AQA

GCSE

Mathematics

93702F Applications of Mathematics
Unit 2: Foundation Tier
Mark scheme

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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 Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

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 within the scheme 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.
3.14 …	Allow answers which begin 3.14 eg 3.14, 3.142, 3.149.
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 candidate has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised.

Questions which ask candidates to show working
Instructions on marking will be given but usually marks are not awarded to candidates who show no working.

Questions which do not ask candidates to show working
As a general principle, a correct response is awarded full marks.

Misread or miscopy
Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate 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.

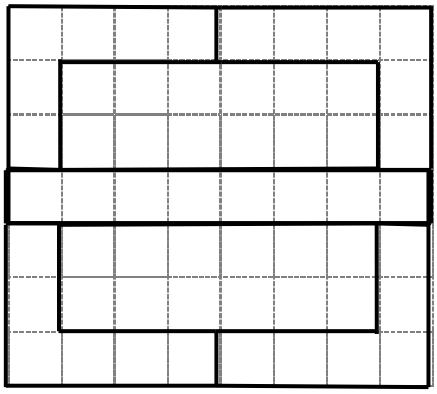
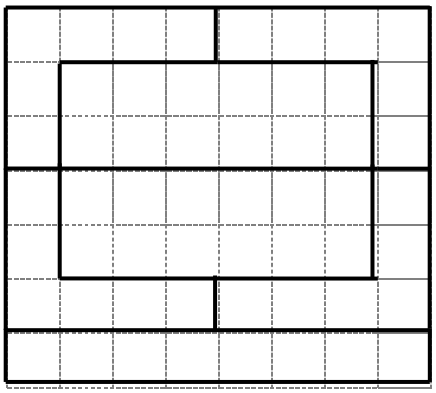
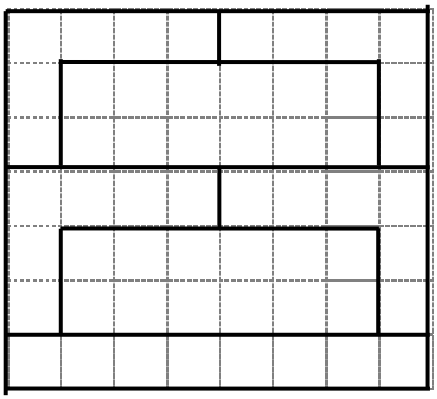
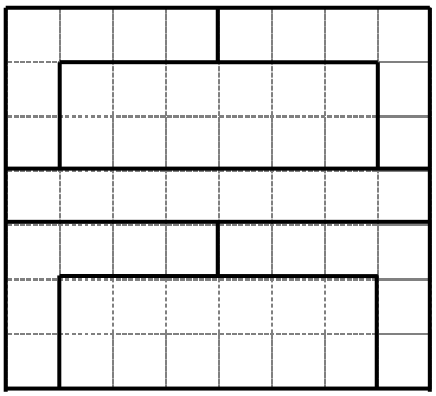
Work not replaced
Erased or crossed out work that is still legible should be marked.

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.

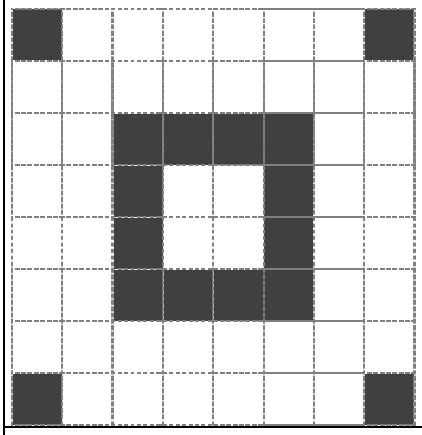
Continental notation Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the candidate intended it to be a decimal point.

