AQA Qualifications

GCSE

Mathematics

Unit 1 43601H

Mark scheme

43601H
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Version 1: 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.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

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
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 …	Accept 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)	Positive	B1	Ignore any other description Accept eg strong positive, weak positive correlation

1(b)	[28, 29] seen or 40 + [24, 30] or [64, 70]	M1	[28, 29] may be seen on graph
	[68, 69]	A1	SC1 Answer [78, 79] with correct point or line(s) marked on graph SC1 Answer [91, 92]
	Additional Guidance		
	[28, 29] seen even with other values or different answer given		M1A0
	Correct working up to [68, 69] but then gives the answer 70		M1A1
	$\frac{68}{90}$ or $\frac{69}{90}$ etc		M1A0
	$\frac{68}{170}$ or $\frac{68}{180}$ or $\frac{68}{200}$ etc		M1A1

Q	Answer	Mark	Comments
2(a)	Suitable hypothesis	Q1	Strand (i) eg Girls are more likely to study Economics More boys study Economics Girls are less likely to study Economics than boys
	Additional Guidance		
	Must mention girls/ boys **and** studying Economics		
	Must be a suggested outcome and **not a question**		
	Condone a correct hypothesis followed by a reason why it may be true		
	May start 'I think', 'I predict', 'I believe' and condone 'should be'		
	Condone 'home economics'		
2(b)	Two-way table with boys/ girls as row/ column and Yes/ No as column/ row	B2	oe B1 boys/ girls or Yes/ No B0 questionnaires intended for individuals to complete
	Additional Guidance		
	Condone a list where all four options can be worked out ie you can tell how many: (1) boys planning E, (2) boys not planning E, (3) girls planning E, (4) girls not planning E This may also be seen as two separate lists/ tally charts		
	Condone questions as headings		
	Ignore any attempt to fill in cells and allow any extra rows/columns eg Don't know or Frequency		
	If the student gives a data collection sheet and a questionnaire, ignore the questionnaire		
	Yes/ No could be indicated by a tick or cross		

Q	Answer	Mark	Comments
3(a)	9 : 5 : 6	B1	
3(b)	$\frac{3000}{6000} \times 100$ or $\frac{1800}{6000} \times 100$ or $\frac{1200}{6000} \times 100$	M1	oe $\frac{50}{100}$ or $\frac{30}{100}$ or $\frac{20}{100}$ or 50 (white) or 30 (brown) or 20 (granary) seen or implied
	50 (white) and 30 (brown) and 20 (granary) seen or implied	A1	
	Bar drawn in correct position and shaded (in correct order) with correct length, divisions and width	B1ft	$\pm \frac{1}{2}$ small square ft their 50, 30 and 20 with bar total 100%
	Additional Guidance		
	Mark the graph first: a correct bar implies all 3 marks		M1A1B1
	Shading can be incomplete (eg only two parts shaded) as long as unambiguous or can use labelling eg white/ brown/ granary or W/B/G		
	A bar drawn in the wrong order must have the correct shading		M1A1B0
	Correct bar with incorrect width or position		M1A1B0
	Condone a bar in the wrong position if it is a replacement for an incorrect bar in the right position		
	30, 18, 12 (30 is for white)		M0A0B0ft
	Any correct section in the graph can imply M1 but you must check it is not from incorrect working eg 6000 ÷ 3000 = 2 → 20%, 6000 ÷ 1800 = 3 → 30%, 6000 ÷ 1200 = 5 → 50% Then bar drawn 20 : 30 : 50 Do **not** award M1 for brown = 30 if this method is seen but they can have B1ft if their bar follows through from their working and totals 100		M0A0B1ft

Q	Answer	Mark	Comments
4	40 – 22 or 18 (female) or (40 – 10) ÷ 2 or 15 (male or female)	M1	Condone $\frac{18}{40}$ or $\frac{15}{30}$
	their 18 – their 15 or 22 – their 15 or 7 (males sold) or (10 – (22 – their 18)) ÷ 2 or $\frac{10-4}{2}$	M1dep	Condone $\frac{7}{30}$ or $\frac{3}{30}$
	3	A1	
	Additional Guidance		
	Answer 13 often comes from 18 – 5 so if 18 is seen award the first mark		M1M0A0
	3 should not be awarded full marks if it comes from an incorrect method		

