Ignore subsequent rounding eg correct value from their line of 28.8 = 29 (ignore the 29)		

Q	Answer	Mark	Comments
12(b)	No as temperatures are generally lower (in December /Winter) No. Weather conditions are different in December No. Graph is only for summer No. No data for December	B1	oe
	Additional Guidance		
	Box for 'No' ticked or 'No' used in working lines. Need to give the idea that December is such a different time of year that its not appropriate **Examples for B1** Temperatures rarely get above 16 in December Temperatures often below freezing in December They are in different seasons July and December have different weather conditions July temperatures would not be representative of December temperatures. No, because the temperatures in December are completely different to that of July. Because heat does not go as high as it does in summer. It's cold in December Because it won't be summer **Examples for B0** Less hours of sunshine in December The graph shows the maximum temperature in July Its only measured on 7 days in July The max temperature doesn't go low enough for December/start low enough Line of best fit is lower in December.		

Q	Answer	Mark	Comments
13	**Alternative method 1**		
	15 × 1.60 or 24 or 25 × 1.20 or £30	M1	
	15 × 1.60 + 25 × 1.20 or 54	M1	Implies first M1
	$\frac{\text{their}54}{15+25}$	M1	dep on M2
	1.35	A1	
	Additional Guidance		
	54 seen can imply M2 if it is then used. If it is replaced by a different method then it is choice. **Example** 15 × 1.60 + 25 × 1.20 = 54 Answer 2.80 M0M0M0A0 (2.80 comes from 1.60 + 1.20. This is a different method so choice.)		
	Alternative method 2		
	$\frac{15}{15+25}$ or $\frac{3}{8}$ or $\frac{25}{15+25}$ or $\frac{5}{8}$ or ratio 3:5 used	M1	
	Their $\frac{3}{8}$ × 1.60 or 0.6 or their $\frac{5}{8}$ × 1.2 or 0.75	M1	their $\frac{3}{8}$ and their $\frac{5}{8}$ must come from $\frac{15}{15+25}$ and $\frac{25}{15+25}$
	Their 0.6 + their 0.75	M1	dep on M2
	1.35	A1	
	Additional Guidance		
	1.6(0) ÷ 8 or 1.2(0) ÷ 8 seen implies correct ratio		

13	**Alternative method 3**		
	15 × 1.60 or £24 or 25 × 1.20 or £30	M1	
	$\frac{their\,24}{15+25}$ or $\frac{their\,30}{15+25}$	M1	oe Implies first M1
	their $\frac{24}{40}$ + their $\frac{30}{40}$ or their 0.6 + their 0.75	M1dep	oe dep on M2
	1.35	A1	
	Additional Guidance		
	their 24 and their 30 must come from correct method Incorrect conversion from fraction to decimal can still score the method marks For example $\frac{24}{40}$ =0.4 $\frac{30}{40}$ =0.75 0.4 + 0.75 = 1.15 This scores M1M1M1 A0		

Q	Answer	Mark	Comments
14(a)	Doesn't have a time frame eg how often each week month etc or Words rarely, very often, mean different amount of times to different people or are too vague or are not specific enough/difficult to decide which box to tick or Don't need to include 'Never'	B2	oe B2 for two distinct criticisms B1 for one correct criticism
	Additional Guidance		
	Ignore incorrect statements –give credit for correct ones under either criticism eg two correct criticisms under criticism 1 Comments such as 'it should be once a week , twice a week and so on' gain the B1 for the lack of time frame but not for the criticism of the response boxes Condone 'there is a gap between rarely and very often' for the mark for poorly defined boxes **Examples for B1** Doesn't have a weekly/monthly section It's not specific on days, like, it's too rough (Time frame) Not detailed enough – for example how often do you visit per week? (second part gets the mark) No time scale of when they are talking about eg per month Very often could mean different things to different people Response boxes are too vague **Examples for B0** Reference to needing numbered response boxes It is too vague/ It is not specific enough ('it' needs to be clarified eg the words are too vague) It doesn't give a clear amount of how many times people go. The response section doesn't give much information on how many times they came to the restaurant. It isn't specific when they come		

Q	Answer	Mark	Comments
14(b)	Suitable question with time frame	B1	Eg how many times a month/last month do/did you visit this restaurant
	At least 3 response boxes, not overlapping, no gaps, to cover all possible values for their question	B1	'None' or equivalent does not have to be included
	Additional guidance		
	If the time frame is one week it is reasonable to have boxes covering no more than 7 or for a month it could be 30/31 . However they could still have a larger range in case customers have more than one meal per day at the restaurant. Time frame may be in the response section. Response boxes should be appropriate for how often customers visit his restaurant –not some irrelevant question they have asked **For example** How many friends come with you to the restaurant Boxes 0, 1, 2, 3 or more B0 B0 'Other' is not acceptable to cover any they miss! Allow 5+ (for example) to mean '5 and over' or 'over 5' Inequalities must be used correctly		

