GCSE
MATHEMATICS
8300/2F

Foundation Tier Paper 2 Calculator

Mark scheme

June 2021

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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 Examiner.

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.

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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.

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.

Q	Answer	Mark	Comments
1	16	B1	

Q	Answer	Mark	Comments
2	$y = x + 3$	B1	

Q	Answer	Mark	Comments
3	$\frac{3}{20}$	B1	

Q	Answer	Mark	Comments
4	$2s + 2w$	B1	

Q	Answer	Mark	Comments
5	60	B2	B1 $10^2 - 4 \times 10$ or $10^2 - 4(10)$ or 100 or 40 or –40 seen or implied
	Additional Guidance		
	Embedded correct value eg $100 - 4a = 96a$		B1
	Further correct work eg $100 - 40 = 60$, Answer $6a$		B2
	Further incorrect work eg $100 - 40 = 60$, Answer $60a$		B1
	Values may be implied eg1 $10^2 - 4 = 96$ implies 100 eg2 96 only does not imply 100		 B1 B0
	Incorrect calculations cannot imply a value eg $10^2 - 4a = 96a$		B0
	$100a$ does not imply 100		B0

Q	Answer	Mark	Comments
6(a)	$\frac{9}{16}$	B1	oe fraction, decimal or percentage eg 0.5625 or 56.25%
	Additional Guidance		
	Ignore incorrect simplification or conversion of a correct probability to a fraction, decimal or percentage but not a ratio eg1 $\frac{9}{16}$ 0.55 eg2 $\frac{9}{16}$ 9 : 16		B1 B0
	Ignore words alongside a correct probability eg1 $\frac{9}{16}$ unlikely eg2 9 out of 16 $\frac{9}{16}$		B1 B1
	Do not accept answer given in words or as a ratio eg 9 out of 16		B0

Q	Answer	Mark	Comments
6(b)	Linear scale starting at 0 and increasing in 1s or 2s on vertical axis Vertical axis labelled frequency or f or Number or How many Bars or horizontal axis labelled with four types of juice (accept A, G, O, M) Four bars with equal widths Equal gaps or no gaps between the four bars All four heights correct	B3	bar chart could be horizontal bars may be in any order B3 for all criteria met B2 for 4 or 5 criteria met B1 for 3 criteria met or a fully correct 2-bar or 3-bar chart
	Additional Guidance		
	Mark intention throughout		
	If axes and labels do not match the orientation of the bar chart then only criteria 4, 5 and 6 may be awarded		B1 max
	All values not needed for axis scale. For example 0 can be implied, but spacing must be linear		
	Allow words after 'Number' on axis label, eg 'Number chosen' or 'Number of people'		
	Condone a different gap between the vertical axis and the first bar to the other, equal gaps		
	If no scale or a non-linear scale is given, bars with heights 6, 1, 4, 5 squares meet the height criterion		
	Allow heights criterion if their heights match their labels for their non-linear scale and it is linear between 1 and 6		
	Points only or vertical lines can score the marks for criteria 1, 2, 3 and 6		B2 max

Q	Answer	Mark	Comments
7	10.74 ÷ 6 × 11 or 1.79 seen	M1	oe eg 2 × 10.74 – 10.74 ÷ 6
	19.69	A1	
	Additional Guidance		
	6 ÷ 10.74 = 1.79 (recovered)		M1
	6 ÷ 10.74		M0

Q	Answer	Mark	Comments
8	240	B1	

Q	Answer	Mark	Comments
9	Two multiples of 9 with a difference of 54 eg 9 and 63 or 18 and 72 or 27 and 81 or 36 and 90 or 45 and 99 or 54 and 108	B2	either order B1 at least one multiple of 9 other than 9 or 54 seen or two numbers with a difference of 54
	Additional Guidance		
	11 × 9 = 99, 5 × 9 = 45, Answer 11 and 5		B1

