GCSE
Mathematics

Paper 3 Foundation Tier

Mark scheme

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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

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.
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.
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.
[a, b)	Accept values $a \leq$ value $< b$
3.14…	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
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 student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

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

Questions which do not ask students to show working

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

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student 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 student intended it to be a decimal point.

Question	Answer	Mark	Comments
1	–7°C	B1	
2	$4n$	B1	
3	$\frac{1}{3}$	B1	
4	32	B1	

5(a)	$a^3 + 2b$	B2	B1 for a^3 (+) or (+) $2b$
	Additional Guidance		
	Do not accept $2 \times b$ or $b2$ for 2b		
	Do not accept ^3a for a^3		
	Do not accept further working for B2 eg $a^3 + 2b = a^32b$		B1
	Do not accept further working for B1 eg $3a + 2b = 5ab$ or $a^3 \quad b^2 = a^3b^2$		B0
	$a^3 + b^2$		B1
	$3a + 2b$		B1
	$a^3 \quad 2b$		B1
	$a^3 \quad 2b = a^32b$		B1
	$a^3 \times 2b$ or a^32b without working for B1		B0
	$a^3 \times b^2$ or a^3b^2		B0
	$3a \times 2b$		B0
	$3a – 2b$		B0

Question	Answer	Mark	Comments
5(b)	$5x$ (+) 15	B1	Implied by correct answer
	$4x + 17$	B2ft	B2ft their $5x + 15$ in the form $5x + b$ or $ax + 15$, both their terms with correct ft in final answer B1ft $4x$ or (+)17 B1ft their $5x + 15$ in the form $5x + b$ or $ax + 15$, one of their terms with correct ft in final answer
	Additional Guidance		
	ft $4x$ or (+)17 or must use $5x + b - x + 2$ or $ax + 15 - x + 2$		
	$4x + 17$ with no expansion seen		B1B2
	Ignore further working with an attempt to solve after their $4x + 17$ eg $4x + 17 = 0$ followed by $x = -4.25$		B1B2
	Do not ignore further working with an attempt to simplify after their $4x + 17$ eg $4x + 17$ followed by $21x$		B1B1
	$5x + 15 - x + 2$ followed by $4x + 15 = -2$		B1B1
	$5x + 3$ followed by $4x + 5$ also $5x - 15$ followed by $4x - 13$		B0B2ft
	Ignore further working after $5x + 15$ for first B1 eg $5x + 15$ followed by $20x$ and $20x - x + 2$ followed by $19x + 2$		B1B0
	$5x$ 15		B1
	$4x + k$, $k \neq 17$, with no expansion seen		B0B1ft
	$kx + 17$, $k \neq 4$, with no expansion seen		B0B1ft
	$5x + 15 - 5x + 10$ followed by 25		B1B0
	$5x + 3$ followed by $4x + 1$		B0B1ft
	$5x^2 + 15$ followed by $5x^2 - x + 17$		B0B1ft
	$5x + 3$ followed by $4x + 1$ followed by $5x$		B0B0ft
	$5x + 3$ followed by $6x + 1$		B0B0ft
	$5x^2 + 3$ followed by $5x^2 - x + 5$		B0B0ft

Question	Answer	Mark	Comments
6	<table><tr><th>Cards</th><th>Total</th></tr><tr><td>1 and 2</td><td>3</td></tr><tr><td>3 and 6</td><td>9</td></tr><tr><td>4 and 7</td><td>11</td></tr><tr><td>5 and 9</td><td>14</td></tr><tr><td>8 and 11</td><td>19</td></tr><tr><td>10 and 12</td><td>22</td></tr></table>	B4	B3 for any three or four pairs giving the correct totals B2 for any two pairs giving the correct totals B1 for any one pair giving the correct total
	Additional Guidance		
	Mark pairs from top down and mark table only		
	Numbers in pairs can be reversed eg 6 and 3 Total 9		
	Accept first use of a number, in a correct or incorrect pair, but discount further use of the same number in a subsequent pair		
	Do not accept repeated numbers eg 7 and 7 or 11 and 11 as a correct pair (this is incorrect, not discounted)		
	Do not accept use of other numbers eg 9 and 13 is not a correct pair		
	4 and 5 Total 9 correct 5 and 6 Total 11 discount (5 already used in a correct pair) 6 and 8 Total 14 correct (first use of 6 as 5 and 6 discounted) 8 and 11 Total 19 discount (8 already used in a correct pair) 10 and 12 Total 22 correct		3 correct B3
	3 and 6 Total 9 correct 7 and 4 Total 11 correct (order reversed) 7 and 7 Total 14 discount (7 already used in a correct pair) 7 and 12 Total 19 discount (7 already used in a correct pair) 10 and 12 Total 22 correct (first use of 12 as 7 and 12 discounted)		3 correct B3