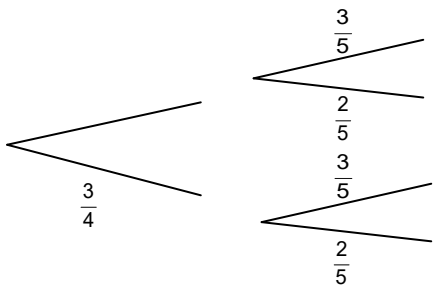
5(a)	Point marked at (100, 0.18)	B1	± $\frac{1}{2}$ small square

5(b)	500	B2	B1 0.1 × 5000 oe or answer of 900 or 850 or 750 or 700 or 640 or 600 or 575 or 550 or 475
	Additional Guidance		
	A correct answer using any relative frequency from the graph or using the average of all of them		B1
	Answer of 500 out of 5000		B2
	Answer $\frac{500}{5000}$		B1
	The calculation for B1 may be seen in stages eg 100 per 1000 and 100 × 5		B1

Q	Answer	Mark	Comments
6	900 × 360 ÷ 120 or 900 × 3 or (900 + 450) × 2	M1	oe
	2700	A1	
	their 2700 ÷ 20 × 80	M1	oe
	10 800	A1ft	ft their 2700 × 4 SC2 13 500
	Additional Guidance		
	A wrong start can still pick up the last two marks eg 900 × 120 ÷ 360 = 300 300 ÷ 2 = 150 150 × 8 = 1200		M0A0 M1A1ft
	Allow 900 for their 2700 eg 900 × 4 → 3600		M0A0M1A1ft
	1800 said No Answer 7200 (either M can be implied)		M0A0 M1A1ft
	1350 = 20% Answer 5400 (either M can be implied)		M0A0 M1A1ft
	900 × 12 as a full method, answer 10 800		M1A1M1A1
	900 × 12 as a full method with incorrect answer		M1A1M1A0

Q	Answer	Mark	Comments
7(a)	0.56 + 0.19 + 0.14 + 0.08 or 0.97 or 1 – 0.56 – 0.19 – 0.14 – 0.08 or 100 – 56 – 19 – 14 – 8 or 100 – 97	M1	
	0.03 or 3% or $\frac{3}{100}$	A1	
	Additional Guidance		
	3 without %		M1A0
	Embedded answer: 0.97 + 0.03 = 1 (table blank)		M1A0
	Table wins unless blank		
7(b)	1.28 or 128% or $\frac{128}{100}$	B1	
	9 400 000 ÷ 1.28	M1	oe 9 400 000 ÷ 128 × 100
	7 343 750 or 7 343 800 or 7 344 000 or 7 340 000	A1	Accept 7 300 000 with working SC2 13 055 555.(...) or 13 055 556
	Additional Guidance		
	Condone mistakes in number of zeros for M1 and allow recovery for 3 marks		
	Accept answers as eg 7.34 million		
	For the special case allow the marks if they give full values but then round		SC2
	6 768 000		B0M0A0

Q	Answer	Mark	Comments
8(a)	1.4×10^{-2}	B2	B1 0.013(8...) or 0.014 oe or 1×10^{-2} or B1ft ft their answer with at least 3 sf given in standard form to 2 sf SC1 1.9×10^{-2} or 2.2×10^{-2}
8(b)	$(3.9 \times 10^{-7}) \div (1.2 \times 10^{-8})$	M1	Digits 325 imply M1
	32(.5) or 3.2(5) × $10^{(1)}$ or 33 or 3.3 × $10^{(1)}$	A1	SC1 0.03(0769...) or 3(.0769...) × 10^{-2}
9(a)	Correct box plot with min 40, lower quartile 42, median 43, upper quartile 43.5 and max 46.5	B3	B2 any four values correctly plotted or lower quartile 42, median 43 and upper quartile 43.5 B1 lower quartile 42 or median 43 or upper quartile 43.5 Allow ± ½ small square tolerance
	Additional Guidance		
	The box plot wins but if blank the stated values may gain up to B2		
	Mark intention throughout		
	Accept unconventional plots eg line through middle of box arrows/ dots/ longer vertical lines/ no endings on whiskers any depth of box any vertical alignment but not overlapping Ben's (max B2 if it overlaps Ben's)		
	Assume a box without a median line represents the LQ and UQ		