Q	Answer	Mark	Comments
10	$11.2 \div 8 \times 5$ or 1.4 seen or 1.6 seen or 0.625 seen	M1	oe full method oe eg $\frac{7}{5}$ oe eg $\frac{8}{5}$ oe eg $\frac{5}{8}$
	7	A1	
	Additional Guidance		
	Build up methods may score for seeing the correct scale factor ie 1.6 or 0.625 but otherwise need a fully correct method for the first mark		
	Build up methods that do not reach exactly 7 but are then rounded to 7 will score M1 max for seeing 1.4, 1.6 or 0.625		
	M1 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
11	£20 notes 13 £10 notes 2 £5 notes 3	B3	B2 three or four shops correct (A) 3 × £20, 1 × £5 (B) 2 × £20 (C) 5 × £20, 1 × £10, 1 × £5 (D) 3 × £20, 1 × £10, 1 × £5 B1 one or two shop(s) correct SC1 £20 notes 14 £10 notes 1 £5 notes 1
	Additional Guidance		
	Notes may be seen by the table		
	Mark intention for up to B2 eg allow tallies		
	Units may be implied eg Shop A = 20 20 20 5		B1

Q	Answer	Mark	Comments
12(a)	20 home and 20 away	B1	
	8 home losses	B1ft	ft their 20 × $\frac{2}{5}$ rounded to the nearest whole number
	2 away wins	B1ft	ft their 20 × $\frac{1}{10}$ rounded to the nearest whole number
	5 home draws and 6 away draws	B1ft	ft their 8 and their 2 condone their 8 and their 2 as zero or non-integers award if total of home games is their 20 **and** total of away games is their 20 **and** total number of games is 40
	Additional Guidance		
	Mark the cells in the frequency tree		

Q	Answer	Mark	Comments
12(b)	Any two of (home wins =) 7 × 6 or 42 or (home draws =) their 5 × 3 or 15 or (away wins =) their 2 × 6 or 12 or (away draws =) their 6 × 3 or 18	M1	may be implied by one of (total points for their wins) 54 or (total points for their draws) 33 or (total points for their home) 57 or (total points for their away) 30
	87	A1ft	ft their frequency tree with positive integers in all relevant sections
	Additional Guidance		
	Using non-integers		M0A0

Q	Answer	Mark	Comments
13	$50(x + 2)$	B2	B1 $25(2x + 4)$ or $10(5x + 10)$ or $5(10x + 20)$ or $2(25x + 50)$
	Additional Guidance		
	$(x + 2)50$		B2
	$50(x + 2$		B2
	$50(1x + 2)$		B1
	$50 \times (x + 2)$ or $(x + 2) \times 50$		B1
	Ignore a multiplication sign in B1 response		B1
	$50(x + 2)$ followed by further incorrect simplification		B1
	B1 may be awarded for a correct partial factorisation, with no or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
14	$\frac{3}{8}$	B1	

Q	Answer	Mark	Comments
15	It has 12 edges	B1	

Q	Answer	Mark	Comments
16	$x + 53 + 48 = 180$ or $53 + 48$ or 101 or $180 - 53$ or 127 or any correct angle marked as 53 or 127 on the diagram	M1	oe equation in x
	$180 - (53 + 48)$ or $360 - 53 - 53 - (180 - 53) - 48$	M1dep	oe eg $180 - 101$ or $127 - 48$
	79	A1	
	Additional Guidance		
	M1 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	Correct angle on diagram may be credited even if alongside other incorrectly marked angles or incorrect or no working in working lines		
	Correct method in the working lines may be credited even with incorrect angles on the diagram		
	Method for 79 followed by further work to their 79		M1M1A0

