GCSE
MATHEMATICS
8300/2H

Higher Tier Paper 2 Calculator

Mark scheme

June 2020

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 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.

Further copies of this mark scheme are available from aqa.org.uk

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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	$x + 4x \equiv 5x$	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
2	SAS	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
3	5.2×10^{-4}	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
4	a^2	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
5(a)	Plots at least 3 points correctly	M1	$\pm\frac{1}{2}$ square
	All four points correctly plotted and joined	A1	$\pm\frac{1}{2}$ square ignore working for part (b)
	Additional Guidance		
	$\pm\frac{1}{2}$ square means half a small square horizontally **and** vertically		
	If a point is within tolerance the line must be within $\pm\frac{1}{2}$ square of their point		
	Mark intention for joining point to point		

Q	Answer	Mark	Comments
5(b)	[70, 78]	B1	
	Additional Guidance		
	Answer in range with or without working, with no graph or incorrect graph		B1
	70.5 – 75 on answer line (both values in range)		B1

Q	Answer	Mark	Comments
6	15	B2	B1 answer 3 or answer 5 or answer 3 (×) 5 or (75 =) 3 (×) 5 (×) 5 or (75 =) 3 (×) 5^2 or (105 =) 3 (×) 5 (×) 7 or (1) 3 5 15 25 (75) or (1) 3 5 7 15 21 35 (105)
	Additional Guidance		
	NB 15 from 3 + 5 + 7 does not score unless working for B1 seen elsewhere		
	Prime factor responses for B1 may be seen in repeated division, on a factor tree or in a Venn diagram eg1 3 5 5 in repeated division or factor tree for 75 eg2 3 5 7 inside one circle of a Venn diagram eg3 3 5 inside the intersection of a Venn diagram		 B1 B1 B1
	For products of prime factors, repeated division, factor trees and Venn diagrams, ignore inclusion of factors of 1		
	A repeated division needs to reach the final prime factor but does not need to reach 1		
	B1 can be awarded even if LCM is subsequently worked out		
	List of factors may be seen as factor pairs		

Q	Answer	Mark	Comments
7(a)	2 and 5 with no other roots	B2	either order B1 at least one correct root with up to one incorrect root SC1 (2, 0) or (5, 0) or (2, 5) or (5, 2)
	Additional Guidance		
	$x = 2$ and $x = 5$		B2
	2, 5 or 5, 2		B2
	(2, 0) and (5, 0) and 2 and 5		SC1
	(2, 0) and (5, 0) and –2 and –5		B0
	2, 0 and 5, 0 (both pairs imply coordinates)		SC1
	2, 0 or 5, 0 (one pair implies roots)		B1
	(0, 2) and (0, 5)		B0
	0, 2 and 0, 5 (both pairs imply coordinates)		B0
	0, 2 or 0, 5 (one pair implies roots)		B1
	Both answers embedded $2^2 - 7 \times 2 + 10 = 0$ and $5^2 - 7 \times 5 + 10 = 0$		B1
	$(x - 2)(x - 5)$		B0

Q	Answer	Mark	Comments
7(b)	3.5	B1	oe
	Additional Guidance		
	$x = 3.5$		B1
	$3.5x$		B0
	Ignore any y-coordinate even with brackets omitted eg (3.5, –2.25) or 3.5, –2 or $x = 3.5$ $y = -2.25$ or $x = 3.5$ $y = 2$		B1
	(–2.25, 3.5)		B0

Q	Answer	Mark	Comments
8	40 (women) and 44 (men) and No or 40 : 44 and No or 84 and No or 8 (women leave) and 2 (men arrive) and No	B2	oe B1 40 (women) and 44 (men) or 40 : 44 or 84 or 8 (women leave) and 2 (men arrive)
	Additional Guidance		
	NB 84 from incorrect working eg 41 + 43 = 84		B0
	For B1 the values may be seen among others eg1 20 : 22 30 : 33 40 : 44 50 : 55 eg2 21, 42, 63, 84, 105, … eg3 10, 20, 30, 40, 50, … and 11, 22, 33, 44, 55, … eg4 $\frac{44}{84}$ (implies 84)		B1
	For B2 the value(s) must be chosen by eg circling or a list stopping at that point and No must be indicated		

