

GCSE

# Methods in Mathematics (Linked Pair)

Foundation Tier Unit 1 Algebra and Probability  
Mark scheme

9365

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Version 1.0 Final

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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](http://aqa.org.uk)

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## 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.

<b>M</b>	Method marks are awarded for a correct method which could lead to a correct answer.
<b>M dep</b>	A method mark dependent on a previous method mark being awarded.
<b>A</b>	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>B</b>	Marks awarded independent of method.
<b>B dep</b>	A mark that can only be awarded if a previous independent mark has been awarded.
<b>Q</b>	Marks awarded for quality of written communication.
<b>ft</b>	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
<b>SC</b>	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
<b>oe</b>	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
<b>[a, b]</b>	Accept values between $a$ and $b$ inclusive.
<b>25.3 ...</b>	Allow answers which begin 25.3 e.g. 25.3, 25.31, 25.378.
<b>Use of brackets</b>	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.

<b>Q</b>	<b>Answer</b>	<b>Mark</b>	<b>Comments</b>
<b>1 (a)</b>	$\frac{7}{10}$	B1	
<b>1 (b)</b>	500 000	B1	
<b>1 (c)</b>	47.78	B1	
<b>2 (a)</b>	C	B1	
<b>2 (b)</b>	D	B1	
<b>2 (c)</b>	A and D	B1	Either order

Q	Answer	Mark	Comments	
<b>2 (d)</b>	2, 5, 5, $x$ where $x$ is any number other than 2	B2	Any order Condone a blank space for $x$ B1 One of the criteria met, i.e. one 2 or two or more 5s	
	<b>Additional Guidance</b>			
	The Answer spinner takes precedence but if this is blank mark the Practice spinner			
	Allow use of decimals/fractions/negatives			
	Examples:			
	5 5 2 4		B2	
	5 5 2 blank		B2	
	5 4 2 – 2 (only one 5)		B1	
	5 5 5 5 (2 missing)		B1	
	5 5 2 2 (too many 2s)		B1	
	5 4 2 1 (not enough 5s)		B1	
	5 5 3 1 (2 missing)		B1	
	4 3 2 1 (no 5s)		B1	
5 4 3 1 (not enough 5s and 2 missing)		B0		
<b>3</b>	60 × 3 or 180 or 60 ÷ 4 or 15 or 60 × 3.25	M1		
	195	A1	SC1 189	
	<b>Additional Guidance</b>			
	60 × 3.15	M0		

Q	Answer	Mark	Comments
4	<b>Alternative method 1</b>		
	12 ÷ 3 or 4 or 4 × 3 = 12 or their 4 + 10 or (x – 10) × 3 = 12 or reverse flow diagram showing ÷ 3 and + 10 in the correct order	M1	If their first operation is incorrect they can still get M1 by adding 10  oe any letter or symbol
	14	A1	SC1 46 or – 6
	<b>Alternative method 2</b>		
	Trial of any number correctly evaluated	M1	eg 13 – 10 = 3, 3 × 3 = 9
	14	A1	SC1 46 or – 6
	<b>Additional Guidance</b>		
12 + 10 ÷ 3 or (12 + 10) ÷ 3		M0 A0	
5 (a)	35 53 36 63 45 54 46 64	B2	B1 No more than 2 errors or 34 and 43 and 56 and 65 also given
	<b>Additional Guidance</b>		
	Be careful of repetitions		
	An error could be an incorrect number or an omission		

Q	Answer	Mark	Comments
5 (b)	$\frac{6}{8}$ or $\frac{3}{4}$ or 0.75 or 75%	B1ft	oe fraction, decimal or percentage ft a list of at least four numbers
	<b>Additional Guidance</b>		
	Ignore incorrect cancellations of $\frac{6}{8}$		
	Ignore descriptive words such as ‘likely’		
	ft from their list in (a) provided at least 2 more numbers have been written down		
	Use of words eg 6 in 8		B0
	6 : 8 oe		B0
6	<b>Alternative method 1</b>		
	1 + 0.5 + 0.1 or 1.6(0)	M1	oe using pence
	24 ÷ their 1.6 (× 3) or 15	M1	oe using pence
	45	A1	SC1 104 or 312
	<b>Alternative method 2</b>		
	Works out a total value using the same number of coins in each box	M1	
	15 (coins in each box)	M1	
	45	A1	SC1 104 or 312
	<b>Additional guidance for Q6 is overleaf</b>		



