



GCSE MATHEMATICS 8300/2F

Foundation Tier

Paper 2 Calculator

Shadow paper based on November 2021 paper

Mark scheme

Version: 1.0

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 $a \leq \text{value} < b$
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	18	B1	

Q	Answer	Mark	Comments
2	$y = x + 5$	B1	

Q	Answer	Mark	Comments
3	$\frac{3}{5}$	B1	

Q	Answer	Mark	Comments
4	<i>sw</i>	B1	

Q	Answer	Mark	Comments
5	28	B2	B1 $4^2 + 3 \times 4$ or $4^2 + 3(4)$ or 16 or 12 or +12 seen or implied
	Additional Guidance		
	Embedded correct value eg $16 + 3a = 19a$ or $a^2 + 12 = 14a$		B1
	Further correct work, eg $16 + 12 = 28$, Answer $7a$		B2
	Further incorrect work, eg $16 + 12 = 28$, Answer $28a$		B1
	Values may be implied eg1 $4^2 + 34 = 50$ implies 16		B1
	eg2 50 only does not imply 16		B0
	Incorrect calculations cannot imply a value eg $4^2 + 3a = 19a$		B0
16a does not imply 16		B0	

Q	Answer	Mark	Comments
6(a)	$\frac{6}{16}$	B1	oe fraction, decimal or percentage eg $\frac{3}{8}$ or 0.375 or 37.5%
	Additional Guidance		
	Ignore incorrect simplification or conversion of a correct probability to a fraction, decimal or percentage but not a ratio		
	Ignore words alongside a correct probability eg1 $\frac{6}{16}$ unlikely eg2 6 out of 16 $\frac{6}{16}$	B1	
	Do not accept answer given in words or as a ratio eg 6 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 cake (accept S, F, C, W) 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 cakes'		
	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 7, 3, 1, 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 7		
Points only or vertical lines can score the marks for criteria 1, 2, 3 and 6	B2 max		

Q	Answer	Mark	Comments	
7	$11.92 \div 8 \times 13$ or 1.49 seen	M1	oe eg $2 \times 11.92 - 3(11.92 \div 8)$	
	19.37	A1		
	Additional Guidance			
	$8 \div 11.92 = 1.49$ (recovered)		M1	
	$8 \div 11.92$		M0	

Q	Answer	Mark	Comments
8	378	B1	

Q	Answer	Mark	Comments
9	Two multiples of 7 with a difference of 28 eg 7 and 35 or 14 and 42 or 21 and 48 or 28 and 56 or 35 and 63 or 42 and 70	B2	either order B1 at least one multiple of 7 other than 7 or 28 seen or two numbers with a difference of 28
	Additional Guidance		
	$6 \times 7 = 42, 2 \times 7 = 14$, Answer 6 and 2		B1

Q	Answer	Mark	Comments	
10	$20 \div 8 \times 5$ or 2.5 seen or 1.6 seen or 0.625 seen	M1	oe full method	
	12.5	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			
	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	50p coins 3 20p coins 4 10p coins 1 5p coins 3	B3	B2 two or three shops correct (A) 1 × 50p, 1 × 20p, 1 × 5p (B) 2 × 20p, 1 × 5p (C) 2 × 50p, 1 × 20p, 1 × 10p, 1 × 5p B1 one shop correct SC1 50p coins 5 5p coins 1	
	Additional Guidance			
	Coins may be seen by the table			
	Mark intention for up to B2, eg allow tallies			
	Units may be implied eg Shop A = 50 20 5		B1	

Q	Answer	Mark	Comments
12(a)	21 home and 21 away	B1	
	7 home losses	B1ft	ft their $21 \times \frac{1}{3}$ rounded to the nearest whole number
	3 away wins	B1ft	ft their $21 \times \frac{1}{7}$ rounded to the nearest whole number
	4 home draws and 6 away draws	B1ft	ft their 7 and their 3 condone their 7 and their 3 as zero or non-integers award if total of home games is their 21 and total of away games is their 21 and total number of games is 42
	Additional Guidance		
	Mark the cells in the frequency tree		

Q	Answer	Mark	Comments
12(b)	Any two of (home wins =) 10×3 or 30 or (home draws =) their 4×1 or 4 or (away wins =) their 3×3 or 9 or (away draws =) their 6×1 or 6	M1	may be implied by one of (total points for their wins) 39 or (total points for their draws) 10 or (total points for their home) 34 or (total points for their away) 15
	49	A1ft	ft their frequency tree with positive integers in all relevant sections
	Additional Guidance		
	Using non-integers		MOA0