Q	Answer	Mark	Comments
9(a)	**Alternative method 1**		
	$200 - 2 \times 5 \times 5$ or $200 - 50$ or 150 or $4 \times 5 \times y$ or $20y$	M1	oe eg $5y + 5y + 5y + 5y$ implied by 37.5 or answer 937.5
	$4 \times 5 \times y = 200 - 2 \times 5 \times 5$ or $4 \times 5 \times y = 200 - 50$ or $4 \times 5 \times y = 150$ or $150 \div 4 \div 5$ or $150 \div 20$ or 7.5	M1dep	oe eg $20y = 150$
	187.5	A1	oe
	Alternative method 2		
	$200 - 2 \times 5 \times 5$ or $200 - 50$ or 150	M1	oe implied by 37.5 or answer 937.5
	$150 \div 4 \times 5$ or 37.5×5	M1dep	oe
	187.5	A1	oe
	Additional Guidance		
	Embedded 7.5 eg $4 \times 5 \times 7.5 = 150$		M1M1

Q	Answer	Mark	Comments
9(b)	It is smaller than the answer to part (a)	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
10	**Alternative method 1** Total % for A after 6 tests – total % for B after 5 tests		
	60×5 or 300 or 52×5 or 260	M1	oe
	$\frac{24}{50} \times 100$ or 0.48×100 or 48	M1	oe 348 implies M1M1
	$60 \times 5 + \frac{24}{50} \times 100 - 52 \times 5$ or $300 + 48 - 260$ or 88	M1dep	oe eg $348 - 260$ dep on M1M1
	44	A1	allow $\frac{44}{50}$
	Alternative method 2 Total score for A after 6 tests – total score for B after 5 tests		
	$\frac{60}{100} \times 50$ or 30	M1	oe allow $\frac{30}{50}$ implied by 150 or 174
	$\frac{52}{100} \times 50$ or 26	M1	oe allow $\frac{26}{50}$ implied by 130
	$\frac{60}{100} \times 50 \times 5 + 24 - \frac{52}{100} \times 50 \times 5$ or $150 + 24 - 130$	M1dep	oe eg $174 - 130$ dep on M1M1
	44	A1	allow $\frac{44}{50}$

Mark scheme and Additional Guidance continues on the next two pages

Q	Answer	Mark	Comments
10 cont	**Alternative method 3** Total score for A after 6 tests – total score for B after 5 tests		
	50×5 or 250	M1	oe implied by 150 or 130 or 174
	$\frac{60}{100} \times 50 \times 5$ or 150 and $\frac{52}{100} \times 50 \times 5$ or 130	M1dep	oe allow $\frac{150}{250}$ and $\frac{130}{250}$
	$\frac{60}{100} \times 50 \times 5 + 24 - \frac{52}{100} \times 50 \times 5$ or $150 + 24 - 130$	M1dep	oe eg 174 – 130
	44	A1	allow $\frac{44}{50}$
	Alternative method 4 Difference in scores after 5 tests + 6th score for A		
	$60 - 52$ or 8	M1	oe
	$\frac{60-52}{100} \times 50$ or 4	M1dep	oe eg $\frac{60}{100} \times 50 - \frac{52}{100} \times 50$ or $30 - 26$ allow $\frac{4}{50}$
	$\frac{60-52}{100} \times 50 \times 5 + 24$ or $4 \times 5 + 24$ or $20 + 24$	M1dep	oe
	44	A1	allow $\frac{44}{50}$

Additional Guidance is on the next page

10 cont	**Additional Guidance**	
	To award the 3rd M a calculation or a value (not an equation) must be seen	
	Select the scheme that favours the student for the first 2 M marks even if not subsequently used	
	Alt 1 Do not award 1st M for 300 if incorrect method seen eg $6 \times 50 = 300$ does not score the 1st M	
	Alt 1 Do not award 2nd M for 48 if incorrect method seen eg $100 - 52 = 48$ does not score the 2nd M	
	Alt 2 Do not award 2nd M for 26 if incorrect method seen eg $50 - 24 = 26$ does not score the 2nd M	