Q	Answer	Mark	Comments
1(a)	0.9 m	B1	
1(b)	80 g	B1	
1(c)	250 ml	B1	

Q	Answer	Mark	Comments
2	All 4 pieces correct 	B2	B1 All 4 pieces used but only 1 line of symmetry  or  or 
	Additional Guidance Mark answer space unless blank		

Q	Answer	Mark	Comments
3	Circle radius 6 cm	B1	Allow circle radius [5.8, 6.2] cm
	Vertical diameter	B1ft	ft their circle
	Two chords of length [9.8,10.2] cm from top of vertical diameter	B1ft	ft their diameter
	Additional guidance		
	3rd mark Allow from one end of their diameter even if not vertical		
4(a)	50	B1	
4(b)	B and 80	B2	B1 80 or 320
	Additional Guidance		
	B with incorrect number or with no number scores B0		

Q	Answer	Mark	Comments
5(a)	E6 and E7 or E7 and E8	B2	B1 Any 2 available seats that are next to each other in the same row eg G16 and G17 or C1 and C2 or any 2 available seats that are not in columns 1, 2, 17 or 18 eg L11 and N14
	Additional Guidance		
	Accept 6E for E6 etc		
	Accept E6 and 7 etc		
	Allow if there is an unambiguous response on the diagram		
5(b)	6 × 18 + 2 × 13 or 8 × 18 – 2 x 2 – 2 x 3 or [128 , 140]	M1	oe Correct attempt at calculating number of seats sold in rows A to H or answer in the range shown
	3 × 18 + 2 × 14 – 8 or 5 × 14 + 3 x 2 + 3 x 2 – 8 or 2 × 18 + 2 × 14 + 10 or 74	M1	oe Correct attempt at calculating number of seats sold in rows J to N
	their 134 × 22.5(0) or 3015 or their 74 × 16.(00) or 1184	M1dep	their 134 and their 74 must each be > 1 dep on M1M0 or M0M1
	4199	A1	
6(a)	13 ± 1 (sides) or 216 or 252	M1	May be implied eg 6 × 36 implies 12 (sides)
	234	A1	

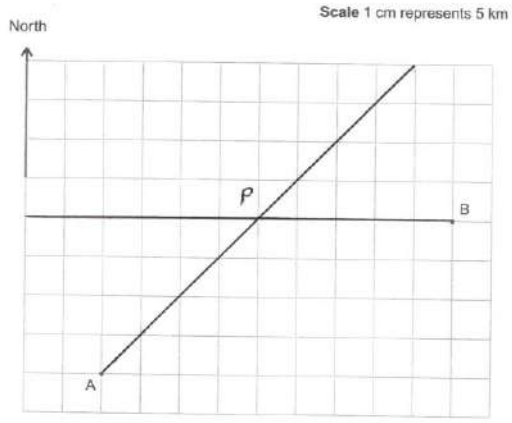
Q	Answer	Mark	Comments
6(b)	**Alternative Method 1**		
	(equilateral triangle angle =) 60	M1	May be implied or be seen on diagram
	(x =) 30	A1	
	180 – 2 × their 30	M1	
	(y =) 120	A1ft	ft their x = 30
	Alternative Method 2		
	(equilateral triangle angle =) 60	M1	May be implied or be seen on diagram
	(y =) 120	A1	
	$\frac{180 - \text{their } 120}{2}$	M1	
	(x =) 30	A1ft	ft their y = 120
7(a)		B2	B1 Corner square shaded or two squares shaded to complete central section or more than 3 but no more than 7 squares shaded with rotational symmetry
	Additional Guidance		
	More or less than 3 squares shaded can score a maximum of B1		
7(b)	2	B1	