Q	Answer	Mark	Comments
13	$4(x + 3)$	B2	B1 $2(2x + 6)$
	Additional Guidance		
	$(x + 3)4$		B2
	$4(x + 3)$		B2
	$4(1x + 3)$		B1
	$4 \times (x + 3)$ or $(x + 3) \times 4$		B1
	Ignore a multiplication sign in B1 response ie $2 \times (2x + 6)$		B1
	$4(x + 3)$ 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	$\frac{2}{9}$	B1	

Q	Answer	Mark	Comments
15	It has 6 faces	B1	

Q	Answer	Mark	Comments
16	$x + 62 + 35 = 180$ or $62 + 35$ or 97 or $180 - 62$ or 118 or any correct angle marked as 62 or 118 on the diagram	M1	oe equation in x
	$180 - (62 + 35)$ or $360 - 62 - 62 - (180 - 62) - 35$	M1dep	oe eg $180 - 97$ or $118 - 35$
	83	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 83 followed by further work to their 83		M1M1A0	

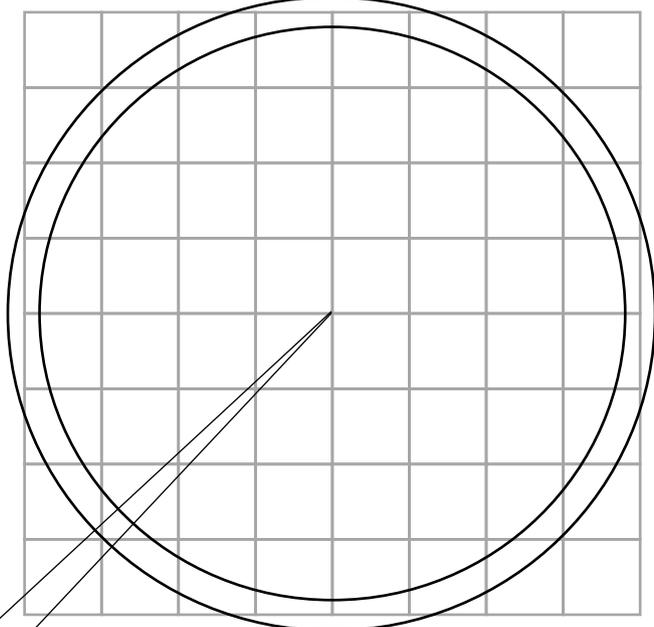
Q	Answer	Mark	Comments	
17	$4.2(0) \times 2$ or $8.4(0)$	M1	oe	
	$4.20 \div 3$ or $[1.39, 1.40]$	M1	oe implied by 5.10 allow 0.33 or better	
	their $8.4(0) - (6.50 - \text{their } 1.40)$	M1dep	oe dep on M1M1	
	3.30	A1		
	Additional Guidance			
	Up to M2 may be awarded for correct work, with no or incorrect 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	$5x = 11 + 2$ or $5x = 13$ or $(11 + 2) \div 5$ or $13 \div 5$	M1	oe eg $-5x = -2 - 11$	
	2.6	A1	oe eg $\frac{13}{5}$ or $2\frac{3}{5}$ SC1 1.8 oe	
	Additional Guidance			
	$5x - 2 + 2 = 11 + 2$		M1	
	$5x - 2 = 11 - 2$ or $5x - 2 + 2 = 11$ unless recovered		M0	
	$5x \div 5 - 2 \div 5 = 11 \div 5$		M1	
	$5x \div 5 - 2 = 11 \div 5$ unless recovered		M0	
Embedded answer, eg $5 \times 2.6 - 2 = 11$ with no or incorrect answer		M1A0		

Q	Answer	Mark	Comments
19	Alternative method 1		
	0.43(75) or 1.56	M1	oe eg 43(.75)% or 156%
	1 – 0.43(75) = 0.5625 and 1.56 and $\frac{39}{25}$	A1	accept 1.56 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 $\frac{175}{400}$ and $\frac{624}{400}$ with one numerator correct
	Two correct fractions with a common denominator and $\frac{39}{25}$	A1	accept $\frac{624}{400}$ oe as the answer with both values seen
	Alternative method 3		
	Gives differences from 1 in same form with at least one correct	M1	eg $\frac{175}{400}$ and $\frac{624}{400}$ with one numerator correct or 1 – 0.4375 = 0.5625 and 1.56 with one correct
Both differences correct and $\frac{39}{25}$	A1	accept 1.56 as the answer with both values seen	