Q	Answer	Mark	Comments
11	2625 ÷ 250 or 2.625 ÷ 250 or 2625 ÷ 0.000 25 or answer with digits 105	M1	oe eg $\frac{2.625 \times 1000}{250}$
	10.5	A1	oe
	Additional Guidance		
	Digits 105 may have additional zeros before 1 or after 5 eg1 0.000 105 eg2 10 500 eg3 10.05		 M1A0 M1A0 M0A0

Q	Answer	Mark	Comments
12	$\frac{9-3}{1--2}$ or $\frac{6}{3}$ or $2x$ (+ c) where c is a constant	M1	oe eg $\frac{3-9}{-2-1}$ or $\frac{-6}{-3}$
	2	A1	
	Additional Guidance		
	$2x$ may be implied eg $y - 3 = 2(x + 2)$		M1A0

Q	Answer	Mark	Comments
13	$\frac{1}{2}$ × (2.8 + 2.1) (× h) or 2.45(h)	M1	oe eg 2.1(h) + 0.5(h) × 0.7 any letter may be implied
	$\frac{1}{2}$ × (2.8 + 2.1) × h = 39.2 or (2.8 + 2.1) × h = 39.2 × 2 or 39.2 ÷ 2.45 or 78.4 ÷ 4.9	M1dep	oe equation or calculation
	16	A1	SC1 8
	Additional Guidance		
	Different letter used eg $2.1h + 0.5x \times 0.7$ is M0 unless recovered		

Q	Answer	Mark	Comments
14	**Alternative method 1**		
	6500 × 1.05 or 6825	M1	oe eg 6500 + 0.05 × 6500 or 6500 + 325 may be implied eg 7475
	6500×1.05^3 or 7524.(…) or 7525	M1dep	oe eg their 6825 × 1.05 or 7166.25 and their 7166.25 × 1.05 6825×1.05^2 is M2
	7524.(…) and Yes or 7525 and Yes	A1	oe eg 7524.(…) which is more than 7500
	Alternative method 2		
	1.05^3 or 1.157… or 1.158 or 1.16 or $\frac{7500}{6500}$ or 1.15(3…) or 1.154	M1	oe
	1.05^3 or 1.157… or 1.158 or 1.16 and $\frac{7500}{6500}$ or 1.15(3…) or 1.154	M1dep	oe
	1.157… or 1.158 or 1.16 and 1.15(3…) or 1.154 and Yes	A1	

Additional Guidance is on the next page

	Additional Guidance	
14 cont	Working is implied by a correct value 7524.(…) and Yes with no working 7525 and Yes with no working 7524.(…) with no working 7525 with no working	 M1M1A1 M1M1A1 M1M1A0 M1M1A0
	7525 > 7500	M1M1A1
	7525 < 7500	M1M1A0
	For year on year working allow truncation/rounding eg 6825 × 1.05 = 7166 7166 × 1.05 = 7524.30 Yes	 M1 M1A1
	Increasing by 5% four or more times can score a maximum of M1M1A0	
	Increasing by 5% two times can score a maximum of M1M0A0	
	Do not allow misreads of 5%	

Q	Answer	Mark	Comments	
15	**Alternative method 1**			
	$ac = b + 5c$	M1	oe fraction eliminated	
	$ac - 5c = b$ or $c(a - 5) = b$ or $\frac{b}{a-5}$	M1dep	oe terms in c collected	
	$c = \frac{b}{a-5}$	A1		
	Alternative method 2			
	$a - 5 = \frac{b}{c}$	M1		
	$\frac{1}{a-5} = \frac{c}{b}$ or $\frac{a-5}{b} = \frac{1}{c}$ or $c(a - 5) = b$ or $\frac{b}{a-5}$	M1dep		
	$c = \frac{b}{a-5}$	A1		
	Additional Guidance			
	$c = \frac{b}{a-5}$ in working lines with $\frac{b}{a-5}$ on answer line			M1M1A1

Q	Answer	Mark	Comments
16	$\frac{4}{11} \times 22$ or 8 or $\frac{40}{100} \times 5$ or 2 or $22 \times 7 \times 5$ or 770 or $\frac{4}{11} \times \frac{40}{100}$ or $\frac{160}{1100}$ or $\frac{8}{55}$	M1	oe accept $\frac{8}{22}$ for 8 accept $\frac{2}{5}$ for 2
	$\frac{4}{11} \times 22 \times 7 \times \frac{40}{100} \times 5$ or $8 \times 7 \times 2$	M1dep	oe eg $\frac{4}{11} \times \frac{2}{5} \times 770$ or $\frac{8}{55} \times 770$ or $\frac{8}{22} \times \frac{7}{7} \times \frac{2}{5}$ or $\frac{112}{770}$
	112	A1	allow 112 out of 770