Q	Answer	Mark	Comments
9(b)	Zoe because her inter-quartile range is smaller or Zoe and her inter-quartile range = 1.5 and Ben's = 2	B1ft	oe Accept Zoe because her range is smaller or Zoe and her range = 6.5 and Ben's = 7 ft their complete box plot
	Additional Guidance		
	If values are quoted they must be correct, but follow through their values from a (completed) box plot		
	They must be using inter-quartile range (IQR) or range. Ignore comments about other measures		
	If they do not have a complete box plot, then assume they are using the graph		
	Must use the words range or (inter-)quartile range – do not accept a description of the measure		
	If the 'correct' answer is seen but it does not match their box plot, please escalate the clip		
	Accept eg Zoe because her IQR is closer/ lower		B1
10(a)		B2	oe B1 at least **two** correct probabilities in the correct position
	Additional Guidance		
	Accept decimals or percentages or equivalent fractions. $\frac{3}{4}$ may be 0.75 or 75% $\frac{3}{5}$ may be 0.6(0) or 60% $\frac{2}{5}$ may be 0.4(0) or 40%		

Q	Answer	Mark	Comments
10(b)	**Alternative method 1**		
	$\frac{1}{4}\times$ their $\frac{3}{5}$ or $\frac{3}{20}$ **or** their $\frac{3}{4}\times$ their $\frac{2}{5}$ or $\frac{6}{20}$ or $\frac{3}{10}$	M1	oe
	$\frac{1}{4}\times$ their $\frac{3}{5}$ + their $\frac{3}{4}\times$ their $\frac{2}{5}$	M1dep	oe
	$\frac{9}{20}$ or 0.45 or 45%	A1ft	oe ft their tree diagram (for probabilities < 1)
	Alternative method 2		
	$\frac{1}{4}\times$ their $\frac{2}{5}$ or $\frac{2}{20}$ or $\frac{1}{10}$ **and** their $\frac{3}{4}\times$ their $\frac{3}{5}$ or $\frac{9}{20}$	M1	oe
	$1-(\frac{1}{4}\times$ their $\frac{2}{5}+$ their $\frac{3}{4}\times$ their $\frac{3}{5})$	M1dep	oe
	$\frac{9}{20}$ or 0.45 or 45%	A1ft	oe ft their tree diagram (for probabilities < 1)
	Additional Guidance		
	$\frac{9}{20}$ from $\frac{3}{4}\times\frac{3}{5}$ (and correct tree diagram)		M0M0A0
	Allow up to M1 if all four combined probabilities shown next to tree diagram and no work of further merit seen		M1
	Students may restart in part (b) and not use their tree diagram		
	Correct method seen for top, bottom or middle two probabilities		M1

Q	Answer	Mark	Comments
11(a)	440 × 150 ÷ 1200 or 1200 ÷ 150 = 8 or 150 ÷ 1200 = 0.125 oe	M1	oe 440 ÷ 8 or 440 × 0.125 Condone 150 × [0.36, 0.37] implied by [54, 55.5]
	55	A1	
	Additional Guidance		
	Do not allow 1040 as a misread for 1200 eg 440 × 150 ÷ 1040 = 63		M0A0
	but there is a correct method using 1040 where the student works out that there are 130 in the sample from the main school and works out 130 ÷ 1040 × 440 oe (which evaluated is 55)		M1(A1)

Q	Answer	Mark	Comments
11(b)	**Alternative method 1**		
	160 × 150 ÷ 1200 or 150 – 75 – their 55 or 20	M1	oe eg 160 ÷ 8 Condone 150 × 0.13(...)
	11 and 9 or 9 × 1200 ÷ 150 or 88 seen	M1	oe Condone 8 × 1200 ÷ 150 with 12 or 20 seen
	72	A1	
	Alternative method 2		
	2 × 1200 ÷ 150 or 2 × 8 or 16	M1	oe
	(160 – their 16) ÷ 2 or 160 ÷ 2 – their 16 ÷ 2 or 88 seen	M1	oe
	72	A1	
	Additional Guidance		
	Two numbers with a difference of 16	M1	
	Allow eg 12000 or 2000 or 2100 as a misread of 1200 for up to M2		
	Check table for possible creditworthy work		
	If they use an incorrect scale factor in (b) that follows through from (a), then escalate the clip		
	In Alt 1 for the second M1 accept **their** 9 × 1200 ÷ 150 if their 9 comes from an arithmetic error with full method shown		
	11 and 9 seen even with other wrong working	M2	

