GCSE

MATHEMATICS

8300/2F

Foundation Tier Paper 2 Calculator

Mark scheme

June 2019

Version: 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.

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	26	B1	
	Additional Guidance		
2	$\frac{3}{12}$	B1	
	Additional Guidance		
3	3.6	B1	
	Additional Guidance		
4	3270	B1	
	Additional Guidance		

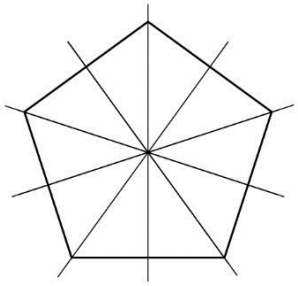
Question	Answer	Mark	Comments
5	**Alternative method 1**		
	24 ÷ 4 × 3 or 18	M1	oe
	their 18 × 60 or 1080	M1dep	oe 1080 implies M2
	1080 and $\frac{3}{4}$ (of a day)	A1	
	Alternative method 2		
	24 × 60 or 1440	M1	oe
	their 1440 ÷ 4 × 3 or 1080	M1dep	oe 1080 implies M2
	1080 and $\frac{3}{4}$ (of a day)	A1	
	Alternative method 3		
	24 ÷ 4 × 3 or 18	M1	oe may be seen in either order (M marks not dependent)
	1000 ÷ 60 or 16(.6…) or 16.7 or 17	M1	[16 h 36 m, 16 h 42 m] implies division 16 or 17 may be embedded
	16(.6…) or 16.7 or 17 or [16 h 36 m, 16 h 42 m] and 18 and $\frac{3}{4}$ (of a day)	A1	16 or 17 may be embedded

Alternative method and Additional Guidance continued on the next page

Question	Answer	Mark	Comments
5 cont	**Alternative method 4**		
	24 × 60 or 1440	M1	oe
	1000 ÷ their 1440 (× 100) or $\frac{25}{36}$ or 0.69… or 69(…)%	M1dep	oe $\frac{25}{36}$ or 0.69… or 69(…)% implies M2
	$\frac{25}{36}$ and $\frac{27}{36}$ and $\frac{3}{4}$ (of a day) or 0.69… and 0.75 and $\frac{3}{4}$ (of a day) or 69(…)% and 75% and $\frac{3}{4}$ (of a day)	A1	
	Additional Guidance		
	Ignore units for the M marks but they must be correct, if given, for the A mark		
	$\frac{3}{4}$ of 24 is insufficient method unless a correct method or 18 is seen		
	Once 1000 ÷ 60 or 16 or 16.6… or 16.7 or 17 is seen in Alt method 3, ignore any incorrect conversion to hours and minutes. If the student only shows hours and minutes, they must be in the given range.		
	Do not accept $\frac{3}{4}$ (of a day) in equivalent form eg 1080 or 18		A0

Question	Answer	Mark	Comments
6(a)	494.325 or $\frac{19\,773}{40}$ or $494\frac{13}{40}$ or 40.96 or $\frac{1024}{25}$ or $40\frac{24}{25}$ or 535.29 or 535.3 or $\frac{107\,057}{200}$ or $535\frac{57}{200}$	M1	
	535.285	A1	
	Additional Guidance		
	Ignore any subsequent truncation or rounding if 535.285 seen in working		M1A1
6(b)	10^3 and 2 and 6^2 and 536 and indicates Sensible	B3ft	ft correct decision for comparing 536 with their 535.285 B2 10^3 and 2 and 6^2 seen B1 any two of 10, 2 and 6 seen allow 1000 to imply 10 or 10^3 and 36 to imply 6 or 6^2 for B1 or B2 only
	Additional Guidance		
	Students must give the correct ft decision for part (a) for B3		
	Correct decision for their (a) should be Sensible if their 535.285 is 530 or 540 to 2 sf. Otherwise they should indicate Not sensible		
	Condone eg 10.00 for 10 etc		