Additional Guidance	
$\frac{112}{770}$	M1M1A0
$\frac{8}{55}$ from $\frac{112}{770}$	M1M1A0
$\frac{8}{55}$ from $\frac{4}{11} \times \frac{2}{5}$ (×1)	M1M0A0
Allow [0.36, 0.364] for $\frac{4}{11}$ eg $0.36 \times 22 = 7.92$ (allow 7 if method seen) $7.92 \times 7 \times 2$ (or $7 \times 7 \times 2$)	 M1 M1A0

Q	Answer	Mark	Comments
17(a)	[82.5, 83.5]	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
17(b)	156	B1	accept 155 or 157
	their 156 × (0.)32 or 4992 or 49.92 and (200 – their 156) × (0.)39 or 44 × (0.)39 or 1716 or 17.16	M1	0 < their 156 < 200 but their 156 cannot be 90 6708 implies B1M1
	67.08	A1ft	ft their 156
	Additional Guidance		
	155 155 × 0.32 + 45 × 0.39 = 49.60 + 17.55 = 67.15		B1 M1 A1
	157 157 × 0.32 + 43 × 0.39 = 50.24 + 16.77 = 67.01		B1 M1 A1
	158 158 × 0.32 + 42 × 0.39 = 50.56 + 16.38 = 66.94		B0 M1 A1ft
	90 90 × 0.32 + 110 × 0.39 = 28.80 + 42.90 = 71.70		B0 M0 A0

Q	Answer	Mark	Comments
18	**Alternative method 1**		
	$\tan 62 = \frac{h}{5}$	M1	oe eg $\tan(90-62) = \frac{5}{h}$ or $\frac{h}{\sin 62} = \frac{5}{\sin 28}$ any letter
	$5 \times \tan 62$ or 9.4(0…)	M1dep	oe eg $\frac{5}{\tan 28}$ or $\frac{5}{\sin 28} \times \sin 62$
	$\sin x = \frac{\text{their } 9.4(0...)}{12}$ or $\sin x = [0.78, 0.784]$	M1dep	oe eg $\sin x = \frac{5 \times \tan 62}{12}$ or $\cos x = \frac{\sqrt{12^2 - \text{their } 9.4^2}}{12}$
	[51.536, 51.63]	A1	accept 52 with M3 seen
	Alternative method 2		
	$\left(\frac{5}{\cos 62}\right)^2 - 5^2$ or [88.4, 88.43]	M1	oe
	$\sqrt{\left(\frac{5}{\cos 62}\right)^2 - 5^2}$ or 9.4(0…)	M1dep	oe
	$\sin x = \frac{\text{their } 9.4(0...)}{12}$ or $\sin x = [0.78, 0.784]$	M1dep	oe eg $\cos x = \frac{\sqrt{12^2 - \text{their } 9.4^2}}{12}$
	[51.536, 51.63]	A1	accept 52 with M3 seen
	Additional Guidance		
	Answer in range with truncation to 51		M1M1M1A1

Q	Answer	Mark	Comments
19	$4a + 2b$ and $10a + 5b$	M1	
	$2(2a + b)$ or $5(2a + b)$	M1	
	$\frac{2(2a+b)}{5(2a+b)}$ and $\frac{2}{5}$ or $\frac{2(2a+b)}{5(2a+b)}$ and 0.4	A1	
	Additional Guidance		
	$\frac{2}{5}$ with no working or only from substitution of values		M0M0A0
	Ignore substitution of values eg $\frac{2(2a+b)}{5(2a+b)} = \frac{2}{5}$ followed by substitution of values		M1M1A1
	$\frac{4a+2b}{10a+4b} = \frac{2}{5}$		M1M0A0
	$2b + 4a$ and $5b + 10a$ are equivalent to $4a + 2b$ and $10a + 5b$ etc		