Additional Guidance continues on the next page

Question	Answer	Mark	Comments
6 cont	2 and 7 Total 9 discount (2 already used in correct pair) 5 and 6 Total 11 correct 4 and 10 Total 14 correct 9 and 10 Total 19 discount (10 already used in a correct pair) 11 and 11 Total 22 incorrect (11 is a repeated number in a pair)		2 correct B2
	3 and 3 Total 9 incorrect (3 is a repeated number in a pair) 3 and 8 Total 11 discount (3 already used in an incorrect pair) 6 and 8 Total 14 correct (first use of 8 as 3 and 8 discounted) 9 and 10 Total 19 correct 7 and 15 Total 22 incorrect (15 is not a card number)		2 correct B2
	3 and 5 Total 9 incorrect 3 and 8 Total 11 discount (3 already used in an incorrect pair) 7 and 7 Total 14 incorrect (7 is a repeated number in a pair) 7 and 12 Total 19 discount (7 already used in an incorrect pair) 10 and 12 Total 22 correct (first use of 12 as 7 and 12 discounted)		1 correct B1
7(a)	10	B1	
7(b)	–14	B1	

Question	Answer	Mark	Comments
8(a)	2nd	B1	

8(b)	(4 + 2 + 4 + 8 + 8 + 7 + 9 + 5) ÷ 10 or (6 + 12 + 15 + 14) ÷ 10 or (25 + 22) ÷ 10 or 2.5 + 2.2 or 47 ÷ 10	M1	Condone the omission of brackets Accept one error or omission in reading from diagram
	4.7	A1	oe
	Additional Guidance		
	5 on answer line with 4.7 in working		M1A1
	4 on answer line with 4.7 in working		M1A0
	(4 + 2 + 4 + 8 + 8 + 7 + 9) ÷ 10 is one omission (4 + 2 + 4 + 8 + 8 + 7 + 9 + 6) ÷ 10 is one error (6 + 12 + 15 + 13) ÷ 10 assume one error (25 + 23) ÷ 10 assume one error 2.5 + 2.3 assume one error		M1
	Do not accept further calculation after 4.7 seen 47 ÷ 10 = 4.7 4.7 × 4 = 18.8		M1A0
	Use of away goals only, treat as misread from the words in part (a) (2 + 8 + 7 + 5) ÷ 10 or 2.2 condone the omission of brackets		M1A0
	5 on answer line without working		M0A0
	(6 + 12 + 15) ÷ 10 assume two omissions		M0A0

Question	Answer	Mark	Comments
8(c)	**Alternative method 1**		
	4 + 4 + 8 + 9 and 2 + 8 + 7 + 5 or 25 and 22	M1	Accept one error in reading from diagram
	3	A1	
	Alternative method 2		
	4 – 2 or 2 and 4 – 8 or –4 and 8 – 7 or 1 and 9 – 5 or 4	M1	Accept one error in reading from diagram Differences may be seen on the diagram
	3	A1	
	Additional Guidance		
	25 – 22 = 3		M1A1
	4 – 2 = 2 and 4 – 8 = –4 and 8 – 6 = 2 and 9 – 5 = 4 is one reading error		M1
	4 – 2 = 2 and 4 – 8 = 4 and 8 – 7 = 1 and 9 – 5 = 4		M1
	4 + 4 + 8 + 9 and 2 + 7 + 7 + 5 is one reading error 24 – 21 = 3		M1 A0
	1^{st} 2 2^{nd} 4 3^{rd} 1 4^{th} 4 is one error in calculation without working		M0A0
	1^{st} 2 3^{rd} 1 4^{th} 4 is one omission		M0A0
	24 – 21 = 3 with no other working		M0A0
	4 + 4 + 8 + 8 and 2 + 8 + 6 + 5 is two reading errors 24 – 21 = 3		M0 A0