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
<tr><td rowspan="8">7</td><td>261.43</td><td>B1</td><td>in correct place</td></tr>
<tr><td>14.66</td><td>B1</td><td>in correct place</td></tr>
<tr><td>1517.04</td><td>B1</td><td>in correct place</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2">
<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>01/04/2019</td><td>Starting balance</td><td></td><td></td><td>261.43</td></tr>
<tr><td>05/04/2019</td><td>Council tax</td><td></td><td>189.34</td><td>72.09</td></tr>
<tr><td>10/04/2019</td><td>Refund</td><td>14.66</td><td></td><td>86.75</td></tr>
<tr><td>12/04/2019</td><td>Salary</td><td>1430.29</td><td></td><td>1517.04</td></tr>
</table>
</td><td>B3</td></tr>
<tr><td colspan="2">Mark the table</td><td></td></tr>
<tr><td colspan="2">Condone £ and p on values</td><td></td></tr>
<tr><td colspan="2">Ignore working or values in shaded cells</td><td></td></tr>
<tr><td colspan="2">–14.66</td><td>2nd B0</td></tr>
</table>

Question	Answer	Mark	Comments
8(a)	**Alternative method 1**		
	360 – 108 or 252	M1	oe eg 360 ÷ 5 + 180 may be on diagram
	their 252 × 5	M1dep	oe eg 5 × (180 – 108) + 5 × 180 or 5 × 72 + 5 × 180 or 5 × (72 + 180)
	1260	A1	SC1 answer 540
	Alternative method 2		
	5 × 360 or 1800 **and** 5 × 108 or 540	M1	
	5 × 360 – 5 × 108 or 1800 – 540	M1dep	oe
	1260	A1	SC1 answer 540
	Additional Guidance		
	Allow 252 seen on the diagram or in the working even if not used		M1
8(b)	Line through each vertex to the midpoint of the opposite side 	B1	mark intention
	Additional Guidance		
	Allow dotted lines		
8(c)	There could be 0 or 1	B1	
	Additional Guidance		

Question	Answer	Mark	Comments
9	**Alternative method 1**		
	56 × 24.5 or 1372 or 21 × 27.5 or 577.5 or (14 + 8) × 18 or 22 × 18 or 14 × 18 + 8 × 18 or 252 + 144 or 396	M1	amount for basic or amount for sports or amount for movies oe
	Any **two** of 56 × 24.5 or 1372 or 21 × 27.5 or 577.5 or (14 + 8) × 18 or 22 × 18 or 14 × 18 + 8 × 18 or 252 + 144 or 396	M1dep	any **two** of the above implies M2
	56 × 24.5 + 21 × 27.5 + (14 + 8) × 18 or 22 × 18 or 14 × 18 + 8 × 18 or 252 + 144 or 1372 + 577.5 + 396 or 2345.5	M1dep	full method that would lead to 2345.5 if evaluated correctly implies M3
	2345.50	A1	

Alternative methods and Additional Guidance continued on the next pages

Question	Answer	Mark	Comments
9 cont	**Alternative method 2**		
	14 × (24.5 + 27.5 + 18) or 14 × 70 or 980 or 7 × (24.5 + 27.5) or 7 × 52 or 364 or 8 × (24.5 + 18) or 8 × 42.5 or 340 or 27 × 24.5 or 661.5	M1	amount for all 3 packages or amount for basic + sports or amount for basic + movies or amount for basic only
	Any **two** of 14 × (24.5 + 27.5 + 18) or 14 × 70 or 980 or 7 × (24.5 + 27.5) or 7 × 52 or 364 or 8 × (24.5 + 18) or 8 × 42.5 or 340 or 27 × 24.5 or 661.5	M1dep	any **two** of the above implies M2
	14 × (24.5 + 27.5 + 18) or 14 × 70 + 7 × (24.5 + 27.5) or 7 × 52 + 8 × (24.5 + 18) or 8 × 42.5 + 27 × 24.5 or 980 + 364 + 340 + 661.5 or 2345.5	M1dep	full method that would lead to 2345.5 if evaluated correctly implies M3
	2345.50	A1	