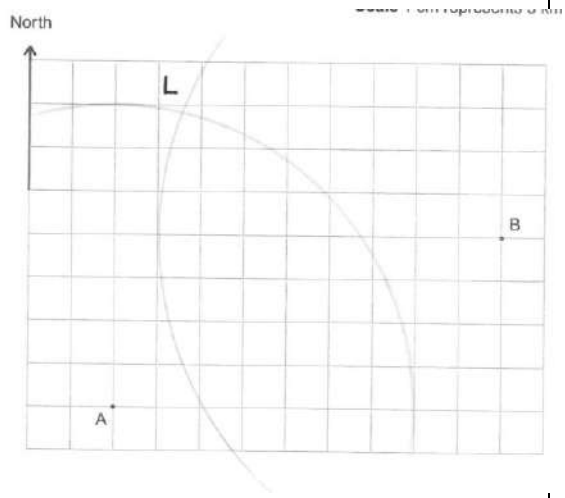
Q	Answer	Mark	Comments
8	1.5 seen	M1	
	their 1.5 × 0.88 or 1.32	M1	oe eg working in pence 88 + 44 implies M2
	(6 – their 1.32) ÷ 1.95	M1dep	oe dep on 2nd M1
	2.4	A1	oe
9(a)	62.5 miles	B1	
9(b)	**Alternative Method 1**		
	140 ÷ 100 or 1.4(0)	M1	or their 62.5 x 140
	their 1.4(0) × their 62.5	M1dep	their 62.5 from (a)
	87.5	A1ft	Correct or ft their 62.5 from (a) and M2 ifw
	Alternative Method 2		
	their 62.5 ÷ 100 or 0.625	M1	their 62.5 from (a)
	their 0.625 × 140	M1dep	
	87.5	A1ft	Correct or ft their 62.5 from (a) and M2 ifw
	Alternative Method 3		
	$\frac{40}{100}$ × their 62.5 or 25	M1	their 62.5 from (a)
	their 62.5 + their 25	M1dep	their 62.5 from (a)
	87.5	A1ft	Correct or ft their 62.5 from (a) and M2 ifw
	Alternative Method 4		
	1 km = [0.6, 0.63] mile or 8km= 5miles	M1	1 mile = [1.58, 1.7] km
	140 × their [0.6, 0.63] or 140 x 5/8	M1dep	140 ÷ their [1.58, 1.7] or 140 ÷ 8/5

Q	Answer	Mark	Comments
9(b) (cont)	87.5	A1	ifw
	Additional Guidance		
	ft answers from (a) for alts 1, 2 and 3 25 → 35 160 → 224 200 → 280		
	In Alt 4 they do not use their answer to part (a) so no ft		
9(c)	$\frac{1}{2}$ × 3 x 12 or 18	M1	oe
	3 × 40 or 120 or 2 × 7.5(0) or 15(.00)	M1	
	3 × 40 + 2 × 7.5(0) + their 18	M1	Must be sum of 3 components their 18 can be 36
	153	A1	SC2 171

Q	Answer	Mark	Comments
10	**Alternative Method 1**		
	30 + 8 + 8 or 46	M1	
	their 46 × 23	M1dep	
	1058	A1	
	cm^2 or sq cm	B1	oe
	Alternative Method 2		
	30 × 23 or 690 or 8 × 23 or 184 or 2 x 8 x 23 or 368	M1	
	their 690 + their 368	M1dep	oe Must be an attempt at the total area
	1058	A1	
	cm^2 or sq cm	B1	oe SC3 2116 cm^2 SC2 2116
	Additional Guidance		
	Allow consistent working in metres with A1 for 0.1058 and B1 for m^2		

Q	Answer	Mark	Comments
11	**Alternative Method 1**		
	40 (mph)	B1	can be implied
	20 ÷ their 40 or 0.5(h) or 30(min) or 6.10	M1	oe
	6.10 and Yes or 30 (mins) and 35 (mins) and Yes	A1ft	ft their 40 (mph) and decision with B0 M1
	Alternative Method 2		
	40 (mph)	B1	
	6.15 – 5.40 or 35 (min) and $20 \div \frac{35}{60}$ or [34.2 34.3]	M1	oe Allow 34 if correct method seen
	[34.2, 34.3] and their 40 and Yes	A1ft	ft their 40 (mph) and decision with B0 M1 Allow 34 if correct method seen
12	197.6 x 1000 or 197 600 or 95 × 65 or 6175	M1	
	their 197 600 ÷ (95 × 65)	M1dep	oe
	32	A1	

