GCSE
MATHEMATICS
8300/2F

Foundation Tier Paper 2 Calculator

Mark scheme

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226G8300/2F/MS

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 $a \leqslant$ 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	1.5	B1	

Q	Answer	Mark	Comments
2	$7b$	B1	

Q	Answer	Mark	Comments
3	120	B1	

Q	Answer	Mark	Comments
4	circumference	B1	

Q	Answer	Mark	Comments
5(a)	$\frac{13}{9}$	B1	oe improper fraction
	Additional Guidance		
	$\frac{13}{9}$ in working with a decimal on answer line		B0

Q	Answer	Mark	Comments
5(b)	0.4375	B1	accept .4375
	Additional Guidance		
	7 ÷ 16 with incorrect or no decimal		B0
	0.4375 in working with 0.437 or 0.438 or 0.43 or 0.44 or 0.4 on answer line		B0

Q	Answer	Mark	Comments
5(c)	2.8	B1	
	Additional Guidance		
	2.80		B0

Q	Answer	Mark	Comments
6	Cost of 5 litres of cleaning fluid $2 \times 18 + 10$ or $36 + 10$ or 46 or $18 + 3 \times 10$ or $18 + 30$ or 48 or 5×10 or 50	M1	oe cost of 2×2 litres + 1×1 litre or cost of 1×2 litres + 3×1 litre or cost of 5×1 litre
	Cost of machine plus 5 litres of cleaning fluid $25 + 2 \times 18 + 10$ or $25 + 18 + 3 \times 10$ or 73 or $25 + 5 \times 10$ or 75	M1dep	oe
	71(.00p)	A1	SC1 70(.00p)
	Additional Guidance		
	Up to M2 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts		
	Special case is for the correct total from using 2.5 bottles at £18		

Q	Answer	Mark	Comments
7	Angle [88°, 92°] at *B*	M1	length ⩾ 1 cm for vertical may be implied by a point marked
	Line parallel to *AB*	M1	mark intention length ⩾ 1 cm may be implied by two points marked
	Quadrilateral *ABCD* with angle *ABC* = [88°, 92°] and *CD* parallel to *BA* and *BC* = [3.8, 4.2] cm and *DC* = [5.8, 6.2] cm	A1	sides must be joined and look straight ignore extra lines and lines extended SC2 reflection of correct shape with right angle at *A* (ignore labels)
	Additional Guidance		
	Lengths of lines (as long as ⩾ 1 cm) irrelevant for up to M2		
	Condone absence of labels *C* and *D*		
	Correct quadrilateral with *C* and *D* labels swapped		M2A0

Q	Answer	Mark	Comments
8	7 (kg) 200 (g) + 650 or 7200 + 650 or 7.2(00) + 0.65(0) or 7850 seen or 7.85(0) seen or 850 seen or 0.85(0) seen	M1	
	7 kilograms 850 grams	A1	SC2 7.85(0) kilograms 7850 grams
	Additional Guidance		
	850 may be seen embedded eg Answer 29.75 kilograms 850 grams		M1A0
	7 kg 850 g seen in working but different answer		M1A0
	7.2 + 650 with no other creditworthy work		M0A0

Q	Answer	Mark	Comments
9(a)	(8 – 5) × 4 or 3 × 4 or 12	M1	oe may be implied
	18 – their 12 or 6	M1	oe 8 ⩽ their 12 ⩽ 16 may be implied by their correct ft answer
	7 (pm)	A1ft	allow 7.00 (pm) or 19.00 (pm) ft 1 (pm) + their 6 with M0M1awarded
	Additional Guidance		
	Allow dot, colon, comma, space or no space in time notation		
	18 – 12 = 6, Answer 6 (pm)		M1M1A0
	4 × 4 = 16, 18 – 16 = 2, Answer 3 (pm)		M0M1A1ft
	3 × 5 = 15, 18 – 15 = 3, Answer 4 (pm)		M0M1A1ft
	(5 – 8) × 4 = 12 (reverse subtraction recovered and could go on to score up to M1M1A1ft)		
	(5 – 8) × 4 = 8 (reverse subtraction not recovered but could go on to score up to M0M1A1ft)		

Q	Answer	Mark	Comments
9(b)	Valid explanation or correct calculation	B1	eg she hasn't multiplied 2 by 3 or $3 \times 2 = 6$ or answer is 18
	Additional Guidance		
	A correct calculation may be seen by Sofia's work		
	It should be 3×6		B1
	It should be 18		B1
	$3 \times 6 = 18$		B1
	3 should be 6		B1
	Needs to multiply everything in the brackets (by 3)		B1
	She should have done the brackets first		B1
	She should have added 4 and 2 first		B1
	She did 3×4 but not 3×2		B1
	She didn't use BIDMAS and work out the brackets first		B1
	Accept highlighting the second 3 as the error (with no subsequent incorrect calculation seen) eg It shouldn't be + 3		B1
	A correct calculation or answer 18 with any or no explanation		B1
	A correct explanation alongside an incorrect calculation		B0
	She didn't use BODMAS / BIDMAS		B0
	She didn't expand / multiply out the brackets correctly		B0
	3 should be 2		B0
	It should be 14		B0
	The brackets are in the wrong place		B0