Alternative method and Additional Guidance continued on the next pages

Question	Answer	Mark	Comments
9 cont	**Alternative method 3**		
	56 × (24.5 + 27.5 + 18) or 56 × 70 or 3920 or 35 × 27.5 or 962.5 or (27 + 7) × 18 or 34 × 18 or 27 × 18 + 7 × 18 or 486 + 126 or 612	M1	amount if everyone has all 3 packages or amount for not having sports or amount for not having movies
	Any **two** of 56 × (24.5 + 27.5 + 18) or 56 × 70 or 3920 or 35 × 27.5 or 962.5 or (27 + 7) × 18 or 34 × 18 or 27 × 18 + 7 × 18 or 486 + 126 or 612	M1dep	any **two** of the above implies M2
	56 × (24.5 + 27.5 + 18) or 56 × 70 or 3920 – 35 × 27.5 or 962.5 – (27 + 7) × 18 or 34 × 18 or 27 × 18 + 7 × 18 or 486 + 126 or 612 or 3920 – 962.5 – 612 or 2345.5	M1dep	full method that would lead to 2345.5 if evaluated correctly implies M3
	2345.50	A1	

Additional Guidance continued on the next page

Question	Answer	Mark	Comments

9 cont	**Additional Guidance**	
	2345.50(p)	M1M1M1A1
	2345.5	M1M1M1A0
	Working may be seen on the diagram	
	Allow all decimal values to be seen as equivalent fractions eg $\frac{1155}{2}$ for 577.5 for the M marks	
	A 'correct' calculation does not have to be evaluated correctly	
	Division or multiplication by 12 or division by 56 at the end will only lose the A mark eg 2345.50 ÷ 56 = 41.88 per person	M1M1M1A0
	For the first two marks use the scheme that awards the most credit and do not apply the rules of choice	
	Addition may be implied by a column of figures	

10	$90 \times \frac{3}{10}$ or 27	M1	oe
	their 27 × 2	M1dep	oe 27 × 2 implies M2
	54	A1	SC1 answer 126 or answer 600
	Additional Guidance		
	Answer 54		M1M1A1
	$\frac{3}{10}$ of 90 is insufficient method unless a correct method or 27 is seen or implied		

Question	Answer	Mark	Comments
11	Any two of these criticisms Letters are used instead of words Gaps are different Bar heights do not add up to 30	B2	B1 for any one correct criticism ignore non-contradictory statements
	Additional Guidance		
	There's no key		B1
	It's not clear what C stands for / what type of vehicle it is		B1
	She's only used first letters		B1
	Labels are wrong (insufficient – needs to specify which labels)		B0
	The bars aren't evenly / equally spaced or are spread unevenly		B1
	The Van bar is too far away from the Car bar		B1
	The second gap is smaller		B1
	The Van bar is out of place		B1 bod
	The x-axis is not evenly spread / spaced		B1
	The positioning of the bars is wrong		B1
	The bars should be 1 cm apart		B0
	Not distributed evenly		B0
	There are only 28 vehicles		B1
	14 + 4 + 10 = 28 (not 30)		B1
	It doesn't / they don't add up to 30		B1
	She is 2 vehicles short		B1
	She hasn't drawn all 30 **cars** on the chart		B0
	14 should be 16		B0
	Number of vehicles should go up to 30 not 14		B0
	Number of vehicles is wrong (doesn't mention 30 or 28 or 2)		B0
	14 + 4 + 10 = 26 not 30 (error seen)		B0

Additional Guidance continued on the next page

Question	Answer	Mark	Comments

11 cont	Three criticisms, two correct and one non-contradictory	B2
	Three criticisms, two correct and one incorrect	B1
	Non-contradictory statements can be ignored eg The chart is too small and the vehicles don't add up to 30	B1
	The title is incorrect	B0
	The y-axis isn't tall enough	B0
	She doesn't give a time-frame / She should record colours	B0
	Both criticisms may be seen in one sentence eg The bars don't add up to 30 and are spread unevenly	B2

Question	Answer	Mark	Comments
12	**Alternative method 1**		
	10 × 40 or 400 or 18 × 40 or 720	M1	
	10 × 40 × 18 × 40	M1dep	oe implies M2
	288 000	A1	implies M2A1
	Kitchen	A1ft	correct decision for their area with M2 awarded accept 300 000 for Kitchen
	Alternative method 2		
	10 × 18 or 180 **and** 40^2 or 1600	M1	oe 10 × 18 × 40 **and** 300 000 ÷ 40 implies M2
	$10 \times 18 \times 40^2$ or 10 × 18 **and** $300\,000 \div 40^2$	M1dep	
	288 000 or 180 **and** 187.5 or 7200 **and** 7500	A1	implies M2A1
	Kitchen	A1ft	correct decision for their area with M2 awarded accept 300 000 for Kitchen