Question	Answer	Mark	Comments
8(d)	No and valid reason eg Indicates that one or more home teams might have won a game or games by a lot of goals	B1	
	Additional Guidance		
	In numerical examples relating to results, the total home goals must be more than the total away goals and there cannot be more home wins than away wins eg No, the scores could have been 2-0 6-0 0-3 0-2 2-2 3-3 3-3 4-4 4-4 1-1 No, the scores could have been 2-0 6-0 0-3 0-2 and then all draws	B1 B1	
	If scores are given, assume home team first		
	Use of 'they' implies the home team in a statement relating to a team eg No, because they could score more just in one game	B1	
	No, the home team scored 0 in 9 matches and 25 in the final game	B1	
	No, the home team may have scored lots in one game	B1	
	No, multiple goals could be scored by a home team in one game	B1	
	No, the away team win a lot of games by one goal and lose by a lot of goals in one game	B1	
	Yes with or without an explanation	B0	
	No, the away team win a lot of games by one goal	B0	
	No, multiple goals could be scored in one game	B0	
	No, more goals scored at home but it doesn't mean that they won more	B0	
	No, we don't know how many goals were scored in each game	B0	
	No, the home team scored more goals in some games than others	B0	

Question	Answer	Mark	Comments
9(a)	1, 2, 3, 5, 6, 10, 15, 30	B2	B1 for one, two or three omissions or incorrect numbers
	Additional Guidance		
	Accept factors as products eg 1 × 30		
	Accept factors as pairs in brackets eg (1,30)		
	Disregard any repeated factors or reversed factor pairs		
	Disregard any negative factor pairs –5 × –6		
	1, 2, 3, 5, 6, 10, 15, 30 shown in working 1, 2, 3, 5, 6, 10, 15 on answer line (Allow transcription error)		B2
	1, 2, 3, 4, 5, 6, 10, 12, 15 (one omission of 30 and two incorrect numbers in 4 and 12)		B1
9(b)	$\frac{3}{8}$	B1ft	oe fraction, decimal or percentage ft their list in (a) with at least four numbers, at least one of which is two-digit
	Additional Guidance		
	$\frac{3}{8}$ is B1, if not $\frac{3}{8}$ refer to 9(a) for possible ft		
	0.375 or 37.5%		B1
	Ignore further working with description of probability eg $\frac{3}{8}$ unlikely		B1
	Ignore further working with attempts to convert to percentage or decimal eg $\frac{3}{8}$ = 37% or 38%		B1
	3 : 8 in working with $\frac{3}{8}$ on answer line		B1
	37% or 38% without $\frac{3}{8}$ or 37.5% in working		B0
	3 : 8 on answer line		B0

	3 out of 8 without $\frac{3}{8}$ in working	B0

Question	Answer	Mark	Comments
10	Rectangle: 4	B1	
	Triangle: 0.5 × ? × 16 = 24 or (2 ×) 24 ÷ 16 or (2 ×) 1.5 or 2 × 24 or 48	M1	oe
	3	A1	
	Additional Guidance		
	Ignore any units given		
11	**Alternative method 1**		
	18 (hours) or 36 (half hours) or 24 (minutes per hour)	B1	their hours × 2 × 12 implies 24
	18 × 2 × 12 or 18 × 24 or their hours × 2 × 12 or their hours × 24 or 36 × 12 or their half hours × 12	M1	oe
	432	A1	Ignore fw in an attempt to convert 432 minutes to hours and minutes
	Alternative method 2		
	Build up method using 12 minutes or 24 minutes with at least three additions	M1	
	36 additions using 12 minutes or 18 additions using 24 minutes	M1dep	
	432	A1	Ignore fw in an attempt to convert 432 minutes to hours and minutes

Additional Guidance continues on the next page

Question	Answer	Mark	Comments

	Additional Guidance	
11 cont	7 hours 12 minutes with 432 in working	B1M1A1
	7.2 hours or 7 hours 20 minutes with 432 in working	B1M1A1
	18 hours 18 ÷ 2 = 9 (half hours) 9 × 12 108	B1M1A0
	7 hours 12 minutes without 432 in working	B1M1A0
	7.2 hours without 432 in working	B1M1A0
	their hours × 2 × 12 implies 24 eg 2 2 2 2 2 2 (6 hours, 12 half hours)) 12 × 12 144	B1M1A0
	Condone division of their number of hours by 2 to imply an attempt to calculate their number of half hours eg 10 hours 10 ÷ 2 = 5 (half hours) 5 × 12 60	B0M1A0