Q	Answer	Mark	Comments
13(a)	Bearing of 045° from A or bearing of 270° from B	M1	Allow [043, 047]º or [268, 272]º
	Bearing of 045° from A and bearing of 270° from B	A1	 SC1 Point P labelled in correct position but paths of ships not shown
	Additional Guidance		
	Ignore additional lines eg line from A to B Incorrect point labeled P	A0	

Q	Answer	Mark	Comments
13(b)	Arc, centre A, radius 7 cm or arc, centre B, radius 8 cm	M1	Allow arc, centre A, radius [6.8, 7.2] cm or arc, centre B, radius [7.8, 8.2] cm
	Both arcs correct	A1	 SC1 Point L labelled in correct position but arcs not shown SC1 Arc, centre A, radius [7.8, 8.2] cm and arc, centre B, radius [6.8, 7.2] cm
	Additional Guidance		
	Incorrect point labeled L		A0

Q	Answer	Mark	Comments
14	60	B2	B1 Any other multiple of 60 as the answer or correctly converts all 3 fractions to a common denominator eg $\frac{40}{60}$ and $\frac{36}{60}$ and $\frac{39}{60}$
	Additional Guidance		
	Must select 60 as the answer for B2 60% is B0 unless B1 seen		
15	$4x + 57.6 = 67.2$	B1	oe equation eg1 $x + x + x + x + 57.6 = 67.2$ eg2 $4x = 9.6$ (scores M1 also) eg3 $x = \frac{67.2 - 57.6}{4}$ (scores M1 also) $x = 2.4$ with no other equation is B0
	$4x = 67.2 - 57.6$ or $(67.2 - 57.6) \div 4$	M1	Isolates and collects term in x for their equation of form $ax + b = c$ $a > 1$ $b \neq 0$ $c \neq 0$ Allow one rearranging error
	2.4	A1ft	ft B0 M1 with no rearranging errors SC2 2.4 with no equation seen
	Additional Guidance		
	$3x + 57.6 = 67.2$ $3x = 9.6$ $x = 3.2$		B0 M1 A1ft
	Embedded solutions can score 1 or 2 marks eg1 $4x = 9.6$ $4 \times 2.4 = 9.6$ (nothing on answer line) eg2 $4 \times 2.4 + 57.6 = 67.2$ (nothing on answer line)		B1 M1 A0 B0 M1 A0

Q	Answer	Mark	Comments
16 (cont)	**Alternative method 1**		
	Any two of 6 (litres apple) 1.5 (litres orange) 1.5 (litres pineapple)	M1	oe eg working in ml Number of litres she needs to buy Implied by any two of 3 (cartons apple) 2 (cartons orange) 3 (cartons pineapple)
	(apple) 5 ÷ 30 or [0.16, 0.17] or (orange/pineapple) 1.25 ÷ 30 or [0.0416, 0.042]	M1	oe eg working in ml Number of litres per person
	(apple) their 6 ÷ their [0.16, 0.17] and (orange) their 1.5 ÷ their [0.0416, 0.0417] and (pineapple) their 1.5 ÷ their [0.0416, 0.0417]	M1dep	oe Division of their litres by their litres per person dep on M1 M1 If the same number of litres of orange and pineapple, only need to see their 1.5 ÷ their [0.0416, 0.0417] once
	36	Q1	Strand (ii) All three numbers of litres must be correct in 1st M1 and correct working seen for 3rd M1 SC1 36 with no M marks gained
	Additional Guidance		
	Answer 36 will not always gain 4 marks		