Q	Answer	Mark	Comments
10(a)	(8, 1)	B1	accept $\overset{x}{(8}\ \overset{y}{1)}$
	Additional Guidance		
	$(8x, 1y)$		B0

Q	Answer	Mark	Comments
10(b)	(7, 6)	B1	accept $\overset{x}{(7}\ \overset{y}{6)}$
	Additional Guidance		
	$(7x, 6y)$		B0

Q	Answer	Mark	Comments
10(c)	(2, 1)	B1	accept $\overset{x}{(2}\ \overset{y}{1)}$
	Additional Guidance		
	$(2x, 1y)$		B0
	If two or more parts have (x, y) as (y, x) then give the first 0 and condone the other(s) eg1 (a) (1, 8) (b) (6, 7) (c) (1, 2) eg2 (a) (1, 8) (b) (7, 6) (c) (1, 2) eg3 (a) (1, 8) (b) (6, 10) (c) (1, 2) eg4 (a) (8, 1) (b) (6, 7) (c) (1, 2)		 B0 B1 B1 B0 B1 B1 B0 B0 B1 B1 B0 B1

Q	Answer	Mark	Comments
10(d)	$y = 6$ or $6 = y$	B1	accept $y = 0x + 6$
	Additional Guidance		
	$y = x + 6$		B0
	$x = 6$		B0
	6		B0

Q	Answer	Mark	Comments
11(a)	**Alternative method 1**		
	$\frac{5}{7} \times 168$ or 120	M1	oe eg $168 \div 7 \times 5$ implied by 48 allow 0.71(4…) or 71(.4…)% for $\frac{5}{7}$
	$\frac{1}{3} \times (168 - \text{their } 120)$ or $\frac{1}{3} \times 48$ or 16 or $\left(1 - \frac{1}{3}\right) \times (168 - \text{their } 120)$ or $\left(1 - \frac{1}{3}\right) \times 48$	M1	oe must subtract their 120 from 168 with $10 <$ their $120 < 150$ allow 0.33(3…) or 33(.3…)% for $\frac{1}{3}$ allow 0.66(6…) or 0.67 or 66(.6…)% or 67% for $\left(1 - \frac{1}{3}\right)$ 16 is M1M1
	32(.00p)	A1	SC2 80 SC1 40
	Alternative method 2		
	$\left(1 - \frac{5}{7}\right) \times 168$ or 48	M1	oe eg $168 \div 7 \times 2$ allow 0.28(6…) or 0.29 or 28(.6…)% or 29% for $\left(1 - \frac{5}{7}\right)$
	$\frac{1}{3} \times$ their 48 or 16 or $\left(1 - \frac{1}{3}\right) \times$ their 48	M1	oe $18 <$ their $48 < 100$ allow 0.33(3…) or 33(.3…)% for $\frac{1}{3}$ allow 0.66(6…) or 0.67 or 66(.6…)% or 67% for $\left(1 - \frac{1}{3}\right)$ 16 is M1M1
	32(.00p)	A1	SC2 80 SC1 40

Additional Guidance is on the next page

11(a) cont	**Additional Guidance**	
	Up to M2 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts	
	$\frac{5}{7} \times 168 = 120$, $120 \div 3 = 40$, Answer 40	M1M0A0 (or SC1)
	$\frac{5}{7} \times 168 = 120$, $120 \div 3 = 40$, Answer 80	SC2
	Alt 1 Allow 0.71(4…) or 71(.4…)% for $\frac{5}{7}$ and 0.33(3…) or 33(.3…)% for $\frac{1}{3}$ eg $0.71 \times 168 = 119.28$ $0.33 \times (168 - 119.28) = 16.08$, Answer 32.64	M1 M1A0
	Do **not** allow $\frac{5}{7} = 0.7$ or $\frac{2}{7} = 0.3$ or $\frac{1}{3} = 0.3$ or $\frac{2}{3} = 0.7$ eg $0.7 \times 168 = 117.6$ $0.3 \times (168 - 117.6) = 15.12$, Answer 35.28	M0 M0A0
	Second mark of Alt 1 is independent eg $0.7 \times 168 = 117.6$ (unacceptable to use 0.7 for $\frac{5}{7}$) $(168 - 117.6) \div 3 = 16.8$	M0 M1A0
	Second mark of Alt 2 is independent eg $0.3 \times 168 = 50.4$ (unacceptable to use 0.3 for $\frac{2}{7}$) $0.33 \times 50.4 = 16.63$	M0 M1A0
	Calculation shown as eg 71% × 168	M1