Alternative methods and Additional Guidance continued on the next pages

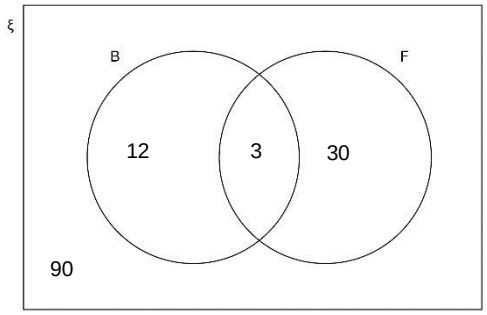
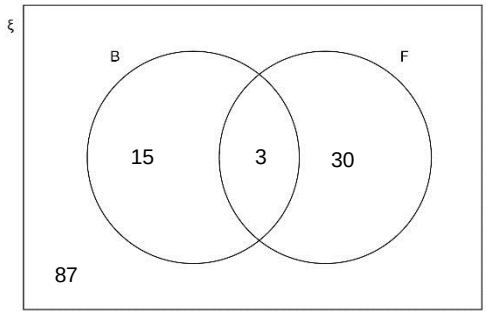
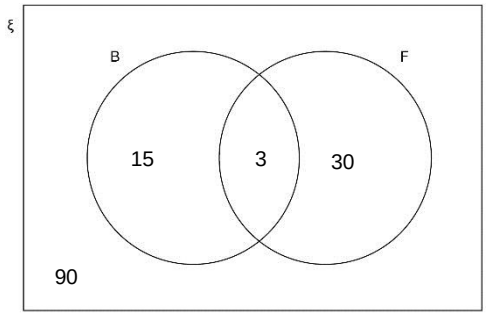
Question	Answer	Mark	Comments
12 cont	**Alternative method 3 (working in metres)**		
	0.1 × 40 or 4 or 0.18 × 40 or 7.2	M1	
	0.1 × 40 × 0.18 × 40 or 28.8	M1dep	oe implies M2
	28.8 **and** 30	A1	implies M2A1
	Kitchen	A1ft	correct decision for their area with M2 awarded accept 300 000 for Kitchen
	Alternative method 4 (working in metres)		
	0.1 × 0.18 or 0.018 **and** 40^2 or 1600	M1	oe 0.1 × 0.18 × 40 **and** 30 ÷ 40 implies M2
	0.1 × 0.18 × 40^2 or 28.8 or 0.1 × 0.18 **and** 30 ÷ 40^2	M1dep	
	28.8 **and** 30 or 0.018 **and** 0.01875 or 0.72 **and** 0.75	A1	implies M2A1
	Kitchen	A1ft	correct decision for their area with M2 awarded accept 300 000 for Kitchen

Additional Guidance continued on the next page

Question	Answer	Mark	Comments

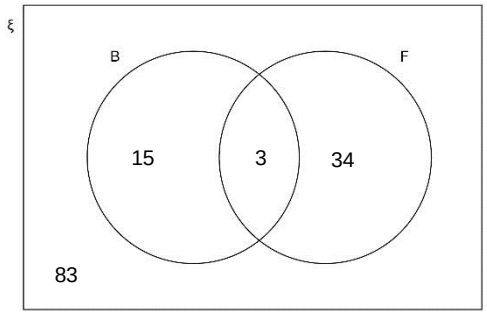
12 cont	**Additional Guidance**	
	288 000 and Kitchen	M1M1A1A1
	288 000	M1M1A1
	10 × 40 = 4000, 18 × 40 = 720 and 2 880 000 and Bedroom	M1M1A0A1ft
	4000 and 720 and 2 880 000 and Bedroom (only 720 scores)	M1M0A0A0ft
	Ignore any incorrect attempt to subtract 288 000 from 300 000	
	Any attempt to change units must be correct	
	NB 10 × 40 = 400, 10 × 18 = 180 400 × 180 = 72 000 and 300 000 – 72 000 = 228 000 and Kitchen	M1 M0A0A0

13	210 ÷ 2 × 5 or 105 × 5 or 1050 ÷ 2 or 210 : 525	M1	oe eg 210 × 2.5 or 420 + 105
	525	A1	
	Additional Guidance		
	Further work after reaching 525		M0A0