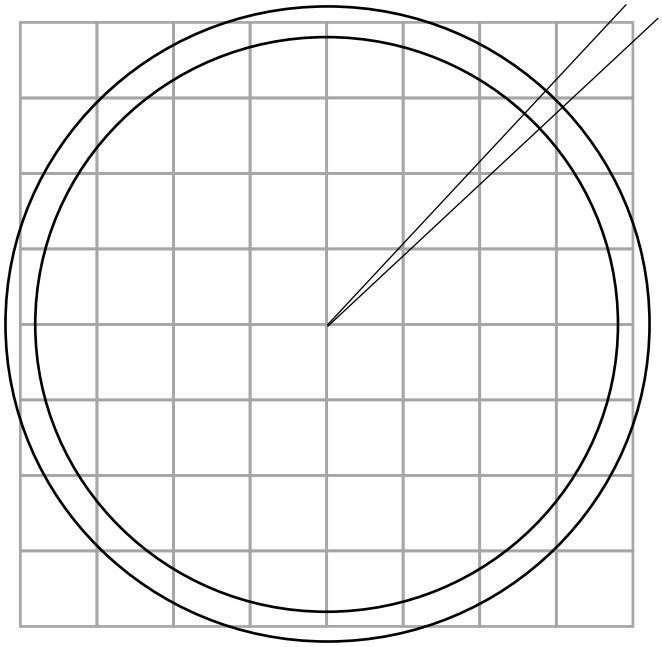
Q	Answer	Mark	Comments
17	7.35 × 4 or 29.4(0)	M1	oe
	7.35 ÷ 3 or [2.42, 2.45]	M1	oe implied by 14.54 allow 0.33 or better
	their 29.4(0) – (16.99 – their 2.45)	M1dep	oe dep on M1M1
	14.86	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	The first two marks may be seen in either order		
	Do not allow use of 0.3		

Q	Answer	Mark	Comments
18	$10x = 21 + 3$ or $10x = 24$ or $(21 + 3) \div 10$ or $24 \div 10$	M1	oe eg $-10x = -3 - 21$
	2.4	A1	oe eg $\frac{24}{10}$ or $\frac{12}{5}$ or $2\frac{4}{10}$ or $2\frac{2}{5}$ SC1 1.8 oe
	Additional Guidance		
	$10x - 3 + 3 = 21 + 3$	M1	
	$10x - 3 = 21 + 3$ or $10x - 3 + 3 = 21$ unless recovered	M0	
	$10x \div 10 - 3 \div 10 = 21 \div 10$	M1	
	$10x \div 10 - 3 = 21 \div 10$ unless recovered	M0	
	Embedded answer eg $10 \times 2.4 - 3 = 21$ with no or incorrect answer	M1A0	

Q	Answer	Mark	Comments
19	**Alternative method 1**		
	0.31(25) or 0.68	M1	oe eg 31(.25)% or 68%
	0.31(25) and 0.68 and $\frac{17}{25}$	A1	accept 0.68 as the answer with both values seen
	Alternative method 2		
	Converts both fractions to a valid common denominator with at least one numerator correct	M1	eg $\frac{125}{400}$ and $\frac{272}{400}$ with one numerator correct
	Two correct fractions with a common denominator and $\frac{17}{25}$	A1	accept $\frac{272}{400}$ oe as the answer with both values seen
	Alternative method 3		
	Gives differences from $\frac{1}{2}$ in same form with at least one correct	M1	eg $\frac{75}{400}$ and $\frac{72}{400}$ with one numerator correct or 0.1875 and 0.18 with one correct
	Both differences correct and $\frac{17}{25}$	A1	accept 0.18 as the answer with both values seen

Additional Guidance is on the next page

19 cont	**Additional Guidance**	
	Accept $\frac{17}{25}$ circled in question with both values seen	
	Ignore subsequent rounding or truncation once 0.31 and 0.68 seen	
	Ignore incorrect attempts at differences in Alt 1 and Alt 2 and award up to full marks	
	Choose the scheme that favours the student	
	Use of other methods requires comparable forms eg $0.5 - \frac{5}{16} = \frac{3}{16}$, $0.5 + \frac{3}{16} = \frac{11}{16}$ and compares with $\frac{17}{25}$	

Q	Answer	Mark	Comments
20(a)	Point marked on grid North East of *A*	B1	± 2°
	Point marked 4 cm from *A*	B1	± 2 mm
	Additional Guidance		
			