Q	Answer	Mark	Comments
11(b)	It is less than the answer to part (a)	B1	

Q	Answer	Mark	Comments
12(a)	36 or 29 or 92	B1	condone 6.3 or 3.6 or 2.9 or 9.2
	Additional Guidance		
	Condone eg multiplication signs or 'by' or commas or 'and' eg 3 × 6 or 2 × 9 or 9 by 2 or 3, 6 or 2, 9 or (9, 2) or 3 and 6 or 2 and 9 or 9 and 2		 B1 B1 B1
	Only 6 × 3 or 6 by 3 or 6, 3 or (6, 3) or 6 and 3		B0
	Any evaluation included in the answer must be correct		
	More than one correct answer eg 36 and 92		B1
	Allow inclusion of 63 eg 36 and 63		B1
	Inclusion of an incorrect answer eg 36 and 24		B0

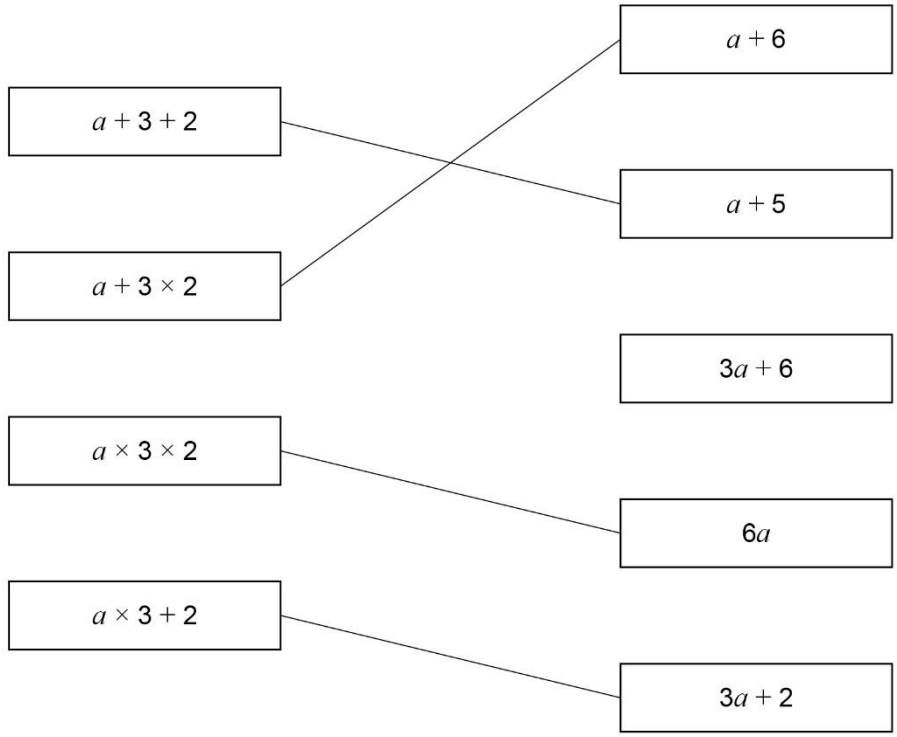
Q	Answer	Mark	Comments
12(b)	Any 2-digit number with at least one digit of 0	B1	eg 50 or −50 condone eg 7.0 or 0.2 or 0.0 condone eg 00 or 01 or 02 etc
	Additional Guidance		
	Condone eg multiplication signs or 'by' or commas or 'and' eg 5 × 0 or 0 by 5 or 0 × 0 or 1, 0 or (0, 1) or 0, 0 or 2 and 0 or 0 and 2 or 0 and 0		 B1 B1 B1
	Any evaluation included in the answer must be correct		
	More than one correct answer eg 20 and 30		B1
	Inclusion of an incorrect answer eg 20 and 21		B0

Q	Answer	Mark	Comments
12(c)	89 or 98 or 99	B1	condone 8.9 or 9.8 or 9.9
	Additional Guidance		
	Condone eg multiplication signs or 'by' or commas or 'and' eg 8 by 9 or 9 × 8 or 9 × 9 or (8, 9) or 9, 8 or 9, 9 or 8 and 9 or 9 and 8 or 9 and 9		 B1 B1 B1
	Any evaluation included in the answer must be correct		
	More than one correct answer eg 89 and 98		B1
	Inclusion of an incorrect answer eg 89 and 91		B0