Q	Answer	Mark	Comments
20	$180 - \frac{360}{10}$ or $180 - 36$ or $1440 \div 10$ or 144	M1	oe eg $(10 - 2) \times 180 \div 10$ may be seen on diagram
	$\frac{540 - 3 \times \text{their } 144}{2}$ or $\frac{540 - 432}{2}$ or $\frac{108}{2}$ or $360 - 90 - \text{their } 144 - \frac{\text{their } 144}{2}$ or $\text{their } 144 - 90$	M1dep	oe eg $\frac{(5 - 2) \times 180 - 3 \times \text{their } 144}{2}$
	54	A1	
	Additional Guidance		
	$540 \div 10 = 54$		M0M0A0
	144 worked out but not used		M1M0A0

Q	Answer	Mark	Comments
21(a)	(2.5, 0.4)	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
21(b)	Valid criticism	B1	eg the graph should go through (4, 16)
	Additional Guidance		
	(4, 15) should be (4, 16)		B1
	It should be (4, 16)		B1
	Graph should end at (y =) 16		B1
	(4, 15) is not on the graph		B1
	The point at $x = 4$ is wrong		B1
	The point at 4 is wrong		B0
	2^4 is 16		B1
	4^2 is 16		B0
	The last point is wrong		B1
	One of the points is wrong		B0
	Graph isn't high enough		B0

Q	Answer	Mark	Comments
22	A	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
23	**Alternative method 1**		
	$5^2 + 12^2$ or 169 or $\sqrt{5^2 + 12^2}$ or 13	M1	oe
	$\sqrt{16^2 - \text{their } 169}$ or $\sqrt{16^2 - \text{their } 13^2}$ or $\sqrt{87}$ or [9.3, 9.33]	M1dep	oe eg $\sqrt{16^2 - 5^2 - 12^2}$ may be implied eg [18.6, 18.7]
	0.5 × 5 × 12 × 2 × their [9.3, 9.33]	M1dep	oe
	[558, 559.8] or $60\sqrt{87}$	A1	accept 560 with full method seen SC3 [1116, 1119.6] or $120\sqrt{87}$
	Alternative method 2		
	$16^2 - 5^2$ or 231 or $\sqrt{16^2 - 5^2}$ or 15.19(8…) or 15.199 or 15.2	M1	oe
	$\sqrt{\text{their } 231 - 12^2}$ or $\sqrt{\text{their } 15.2^2 - 12^2}$ or $\sqrt{87}$ or [9.3, 9.33]	M1dep	oe eg $\sqrt{16^2 - 5^2 - 12^2}$ may be implied eg [18.6, 18.7]
	0.5 × 5 × 12 × 2 × their [9.3, 9.33]	M1dep	oe
	[558, 559.8] or $60\sqrt{87}$	A1	accept 560 with full method seen SC3 [1116, 1119.6] or $120\sqrt{87}$
	Additional Guidance		
	Lengths may be seen on the diagram		
	1st and 2nd M marks can be awarded even if not subsequently used		
	$5^2 + 12^2 + 16^2$		M1M0M0A0

Q	Answer	Mark	Comments
24(a)	(–5, –2)	B2	B1 point (1, –4) from rotation may be seen on the diagram or point (–5, –2) marked on diagram SC1 (–7, 6)
	Additional Guidance		
	(–5, –2) marked on diagram and answer (–2, –5)		B1

Q	Answer	Mark	Comments
24(b)	$y = -x$	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
25	$(3x - 4)(x + 5)$	B2	oe product of brackets eg $(x + 5)(3x - 4)$ or $(3x - 4)(5 + x)$ or $-(4 - 3x)(x + 5)$ B1 $(3x + a)(x + b)$ where $ab = -20$ or $a + 3b = 11$ or $3x(x + 5) - 4(x + 5)$ or $x(3x - 4) + 5(3x - 4)$
	Additional Guidance		
	Ignore attempts to solve $3x^2 + 11x - 20 = 0$		
	$(3x + 4)(x - 5)$		B1
	$(3x + 4)(x + 5)$		B0
	$(3x - 1)(x + 4)$		B1
	$(3x + 1)(x - 4)$		B0
	Condone multiplication signs between brackets for B2 eg $(3x - 4) \times (x + 5)$		B2
	Condone multiplication signs between brackets for B1 eg $(3x - 1) \times (x + 20)$		B1
	Condone missing final bracket eg1 $(3x - 4)(x + 5$ eg2 $(3x - 20)(x + 1$		B2 B1
	Do not allow $x3$ for $3x$ etc		