Question	Answer	Mark	Comments
14(a)	3 in the intersection	B1	
	12 in the left hand part of B	B1	
	30 in the right hand part of F	B1	
	All four sections total 135	B1	must be using integers > 0 and have one integer in each of the four sections
	Additional Guidance		
	Mark the diagram		
	Ignore any correct or incorrect numbers on the diagram outside the rectangle eg 135		
			B1B1B1B1
			B1B0B1B1
			B1B0B1B0

Additional Guidance continued on the next page

Question	Answer	Mark	Comments

14(a) cont		B1B0B0B1
	Two integers in one section is choice and doesn't score the mark for that section or the final mark	
	Condone multiple letters or tallies or crosses etc instead of numbers for all the marks	

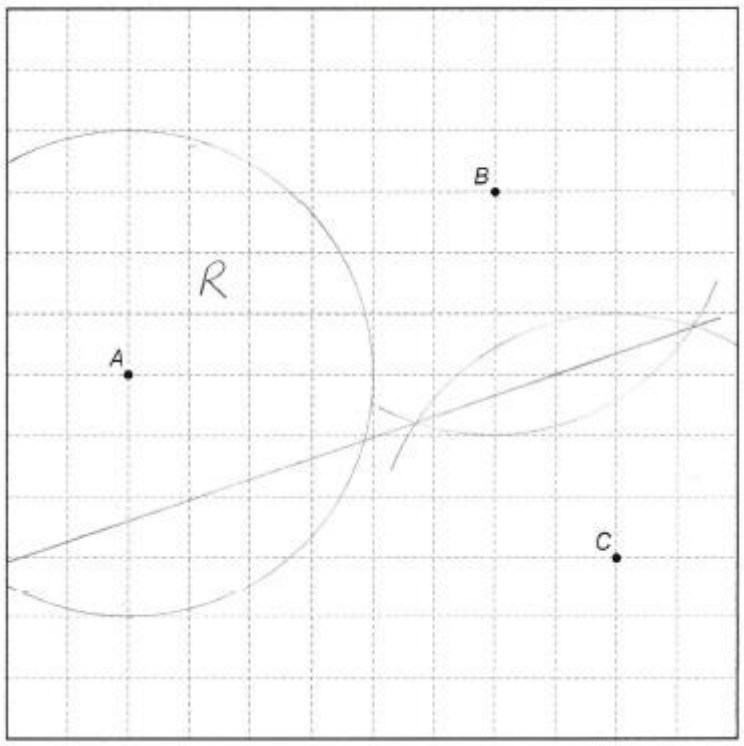
14(b)	$\frac{15}{135}$ or $\frac{5}{45}$ or $\frac{3}{27}$ or $\frac{1}{9}$ or $0.\dot{1}$ or 0.11(1…) or 11(.1…)%	B1	oe fraction decimal or percentage
	Additional Guidance		
	Ignore attempts to simplify or convert a correct fraction to a decimal or percentage		
	15 out of 135		B0
	0.1 without correct fraction seen		B0
	Ratio		B0

Question	Answer	Mark	Comments
15(a)	(0, 3)	B1	
	Additional Guidance		
15(b)	(–3, 0)	B1	SC1 (–3, 0) in (a) and (0, 3) in (b) or (3, 0) in (a) and (0, –3) in (b)
	Additional Guidance		
	(–3, 0) in (a) and (0, 3) in (b)		(a) 0 (b) SC1
	(3, 0) in (a) and (0, –3) in (b)		(a) 0 (b) SC1
16(a)	[4, 5]	B1	
	Additional Guidance		
16(b)	Correct ruled straight line from (–25, –50) to (25, 50)	B2	$\pm \frac{1}{2}$ small square ignore ends of line outside [–25, 25] B1 two correct points added to the table or at least two correct points plotted or correct line too short but crosses 2 horizontal centimetre squares
	Additional Guidance		
	The correct points in the table or on the graph may be outside [–25, 25] eg (100, 200) and (–100, –200) in the table		B1
	For B1, do not count a point as correct if another point has the same x-coordinate, otherwise ignore extra points that are incorrect		
	The B1 for points plotted cannot be implied by a line – you must see eg crosses or dots		
	Ignore incorrect points in the table if B1 or B2 gained elsewhere		