Question	Answer	Mark	Comments
12	$\frac{1}{4}$, $\frac{4}{10}$, 0.404, 44% with no incorrect conversions Accept values in any correct format	B2	B1 two correct conversions to decimals or two correct conversions to percentages or two correct fractions with common denominators
	Additional Guidance		
	Condone missing percentage signs		
	0.25, 0.4, 0.404, 0.44		B2
	25%, 40%, 40.4%, 44%		B2
	25%, $\frac{2}{5}$, 0.404, 44% with no other working (all correct, even though in different formats)		B2
	$\frac{1}{4}$, $\frac{4}{10}$, 0.404, 44% with no working		B2
	$\frac{1}{4}$, $\frac{4}{10}$, 0.404, 44% with conversions to 25%, 40%, 40.04% (one incorrect conversion)		B1
	25%, 40%, 40.04% (two correct conversions)		B1
	44%, 0.404, $\frac{4}{10}$, $\frac{1}{4}$ (in reverse order) with no working for B1		B1
13(a)	Correct tangent drawn	B1	
	Additional Guidance		
	Accept unruled line if intention is clear		
	Tangent must be drawn without clear space between line and circle		
	Ignore square drawn on grid lines from part (b)		
	Tangent may be drawn as part of a square		B1
	Accept tangent which does not extend to both sides of circle		B1
	Accept tangent drawn and ignore any radius or diameter drawn		B1
	Do not accept tangent and chord drawn together		B0

Question	Answer	Mark	Comments
13(b)	Valid reason for the area of the circle or the square around the circle	B1	
	Additional Guidance		
	The area of the circle stated to be [4.5, 6.2] without incorrect working	B1	
	Area of circle of radius 1.5 (cm) is 7(.06…) or 7.07 or 7.1	B1	
	The square around it is only 9 cm^2 or 9 squares or 3 × 3 square	B1	
	There aren't 9 squares in the circle	B1	
	The circle fits into a 9 cm^2 square or 9 squares or 3 × 3 square	B1	
	It only covers about [4.5, 6.2] squares	B1	
	Circle does not (completely) cover nine separate boxes	B1	
	There is one whole square and 8 part squares in the circle	B1	
	Because all of the space for 9 is not used up	B1	
	Calculate radius = 1.6(9…) (cm) or 1.7 (cm) from area of circle 9 (cm^2) and states radius of circle drawn is smaller	B1	
	She uses 9 squares that are half in and half out of the circle, she needed to work it out only using the squares inside the circle	B0	
	Does not fill up the whole square (no reference to 9)	B0	
	Because the radius is not big enough for it to be 9	B0	
14(a)	Cube	B1	
	Additional Guidance		
	Cuboid	B0	
14(b)	Sphere	B1	
	Additional Guidance		
	Accept misspelling as long as intention to indicate sphere	B1	
	Spherical	B0	
	Ball	B0	

Question	Answer	Mark	Comments
15	**Alternative method 1 of 4**		
	Identifies any 3-digit cube number	M1	125 or 216 or 343 or 512 or 729
	125 and 216 and 343 and 512 and 729	M1dep	
	125 and 216 and 343 and 512 and 729 and 64 and 1000	A1	
	Alternative method 2 of 4		
	Identifies any 3-digit cube number	M1	125 or 216 or 343 or 512 or 729
	$5^3 = 125$ and $9^3 = 729$ and 5, 6, 7, 8, 9 or 9 – 4 = 5	M1dep	
	$5^3 = 125$ and $9^3 = 729$ and 5, 6, 7, 8, 9 or 9 – 4 = 5 and (4^3 =) 64 and (10^3 =) 1000	A1	
	Alternative method 3 of 4		
	$\sqrt[3]{100} = 4.6\ldots$	M1	
	$\sqrt[3]{999} = 9.9\ldots$ or $\sqrt[3]{1000} = 10$	M1	
	$\sqrt[3]{100} = 4.6\ldots$ and $\sqrt[3]{999} = 9.9\ldots$ or $\sqrt[3]{1000} = 10$ and 5, 6, 7, 8, 9 or 9 – 4 = 5	A1	

Alternative method 4 continues on the next page

Question	Answer	Mark	Comments
15 cont	**Alternative method 4 of 4**		
	$5^3 = 125$	M1	
	$10^3 = 1000$ or $\sqrt[3]{1000} = 10$	M1	
	$4^3 = 64$ and $5^3 = 125$ and $10^3 = 1000$ or $\sqrt[3]{1000} = 10$ and 5, 6, 7, 8, 9 or 9 – 4 = 5	A1	
16(a)	$6 \div 3$ or 2 or $9 \div 2$ or $3 \div 6$ or 0.5 or 9×0.5 or $9 \div 6$ or 1.5 or 3×1.5 or $6 \div 9$ or $\frac{2}{3}$ or $3 \div \frac{2}{3}$	M1	oe
	4.5	A1	oe
	Additional Guidance		
	Accept embedded answer $4.5 \times 2 = 9$		M1A1
	Ignore further working in attempt to round after answer 4.5 eg $9 \div 2 = 4.5$ with answer 5		M1A1
	'The length is double' without further working		M1A0
	'The triangle is double' without further working		M0A0
16(b)	53	B1	