Q	Answer	Mark	Comments
15	x + 12	B1	used for Sam Implied by correct equation
	x + 2 x + their (x + 12) = 84	M1	oe their x + 12 can be anything, even just12 but must not contradict anything they give separately for Sam
	4 x = 72 or x = 18	M1	Collection of their like times and rearrangement to $ax = b$
	30	A1	
	Organised algebraic response and solution	Q1ft	Must gain both method marks and give a solution QWC strand (ii) SC3 30 from a numerical/T&I approach. SC2 for 18 from a numerical/T&I approach.
	Additional Guidance		
	Their x + 12 used in the equation must not contradict anything they give separately for Sam $4x+12=84$ is B1M1 The Q mark is for an algebraic method leading to their solution **Example** $3x+12=84 \quad 3x=72$ Answer 24 **B0M1M1A0Q1ft** Condone one arithmetical slip for the second Method mark-eg 84 – 12 = 76 Adding 12 instead of subtracting 12 is not an arithmetical error – it is incorrect method Answer 18 from a correct algebraic method is B1M1M1A0Q1 Allow omission of x = for their answer of 18 if it comes from solving an equation **Example** $4x+12=84$ 84 – 12 = 72 72 ÷ 4 = 18 Answer 30 **B1 (implied) M1M1A1Q1** If they give all three answers they must link Sam with 30 eg Andrew 18, Nigel 36, Sam 30 If awarding SC for a numerical approach do not award B1 for x+12 seen		

16	**Alternative method 1**		
	$\frac{1}{4} + \frac{1}{8}$ or $\frac{3}{8}$	M1	oe
	1 – their $\frac{3}{8} = 30$ or $\frac{5}{8} = 30$	M1	
	30 ÷ numerator × their denominator	M1dep	30 ÷ 5 × 8
	48	A1	
	Additional guidance:		
	Oe Allow use of decimals or equivalent fractions.		
	Alternative method 2		
	One complete trial with a multiple of 8	M1	
	A second improved trial with a multiple of 8	M1	
	Trial with 48	M1	
	48	A1	
	Additional guidance:		
	One complete trial includes everything that allows a comparison to be made. Eg For a trial of 80: ¼ of 80 or R(ed) = 20, $^1/_8$ of 80 or B(lue) = 10, 20 (+) 10 (+) 30 (=) 60. (60 is not the same as 80) NB Watch out for trial of 80: R = 20, B = 40, Y = 30 total = 90, which gains M0 as the fractions used are not correct (they have doubled ¼ to find 1/8 but have actually found ¼ and 1/2)		
	Alternative method 3		
	$\frac{x}{4} + \frac{x}{8}$	M1	
	$\frac{x}{4} + \frac{x}{8} + 30 = x$ or $2x + x + 240 = 8x$	M1	
	$240 = 5x$	M1	Simplifies to $ax = b$ condone one arithmetical error
	(x =) 48	A1	

Q	Answer	Mark	Comments
17(a)	Midpoints used	B1	At least 4 correct
	(2.5 × 2) + (7.5 × 6) + (12.5 × 8) + (17.5 × 3) + (22.5 × 1) or 5 + 45 + 100 + 52.5 + 22.5 or 225	M1	Attempt at Σfx using values on or between class boundaries. Condone 1 error. May be seen in the table. Correct fx values implies B1
	Their 225 ÷ 20	M1	Division by 20
	11.25 (minutes) or 11 minutes 15 seconds	A1	Ignore subsequent rounding or incorrect conversion to mins and secs if 11.25 seen 11 with no working is B0M0M0A0 SC2 for 13.75 or 8.75 with no working (use of upper or lower class boundaries)
	Additional Guidance		
	Midpoints must be used correctly. Not just added up and divided by 5 Mark the method that leads to their answer. **Example** fx column completed correctly but then method shows 20 ÷ 5 answer 4 gains no credit for the fx column		
17(b)	Suitable reason eg, Raw data not known Midpoints used to represent the class Data is/are grouped, not individual values	B1	oe
	Additional Guidance		
	Allow reference to just one group eg The average for 0 to 5 may be higher or lower than 2.5		