Question	Answer	Mark	Comments
16(c)	Correct reading of C coordinate of intersection of their graph with the given graph	B2ft	ft their intersection from any line or curve $\pm \frac{1}{2}$ small square B1 line drawn horizontally from point of intersection to vertical axis or F coordinate of intersection given
	Additional Guidance		
	Their line does not intersect given line or they have no line		B0
	If their graph intersects given line at more than one point and they give **all** the C coordinates of the intersections		B1
	If their line is correct the answer should be approximately –25		
	If their line is correct the F coordinate should be approximately –12		
	Both their –25 and their –12 given eg correct line seen and (–25, –12) or (–12, –25)		B1

Question	Answer	Mark	Comments
17(a)	$n + 5$ or $5 + n$	B1	oe eg $N - 2 + 7$
	Additional Guidance		
	Letters other than n or N eg $x + 5$		B0
17(b)	$n + n - 2 +$ their $(n + 5)$ or $3n + 3$	M1	condone any letter ft their algebraic expression in (a)
	$3n + 3 = 60$ or $(n =)$ 19 or $(n - 2 =)$ 17	M1dep	ft their algebraic expression in (a) correct ft equation with terms on LHS collected 19 10p coins or 17 20p coins or 19, 17, 24 chosen implies M2
	(their 19 – 2) × 0.2 or their 17 × 0.2 or 3.4 or (their 19 – 2) × 20 or their 17 × 20 or 340	M1dep	ft their algebraic expression in (a) 3.4 or 340 implies M3
	3.40	A1	condone 3.40p SC2 answer 17
	Additional Guidance		
	Allow a restart in this part ie answer £3.40 scores full marks		
	Working may be seen by the table		
	Answer 340p		M1M1M1A0
	£3.40 with answer eg £17.30 (total of all coins)		M1M1M1A0
	Only follow through their algebraic expression from (a) if an expression and / or equation for the total number of coins is used in this part		
	Award the M mark(s) for a correct ft expression or equation even if not subsequently used		
	The solution to an equation derived from an incorrect expression in (a) can score the first three marks eg answer in (a) $n - 5$ then working in (b) $n + n - 2 + n - 5 = 60$ $n =$ [22, 23] ([22, 23] – 2) × 0.2 = [4, 4.20]		M1M1 M1A0

Question	Answer	Mark	Comments
18	0.5 × 10 × 12 or 60	M1	oe
	180 ÷ their 60	M1dep	
	3	A1	SC1 1.5 oe
	Additional Guidance		
19	Increasing straight line starting at (0, 0)	B1	mark intention any constant positive gradient may be shown by at least three points starting at (0, 0)
	Additional Guidance		
	Must look straight and look as though the intention was to start at the origin		
	Allow a dotted line		
	Ignore work outside the quadrant		
	Ignore construction marks, scales, labels and points plotted		

Question	Answer	Mark	Comments
20	Arc, centre *A*, radius 4 cm on grid	B1	at least a quarter-circle ± 2 mm radius ignore any other arcs
	Correct straight line equidistant from *B* and *C*	B1	their line must intersect any two of the five grid vertices (0, 3), (3, 4), (6, 5), (9, 6), (12, 7) ± 2 mm
	Correct enclosed region identified	B1	± 2 mm for the line at (0, 3), (6, 5) and the arc at (6, 6), (2, 10) region may be identified by labelling R or by shading implies B3
	Additional Guidance		
			B1B1B1
	Arc must be drawn using compasses for the first and third marks		
	If a quarter-circle is in tolerance, ignore the rest of the arc for first B1		
	Grid points are based on the origin being bottom left		
	Use (6, 5) not the intersection of the arc and the line to test the region		
	Lines may be dotted		