Q	Answer	Mark	Comments
26	24.5 or 25.5 or 7.45 or 7.55	B1	accept 25.4$\dot{9}$ for 25.5 accept 7.54$\dot{9}$ for 7.55
	30 × their 25.5 or 765 or 20 × their 7.55 or 151	M1	their 25.5 must be (25, 26] their 7.55 must be (7.5, 7.6]
	30 × their 25.5 + 20 × their 7.55 or 765 + 151 or 916	M1dep	oe eg 920 – 30 × their 25.5 – 20 × their 7.55 their 25.5 must be (25, 26] their 7.55 must be (7.5, 7.6]
	25.5 and 7.55 and 916 and Yes	A1	oe eg 25.5 and 7.55 and –4 and Yes
	Additional Guidance		
	Only using lower bounds can score a maximum of B1M0M0A0		
	Condone 25.50 for 25.5 etc		
	916 and Yes without both 25.5 and 7.55 is A0 but the B mark and M marks are possible eg 30 × 25.5 + 20 × 7.54 (= 915.8) = 916 Yes		B1M1M1A0
	916 and Yes with no working		Zero
	Yes can be implied eg1 30 × 25.5 + 20 × 7.55 = 916 which is less than 920 eg2 30 × 25.5 + 20 × 7.55 = 916 so she can		B1M1M1A1 B1M1M1A1

Q	Answer	Mark	Comments
27	**Alternative method 1**		
	$\frac{4}{20} \times \frac{16}{19}$ or $\frac{64}{380}$ or $\frac{16}{95}$ or $\frac{6}{20} \times \frac{10}{19}$ or $\frac{60}{380}$ or $\frac{3}{19}$ or $\frac{7}{20} \times \frac{3}{19}$ or $\frac{21}{380}$	M1	oe fractions or decimals condone $\frac{4}{20} \times \frac{16}{20}$ etc
	Any 2 of $\frac{4}{20} \times \frac{16}{19}$ or $\frac{64}{380}$ or $\frac{16}{95}$ and $\frac{6}{20} \times \frac{10}{19}$ or $\frac{60}{380}$ or $\frac{3}{19}$ and $\frac{7}{20} \times \frac{3}{19}$ or $\frac{21}{380}$	M1dep	oe fractions or decimals
	$\frac{4}{20} \times \frac{16}{19} + \frac{6}{20} \times \frac{10}{19} + \frac{7}{20} \times \frac{3}{19}$ or $\frac{64}{380} + \frac{60}{380} + \frac{21}{380}$	M1dep	oe fractions or decimals eg $\frac{16}{95} + \frac{3}{19} + \frac{21}{380}$
	$\frac{145}{380}$ or $\frac{29}{76}$ or [0.381, 0.382] or [38.1%, 38.2%]	A1	accept 0.38 or 38% with full working SC2 $\frac{145}{400}$ or $\frac{29}{80}$ or 0.3625 or 36.25%

Mark scheme and Additional Guidance continues on the next 4 pages

Q	Answer	Mark	Comments
27 cont	**Alternative method 2**		
	$\frac{6}{20} \times \frac{4}{19}$ or $\frac{24}{380}$ or $\frac{6}{95}$ or $\frac{7}{20} \times \frac{10}{19}$ or $\frac{70}{380}$ or $\frac{7}{38}$ or $\frac{3}{20} \times \frac{17}{19}$ or $\frac{51}{380}$	M1	oe fractions or decimals condone $\frac{6}{20} \times \frac{4}{20}$ etc
	Any 2 of $\frac{6}{20} \times \frac{4}{19}$ or $\frac{24}{380}$ or $\frac{6}{95}$ and $\frac{7}{20} \times \frac{10}{19}$ or $\frac{70}{380}$ or $\frac{7}{38}$ and $\frac{3}{20} \times \frac{17}{19}$ or $\frac{51}{380}$	M1dep	oe fractions or decimals
	$\frac{6}{20} \times \frac{4}{19} + \frac{7}{20} \times \frac{10}{19} + \frac{3}{20} \times \frac{17}{19}$ or $\frac{24}{380} + \frac{70}{380} + \frac{51}{380}$	M1dep	oe fractions or decimals eg $\frac{6}{95} + \frac{7}{38} + \frac{51}{380}$
	$\frac{145}{380}$ or $\frac{29}{76}$ or [0.381, 0.382] or [38.1%, 38.2%]	A1	accept 0.38 or 38% with full working SC2 $\frac{145}{400}$ or $\frac{29}{80}$ or 0.3625 or 36.25%