Q	Answer	Mark	Comments
13	**Alternative method 1** Compares cost of 480 bags		
	480 ÷ 80 or 6 or 480 ÷ 160 or 3	M1	oe eg 160 + 160 + 160 = 480 may be implied
	480 ÷ 80 × 1.9(0) or 6 × 1.9(0) or 11.4(0)	M1	oe cost from small packs eg 1.90 ÷ 80 × 480 implies first M
	480 ÷ 160 × 3.25 or 3 × 3.25 or 9.75	M1	oe cost from large packs eg 3.25 ÷ 160 × 480 implies first M
	1.65(p)	A1	
	Alternative method 2 Compares cost of 160 bags		
	160 ÷ 80 × 1.9(0) or 2 × 1.9(0) or 3.8(0)	M1	oe cost from small packs
	their 3.8(0) – 3.25 or (0).55	M1dep	oe
	480 ÷ 160 × their 0.55 or 3 × their 0.55	M1dep	oe
	1.65(p)	A1	
	Alternative method 3 Compares cost of 80 bags		
	80 ÷ 160 × 3.25 or 3.25 ÷ 2 or 1.625	M1	oe cost from large packs eg $\frac{1}{2}$ × 3.25
	1.9(0) – their 1.625 or 0.275	M1dep	oe
	480 ÷ 80 × their 0.275 or 6 × their 0.275	M1dep	oe
	1.65(p)	A1	

Mark scheme and Additional Guidance continue on the next page

13 cont	**Alternative method 4** Compares cost of 1 bag		
	1.9(0) ÷ 80 or 0.023 75 **and** 3.25 ÷ 160 or 0.020 312 5	M1	oe cost from small and large packs two comparable costs
	1.9(0) ÷ 80 – 3.25 ÷ 160 or 0.003 437 5	M1dep	oe
	480 × their 0.003 437 5	M1dep	oe
	1.65(p)	A1	
	Additional Guidance		
	Allow working in pence for M marks		
	Up to M3 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts		
	If comparing cost of eg 240 bags apply the principles of Alt 4		
	In Alt 1 the second and third marks both imply the first mark and can be done in either order		
	Alts 2, 3 and 4 for the second mark allow subtractions in either order		

Q	Answer	Mark	Comments
14	All 3 correct matches	B3	B1 each correct match
	Additional Guidance		
	Two different matches from left hand column is choice for that box		
	Allow any unambiguous indication		
			B3

Q	Answer	Mark	Comments
15	**Alternative method 1** Using the given values		
	4.2 ÷ 7 or 0.6 or 7 ÷ 4.2 or 1.66… or 1.67 or 2.5 ÷ 7 or 0.357… or 0.36 or 7 ÷ 2.5 or 2.8	M1	implied by 1 → 0.6 or 0.5 → 0.3
	2.5 × 4.2 ÷ 7	M1dep	oe eg 2.5 ÷ (7 ÷ 4.2) or 2.5 ÷ 1.67 or 4.2 ÷ (7 ÷ 2.5) or 4.2 ÷ 2.8 or full build-up eg 0.6 + 0.6 + 0.3 or 0.3 × 5 or 4.2 ÷ 2 – 0.6
	1.5	A1	oe fraction or decimal SC2 answer with digits 15
	Alternative method 2 Working consistently in centimetres		
	4.2 × 100 ÷ 7 or 60 or 7 ÷ (4.2 × 100) or 0.0166… or 0.0167 or 2.5 ÷ 7 or 0.357… or 0.36 or 7 ÷ 2.5 or 2.8	M1	oe eg 420 ÷ 7 or 7 ÷ 420 implied by 1 → 60 or 0.5 → 30
	2.5 × 420 ÷ 7 or 150	M1dep	oe eg 2.5 ÷ (7 ÷ 420) or 2.5 ÷ 0.0167 or 420 ÷ (7 ÷ 2.5) or 420 ÷ 2.8 or full build-up eg 60 + 60 + 30 or 30 × 5 or 420 ÷ 2 – 60
	1.5	A1	oe fraction or decimal SC2 answer with digits 15

Additional Guidance is on the next page

15 cont	**Additional Guidance**	
	Up to M1 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts	
	Answer 1.5 with no working	M2A1
	150 is M2A0 but Answer 150 cm with m crossed out would be M2A1	
	4.2 : 1.5 or 420 : 150	M2
	For consistent working in millimetres or metres apply the principles of Alt 2	
	Incorrect or inconsistent change of units must be recovered for M2A0 or M2A1, otherwise score 0 or SC2	
	eg1 $42 \div 7 = 6$, $6 \times 2.5 = 15$, Answer 1.5 (units recovered)	M2A1
	eg2 $4200 \div 7 = 800$, $800 \times 2.5 = 2000$, Answer 2 (arithmetic slip but method shown and units recovered)	M2A0
	eg3 $42 \div 7 = 6$, $6 \times 2.5 = 15$, Answer 15 (units never recovered)	SC2
	NB Correct values from incorrect methods	
	eg1 $7 - 4.2 = 2.8$ with no other creditworthy work	M0M0A0
	eg2 $2.5 \div 4.2 = 0.6$ (1 dp) with no other creditworthy work	M0M0A0
	If rounded or truncated values are used, the final answer must be exactly 1.5	
	eg1 $2.5 \div 1.66$ Answer 1.5 (may have kept full value on calculator)	M2A1
	eg2 $2.5 \div 1.66 = 1.506$ Answer 1.5 (comes from further rounding)	M2A0