Q	Answer	Mark	Comments
16 (cont)	**Alternative method 2**		
	Any two of 6 (litres apple) 1.5 (litres orange) 1.5 (litres pineapple)	M1	oe eg working in ml Number of litres she needs to buy Implied by any two of 3 (cartons apple) 2 (cartons orange) 3 (cartons pineapple)
	(apple) 30 ÷ 5 or 6 or (orange/pineapple) 30 ÷ 1.25 or 24	M1	oe eg working in ml Number of people per litre
	(apple) their 6 × their 6 and (orange) their 1.5 × their 24 and (pineapple) their 1.5 × their 24	M1dep	oe Multiplication of their litres by their number of people per litre dep on M1 M1 If the same number of litres of orange and pineapple, only need to see their 1.5 × their 24 once
	36	Q1	Strand (ii) All three numbers of litres must be correct in 1st M1 and correct working seen for 3rd M1 SC1 36 with no M marks gained
	Additional Guidance		
	Answer 36 will not always gain 4 marks		

Q	Answer	Mark	Comments
16 (cont)	**Alternative method 3**		
	Any two of 6 (litres apple) 1.5 (litres orange) 1.5 (litres pineapple)	M1	oe eg working in ml Number of litres she needs to buy Implied by any two of 3 (cartons apple) 2 (cartons orange) 3 (cartons pineapple)
	(apple) their 6 – 5 or 1 (l) or (orange) their 1.5 – 1.25 or 0.25 (l) or (pineapple) their 1.5 – 1.25 or 0.25 (l)	M1	oe eg working in ml Difference between their litres and litres needed for 30 people
	(apple) their 1 ÷ 5 × 30 or 6 and (orange) their 0.25 ÷ 1.25 × 30 or 6 and (pineapple) their 0.25 ÷ 1.25 × 30 or 6	M1dep	oe eg working in ml dep on M1 M1 If the same number of litres of orange and pineapple in 2nd M1, only need to see their 0.25 ÷ 1.25 × 30 once
	36	Q1	Strand (ii) All three numbers of litres must be correct in 1st M1 and correct working seen for 3rd M1 SC1 36 with no M marks gained
	Additional Guidance		
	Answer 36 will not always gain 4 marks		

Q	Answer	Mark	Comments
16 (cont)	**Alternative method 4**		
	Any two of 6 (litres apple) 1.5 (litres orange) 1.5 (litres pineapple)	M1	oe eg working in ml Number of litres she needs to buy Implied by any two of 3 (cartons apple) 2 (cartons orange) 3 (cartons pineapple)
	(apple) their 6 ÷ 5 or 1.2 or (orange) their 1.5 ÷ 1.25 or 1.2 or (pineapple) their 1.5 ÷ 1.25 or 1.2	M1	oe eg working in ml Division of their litres by litres needed for 30 people Implied by 9 ÷ 7.5 (= 1.2) or 9 ÷ (7.5 ÷ 30)
	30 × their 1.2	M1dep	oe dep on M1 M1 Only award if three equal values are seen in 2nd M1 If the same number of litres of orange and pineapple, only need to see their 1.5 ÷ 1.25 once in 2nd M1
	36	Q1	Strand (ii) All three numbers of litres must be correct in 1st M1 and correct working seen for 3rd M1 SC1 36 with no M marks gained
	Additional Guidance		
	Answer 36 will not always gain 4 marks		

Q	Answer	Mark	Comments
16 (cont)	**Alternative method 5**		
	Any two of 6 (litres apple) 1.5 (litres orange) 1.5 (litres pineapple)	M1	oe eg working in ml Number of litres she needs to buy Implied by any two of 3 (cartons apple) 2 (cartons orange) 3 (cartons pineapple)
	their 6 : their 1.5 : their 1.5 = 4 : 1 : 1 or 5 : 1.25 (: 1.25) = 4 : 1 (: 1)	M1	oe eg working in ml If the same number of litres of orange and pineapple, only need to see 6 : 1.5 = 4 : 1
	(their 6 + their 1.5 + their 1.5) × (30 ÷ (5 + 1.25 + 1.25))	M1dep	oe eg 9 ÷ 0.25 dep on M1 M1 Only award if two identical simplified ratios are seen in 2nd M1
	36	Q1	Strand (ii) All three numbers of litres must be correct in 1st M1 and correct working seen for 3rd M1 SC1 36 with no M marks gained
	Additional Guidance		
	Answer 36 will not always gain 4 marks		