Additional Guidance is on the next page

Additional Guidance	
19 cont	Accept $\frac{39}{25}$ circled in question with both values seen
	Ignore subsequent rounding or truncation once 0.4375 and 1.56 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 $1 - \frac{7}{16} = \frac{9}{16}$, $1 + \frac{14}{25} = \frac{39}{25}$ and compares with 1

Q	Answer	Mark	Comments	
20(a)	Point marked on grid South West of A	B1	$\pm 2^\circ$	
	Point marked 3 cm from A	B1	$\pm 2\text{ mm}$	
	Additional Guidance			
				
	Ignore any North lines marked on grid			
	Point marked 3 cm left and 3 cm down – condone in tolerance			B1B1
	Point marked on bottom left 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)	270	B1	

Q	Answer	Mark	Comments
20(c)	30	B1	

Q	Answer	Mark	Comments
21	Alternative method 1		
	$35 \times 22.8(0)$ or $798.(0)$	M1	oe
	$22.8(0) \times 0.15$ or 3.42	M1	oe
	$22.8(0) + \text{their } 3.42$ or 26.22	M1dep	dep on 2nd M1 $22.8(0) \times 1.15$ is 2nd M1 and 3rd M1
	$(981.54 - \text{their } 798) \div \text{their } 26.22$ or $183.54 \div \text{their } 26.22$ or 7	M1dep	oe eg $7 \times 26.22 = 183.54$ or $798 + 26.22 + 26.22 + 26.22 + 26.22 + 26.22 + 26.22 = 981.54$ dep on M3
	42 with 798 and 22.62 seen	A1	
	Alternative method 2		
	$35 \times 22.8(0)$ or $798.(0)$	M1	oe
	$981.54 - \text{their } 798.(0)$ or 183.54	M1dep	
	$\text{their } 183.54 \div 22.8(0)$ or 8.05	M1dep	oe
	$\text{their } 8.05 \div 1.15$ or 7	M1dep	oe
	42 with 798 and 22.62 seen	A1	
	Alternative method 3		
	$981.54 \div 22.8(0)$ or 43.05	M1	oe
	$\text{their } 43.05 - 35$	M1dep	
	8.05	A1	oe may be implied by 7
	$\text{their } 8.05 \div 1.15$ or 7	M1dep	oe dep on M2
	42 with 798 and 22.62 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	25	B1	

Q	Answer	Mark	Comments
23	$a = 7$ and $b = 26$ and $c = 71$	B2	B1 $a = 7$ or $b = 26$ or $c = 71$ or $b + 19 = 45$ oe equation in b
	Additional Guidance		
	For example, 26 written next to b in the sequence and not contradicted implies $b = 26$		B1

Q	Answer	Mark	Comments
24(a)	Alternative method 1		
	25 ² or 625 and 11 ² or 121 or 746	M1	
	$\sqrt{11^2 + 25^2}$ or $\sqrt{121 + 625}$	M1dep	
	27.31(...) or 27.3 or $\sqrt{746}$	A1	accept 27 with M2 awarded
	Alternative method 2		
	$\tan^{-1} \frac{11}{25}$ or 23.7...	M1	
	$\frac{25}{\cos(\textit{their } 23.7\dots)}$ or $\frac{11}{\sin(\textit{their } 23.7\dots)}$	M1dep	
	27.31(...) or 27.3 or 27.4	A1	accept 27 with M2 awarded
	Alternative method 3		
	$\tan^{-1} \frac{25}{11}$ or 66.25... or 66	M1	
	$\frac{25}{\sin(\textit{their } 66.25\dots)}$ or $\frac{11}{\cos(\textit{their } 66.25\dots)}$	M1dep	
	27.31(...) or 27.3 or 27.4	A1	accept 27 with M2 awarded

Additional Guidance is on the next page

		Additional Guidance	
24(a) cont	Allow rounding or truncation after correct answer seen eg1 27.31, Answer 27		M2A1
	eg2 $\sqrt{746}$, Answer 27.3		M2A1
	Misconception of square root eg $\sqrt{746} = 373$		M2A0
	$25^2 - 11^2$		M1M0A0
	$\sqrt{504}$ without seeing 25^2 or 625 and 11^2 or 121		M0M0A0