Q	Answer	Mark	Comments
12	120 **and** 100 in correct positions in the table	B1	
	120 – 140 bar 4.5 large squares high	B1	
	140 – 180 bar 1 large square high	B1	
	Correct vertical scale or key shown	Q1	Strand (ii) 1 large square = 20 ribbons oe or 5 small squares = 4 ribbons oe or scale of 2 per cm
	Additional Guidance		
	Only need to show **one** graduation for scale but if more shown must be correct		
	If correct scale is shown ignore any workings on the histogram		
	Correct frequency on one bar is equivalent to a key as long as the scale does not contradict		
	Look for 'key' near table but do not allow it written as working in the working lines		

Q	Answer	Mark	Comments
13	**Alternative method 1**		
	Identifying possible totals as 4, 6 and 5, 6	M1	Ignore 5, 5 and 6, 6 for M1 May be in sample space diagram or list
	At least three of 4, 6 and 6, 4 and 5, 6 and 6, 5 **only**	M1dep	3 or 4 correct totals chosen in sample space or list (with 30 or 36 outcomes)
	$\frac{1}{6}\times\frac{1}{5}$ or 30 outcomes stated	M1	Denominator of 30
	$\frac{4}{30}$ or $\frac{2}{15}$ or 0.133... or 13.3...%	A1	SC2 $\frac{4}{36}$ oe (from all 4 outcomes) SC1 $\frac{2}{36}$ oe (from 4, 6 and 5, 6)
	Alternative method 2		
	Identifying possible totals as 4, 6 and 5, 6	M1	Ignore 5, 5 and 6, 6 for M1 May be in sample space diagram or list
	Complete list of 15 pairs with **only** 4, 6 and 5, 6 chosen	M1dep	Condone list with any of 1, 1 and 2, 2 etc included
	15 outcomes stated	M1	Denominator of 15
	$\frac{2}{15}$ or 0.133... or 13.3...%	A1	SC2 $\frac{4}{36}$ oe (from all 4 outcomes) SC1 $\frac{2}{36}$ oe (from 4, 6 and 5, 6)
	Additional Guidance		
	The special cases must come from either no working or the methods stated in brackets		
	If a sample space or list is used the possible totals must be identified eg ringed for M1M1 but a correct numerator with a correct sample space or list may imply the correct pairs for M1M1		
	A sample space diagram may be incomplete if unambiguous		
	In any list or diagram allow one error or omission or repeat and always allow 1, 1 and 2, 2 etc		
	Sample space with 36 outcomes and 6 possible pairs chosen (including 5, 5 and 6, 6) is likely to lead to the answer $\frac{6}{36}$ or $\frac{1}{6}$		M1M0M0A0

Q	Answer	Mark	Comments
14	**Alternative method 1**		
	8.5 or 9.5 or 0.145 or 0.155 seen	B1	
	9.5 ÷ 0.145 or 65.5...	M1	Condone (9, 9.5] ÷ [0.145, 0.15)
	65	A1	Must be using 9.5 and 0.145
	Alternative method 2		
	8.5 or 9.5 or 0.145 or 0.155 seen	B1	
	0.145 × 65 = 9.425 and 0.145 × 66 = 9.57	M1	Condone [0.145, 0.15) × n = a and [0.145, 0.15) × (n + 1) = b where a < 9.5 and b > 9.5
	65	A1	Must be using (9.5 and) 0.145
	Additional Guidance		
	9.49 ÷ 0.145 = 65.4... answer 65		B1M1A0
	Answer only of 65		B0M0A0
	Allow conversion to millilitres throughout		
	$9.4\dot{9}$ is equivalent to 9.5 so can score full marks but do not accept use of eg 9.499 for the A mark		