	Ignore any North lines marked on grid		
	Point marked 3 cm right and 3 cm up – condone in tolerance		B1B1
	Point marked on top right corner of the grid		B1B0
	Assume the end of a line drawn from *A* with no point marked is their *B*		
	The point must be marked or implied by the end of a line from *A*, just writing the letter *B* is not enough to indicate the point		B0B0

Q	Answer	Mark	Comments
20(b)	180	B1	

Q	Answer	Mark	Comments
20(c)	30	B1	

Q	Answer	Mark	Comments
21	**Alternative method 1**		
	38 × 10.8(0) or 410.4(0)	M1	oe
	10.8(0) × 0.25 or 2.7(0)	M1	oe
	10.8(0) + their 2.7(0) or 13.5(0)	M1dep	dep on 2nd M1 10.8(0) × 1.25 is 2nd M1 and 3rd M1
	(491.4(0) – their 410.4(0)) ÷ their 13.5(0) or 81 ÷ their 13.5(0) or 6	M1dep	oe eg 6 × 13.5 = 81 or 410.4 + 13.5 + 13.5 + 13.5 + 13.5 + 13.5 + 13.5 = 491.4 dep on M3
	44 with 410.4(0) and 13.5(0) seen	A1	
	Alternative method 2		
	38 × 10.8(0) or 410.4(0)	M1	oe
	491.4(0) – their 410.4(0) or 81	M1dep	
	their 81 ÷ 10.8(0) or 7.5	M1dep	oe
	their 7.5 ÷ 1.25 or 6	M1dep	oe
	44 with 410.4(0) and 7.5 seen	A1	
	Alternative method 3		
	491.4(0) ÷ 10.8(0) or 45.5	M1	oe
	their 45.5 – 38	M1dep	
	7.5	A1	oe may be implied by 6
	their 7.5 ÷ 1.25 or 6	M1dep	oe dep on M2
	44 with 45.5 and 7.5 seen	A1	

Additional Guidance is on the next page

21 cont	**Additional Guidance**	
	Choose the scheme that favours the student	
	Up to 3 marks may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts	
	Build up attempts must be fully correct or show method	

Q	Answer	Mark	Comments
22	256	B1	

Q	Answer	Mark	Comments
23	$p = 11$ and $q = 34$ and $r = 91$	B2	B1 $p = 11$ or $q = 34$ or $r = 91$ or $q + 23 = 57$ oe equation in q
	Additional Guidance		
	For example, 34 written next to q in the sequence and not contradicted implies $q = 34$	B1	

Q	Answer	Mark	Comments
24(a)	**Alternative method 1**		
	15^2 or 225 **and** 7^2 or 49 or 274	M1	
	$\sqrt{7^2+15^2}$ or $\sqrt{49+225}$	M1dep	
	16.55(…) or 16.6 or $\sqrt{274}$	A1	accept 17 with M2 awarded
	Alternative method 2		
	$\tan^{-1}\frac{7}{15}$ or 25.0…	M1	
	$\frac{15}{\cos(\text{their } 25...)}$ or $\frac{7}{\sin(\text{their } 25...)}$	M1dep	
	16.55(…) or 16.6	A1	accept 17 with M2 awarded
	Alternative method 3		
	$\tan^{-1}\frac{15}{7}$ or 64.98… or 65	M1	
	$\frac{15}{\sin(\text{their } 64.98...)}$ or $\frac{7}{\cos(\text{their } 64.98...)}$	M1dep	
	16.55(…) or 16.6	A1	accept 17 with M2 awarded

Additional Guidance is on the next page

24(a) cont	**Additional Guidance**	
	Allow rounding or truncation after correct answer seen eg1 16.55, Answer 16 eg2 $\sqrt{274}$, Answer 16.5	 M2A1 M2A1
	Misconception of square root eg $\sqrt{274} = 137$	M2A0
	$15^2 - 7^2$	M1M0A0
	$\sqrt{176}$ without seeing 15^2 or 225 **and** 7^2 or 49	M0M0A0