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

Q	Answer	Mark	Comments
25	$7t = s - 3$ or $s - 3 = 7t$ or $t + \frac{3}{7} = \frac{s}{7}$ or $\frac{s}{7} = t + \frac{3}{7}$ or $\frac{s-3}{7}$ or $\frac{s}{7} - \frac{3}{7}$	M1	allow negative equivalents eg $-7t = -s + 3$ correct rearrangement omitting $t =$
	$t = \frac{s-3}{7}$ or $t = \frac{s}{7} - \frac{3}{7}$	A1	oe fully simplified SC1 $t = \frac{s+3}{7}$ or $t = \frac{s}{7} + \frac{3}{7}$ oe
	Additional Guidance		
	$\frac{s-3}{7} = t$ or $\frac{s}{7} - \frac{3}{7} = t$		M1A1
	Not fully simplified correct rearrangement eg $t = \frac{-s+3}{-7}$		M1A0
Correct solution followed by further incorrect simplification		M1A0	

Q	Answer	Mark	Comments	
26	Enlargement	B1		
	4	B1	scale factor	
	(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 $\div \frac{1}{4}$			2nd B0
	A combination of transformations cannot score the first B1 eg1 Enlarge sf 4 Translate eg2 Enlarge sf 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 4 $\begin{pmatrix} 3 \\ 9 \end{pmatrix}$			B1B1B0
	Enlargement, sf $\frac{1}{4}$ about (3, 9)			B1B0B1
	Enlarge(d) 4 A			B1B1B1
	Condone <i>ADE</i> is an enlargement of <i>ABC</i>			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 <i>D</i> moves to <i>B</i> and <i>E</i> moves to <i>C</i>			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)			3rd B0
	Reflected in the point (3, 9)			B0B0B1

Q	Answer	Mark	Comments
27	Alternative method 1 Working out time to fill the ball		
	$4 \div 3 \times 20^3 \times \pi$ or [10600, 10700] π or [33284, 33620]	M1	oe allow 1.33 or better and 3sf or better range condones premature rounding for M marks
	their [33284, 33620] – 3000 or [30284, 30620] or their [33284, 33620] \div 500 or [66.56, 67.24]	M1dep	oe
	(their [33284, 33620] – 3000) \div 500 or [60.56, 61.24]	M1dep	oe
	[61, 61.03] and No	A1	
	Alternative method 2 Comparing volume needed with volume that could be filled		
	$4 \div 3 \times 20^3 \times \pi$ or [10600, 10700] π or [33284, 33620]	M1	oe allow 1.33 or better and 3sf or better range condones premature rounding for M marks
	their [33284, 33620] – 3000 or [30284, 30620]	M1dep	
	60 \times 500 or 30000	M1	
	[30493, 30514] and No	A1	oe [493, 514] and No

Mark scheme and Additional Guidance continue on next page

27 cont	Alternative method 3 Volume of ball compared with volume that could be filled + 3000		
	$4 \div 3 \times 20^3 \times \pi$ or [10600, 10700] π or [33284, 33620]	M1	oe allow 1.33 or better and 3sf or better range condones premature rounding for M marks
	60 \times 500 or 30000	M1	oe
	their 30000 + 3000 or 33000	M1dep	dep on 2nd M1
	[33493, 33514] and 33000 and No	A1	
	Additional Guidance		
	Accept $\frac{4}{3}\pi 20^3$ 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 20^2 , $20\pi^3$, $(20\pi)^3$ or omitting π unless recovered		1st M0
No can be implied eg Alt 1 $61 > 60$		M3A1	

Q	Answer	Mark	Comments
28	Never true Sometimes true Always true Always 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 0.72 or 0.80 or 0.74 in the correct cell	M1	oe fraction, decimal or percentage eg $\frac{185}{250}$ implied by any correct point plotted for these three values
	At least two of their relative frequencies plotted accurately	M1dep	$\pm \frac{1}{2}$ square
	(150, 0.72), (200, 0.80) and (250, 0.74) 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)	0.74	B1ft	oe fraction, decimal or percentage eg $\frac{185}{250}$ 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)		