Mark scheme and Additional Guidance continues on the next 3 pages

Q	Answer	Mark	Comments
27 cont	**Alternative method 3**		
	$\frac{6}{20} \times \frac{15}{19}$ or $\frac{90}{380}$ or $\frac{9}{38}$ or $\frac{7}{20} \times \frac{9}{19}$ or $\frac{63}{380}$ or $\frac{3}{20} \times \frac{2}{19}$ or $\frac{6}{380}$ or $\frac{3}{190}$	M1	oe fractions or decimals condone $\frac{6}{20} \times \frac{15}{20}$ etc
	Any 2 of $\frac{6}{20} \times \frac{15}{19}$ or $\frac{90}{380}$ or $\frac{9}{38}$ and $\frac{7}{20} \times \frac{9}{19}$ or $\frac{63}{380}$ and $\frac{3}{20} \times \frac{2}{19}$ or $\frac{6}{380}$ or $\frac{3}{190}$	M1dep	oe fractions or decimals
	$1 - \frac{4}{20} - \frac{6}{20} \times \frac{15}{19} - \frac{7}{20} \times \frac{9}{19} - \frac{3}{20} \times \frac{2}{19}$ or $1 - \frac{4}{20} - \frac{90}{380} - \frac{63}{380} - \frac{6}{380}$	M1dep	oe fractions or decimals eg $1 - \frac{1}{5} - \frac{9}{38} - \frac{63}{380} - \frac{3}{190}$
	$\frac{145}{380}$ or $\frac{29}{76}$ or [0.381, 0.382] or [38.1%, 38.2%]	A1	accept 0.38 or 38% with full working SC2 $\frac{145}{400}$ or $\frac{29}{80}$ or 0.3625 or 36.25%

Mark scheme and Additional Guidance continues on the next 2 pages

Q	Answer	Mark	Comments
27 cont	**Alternative method 4**		
	$\frac{7}{20} \times \frac{16}{19}$ or $\frac{112}{380}$ or $\frac{28}{95}$ or $\frac{6}{20} \times \frac{9}{19}$ or $\frac{54}{380}$ or $\frac{27}{190}$ or $\frac{4}{20} \times \frac{3}{19}$ or $\frac{12}{380}$ or $\frac{3}{95}$	M1	oe fractions or decimals condone $\frac{7}{20} \times \frac{16}{20}$ etc
	Any 2 of $\frac{7}{20} \times \frac{16}{19}$ or $\frac{112}{380}$ or $\frac{28}{95}$ and $\frac{6}{20} \times \frac{9}{19}$ or $\frac{54}{380}$ or $\frac{27}{190}$ and $\frac{4}{20} \times \frac{3}{19}$ or $\frac{12}{380}$ or $\frac{3}{95}$	M1dep	oe fractions or decimals
	$1 - \frac{3}{20} - \frac{7}{20} \times \frac{16}{19} - \frac{6}{20} \times \frac{9}{19} - \frac{4}{20} \times \frac{3}{19}$ or $1 - \frac{3}{20} - \frac{112}{380} - \frac{54}{380} - \frac{12}{380}$	M1dep	oe fractions or decimals eg $1 - \frac{3}{20} - \frac{28}{95} - \frac{27}{190} - \frac{3}{95}$
	$\frac{145}{380}$ or $\frac{29}{76}$ or [0.381, 0.382] or [38.1%, 38.2%]	A1	accept 0.38 or 38% with full working SC2 $\frac{145}{400}$ or $\frac{29}{80}$ or 0.3625 or 36.25%