Q	Answer	Mark	Comments
24(b)	It is more than 90°	B1	

Q	Answer	Mark	Comments
25	$3h = g + 1$ or $g + 1 = 3h$ or $h - \frac{1}{3} = \frac{g}{3}$ or $\frac{g}{3} = h - \frac{1}{3}$ or $\frac{g+1}{3}$ or $\frac{g}{3} + \frac{1}{3}$	M1	allow negative equivalents eg $-3h = -g - 1$ correct rearrangement omitting $h =$
	$h = \frac{g+1}{3}$ or $h = \frac{g}{3} + \frac{1}{3}$	A1	oe fully simplified SC1 $h = \frac{g-1}{3}$ or $h = \frac{g}{3} - \frac{1}{3}$ oe
	Additional Guidance		
	$\frac{g+1}{3} = h$ or $\frac{g}{3} + \frac{1}{3} = h$		M1A1
	Not fully simplified correct rearrangement eg $h = \frac{-g-1}{-3}$		M1A0
	Correct solution followed by further incorrect simplification		M1A0

Q	Answer	Mark	Comments
26	Enlargement	B1	
	$\frac{1}{4}$	B1	scale factor oe eg 0.25
	(3, 9) or *A*	B1	centre do not allow $\begin{pmatrix}3\\9\end{pmatrix}$
	Additional Guidance		
	Do not accept reduction or unenlargement or negative		1st B0
	Do not accept ÷ 4		2nd B0
	A combination of transformations cannot score the first B1 eg1 Enlarge sf $\frac{1}{4}$ Translate $\begin{pmatrix}0\\6\end{pmatrix}$ eg2 Enlarge sf $\frac{1}{4}$ 1.5 right up 6 (3, 9)		B0B1B0 B0B1B1
	Do not allow $\begin{pmatrix}3\\9\end{pmatrix}$ for (3, 9) but do not regard as implying a combination of transformations eg Enlargement sf 0.25 $\begin{pmatrix}3\\9\end{pmatrix}$		B1B1B0
	Enlargement, sf 4 about (3, 9)		B1B0B1
	Enlarge(d) 0.25 *A*		B1B1B1
	Condone *ABC* is an enlargement of *ADE*		1st B1
	Condone enlargement with other words unless referring to another transformation eg1 Enlargement making shapes bigger eg2 Enlarged then moved using a vector eg3 Enlarged which means *B* moves to *D* and *C* moves to *E*		1st B1 1st B0 1st B1
	If more than one point is listed it must be clear which point is their centre eg (1, 1) (5, 1) (3, 9) (2, 7)		3rd B0
	Reflected in the point (3, 9)		B0B0B1

Q	Answer	Mark	Comments
27	**Alternative method 1** Working out time to fill the ball		
	$4 \div 3 \times 15^3 \times \pi$ or [4488, 4500]π or [14 092, 14 139]	M1	oe allow 1.33 or better
	their [14 092, 14 139] – 5000 or [9092, 9139] or their [14 092, 14 139] ÷ 160 or [88, 88.37]	M1dep	oe
	(their [14 092, 14 139] – 5000) ÷ 160 or [56, 57.12]	M1dep	oe eg their [9092, 9139] ÷ 160 or their [88, 88.37] – 5000 ÷ 160
	[56, 57.12] and Yes	A1	
	Alternative method 2 Comparing volume needed with volume that could be filled		
	$4 \div 3 \times 15^3 \times \pi$ or [4488, 4500]π or [14 092, 14 139]	M1	oe allow 1.33 or better
	their [14 092, 14 139] – 5000 or [9092, 9139]	M1dep	
	[58, 60] × 160 or [9280, 9600]	M1	oe
	[9092, 9139] and [9280, 9600] and Yes	A1	