Question	Answer	Mark	Comments
21	**Alternative method 1**		
	$18 \div 36$ or 0.5 or 30	M1	oe implied by 3.5 or 3 h 30 min or 3.3(0) or 210 seen
	$\frac{200-18}{4-\text{their } 0.5}$ or $\frac{182}{3.5}$ or $\frac{200-18}{4\times 60-\text{their } 30}$ or $\frac{182}{210}$ or 0.86(6…) or 0.87	M1dep	oe method for miles per hour or miles per minute implied by $\frac{182}{3 \text{ h } 30 \text{ min}}$ or $\frac{182}{3.3(0)}$
	52	A1	
	Alternative method 2		
	$18 \div 36$ or 0.5 or 30	M1	implied by 7
	$\frac{200}{4}+\frac{50-36}{7}$ or 50 + 2	M1dep	oe
	52	A1	
	Additional Guidance		
	Allow the first mark even if not subsequently used		
	Ignore units for the M marks		
	Answer 0.86(6…) or 0.87		M1M1A0
	Answer 0.86(6…) or 0.87 with mph crossed out and replaced by miles per min oe		M1M1A1
	Working for 52 then (52 + 36) ÷ 2		M1M1A0
	NB 50 + 2 = 52 from 200 ÷ 4 = 50 and 36 ÷ 18 = 2		Zero

Question	Answer	Mark	Comments
22	**Alternative method 1**		
	8^2 or 64 and 17^2 or 289	M1	
	$\sqrt{17^2 - 8^2}$ or $\sqrt{225}$ or 15	M1dep	oe implies M2 may be seen on diagram
	8 × 3 × their 15 or 24 × their 15	M1dep	dep on M2 oe eg (8 + 16) × their 15 or 0.5 × 8 × their 15 × 6
	360	A1	SC2 [448.8, 456]
	Alternative method 2		
	$\cos C = \frac{8}{17}$ or C = [61.9, 62]	M1	may be seen on diagram
	17 × sin their [61.9, 62] or [14.9, 15.1]	M1dep	may be seen on diagram oe eg 8 × tan their [61.9, 62]
	8 × 3 × their [14.9, 15.1] or 24 × their [14.9, 15.1] or [357.6, 362.4]	M1dep	dep on M2 oe eg (8 + 16) × their [14.9, 15.1] or 0.5 × 8 × their [14.9, 15.1] × 6
	360	A1	SC2 [448.8, 456]
	Alternative method 3		
	$\sin A = \frac{8}{17}$ or A = [28, 28.1]	M1	may be seen on diagram
	17 × cos their [28, 28.1] or [14.9, 15.1]	M1dep	may be seen on diagram oe eg 8 ÷ tan their [28, 28.1]
	8 × 3 × their [14.9, 15.1] or 24 × their [14.9, 15.1] or [357.6, 362.4]	M1dep	dep on M2 oe eg (8 + 16) × their [14.9, 15.1] or 0.5 × 8 × their [14.9, 15.1] × 6
	360	A1	SC2 [448.8, 456]

Alternative method and Additional Guidance continued on the next page

Question	Answer	Mark	Comments

22 cont	**Alternative method 4**			
	cos $C = \frac{8}{17}$ or C = [61.9, 62]	M1	may be seen on diagram	
	$\frac{1}{2} \times 8 \times 17 \times \sin$ their [61.9, 62] or [59.9, 60.1]	M1dep	oe	
	6 × their [59.9, 60.1] or [357.6, 362.4]	M1dep	oe	
	360	A1	SC2 [448.8, 456]	
	Additional Guidance			
	15 without a contradictory value for *AB* scores the first two marks on Alt method 1, even if not subsequently used			M1M1
	$\sqrt{17^2 + 8^2}$			M1M0
	3rd M1 is for the total area and may be calculated in various ways eg using a trapezium + a triangle			
	3rd M1 is for the total area so further work will lose the mark eg 360 seen followed by 360 – 60, answer 300			M1M1M0A0
	May use sine rule or cosine rule but must reach *AB* = …. to award the second M1 in Alt 2 or 3			

23(a)	continuous grouped	B1	both circled
	Additional Guidance		

Question	Answer	Mark	Comments
23(b)	**Alternative method 1**		
	380 ÷ 2 or (380 + 1) ÷ 2 or 381 ÷ 2 or 190 or 190.5 or 191	M1	oe eg $\frac{59+158+106+45+12}{2}$ may be seen by the table
	$2 < t \leqslant 4$ with 190 or 190.5 or 191 seen	A1	
	Alternative method 2		
	$2 < t \leqslant 4$ with 59 + 158 – 106 – 45 – 12 = 54 seen	B2	oe calculation eg 217 – 163 = 54 B1 59 + 158 – 106 – 45 – 12 = 54 oe
	Additional Guidance		
	$2 < t \leqslant 4$ with 190 or 190.5 or 191 not seen		M0A0
	Condone 2 – 4 in both or one of the spaces on answer line if 190 or 190.5 or 191 seen		M1A1
	Condone missing brackets if recovered		
	Alt 2 54 with calculation not seen		B0
	Alt 2 $2 < t \leqslant 4$ and 54 with calculation not seen		B0