Q	Answer	Mark	Comments
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6	<b>Additional Guidance</b>																																																														
	<p>The table gives the values for 1 to 20 coins in each box:</p> <table border="1" data-bbox="338 517 1082 1641"> <thead> <tr> <th data-bbox="344 526 624 600">Number of coins in each box</th> <th data-bbox="624 526 874 600">Total number of coins</th> <th data-bbox="874 526 1075 600">Value (£)</th> </tr> </thead> <tbody> <tr><td>1</td><td>3</td><td>1.60</td></tr> <tr><td>2</td><td>6</td><td>3.20</td></tr> <tr><td>3</td><td>9</td><td>4.80</td></tr> <tr><td>4</td><td>12</td><td>6.40</td></tr> <tr><td>5</td><td>15</td><td>8.00</td></tr> <tr><td>6</td><td>18</td><td>9.60</td></tr> <tr><td>7</td><td>21</td><td>11.20</td></tr> <tr><td>8</td><td>24</td><td>12.80</td></tr> <tr><td>9</td><td>27</td><td>14.40</td></tr> <tr><td>10</td><td>30</td><td>16.00</td></tr> <tr><td>11</td><td>33</td><td>17.60</td></tr> <tr><td>12</td><td>36</td><td>19.20</td></tr> <tr><td>13</td><td>39</td><td>20.80</td></tr> <tr><td>14</td><td>42</td><td>22.40</td></tr> <tr><td>15</td><td>45</td><td>24.00</td></tr> <tr><td>16</td><td>48</td><td>25.60</td></tr> <tr><td>17</td><td>51</td><td>27.20</td></tr> <tr><td>18</td><td>54</td><td>28.80</td></tr> <tr><td>19</td><td>57</td><td>30.40</td></tr> <tr><td>20</td><td>60</td><td>32.00</td></tr> </tbody> </table> <p>For the SC:                      104 is from a misconception that each box contains £8                      312 is from a misconception that each box contains £24</p>	Number of coins in each box	Total number of coins	Value (£)	1	3	1.60	2	6	3.20	3	9	4.80	4	12	6.40	5	15	8.00	6	18	9.60	7	21	11.20	8	24	12.80	9	27	14.40	10	30	16.00	11	33	17.60	12	36	19.20	13	39	20.80	14	42	22.40	15	45	24.00	16	48	25.60	17	51	27.20	18	54	28.80	19	57	30.40	20	60
Number of coins in each box	Total number of coins	Value (£)																																																													
1	3	1.60																																																													
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18	54	28.80																																																													
19	57	30.40																																																													
20	60	32.00																																																													

7 (a)	False True True	B3	B1 for each
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Q	Answer	Mark	Comments
7 (b)	(0.5, 2.5)	B1	
	<b>Additional Guidance</b>		
	If the answer line blank, check for the point marked on the grid with coordinates given		
8	Correct conversion of either fraction to a decimal or percentage or converts both fractions to a common denominator with at least one numerator correct or correctly expresses percentage <b>or</b> decimal in fraction form	M1	$\frac{13}{20} = 0.65$ or 65% <b>or</b> $\frac{16}{25} = 0.64$ or 64% or eg $\frac{65}{100}$ <b>and</b> $\frac{64}{100}$ with at least one of 65, 64 correct or eg $\frac{64.5}{100}$ <b>or</b> $\frac{635}{1000}$
	Conversion to a common form with all correct and 0.635	A1	Answer may be given in any form Condone omission of conversion of 64.5% from working if answer is correct
	<b>Additional Guidance</b>		
	The correct answer on the answer line is not automatically 2 marks. The working needs to be checked		
	Answer line: 0.635 $\frac{16}{25}$ 64.5% $\frac{13}{20}$ with all required working		M1 A1
Answer line: $\frac{13}{20}$ 64.5% $\frac{16}{25}$ 0.635 with all required working		M1 A0	
9	$3 \times -5$ and $4 \times 2$ or $-15$ or $8$	M1	
	$-7$	A1	SC1 – 23

Q	Answer	Mark	Comments
10 (a)	$x^2 + 5x$ or $5x + x^2$	B1	
	<b>Additional Guidance</b>		
	Do not ignore further working		
	Examples:		
	$x^2 \quad 5x$		B0
	$x^2 + 5$		B0
	$x2 + 5x$		B0
	$x^2 + 5x = 5x^3$		B0
10 (b)	$3(y - 4)$	B1	
	<b>Additional Guidance</b>		
	Do not ignore further working		
	Examples:		
	$3 \times (y - 4)$		B1
	$(y - 4)3$		B1
	$3 \times y - 4$ (brackets missing)		B0
	$(y - 4)^3$ (3 is a power)		B0
$3(y \quad 4)$ (no minus sign)		B0	
11	$(x =) 3 \times 12$ or 36 or $(y =) 15 \div 3$ or 5	M1	
	41	A1	
12 (a)	$600 \times 0.95$	B1	