Question	Answer	Mark	Comments
17(a)	*E* marked at midpoint of line	B1	mark intention
	Additional Guidance		
	Accept any clear marking of the point		
17(b)	*R* marked 3 cm from *P*	B1	mark intention
	Additional Guidance		
	Accept any clear marking of the point		

Question	Answer	Mark	Comments
18	**Alternative method 1 of 6 – cost per hour**		
	3.6(0) ÷ 8 or (0).45 or 2.94 ÷ 6 or (0).49	M1	360 ÷ 8 or 45 or 294 ÷ 6 or 49
	their (0).45 ÷ 5 or (0).09 or their (0).49 ÷ 5.5 or (0).08(9…)	M1dep	their 45 ÷ 5 or 9 or their 49 ÷ 5.5 or 8.(9…)
	their (0).45 ÷ 5 **and** their (0).49 ÷ 5.5	M1dep	their 45 ÷ 5 **and** their 49 ÷ 5.5
	(£)0.09 and (£)0.08(9…)	A1	9(p) and 8.(9…) (p)
	brand B	A1ft	ft correct decision for their values with M3 scored
	Alternative method 2 of 6 – cost per hour from price of pack		
	8 × 5 or 40 or 6 × 5.5 or 33	M1	
	3.6(0) ÷ their 40 or (0).09 or 2.94 ÷ their 33 or (0).08(9…)	M1dep	360 ÷ their 40 or 9 or 294 ÷ their 33 or 8.(9…)
	3.6(0) ÷ their 40 **and** 2.94 ÷ their 33	M1dep	360 ÷ their 40 **and** 294 ÷ their 33
	(£)0.09 and (£)0.08(9…)	A1	9(p) and 8.(9…) (p)
	brand B	A1ft	ft correct decision for their values with M3 scored

Alternative method 3 continues on the next page

Question	Answer	Mark	Comments
18 cont	**Alternative method 3 of 6 – number of hours per unit cost from number of batteries**		
	3.6(0) ÷ 8 or (0).45 or 2.94 ÷ 6 or (0).49	M1	360 ÷ 8 or 45 or 294 ÷ 6 or 49
	5 ÷ their (0).45 or 11.1(…) or 5.5 ÷ their (0).49 or 11.2(…)	M1dep	5 ÷ their 45 or (0).111(…) or 5.5 ÷ their 49 or (0).112(…)
	5 ÷ their (0).45 **and** 5.5 ÷ their (0).49	M1dep	5 ÷ their 45 **and** 5.5 ÷ their 49
	11.1(…) (hours) and 11.2(…) (hours)	A1	(0).111(…) (hours) and (0).112(…) (hours)
	brand B	A1ft	ft correct decision for their values with M3 scored
	Alternative method 4 of 6 - common number of batteries		
	Scaling towards a cost for a common number of batteries (eg 24 batteries) eg 8 × 3 × 5 or 120 **and** 6 × 4 × 5.5 or 132	M1	
	eg 3 × 3.60 or 10.8(0) **and** 4 × 2.94 or 11.76	M1	eg 3 × 360 or 1080 and 4 × 294 or 1176
	eg their 10.8(0) ÷ their 120 or (0).09 **and** their 11.76 ÷ their 132 or (0).08(9…)	M1dep	eg their 1080 ÷ their 120 or 9 **and** their 1176 ÷ their 132 or 8.(9…) dependent on M1M1
	(£)0.09 and (£)0.08(9…)	A1	9(p) and 8.(9…) (p)
	brand B	A1ft	ft correct decision for their values with M3 scored