Question	Answer	Mark	Comments
23(c)	$\frac{45+12}{380}$ or $\frac{57}{380}$ or $\frac{3}{20}$ or 0.15 or $100 \div \frac{380}{57}$ or $57 \div 3.8$	M1	oe proportion or calculation must use 380
	15	A1	
	Additional Guidance		
	$1 - \frac{59+158+106}{380}$ or $1 - \frac{323}{380}$ or $1 - \frac{17}{20}$ or $1 - 0.85$	M1	
	Correct proportion seen even if not subsequently used	M1A0	
	Do not allow misreads of 380		
	Build-up eg 10% = 380 ÷ 10 or 38 5% = 38 ÷ 2 or 19 38 + 19 = 57 is M0A0 unless answer 15		

Question	Answer	Mark	Comments
24	–1 0 1 2	B3	B2 three correct values with no incorrect values or –3 –2 –1 0 1 2 and –1 0 1 2 3 4 5 or interval that contains only the integers –1 0 1 2 B1 –3 –2 –1 0 1 2 or –1 0 1 2 3 4 5 SC2 answer 2 3 4 5

Additional Guidance	
Examples of intervals that contain only the integers –1 0 1 2 $-1 \leqslant x \leqslant 2$ or [–1, 2] or $-2 < x < 3$ or (–2, 3)	
–1 0 1 2 3 4 5 may be shown as an interval that contains only these integers eg $-1 \leqslant x < 6$ or [–1, 6)	
Intervals can be shown on a number line	
–3 –2 –1 0 1 2 can **not** be shown as an interval or on a number line	
Lists may be in any order eg 1 2 3 4 5 –1 0	B1
Condone repeats in lists eg –1 0 1 1 2	B3
Ignore commas/and/or between numbers in lists	
–3 –2 –1 0 1 2 3 4 5 with no other valid working	B0

Question	Answer	Mark	Comments
25	**Alternative method 1**		
	(65% =) $\frac{13}{20}$ or 7 : 13	M1	
	13	A1	must be selected as the answer
	Alternative method 2		
	(100 – 35) ÷ 35 × 7 or 7 ÷ 35 × 100 – 7 or 20 – 7	M1	oe eg 35 ÷ 7 = 5 and 65 ÷ 5
	13	A1	must be selected as the answer
	Alternative method 3		
	$\frac{35}{7} \times n = 100 - 35$ or $5n = 65$	M1	oe equation eg $\frac{7}{n} = \frac{35}{100-35}$ or $35n = 455$
	13	A1	must be selected as the answer
	Additional Guidance		
	35 : 65 with no other valid working		M0
	Condone answer £13		M1A1
	Answer 13% or 13n		M1A0
	65% = 0.65		M0
	Alt 2 65 ÷ 35 = 1.9 1.9 × 7 = 13.3 (evidence of premature approximation) Answer 13		 M1 A0
	Alt 2 65 ÷ 35 = 1.9 1.9 × 7 = 13 (assume full calculator value used)		M1 A1

Question	Answer	Mark	Comments
26	0.25	B1	
	Additional Guidance		
27	$y = 3x$	B1	
	Additional Guidance		
28	$10n + 1$ or $1 + 10n$	B2	B1 $10n$ (…)
	Additional Guidance		
	Ignore LHS of formula given eg $Tn = 10n + 1$		B2
	Condone $n = 10n + 1$ or nth term $= 10n + 1$		B2
	Allow other variables eg $10x + 1$		B2
	Allow a multiplication sign eg $10 \times n + 1$ or $n \times 10 + 1$		B2
	$n10$ …		B1
	$n10 + 1$		B1
	$10n + 1n$		B0
	Choice eg $10n + 1$ and $1n + 10$		B0