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27 cont	**Alternative method 3** Volume of ball compared with volume that could be filled + 5000		
	$4 \div 3 \times 15^3 \times \pi$ or $[4488, 4500]\pi$ or [14 092, 14 139]	M1	oe allow 1.33 or better
	$[58, 60] \times 160$ or $[9280, 9600]$	M1	oe
	their $[9280, 9600] + 5000$ or [14 280, 14 600]	M1dep	dep on 2nd M1
	[14 092, 14 139] and [14 280, 14 600] and Yes	A1	
	Additional Guidance		
	Accept $\frac{4}{3}\pi 15^3$ without multiplication signs		
	Condone use of 1.3 for up to M3 if 1.3 shown		
	Up to M3 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	Using an incorrect power eg 15^2, $15\pi^3$, $(15\pi)^3$ or omitting π unless recovered		1st M0
	NB 56.(59…) or 56.6 or 57 coming from $5000 \div 88.35…$		M1M1M0
	Yes can be implied eg Alt 1 $57 < 60$		M3A1

Q	Answer	Mark	Comments
28	Sometimes true Always true Always true Never true	B4	B1 for each
	Additional Guidance		
	Allow any unambiguous indication eg all 4 correct boxes contain a cross with all other boxes blank		B4
	A row with one tick and some crosses – mark the tick		
	A row with more than one tick is B0 for that row		
	Mark the boxes not the working lines		

Q	Answer	Mark	Comments
29(a)	Any one of 0.24 or 0.19 or 0.22 in the correct cell	M1	oe fraction, decimal or percentage eg $\frac{36}{150}$ or $\frac{38}{200}$ or $\frac{55}{250}$ implied by any correct point for these three values
	At least two of their relative frequencies plotted accurately	M1dep	$\pm \frac{1}{2}$ square
	(150, 0.24), (200, 0.19) and (250, 0.22) plotted and graph completed with straight lines	A1	$\pm \frac{1}{2}$ square allow dotted or solid lines
	Additional Guidance		
	Mark intention for straightness of lines		
	Ignore any continuation of line after the last point or any other lines drawn on the graph, for example a line of best fit		

Q	Answer	Mark	Comments
29(b)	0.22	B1ft	oe fraction, decimal or percentage eg $\frac{55}{250}$ ft their relative frequency for 250 trains (> 0 and < 1) given in table or plotted on graph
	Additional Guidance		
	The mark may be awarded for a correct restart or a follow through from their table or a follow through from their graph		
	Ignore attempts to convert a correct relative frequency once seen in (b)		
	NB $\frac{166}{750} = 0.2213\ldots$ is incorrect (unless it is given as their relative frequency for 250 trains)	B0ft	

Q	Answer	Mark	Comments
30	**Alternative method 1** Shows algebraically that the angles are equal		
	$4x + 40$	M1	may be embedded or on the diagram
	$x + 2(2x + 20)$ or $x + 4x + 40$	M1	
	$x + 4x + 40 = 5x + 40$ and Yes	A1	
	Alternative method 2 Derives and solves an equation for angles at a point and substitutes into $5x + 40$ or $x + 2(2x + 20)$		
	$4x + 40$	M1	may be embedded or on the diagram or implied eg implied by $10x + 80 = 360$
	$x + 2(2x + 20) + 5x + 40 = 360$ or $x + 4x + 40 + 5x + 40 = 360$ or $(x =) 28$	M1	oe equation eg $10x + 80 = 360$ $(x =) 28$ may be on the diagram
	$140 + 40 = 180$ and Yes or $28 + 152 = 180$ and Yes	A1	oe must obtain $(x =) 28$ from one expression and substitute $(x =) 28$ into a different expression
	Alternative method 3 Assumes line is a diameter. Derives and solves an equation for angles on a line using $5x + 40$ and substitutes into $x + 2(2x + 20)$ or $x + 2(2x + 20) + 5x + 40$		
	$5x + 40 = 180$	M1	
	$(x =) (180 - 40) \div 5$ or $(x =) 28$	M1dep	oe $(x =) 28$ may be on the diagram
	$28 + 152 = 180$ and Yes or $28 + 152 + 140 + 40 = 360$ and Yes	A1	oe must obtain $(x =) 28$ from one expression and substitute $(x =) 28$ into a different expression