Alternative method 5 continues on the next page

Question	Answer	Mark	Comments
18 cont	**Alternative method 5 of 6 – number of hours per unit cost from batteries per unit cost**		
	8 ÷ 3.6(0) or 2.2(…) or 6 ÷ 2.94 or 2.04(…)	M1	8 ÷ 360 or 0.022(…) or 6 ÷ 294 or 0.0204(…)
	their 2.2(…) × 5 or 11.1(…) or their 2.04(…) × 5.5 or 11.2(…)	M1dep	their 0.022(…) × 5 or 0.111(…) or their 0.0204(…) × 5.5 or 0.112(…)
	their 2.2(…) × 5 **and** their 2.04(…) × 5.5	M1dep	their 0.022(…) × 5 **and** their 0.0204(…) × 5.5
	11.1(…) (hours) and 11.2(…) (hours)	A1	(0).111(…) (hours) and (0).112(…) (hours)
	brand B	A1ft	ft correct decision for their values with M3 scored
	Alternative method 6 of 6 – cost for common number of battery hours		
	3.6(0) ÷ 8 or (0).45 or 2.94 ÷ 6 or (0).49	M1	360 ÷ 8 or 45 or 294 ÷ 6 or 49
	Scaling towards a common number of battery hours (eg 55 hours) eg their (0).45 × 11 or their (0).49 × 10	M1dep	eg their 45 × 11 or their 49 × 10
	eg their (0).45 × 11 **and** their (0).49 × 10	M1dep	eg their 45 × 11 **and** their 49 × 10
	eg (£)4.95 and (£)4.9(0)	A1	eg 495(p) and 490(p)
	brand B	A1ft	ft correct decision for their values with M3 scored

Additional Guidance continues on the next page

18 cont	**Additional Guidance**	
	For the first A mark the values must not be rounded to the same value	
	A1ft can be awarded after A0 for the same value for the correct decision eg 0.09 and 0.09 with decision 'both the same'	M3A0A1ft
	8 × 5 = 40 and 40 ÷ 3.6(0) **and** 6 × 5.5 = 33 and 33 ÷ 2.94 is equivalent to 8 ÷ 3.6(0) × 5 **and** 6 ÷ 2.94 × 5.5 on Alt 5	M3
	8 × 5 = 40 and 40 ÷ 3.6(0) is equivalent to 8 ÷ 3.6(0) × 5 on Alt method 5	M2
	6 × 5.5 = 33 and 33 ÷ 2.94 is equivalent to 6 ÷ 2.94 × 5.5 on Alt method 5	M2
	(0).45 ÷ 5	M1M1
	(0).45 ÷ 5 and (0).49 ÷ 5.5	M1M1M1
	(0).45 ÷ 5 and (0).415 ÷ 5.5 0.415 is not from a correct method	M1M1M0
	In Alt method 4 M1M1 can be awarded in either order	
	In Alt method 5 their 2.2(…) must be correct or from correct method their 2.04(…) must be correct or from correct method	
	Accept misread of 4 batteries (A) or 3 batteries (B) for up to M3A0A1ft	
	Accept working with minutes eg in Alt method 3 for 2nd M1dep accept 300 ÷ 45 = 6.6(…) or 6.7 or 330 ÷ 49 = 6.7(…) for 3rd M1dep accept 300 ÷ 45 **and** 330 ÷ 49 for first A mark must see 6.6(…) or 6.67 **and** 6.7(…) or 6.7 **and** 6.73(…)	

Question	Answer	Mark	Comments
19(a)	6, 15, 24, 60 in any order	B2	B1 for 6, 15, 24, 60 with no more than one additional value or three correct values with no more than one incorrect value
	Additional Guidance		
	Ignore repeated values for B2 and B1		
	6, 10, 15, 24, 60		B1
	6, 10, 15, 24		B1
	6, 10, 15, 24, 36		B0
	2 × 3, 5 × 3, 2 × 12, 5 × 12		B0
	6xy, 15xy, 24xy, 60xy		B0
19(b)	$\frac{2-12}{2}$ or one correctly evaluated trial with correct substitutions for x = 2 or 5 and y = 3 or 12 or two correct values from $-\frac{10}{2}, -\frac{1}{2}, -\frac{7}{5}, \frac{2}{5}$ oe or two correct values from – 5, – 0.5, – 1.4, 0.4 oe	M1	$\frac{2-3}{2} = -\frac{1}{2}$ oe or $\frac{5-12}{5} = -\frac{7}{5}$ oe or $\frac{5-3}{5} = \frac{2}{5}$ oe
	$-\frac{10}{2}$ or – 5	A1	
	Additional Guidance		
	Two separate correct values can be in either fraction or decimal form		
	2 – 12 ÷ 2 = – 5 (recovered)		M1A1
	2 – 12 ÷ 2		M0A0
	An example of an incorrect substitution with different values of x eg $\frac{5-12}{2} = -\frac{7}{2}$		