Q	Answer	Mark	Comments
16	90 seen or [88°, 92°] drawn on pie chart	M1	 allow missing or incorrect label
	$\frac{20}{60} \times 360$ or 120 seen or [118°, 122°] drawn on pie chart	M1	oe eg $360 \div 3$ allow missing or incorrect label
	Fully correct pie chart with unambiguous labels and all angles ±2°	A1	
	Additional Guidance		
	All three labels (or a key) needed for the A1 but accept eg No, Yes, Rest or N, Y, M or N, Y, R eg for No do not accept 15 (people) or $\frac{1}{4}$ or 90 as the label		
	Not using the given radius will score a maximum of M2		

Q	Answer	Mark	Comments
17(a)	$x \geqslant 7$	B1	

Q	Answer	Mark	Comments
17(b)	$10cd + 5c$ or $10dc + 5c$ or $5c + 10cd$ or $5c + 10dc$	B2	B1 fully simplified first term ie $10cd$ or $10dc$ or correct expansion not fully simplified eg $10 \times cd + 5c$ or $5c \times 2d + 5c$ ($\times 1$) or $5c2d + 5 \times c$
	Additional Guidance		
	Further incorrect work after a B2 response is B1 eg $10cd + 5c = 15cd$		B1
	Further incorrect work after a B1 response is still B1 eg $10cd + 1 = 11cd$		B1

Q	Answer	Mark	Comments
17(c)	$7(3x + 4)$	B1	
	Additional Guidance		
	Condone missing final bracket ie $7(3x + 4$		B1
	Allow multiplying back out to check their answer		
	Further incorrect work after a correct response is B0 eg $7(3x + 4) = 7(7x)$		B0
	$7(x3 + 4)$		B0
	$7 \times (3x + 4)$		B0

Q	Answer	Mark	Comments
18(a)	$\frac{9}{9+11}$ or $\frac{9}{20}$ or 0.45 or $100 \div 20 \times 9$ or 5×9 or 45 : 55	M1	oe eg $9 \div 20$
	45	A1	SC1 55
	Additional Guidance		
	Allow eg $\frac{9}{20}$ seen with further incorrect work eg $\frac{9}{20} \times 11$		M1A0
	9 out of 20 with no other creditworthy work		M0
	Build-up method must be a fully correct method		

Q	Answer	Mark	Comments
18(b)	$\frac{100-68}{2}$ or $\frac{32}{2}$ or 16(%) or $\frac{1-0.68}{2}$ or $\frac{0.32}{2}$ or 0.16	M1	oe
	68 : 16 or $\frac{68}{16}$ or 68 ÷ 16 or 4.25	A1	oe ratio not in form n : 1 eg 68% : 16% or 17 : 4 or 0.68 : 0.16 oe fraction or division or decimal implied by 4.25 : 1 oe
	4.25 : 1 or $4\frac{1}{4}$: 1	B1ft	oe ratio in form n : 1 eg $\frac{68}{16}$: 1 ft any **ratio** not in form n : 1 ft values must give n to 2 dp or better

Additional Guidance	
$\frac{100-68}{2} = 66$ 68 : 66 = 1.03 : 1	M1 A0B1ft
68 : 32 = 2.125 : 1 or 68 : 32 = 2.13 : 1	M0A0B1ft
68 ÷ 32, Answer 2.125 : 1 (no ratio seen to ft)	M0A0B0ft
Correct ratio with subsequent truncation or rounding to < 2 dp eg1 4.25 : 1, Answer 4 : 1 eg2 68 : 32 = 2.125 : 1, Answer 2.1 : 1	 M1A1B0 M0A0B0
4.25n : 1	M1A1B0
16 : 1 with no other creditworthy work	M1A0B0

Q	Answer	Mark	Comments
19(a)	$(2, -1)$	B1	

Q	Answer	Mark	Comments
19(b)	$(0, 8)$	B1	accept $\overset{x}{(0,} \overset{y}{8)}$
	Additional Guidance		
	$(0x, 8y)$		B0

Q	Answer	Mark	Comments
19(c)	5	B1	
	Additional Guidance		
	$\frac{5}{1}$		B1
	$\frac{10}{2} = 5$		B1
	$\frac{10}{2}$		B0
	$5x$		B0
	$y = 5$		B0

Q	Answer	Mark	Comments
20(a)	0.2 on Jose not pass	B1	oe fraction, decimal or percentage
	0.4 on Maria pass and 0.6 on Maria not pass twice	B1	oe fraction, decimal or percentage
	Additional Guidance		

Q	Answer	Mark	Comments
20(b)	0.32 or $\frac{32}{100}$ or $\frac{16}{50}$ or $\frac{8}{25}$ or 32%	B1	oe fraction, decimal or percentage
	Additional Guidance		
	Ignore simplification or conversion if correct answer seen eg1 $\frac{32}{100}$ seen Answer $\frac{3}{10}$ eg2 $\frac{32}{100}$ seen Answer 3.2%		B1 B1
	Ignore words if correct answer seen eg1 $\frac{32}{100}$ seen Answer 32 out of 100 eg2 0.32, unlikely		B1 B1
	Answer given as ratio (even if correct answer also seen) eg 32 : 100		B0
	Answer only in words eg 32 out of 100		B0
	Only 32 (without %)		B0