Mark scheme and Additional Guidance continue on next two pages

30 cont	**Alternative method 4** Assumes line is a diameter. Derives and solves an equation for angles on a line using $x + 2(2x + 20)$ and substitutes into $5x + 40$ or $x + 2(2x + 20) + 5x + 40$		
	$x + 2(2x + 20) = 180$ or $x + 4x + 40 = 180$	M1	
	$(x =)\ (180 - 40) \div 5$ or $(x =)\ 28$	M1dep	oe $(x =)\ 28$ may be on the diagram
	$140 + 40 = 180$ and Yes or $28 + 152 + 140 + 40 = 360$ and Yes	A1	oe must obtain $(x =)\ 28$ from one expression and substitute $(x =)\ 28$ into a different expression
	Alternative method 5 Assumes line is a diameter. Derives and solves two equations for angles on a line/angles at a point		
	$5x + 40 = 180$ or $x + 2(2x + 20) = 180$ or $x + 4x + 40 = 180$ or $x + 2(2x + 20) + 5x + 40 = 360$ or $x + 4x + 40 + 5x + 40 = 360$	M1	
	$(x =)\ (180 - 40) \div 5$ or $(x =)\ 28$	M1dep	oe $(x =)\ 28$ may be on the diagram
	Obtains $(x =)\ 28$ from two equations for angles on a line/ angles at a point and Yes	A1	

Additional Guidance is on the next page

30 cont	**Additional Guidance**	
	Choose the scheme that favours the student	
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts	
	Correct response with other incorrect work	M1M1A0
	Alt 1 $2(2x + 20) = 4x + 20$ followed by $x + 4x + 20$ Alt 1 $x + 4x + 20$ with $2(2x + 20) = 4x + 20$ not seen Apply marks in a similar way in alts 2, 4 and 5	M0M1 M0M0
	$(x =)$ 28	M1M1
	Allow $(x =)$ 28 to be embedded	M1M1
	No method marks scored with a value of x ($\neq$ 28) substituted into $5x + 40$ and $x + 2(2x + 20)$ giving the same value	M0M0A0
	Yes can be implied eg Alt 1 $x + 4x + 40 = 5x + 40$ and It is a diameter	M1M1A1

Q	Answer	Mark	Comments
31	**Alternative method 1**		
	$6 \times 3 + c = 19$	M1	oe eg $18 + c = 19$
	$(c =)\ 19 - 6 \times 3$ or $(c =)\ 1$	M1dep	oe implied by (0, 1)
	$y = 6x + 1$	A1	SC1 $y = 6x + c \quad c \neq 1$
	Alternative method 2		
	$y - 19 = 6(x - 3)$	M1	oe
	$y - 19 = 6x - 18$	M1dep	oe correct equation with brackets expanded
	$y = 6x + 1$	A1	SC1 $y = 6x + c \quad c \neq 1$
	Additional Guidance		
	Allow $y = 6 \times x + 1$		
	$6x + 1$ on answer line, $y = 6x + 1$ seen in working		M1M1A1
	$6x + 1$ on answer line, $y = 6x + 1$ not seen in working		M1M1A0
	$m = 6$, $c = 1$ on answer line, $y = 6x + 1$ seen in working		M1M1A1
	$m = 6$, $c = 1$		M1M1A0
	$y = mx + 1$		M1M1A0
	Allow embedded value for c eg $19 = 6 \times 3 + 1$		M1M1A0
	$y = 6x + c$		SC1
	$y = 6x$		SC1
	$6x + c$ on answer line with $c \neq 1$, $y = 6x + c$ seen in working		SC1
	$6x + c$ on answer line with $c \neq 1$, $y = 6x + c$ not seen in working		M0M0A0