Question	Answer	Mark	Comments
20	33 + 75 or 108 seen or 60 + 100 or 160 seen	M1	
	(33 + 75) ÷ (60 + 100) (× 100) or their 108 ÷ their 160 (× 100) or 0.675 (× 100)	M1dep	oe
	67.5 or 68	A1	
	Additional Guidance		
	67.5 or 68		M1M1A1
	108 ÷ 160 = 0.67 67		M1M1A0
	0.675 67		M1M1A0
	67 with no working		M0M0A0

Question	Answer	Mark	Comments
21	**Alternative method 1**		
	Any correct scaling of the ratio 5 : 2 eg 10 (:) 4 or 20 (:) 8 or 25 (:) 10	M1	oe
	22.5 (:) 9 or 22.5 (red) or 30 (:) 12 or 12 (blue)	M1dep	oe
	31.5 or $31\frac{1}{2}$ or $\frac{63}{2}$	A1	
	Alternative method 2		
	9 ÷ 2 or 4.5 or 30 ÷ 5 or 6	M1	oe 2 ÷ 9 or 0.22… 5 ÷ 30 or 0.16… or 0.17
	5 × their 4.5 or 22.5 or 7 × their 4.5 or 2 × their 6 or 12 or 7 × their 6 or 42	M1dep	oe
	31.5 or $31\frac{1}{2}$ or $\frac{63}{2}$	A1	
	Alternative method 3		
	$\frac{2}{7}$ × purple = blue $\frac{5}{7}$ × purple = red	M1	oe $\frac{2}{7}$ × purple = 9 $\frac{5}{7}$ × purple = 30
	$9 \times \frac{7}{2}$ or $30 \times \frac{7}{5}$ or 42	M1dep	oe
	31.5 or $31\frac{1}{2}$ or $\frac{63}{2}$	A1	

Additional Guidance continues on the next page

Question	Answer	Mark	Comments

	Additional Guidance	
21 cont	28 + 3.5 = 31.5	M1M1A1
	28 + 3.5	M1M1A0
	31.5, answer 31	M1M1A1
	31.5 + 42 = 73.5	M1M1A0
	10 4	M1M0A0
	10, 4	M1M0A0
	10 + 4	M1M0A0
	'He has 2.5 times more red than blue'	M1M0A0
	2.5 : 1	M1M0A0
	2.5	M0M0A0
	28 on its own	M0M0A0

22(a)	Could be true	B1	

22(b)	Must be true	B1	

Question	Answer	Mark	Comments
23(a)	5.5 in the correct position	B1	oe
	6.5 in the correct position	B1	oe
	Additional Guidance		
	5.50 or $5\frac{1}{2}$ or $\frac{11}{2}$		B1
	6.50 or $6\frac{1}{2}$ or $\frac{13}{2}$		B1
23(b)	One correctly evaluated trial using (6, 6.5] + (4, 4.5) or (6, 6.5) + (4, 4.5] or **two** values in the ranges given that work if correctly evaluated	M1	eg 6.3 + 4.1 = 10.4 eg 6.4, 4.2
	One correctly evaluated trial using (6, 6.5) + (4, 4.5) with an answer that rounds to 11	A1	eg 6.4 + 4.2 = 10.6 Ignore fw
	Additional Guidance		
	6.4 + 4.4 = 10.8 (= 11) do not need to show 11		M1A1
	6.4999 + 4.4999 = 10.9998		M1A1
	6.5 + 4.4 = 10.9		M1A0
	4.5 + 6.2 = 10.7		M1A0
	6 + 4 = 10		M0
	6.5 + 4.5 = 11		M0
	$6.4\dot{9} + 4.4\dot{9} = 11$		M0

Question	Answer	Mark	Comments
24(a)	$2x + 10 = 3x - 20$	M1	oe $180 - (2x + 10) + 3x - 20 = 180$
	$3x - 2x = 20 + 10$ or $x = 30$	M1dep	oe
	2 × their 30 + 10 or 3 × their 30 – 20 or 70	M1dep	oe
	110	A1	
	Additional Guidance		
	$x = 30$, $y = 180 - 3(30) + 20 = 110$		M1M1M1A1
	$x = 30$, $y = 180 - 3(30) - 20 = 110$ recovered missing bracket		M1M1M1A1
	$x = 30$, $y = 180 - 3(30) - 20 = 70$ not recovered		M1M1M0A0
	$2x + 10 = 3x - 20$ $3x - 2x = 20 + 10$ $x = 10$ 2 × 10 + 10 (= 30)		M1M1M1A0
	$2x + 10 = 3x - 20$ $x = 10$ 2 × 10 + 10 (= 30)		M1M0M0A0
	$y + 2x + 10 = 3x - 20 + y$		M1M0M0A0
	$w = 3x - 20$ seen or on diagram		M0M0M0A0
	$w = 2x + 10$ seen or on diagram		M0M0M0A0