Q	Answer	Mark	Comments
12 (b)	<b>Alternative method 1</b>		
	413 – 350 or 63	M1	
	Their 63 ÷ 350 (× 100) or 0.18 (× 100)	M1dep	
	18	A1	
	<b>Alternative method 2</b>		
	413 ÷ 350 or 1.18	M1	
	Their 1.18 × 100 or 118 or their 1.18 – 1 (× 100) or 0.18 (× 100)	M1dep	
	18	A1	
13	$3n - 10$	B2	oe $3 \times n - 10$ or $n \times 3 - 10$ B1 $3n$ or $3 \times n$ or $n \times 3$ or $n^3 - 10$ or $an - 10$ , where $a$ is a positive integer other than 3 or $n^b - 10$ , where $b$ is a positive integer other than 1 or a different letter used in an otherwise correct answer
	<b>Additional Guidance</b>		
	$3n$ as a term in any expression		B1
	$n - 10$ or $4n - 10$		B1
	$n + 3n - 10$		B1
	$n + 4n - 10$		B0
	$3(n - 10)$		B0
	Ignore ' $n =$ ' before or ' $= n$ ' after the expression		

Q	Answer	Mark	Comments
14	<b>Alternative method 1</b>		
	$(100 - 65)(\%)$ or $35(\%)$	M1	oe
	$(65 - \text{their } 35)(\%)$ related to 12 or $30(\%)$ related to 12	M1	
	$12 \div \text{their } 30 \times \text{their } 35$ or $12 \div \text{their } 30 \times 100$ or 40	M1	oe 40 is the total number of members
	14	A1	SC3 26
	<b>Alternative method 2</b>		
	$(65 - 50)(\%)$ or $15(\%)$	M1	
	Their $15(\%)$ related to 6	M1	
	$6 \div \text{their } 15 \times (100 - 65)$ or $6 \div \text{their } 15 \times 35$ or $6 \div \text{their } 15 \times 100$ or 40	M1	40 is the total number of members
	14	A1	SC3 26
	<b>Alternative method 3</b>		
	65 and $(100 - 65)$ or 65 and 35	M1	
	13 and 7	M1	
	26 and 14	M1	
	14	A1	SC3 26
	<b>Alternative method 4</b>		
	Any trial of two numbers with a difference of 12 or of 65% and 35% of an assumed total	M1	eg 13 and 1 and [93, 93]% or $60 \rightarrow$ 39 girls and 21 boys
	A better trial	M1dep	eg 14 and 2 and [87, 88]%
	A better trial	M1dep	eg 15 and 3 and [83, 84]%
	14	A1	SC3 26

Q	Answer	Mark	Comments
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Q	Additional Guidance		
14	Percentage signs might be missing from students' work $65 - 45 = 20$ (45 taken to be 45%, the (incorrect) percentage of boys) $20 = 12$ (read as 20% = 12) $10 = 6$ (read as 10% = 6) $5 = 3$ Boys = $12 + 12 + 3 = 27$		M0 M1  M1 A0

15 (a)	446	B1	
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15 (b)	108	B1	
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15 (c)	17	B1	
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15 (d)	11	B1	
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16		B2	B1 One line adds to 10 using the digits 1, 3 or 5
	<b>Additional Guidance</b>		
	The Answer grid takes precedence but if this is blank mark the Practice grid		

17 (a)	Any point in the top left quadrant ie $x < 0$ and $y > 0$	B1	Condone missing label
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Q	Answer	Mark	Comments
17 (b)	Any point on the line $2y = x$	B1	Condone missing label SC1 If answer to (a) is in the 4 <sup>th</sup> quadrant then any point on the line $y = 2x$
17 (c)	Any point on the $x$ axis or $y$ axis	B1	Including the origin Condone missing label
18 (a)	1.2	B1	
	An indication that probability must lie in the range 0 to 1 or cannot be greater than 1	B1	
	<b>Additional Guidance</b>		
	Take “between” to mean including the end points		
	Explanations may use percentages but the percentage sign must be present		
	Examples		
	It has to be between 0 and 1		B1
	All probabilities add up to 1		B1
	Probabilities have to be under 1		B0
It's too big		B0	
18 (b)	0.7	B1	oe
19	$\frac{1}{n}$ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ where $n$ is an integer greater than 3	B2	B1 first value correct or inner two values correct

Q	Answer	Mark	Comments
20	$20 \div 5$ or 4 or $\frac{4}{20}$ or $1 - \frac{1}{5}$ or $\frac{4}{5}$	M1	oe  oe
	$20 - \text{their } 4$ or $20 \div 5 \times 4$ or 16 or two whole numbers with a total of (20 – their 16)	M1dep	oe  eg 10 and 6 Allow the numbers as numerators of fractions with 20 as the denominators
	7	A1	SC2 $\frac{7}{20}$
	<b>Additional Guidance</b>		
	For the first M1, $\frac{4}{5}$ can be implied by two fractions (for orange and yellow) which add to 1		
21 (a)	True True False	B2	B1 any two correct
21 (b)	100	B2	B1 ( $5^3 =$ ) 125 or ( $5^2 =$ ) 25
22 (a)	27	B1	
22 (b)	4.06	B1	
22 (c)	13	B1	