Q	Answer	Mark	Comments
21	125 and 17 or 5^3 and 17 or 5 and 5 and 5 and 17	B2	together in any order eg 125×17 or 17×5^3 or 5, 5, 5, 17 or $2125 \div 17 = 125$ or $2125 \div 125 = 17$ B1 at least three of 8, 27, 64, 125, 216, 343, 512, 729, 1000, 1331, 1728, 2197 etc (allow 2^3, 3^3, 4^3 etc) or all four of 11, 13, 17, 19 (ignore any numbers not between 10 and 20) or (cube number > 1) × (prime number between 10 and 20) or 2125 ÷ (cube number > 1) or 2125 ÷ (prime number between 10 and 20)

Additional Guidance	
B1 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts	
B2 responses may be seen on a factor tree	
B1 for three cube numbers given in index form – evaluations can be ignored eg 4^3 5^3 6^3 scores B1 with no evaluations or with incorrect evaluations	
B1 for multiplications or divisions – evaluation can be ignored eg1 $2^3 \times 13$ scores B1 with no evaluation or evaluated incorrectly eg2 2125 ÷ 27 scores B1 with no evaluation or evaluated incorrectly eg3 2125 ÷ 11 scores B1 with no evaluation or evaluated incorrectly	
125 and 17 seen in multiple attempts is B2 if 2125 included eg $125 \times 17 = 2125$ or $2125 \div 17 = 125$ or $2125 \div 125 = 17$ seen amongst multiple attempts	B2
125 and 17 seen in multiple attempts is B1 if 2125 not included eg 125×17 seen amongst multiple attempts	B1
11 13 15 17 19 does not score B1 unless 11 13 17 19 selected	
Incomplete list eg 11 13 19 does not score B1	

Q	Answer	Mark	Comments
22	**Alternative method 1**		
	90×5 or 450 or $\frac{72+83+88+97+x}{5}$ or $\frac{340+x}{5}$	M1	oe any letter or symbol
	$90 \times 5 - 72 - 83 - 88 - 97$ or $90 \times 5 - 340$ or $72 + 83 + 88 + 97 + x = 90 \times 5$ or $340 + x = 90 \times 5$	M1dep	oe any letter or symbol equations must have fraction eliminated
	110	A1	
	Alternative method 2		
	Trial of any value with mean correctly evaluated	M1	also allow if given to the next or previous integer eg1 trial of 100 $\frac{72+83+88+97+100}{5} = 88$ eg2 trial of 78 $\frac{340+78}{5} = 83$ (or 84 or 83.6) ignore trials with mean not evaluated or incorrectly evaluated
	Trial of 110 with mean evaluated to 90	M1dep	eg $\frac{72+83+88+97+110}{5} = 90$ this mark implies M1M1
	110	A1	

Mark scheme and Additional Guidance continue on the next page

22 cont	**Alternative method 3**		
	$\frac{72+83+88+97}{4}$ or $\frac{340}{4}$ or 85	M1	oe
	their 85 + 5 × (90 – their 85) or their 85 + 5 × 5 or their 85 + 25	M1dep	oe 90 + 4 × (90 – their 85)
	110	A1	
	Alternative method 4		
	$\frac{72+83+88+97}{5}$ or $\frac{340}{5}$ or 68	M1	oe
	5 × (90 – their 68) or 5 × 22	M1dep	oe
	110	A1	
	Alternative method 5		
	(90 – 72) + (90 – 83) + (90 – 88) + (90 – 97) or 18 + 7 + 2 – 7 or 20	M1	oe eg (72 – 90) + (83 – 90) + (88 – 90) + (97 – 90) or 90 × 4 – 72 – 83 – 88 – 97 or –18 – 7 – 2 + 7 or –20
	90 + their 20	M1dep	oe eg 90 – their –20
	110	A1	
	Additional Guidance		
	M1 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts		
	Embedded 110 scores M1M1A0 using Alt 2 (even if a different answer is given)		
	Condone eg Alt 3 72 + 83 + 88 + 97 ÷ 4 No further marks unless recovered		M1
	Alt 5 1st M1 Subtractions must be consistent		
	Condone 110% for 110		