Q	Answer	Mark	Comments
30	Alternative method 1 Shows algebraically that the angles are unequal		
	$4x + 50$	M1	may be embedded or on the diagram
	$x + 2(2x + 25)$ or $x + 4x + 50$	M1	
	$x + 4x + 50 = 5x + 30$ and No	A1	
	Alternative method 2 Derives and solves an equation for angles at a point and substitutes into $5x + 40$ or $x + 2(2x + 20)$		
	$4x + 50$	M1	may be embedded or on the diagram or implied eg implied by $10x + 80 = 360$
	$x + 2(2x + 25) + 5x + 30 = 360$ or $x + 4x + 50 + 5x + 30 = 360$ or $(x =) 28$	M1	oe equation eg $10x + 80 = 360$ $(x =) 28$ may be on the diagram
	$140 + 30 = 170$ and No or $28 + 162 = 190$ and No	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 $5x + 30$ and substitutes into $x + 2(2x + 25)$ or $x + 2(2x + 25) + 5x + 30$		
	$5x + 30 = 180$	M1	
	$(x =) (180 - 30) \div 5$ or $(x =) 30$	M1dep	oe $(x =) 30$ may be on the diagram
	$30 + 170 = 200$ and No or $30 + 170 + 150 + 30 = 380$ and No	A1	oe must obtain $(x =) 30$ from one expression and substitute $(x =) 30$ 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 $x + 2(2x + 25)$ and substitutes into $5x + 30$ or $x + 2(2x + 25) + 5x + 30$		
	$x + 2(2x + 25) = 180$ or $x + 4x + 50 = 180$	M1	
	$(x =) (180 - 50) \div 5$ or $(x =) 26$	M1dep	oe $(x =) 26$ may be on the diagram
	$154 + 26 = 180$ and No or $26 + 154 + 160 = 340$ and No	A1	oe must obtain $(x =) 26$ from one expression and substitute $(x =) 26$ 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		
	$5x + 30 = 180$ or $x + 2(2x + 25) = 180$ or $x + 4x + 50 = 180$ or $x + 2(2x + 25) + 5x + 30 = 360$ or $x + 4x + 50 + 5x + 30 = 360$	M1	
	$(x =) (360 - 80) \div 10$ or $(x =) 28$	M1dep	oe $(x =) 28$ may be on the diagram
	Obtains $(x =) 28$ $5 \times 28 + 30 = 170$ and No	A1	

Additional Guidance is on the next page

Additional Guidance		
30 cont	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 $2(2x + 25) = 4x + 25$ followed by $x + 4x + 25$ Alt 1 $x + 4x + 25$ with $2(2x + 25) = 4x + 25$ not seen Apply marks in a similar way in alts 2, 4 and 5	M0M1 M0M0
	$(x =) 28$ or 26	M1M1
	Allow $(x =) 28$ or 26 to be embedded	M1M1
	No method marks scored with a value of $x (\neq 28)$ substituted into $5x + 30$ and $x + 2(2x + 25)$ giving the same value	M0M0A0
	No can be implied eg Alt 1 $x + 4x + 50 \neq 5x + 30$ and It is not a diameter	M1M1A1

Q	Answer	Mark	Comments
31	Alternative method 1		
	$5 \times 3 + c = 11$	M1	oe eg $15 + c = 11$
	$(c =) 11 - 5 \times 3$ or $(c =) -4$	M1dep	oe implied by $(0, -4)$
	$y = 5x - 4$	A1	SC1 $y = 5x + c \quad c \neq -4$
	Alternative method 2		
	$y - 11 = 5(x - 3)$	M1	oe
	$y - 11 = 5x - 15$	M1dep	oe correct equation with brackets expanded
	$y = 5x - 4$	A1	SC1 $y = 5x + c \quad c \neq -4$
	Additional Guidance		
	Allow $y = 5 \times x - 4$		
	$5x - 4$ on answer line, $y = 5x - 4$ seen in working		M1M1A1
	$5x - 4$ on answer line, $y = 5x - 4$ not seen in working		M1M1A0
	$m = 5, c = -4$ on answer line, $y = 5x - 4$ seen in working		M1M1A1
	$m = 5, c = -4$		M1M1A0
	$y = mx - 4$		M1M1A0
	Allow embedded value for c eg $11 = 5 \times 3 - 4$		M1M1A0
$y = 5x + c$		SC1	
$y = 5x$		SC1	
$5x + c$ on answer line with $c \neq -4$, $y = 5x + c$ seen in working		SC1	
$5x + c$ on answer line with $c \neq -4$, $y = 5x + c$ not seen in working		M0M0A0	