Question	Answer	Mark	Comments
24(b)	$2x + 10 = 60$ or $2x = 60 - 10$ or $2x = 50$ or $x = 25$	M1	
	3 × their 25 – 20 or 55 or 180 – 55 or 125	M1dep	oe
	(y =) 125 and bigger or (y is) 15 bigger	A1ft	oe ft their (a)
	Additional Guidance		
	Note: A complete logical explanation of the effect of lines not being parallel eg w is smaller so $2x + 10$ is smaller so x is smaller so $3x - 20$ is smaller so y is bigger		M1M1A1
	2 × 25 + 10 = 60		M1M0A0
	y is bigger ticked but no valid working		M0M0A0

Question	Answer	Mark	Comments
25(a)	$\frac{2}{3} \times 720$ or $\frac{3}{5} \times 700$	M1	oe Accept use of 0.66… or 0.67
	480 or 420	A1	
	900	A1	Ignore fw
	Additional Guidance		
	900 with no working		M1A1A1
	900 out of 1420 or $\frac{900}{1420}$ (ignore fw)		M1A1A1
	$\frac{480}{720}$ (480 boys out of 720) or $\frac{420}{1420}$ (420 girls out of 1420 students)		M1A1A0

Question	Answer	Mark	Comments
25(b)	**Alternative method 1**		
	720 + 700 or 1420 or 720 + 700 – their 900 or 520	M1	oe
	$\frac{520}{1420}$ or $\frac{26}{71}$	A1ft	oe fraction, decimal or percentage 0.36(6…) or 0.37 36.(6…)% or 37% ft their part (a) Ignore fw
	Alternative method 2		
	720 + 700 or 1420 or $\frac{1}{3}$ × 720 or 240 or $\frac{2}{5}$ × 700 or 280 or 240 + 280 or 520	M1	oe
	$\frac{520}{1420}$ or $\frac{26}{71}$	A1	oe fraction, decimal or percentage 0.36(6…) or 0.37 36.(6…)% or 37% Ignore fw
	Alternative method 3		
	720 + 700 or 1420 or $\frac{900}{1420}$ or $\frac{45}{71}$ or $\frac{\text{their } 900}{1420}$	M1	oe fraction, decimal or percentage 0.63… or 0.63 63.(…)% or 63%
	$\frac{520}{1420}$ or $\frac{26}{71}$	A1ft	oe fraction, decimal or percentage 0.36(6…) or 0.37 36.(6…)% or 37% ft their part (a) Ignore fw

Additional Guidance continues on the next page

Question	Answer	Mark	Comments

25(b) cont	Additional Guidance	
	$\frac{520}{1420}$ followed by incorrect simplification of fraction	M1A1

26	$(x + 2)(x – 6)$	B1	

Question	Answer	Mark	Comments
27	**Alternative method 1**		
	A includes 1 or B does not include 1	B1	oe Correct statement about 1 without contradiction
	A does not include 6 or B includes 6	B1	oe Correct statement about 6 without contradiction
	Alternative method 2		
	$1 \leq x < 6$ or $1 < x \leq 6$ or $1 \leq x$ and $1 < x$ or $x < 6$ and $x \leq 6$ or A is 1, 2, 3, 4, 5 or B is 2, 3, 4, 5, 6	M1	oe eg $x \geq 1$ and $x < 6$ for 1st statement A includes 3 and B includes 18 A is 3, … 17 and B is 4, … 18
	A is 1, 2, 3, 4, 5 and B is 2, 3, 4, 5, 6	A1	oe eg A = 1 to 5 and B = 2 to 6
	Additional Guidance		
	For 2 marks, must have clearly indicated both sets of integer solutions		M1A1
	For 2 marks, must have clearly indicated both differences		B1B1
	A could be 1 but not 6, B could be 6 but not 1		B1B1
	A is $x = 1$ and B is $x = 6$		B1B1
	A: 3, 6, 9, 12, 15 and B: 6, 9, 12, 15, 18		M1A0
	Comment that inequality signs are switched with no other working		B0B0
	'1 and 6 don't appear in both' – need to be correctly linked to A and B		B0B0