Mark scheme and Additional Guidance continues on the next page

Q	Answer	Mark	Comments
27 cont	**Alternative method 5**		
	4×16 or 6×10 or 7×3 or 3×17 or 7×10 or 6×4	M1	oe eg 64 or 60 or 21 or 51 or 70 or 24
	Any 2 of 4×16 and 6×10 and 7×3 or any 2 of 3×17 and 7×10 and 6×4	M1dep	oe implied by 145
	$\frac{4\times16+6\times10+7\times3}{20\times19}$ or $\frac{3\times17+7\times10+6\times4}{20\times19}$	M1dep	oe
	$\frac{145}{380}$ or $\frac{29}{76}$ or [0.381, 0.382] or [38.1%, 38.2%]	A1	accept 0.38 or 38% with full working SC2 $\frac{145}{400}$ or $\frac{29}{80}$ or 0.3625 or 36.25%
	Additional Guidance		
	Ignore simplification or conversion attempt after correct answer seen		
	For M marks accept oe decimals rounded to 2 dp or better		
	Select the scheme that favours the student for the first 2 M marks even if not subsequently used		
	Using $\frac{4}{20} \times \frac{16}{20}$ etc can score M1M0M0A0 or SC2		
	Do not award marks if a fraction comes from an incorrect method eg Alt 1 $\frac{4}{20} \times \frac{15}{19} = \frac{3}{19}$		M0

Q	Answer	Mark	Comments
28	**Alternative method 1**		
	$0.5 \times 4 \times 10$ or 20	M1	oe may be seen on graph
	$\frac{75 - 0.5 \times 4 \times 10}{10}$ or $\frac{55}{10}$ or 5.5	M1dep	oe may be embedded eg $5.5 \times 10 = 55$
	9.5	A1	oe
	Alternative method 2		
	Correct method or value for distance travelled in the first t seconds where $t > 4$	M1	eg distance for 12s = 100 or distance for 9s = $0.5 \times (9 + 5) \times 10$ or 70 may be seen on graph
	$\frac{\text{their distance} - 75}{10}$ or $\frac{75 - \text{their distance}}{10}$	M1dep	eg $\frac{100 - 75}{10}$ or $\frac{75 - 70}{10}$
	9.5	A1	oe
	Additional Guidance		
	1st M can be awarded even if not subsequently used		

Q	Answer	Mark	Comments
29	$5(x^2 + 3)$ or $5x^2 + 15$ or $2x(4x + 1)$ or $8x^2 + 2x$	M1	oe ignore any denominators
	$5(x^2 + 3) = 2x(4x + 1)$ or $5x^2 + 15 = 8x^2 + 2x$	M1dep	oe allow both sides to have denominator $(4x + 1)(x^2 + 3)$ oe
	$3x^2 + 2x - 15$ (= 0)	M1dep	oe equation with terms collected eg $3x^2 + 2x = 15$ no denominator allowed unless recovered in subsequent working
	$\frac{-2 \pm \sqrt{2^2 - 4 \times 3 \times -15}}{2 \times 3}$ or $\frac{-2 \pm \sqrt{184}}{6}$ or $-\frac{1}{3} \pm \frac{1}{3}\sqrt{46}$ or 1.927… and –2.594… and $3x^2 + 2x - 15$ (= 0) seen	M1	oe ft their 3-term quadratic allow correct factorisation of their 3-term quadratic
	1.93 and –2.59 and $3x^2 + 2x - 15$ (= 0) seen	A1	oe eg 1.93 and –2.59 with $3x^2 + 2x = 15$ seen

Additional Guidance is on the next page

	Additional Guidance	
29 cont	1.93 and -2.59 and $3x^2 + 2x - 15$ (= 0) not seen	Zero
	1.927… and -2.594… and $3x^2 + 2x - 15$ (= 0) not seen	Zero
	One solution and $3x^2 + 2x - 15$ (= 0) not seen	Zero
	Missing brackets must be recovered	
	$\frac{3x^2 + 2x - 15}{(4x+1)(x^2+3)} = 0$ followed by $3x^2 + 2x - 15 = (4x + 1)(x^2 + 3)$	M1M1M0M0A0
	$\frac{3x^2 + 2x - 15}{(4x+1)(x^2+3)} = 0$ followed by 1.93 and -2.59	M1M1M1M1A1