Q	Answer	Mark	Comments
17	11×4 or 44 (cm) or 440 (mm) or 7.5×4 or 30 (cm) or 300 (mm) or 4×4 or 16 (cm) or 160 (mm)	M1	May be seen on diagram Allow $[10.8, 11.2] \times 4$ or [43.2, 44.8] cm or [432, 448] mm or $[7.3, 7.7] \times 4$ or [29.2, 30.8] cm or [292, 308] mm or $[3.8, 4.2] \times 4$ or [15.2, 16.8] cm or [152, 168] mm
	their 440 ÷ 72 or 6(.1…) or their 300 ÷ 72 or 4(.1 …) or 4.2 or their 160 ÷ 72 or 2(.2 …)	M1dep	oe eg their 44 ÷ 7.2 72 × 6 = 432 or 72 × 4 = 288 or 72 × 2 = 144 Implied by (their 440 × their 300 × their 160) ÷ 72^3 oe
	their 6 × their 4 × their 2 or 48	M1dep	their 6, their 4 and their 2 must be integers from rounding down their values
	48 and decision with no incorrect working	A1	
	Additional Guidance		
	Working with volumes can score a maximum of M1 M1 M0 A0		

18(a)	(5 →) 13.5 (10 →) 24 (30 →) 36 (50 →) 0	B2	B1 Any two values correct Other values may be incorrect or missing

Q	Answer	Mark	Comments
18(b)	Smooth quadratic curve through (0, 0), (5, 13.5), (10, 24), (20, 36), (30, 36), (40, 24) (45, 13.5) and (50, 0) All points ±0.5 square	B2ft	Correct or ft their points from (a) for B2 or B1 B1ft At least 5 points plotted correctly All points ±0.5 square
	Additional Guidance		
	For B2, curve must have 36.5 ≤ maximum y value ≤ 39.5		
	For B2 and B1, points can be implied by their graph passing through the points		
18(c)	37.5	B1ft	Correct or ft their quadratic graph if 36.5 ≤ answer ≤ 40 Allow ±0.5 square
19(a)	$\pi \times 9^2$ or 81π or [254, 254.502] or 255	M1	
	$\pi \times (10 + \frac{18}{2})^2$ or 361π or [1133.5, 1134.3]	M1	280π or [879.2, 879.8] implies M2
	[879.2, 879.8] and 880	A1	
	Additional Guidance		
	280π = 880 is M1 M1 A0		

Q	Answer	Mark	Comments
19(b)	**Alternative method 1**		
	85 × 40 – 2 × their 880 or 1640	M1	oe correct or using their (a)
	their 1640 ÷ (85 × 40) or [0.48, 0.484]	M1dep	oe
	[48, 48.4]	A1	
	Alternative method 2		
	2 × their 880 ÷ (85 × 40) or 1760 ÷ 3400 or [0.516, 0.52]	M1	oe correct or using their (a)
	1 – their [0.516, 0.52] or [0.48, 0.484]	M1dep	oe
	[48, 48.4]	A1	
20(a)	4	B1	
20(b)	$\frac{1}{2}$ × 12 × 6 or $\frac{1}{2}$ × 10 × 8	M1	oe eg $\frac{1}{2} \times 3 \times 6$ (+) $\frac{1}{2} \times (12 - 3) \times 6$
	36 or 40	A1	
	36 and 40 and Finn	Q1	Strand (ii) Two correct areas and correct decision