Q	Answer	Mark	Comments
23	**Alternative method 1** Words per minute or words per second		
	416 ÷ 8 or 52	M1	oe eg 416 ÷ (8 × 60) or 416 ÷ 480 or $\frac{13}{15}$ or [0.86, 0.87] or 0.9
	1534 ÷ their 52 or (1534 – 416) ÷ their 52 + 8 or 29.5	M1dep	oe eg 1534 ÷ their [0.86, 0.87] or (1534 – 416) ÷ their [0.86, 0.87] + 8 × 60 or 1770
	29 minutes 30 seconds	A1	SC2 29 minutes 50 seconds or 29 minutes 5 seconds
	Alternative method 2 Minutes per word or seconds per word		
	8 ÷ 416 or $\frac{1}{52}$ or [0.019, 0.019 231] or 0.02	M1	oe eg 8 × 60 ÷ 416 or 480 ÷ 416 or $\frac{15}{13}$ or [1.15, 1.154] or 1.2
	1534 × their [0.019, 0.019 231] or (1534 – 416) × their [0.019, 0.019 231] + 8 or 29.5	M1dep	oe eg 1534 × their [1.15, 1.154] or (1534 – 416) × their [1.15, 1.154] + 8 × 60 or 1770
	29 minutes 30 seconds	A1	SC2 29 minutes 50 seconds or 29 minutes 5 seconds

Mark scheme and Additional Guidance continue on the next page

23 cont	**Alternative method 3** Essay words ÷ report words		
	$1534 \div 416$ or $\frac{59}{16}$ or [3.68, 3.69] or 3.7 or $(1534 - 416) \div 416$ or [2.68, 2.69] or 2.7	M1	oe
	8 × their [3.68, 3.69] or 8 × their [2.68, 2.69] + 8 or 29.5	M1dep	oe eg 8 × 60 × their [3.68, 3.69] or 8 × 60 × their [2.68, 2.69] + 8 × 60 or 1770
	29 minutes 30 seconds	A1	SC2 29 minutes 50 seconds or 29 minutes 5 seconds
	Additional Guidance		
	M1 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts		
	Answer 29.5 minutes 1770 seconds		M1M1A0
	Build-up method must be a fully correct method that would lead to 29.5		
	If working with report words ÷ essay words apply the principles of Alt 3		

Q	Answer	Mark	Comments
24	y is 125% of x	B1	

Q	Answer	Mark	Comments
25(a)	$\frac{33}{120}$ or $\frac{11}{40}$ or 0.275 or 27.5%	B1	oe fraction, decimal or percentage
	Additional Guidance		
	Correct answer seen with an answer of 33		B0
	Ignore simplification or conversion if correct answer seen eg1 $\frac{33}{120}$ seen Answer $\frac{3}{10}$ eg2 0.275 seen Answer 0.28 eg3 $\frac{11}{40}$ seen Answer 27.5		 B1 B1 B1
	Ignore words if correct answer seen eg1 $\frac{33}{120}$ seen Answer 11 out of 40 eg2 $\frac{33}{120}$, unlikely		 B1 B1
	Answer given as ratio (even if correct answer also seen) eg 33 : 120		 B0
	Answer only in words eg 33 out of 120		B0
	Only 27.5 (without %)		B0
	Only 27% or 28%		B0
	Only 0.27 or 0.28		B0
	Only $\frac{1.1}{4}$		B0

Q	Answer	Mark	Comments
25(b)	$\frac{6}{120} \times 500$ or [4.16, 4.17] × 6 or [24.96, 25.02] or 4.2 × 6 or 25.2 or 25 : 500 or $\frac{25}{500}$	M1	oe eg 0.05 × 500 or 500 ÷ 20
	25	A1	
	Additional Guidance		
	Working and value may be seen by table		
	24 + 1, Answer 25		M1A1
	480 = 24, Answer 25		M1A1
	Embedded but not selected as answer eg 137.5 + 337.5 + 25 = 500		M1A0
	Working for Not answered or Answered but sale not made is **not** choice eg ignore 137.5 and 337.5 seen		
	25 followed by answer 19		M1A0
	If rounded or truncated values are used, the final answer must be exactly 25 eg1 500 ÷ 120 = 4.16, 4.16 × 6 Answer 25 (may have kept full value on calculator) eg2 500 ÷ 120 = 4.16, 4.16 × 6 = 24.96 Answer 25 (comes from further rounding)		 M1 A1 M1 A0

Q	Answer	Mark	Comments
26	80 × 0.9 or 72 or 25 × 1.2 or 30 or 80 × 0.1 **and** 25 × 0.2 or 8 **and** 5 or –8 **and** 5	M1	oe eg 80 × (1 – 0.1) or 25 + 25 × 0.2 or 25 + 5 implied by 102 or 3 or –3
	No and correct valid amount(s)	A1	eg no and 105 and 102 or no and 3 or no and –3 or no and 8 and 5 or no and –8 and 5
	Additional Guidance		
	If neither box is ticked, No may be implied eg neither box is ticked and Ellie paid 3 less	M1A1	
	Working and values may be seen by the table		
	No and 105 with M1 not seen	M0A0	
	No and 8 with M1 not seen	M0A0	
	No and 5 with M1 not seen	M0A0	
	Condone No and 8 and 5 with arithmetic error(s) seen eg 72 so 8 less 30 so 5 more 105 and 103 No (arithmetic error in calculating Ellie's total)	M1A1	
	Do not condone No and 8 and 5 with process error(s) seen eg 80 – 8 = 72 25 – 5 = 20 (process error, should be 25 + 5) 105 and 92 No	M1A0	