Q	Answer	Mark	Comments	
22 (d)	378 + 420 or 392 + 406 or 392 + 392 + 14 or 378 + 378 + 3 × 14 or 364 + 364 + 5 × 14 or 350 + 350 + 7 × 14	M1	oe	
	798	A1		
	<b>Additional Guidance</b>			
	798 scores 2 marks (obtained by any correct method)			
	M1 may be scored for any fully correct method which uses a value or values in the table and a single digit multiplication of 14 eg $420 \times 2 - 3 \times 14$			M1
There is no method mark for long multiplication, so $57 \times 14$ is 2 (if 798 obtained) or 0 (if not)				

Q	Answer	Mark	Comments
<b>23</b>	<b>Alternative method 1</b>		
	$3x + 12 = 28.5$	M1	
	$3x = 28.5 - 12$ or $3x = 16.5$	M1	
	$(x =) 5.5$	A1ft	ft M1M0 with one error
	$(A =) 28.5$ and $(B =) 29.5$ and Yes	Q1ft	Strand (iii) Correct decision for their values, which must be correct for their value of $x$
	<b>Alternative method 2</b>		
	$28.5 - 12$ or $16.5$	M1	
	Their $16.5 \div 3$	M1	
	$(x =) 5.5$	A1ft	ft M1M0 or M0M1 with one error
	$(A =) 28.5$ and $(B =) 29.5$ and Yes	Q1ft	Strand (iii) Correct decision for their values, which must be correct for their value of $x$
	<b>Alternative method 3</b>		
	$5x + 1 = 3x + 12$	M1	
	$5x - 3x = 12 - 1$ or $2x = 11$	M1	
	$(x =) 5.5$	A1ft	ft M1M0 with one error
	$(A =) 28.5$ and $(B =) 29.5$ and Yes or $(C =) 28.5$ and $(B =) 29.5$ and Yes	Q1	Strand (iii)
	<b>Additional Guidance</b>		
	Their error could be adding 12 instead of subtracting.		
	On alt 2, if they start with an incorrect value for $x$ , they can achieve the Q1ft for only working out that $A$ is not 28.5 and saying 'No'		

Q	Answer	Mark	Comments
24	$\frac{5 \times 4}{8}$ or $\frac{20}{8}$ or $2\frac{4}{8}$ or 2.5	M1	oe
	$2\frac{1}{2}$	A1	
	<b>Additional Guidance</b>		
	$\frac{10}{4}$ or $\frac{5}{2}$		M1A0
25	$2a = b + 3$ or $-2a = -b - 3$ or $\frac{b}{2} = a - \frac{3}{2}$ or $\frac{b}{2} = \frac{2a - 3}{2}$	M1	
	$a = \frac{b+3}{2}$ or $a = \frac{-b-3}{-2}$ or $a = \frac{b}{2} + \frac{3}{2}$ or $a = \frac{1}{2}(b+3)$	A1	SC1 $\frac{b+3}{2}$ or $\frac{-b-3}{-2}$ or $\frac{b}{2} + \frac{3}{2}$ or $\frac{1}{2}(b+3)$
	<b>Additional Guidance</b>		
	$a = (b + 3) \div 2$		M1 A1
	$a = b + 3 \div 2$		M1 A0
In all cases, $3 + b$ is equivalent to $b + 3$			

Q	Answer	Mark	Comments
<b>26 (a)</b>	<b>Alternative method 1</b>		
	$(P(A)=) 2 \times 0.12$ or 0.24	M1	oe
	$(P(D) =) 1 - (\text{their } 0.24 + 0.12 + 0.28)$ or $1 - 0.64$ or 0.36	M1	oe
	$1 - (0.24 + 0.12 + 0.28) = 0.36$ <b>and</b> $0.12 \times 3 = 0.36$	Q1	oe Strand ii All working correct
	<b>Alternative method 2</b>		
	$(P(D)=) 3 \times 0.12$ or 0.36	M1	oe
	$(P(A) =) 1 - (0.12 + 0.28 + \text{their } 0.36)$ or $1 - 0.76$ or 0.24	M1	oe
	$1 - (0.12 + 0.28 + 0.36) = 0.24$ <b>and</b> $0.12 \times 2 = 0.24$	Q1	oe Strand ii All working correct
<b>26 (b)</b>	$0.28 \times 200$	M1	oe
	56	A1	Allow $\frac{56}{200}$
	62	A1ft	ft their 56 + 6 if M1 scored