Q	Answer	Mark	Comments
27	**Alternative method 1**		
	16^2 or 256 and 30^2 or 900	M1	oe implied by 1156
	$\sqrt{16^2+30^2}$ or $\sqrt{256+900}$ or $\sqrt{1156}$ or 34	M1dep	oe eg $\sqrt{16^2+30^2-2\times16\times30\times\cos 90}$
	52 × their 34 or 1768	M1dep	oe if M1M0 their 34 can be any value other than 16, 30 or 52 dep on 1st M
	0.5 × 30 × 16 or 240	M1	oe eg 0.5 × 30 × 16 × sin 90
	2008	A1	SC3 2248
	Alternative method 2		
	$\tan^{-1}\frac{16}{30}$ or [28, 28.1] or $\tan^{-1}\frac{30}{16}$ or [61.9, 62]	M1	oe may be on diagram
	$\frac{30}{\cos(\text{their [28, 28.1]})}$ or $\frac{16}{\cos(\text{their [61.9, 62]})}$ or 34	M1dep	oe eg $\frac{16}{\sin(\text{their [28, 28.1]})}$ or $30\cos(\text{their [28, 28.1]}) + 16\cos(\text{their [61.9, 62]})$
	52 × their 34 or 1768	M1dep	oe if M1M0 their 34 can be any value other than 16, 30 or 52 dep on 1st M
	0.5 × 30 × 16 or 240	M1	oe eg 0.5 × 30 × 16 × sin 90
	2008	A1	SC3 2248

Additional Guidance is on the next page

27 cont	**Additional Guidance**	
	Up to M4 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts	
	The 4th mark in Alts 1 and 2 is not dependent on any other marks	
	34 or 1768 or 240 may be on the diagram	
	SC3 is for using 30 × 16 for the area of the triangle	
	Ignore units	

Q	Answer	Mark	Comments
28	**Alternative method 1**		
	$10x - 5$	M1	may be seen in a grid
	their $10x - 6x = 9$ + their 5 or $4x = 14$ or $14 \div 4$ or $7 \div 2$	M1	oe eg their $-5 - 9 = 6x$ – their $10x$ or $4x - 14 = 0$ collecting two terms in x and two constant terms correctly
	$\frac{14}{4}$ or $3\frac{2}{4}$ or $\frac{7}{2}$ or $3\frac{1}{2}$ or 3.5	A1ft	oe ft M1M0 or M0M1 with exactly one error
	Alternative method 2		
	$\frac{6x}{5} + \frac{9}{5}$	M1	oe two terms eg $1.2x + 1.8$
	$2x$ – their $\frac{6x}{5}$ = their $\frac{9}{5} + 1$ or $\frac{4x}{5} = \frac{14}{5}$	M1	oe eg -1 – their $\frac{9}{5}$ = their $\frac{6x}{5} - 2x$ or $\frac{4x}{5} - \frac{14}{5} = 0$ collecting two terms in x and two constant terms correctly
	$\frac{14}{4}$ or $3\frac{2}{4}$ or $\frac{7}{2}$ or $3\frac{1}{2}$ or 3.5	A1ft	oe ft M1M0 or M0M1 with exactly one error

Additional Guidance is on the next page

	Additional Guidance	
28 cont	Ignore simplification or conversion if correct answer seen	
	Correct answer from trial and improvement	M1M1A1
	Correct equation with terms collected or division with no or incorrect answer	M1M1A0
	Embedded 3.5 with no or incorrect answer	M1M1A0
	$10x - 5 = 6x + 9$ $10x - 6x = 9 - 5$ $x = 1$ (exactly one error in line 2)	M1 M0 A1ft
	$7x - 5 = 6x + 9$ $7x - 6x = 9 + 5$ $x = 14$ (exactly one error in line 1)	M0 M1 A1ft
	$10x - 5 = 6x + 9$ $10x + 6x = 9 - 5$ $x = \frac{4}{16}$ (two errors in line 2)	M1 M0 A0ft
	$10x - 1 = 6x + 9$ $10x - 6x = 9 + 1$ $x = 3$ (exactly one error in line 1 but answer does not ft)	M0 M1 A0ft
	$7x - 6 = 6x + 9$ $7x - 6x = 9 + 6$ $x = 15$ (two errors in line 1)	M0 M1 A0ft
	$10x + 4 = 6x + 9$ $10x - 6x = 9 + 4$ $x = 3.25$ (neither M mark scored)	M0 M0 A0ft
	$10x - 5 = 30x + 45$	M1M0A0ft
	Any ft answer must be rounded or truncated to 1 dp or better	
	The last two marks can be implied without the collection of terms seen eg $10x - 1 = 6x + 9$ and $x = 2.5$	M0M1A1ft
	Collecting terms before the bracket has been expanded	M0M0A0ft