GCSE

Applications of Mathematics (Linked Pair)

Foundation Tier Unit 2 – Geometry and Measures
Mark scheme

9370/2F
November 2016

Version/Stage: 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 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.
M dep	A method mark dependent on a previous method mark being awarded.
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.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
Q	Marks awarded for quality of written communication.
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.
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.
25.3 …	Allow answers which begin 25.3 e.g. 25.3, 25.31, 25.378.
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	Draws line *BD*	B1	
	Line joining midpoint of *BC* to midpoint of *CD*	B2	B1 midpoint of *CD* and midpoint of *BC* identified
2(a)	1030	B1	
2(b)	42 min or 45 min	M1	
	Ticks Yes and 42 min is less than three-quarters of an hour or Ticks Yes and 42 min and 45 min or Ticks Yes and 1015 or 1045 or 1115 or 1145 or 1215	A1	oe eg Ticks Yes and 3 minutes

Q	Answer	Mark	Comments
2(c)	23	B2	B1 (0)9.55 or 10.18
	Additional Guidance		
	B1 allow (0)9:55 or (0)955 or 10:18 or 1018		
3	Draws a square with side length [9.8, 10.2] cm	B1	
	Draws a circle with radius [4.8, 5.2] cm	B1	
	Draws a vertical diameter and a horizontal diameter on their circle	B1ft	ft their circle
	Shades in the top right sector of their circle	B1ft	ft their circle divided into 4 sectors

Q	Answer	Mark	Comments
4	**Alternative method 1**		
	2 + 5 + 5 + 10 + 10 + 10 + 10 + 20 or 72	M1	oe Allow one error or omission
	their 72 ÷ 6 or 12	M1dep	
	10p and 2p	A1	SC2 5p, 5p and 2p
	Alternative method 2		
	Adds two coins and adds the remaining six coins	M1	eg 2 + 5 = 7 and 5 + 10 + 10 + 10 + 10 + 20 = 65
	Repeats with a different choice	M1dep	
	10p and 2p	A1	SC2 5p, 5p and 2p
	Alternative method 3		
	Adds two coins and multiplies the total by 5	M1	eg 2 + 5 = 7 and 7 × 5 = 35
	Repeats with a different choice	M1dep	
	10p and 2p	A1	SC2 5p, 5p and 2p
5	✓ ✓ ✗ ✓ ✗	B4	B3 4 correct B2 3 correct B1 2 correct
	Additional Guidance		
	In the comments, 'correct' means a ✓ or a ✗ as appropriate		

Q	Answer	Mark	Comments
6	**Alternative method 1**		
	112 ÷ 100 or 1.12	M1	
	their 1.12 × [2.5, 3.5]	M1dep	
	[2.8, 3.92]	A1	
	Alternative method 2		
	112 × [2.5, 3.5] or [280, 392]	M1	
	their [280, 392] ÷ 100	M1dep	
	[2.8, 3.92]	A1	
	Additional Guidance		
	Answer [2.8, 3.92]		M1 M1 A1
7(a)	28	B1	

Q	Answer	Mark	Comments
7(b)	11.48 ÷ their 28 or (0.)41	M1	oe their 28 from (a)
	[30, 38] × their (0.)41 or 1394	M1dep	
	13.94	A1ft	Only ft their 28 from (a) and use of 34 in 2nd M1 SC2 6.97
7(c)	Fits a total of 4 more 0s, all the correct size	B2	B1 Fits at least two more 0s, the correct size
8	Draws bearing [033, 037]º at P and draws bearing [308, 312]º at Q and lines cross (marked S)	B2	B1 Draws bearing [033, 037]º at P or draws bearing [308, 312]º at Q
9(a)	(a =) 210	B1	SC1 a = 162 and b = 210
	(b =) 162	B1	
9(b)	(c =) 60	B1	

Q	Answer	Mark	Comments
9(c)	(d =) 76	B1	
	$\frac{180 - \text{their } 76}{2}$ or $\frac{104}{2}$	M1	
	(e =) 52	A1ft	ft their d
9(d)	180 – 139	M1	
	41	A1	
10(a)	6	B1	
10(b)	2	B1	

Q	Answer	Mark	Comments
10(c)	**Alternative method 1**		
	40 – 3 × their 6 or 22	M1	their 6 from (a)
	their 22 ÷ (their 2 × 2) or their 22 ÷ 4 or 5.5	M1dep	their 2 from (b)
	5	A1ft	ft their 6 from (a) and their 2 from (b) SC2 Answer 7
	Alternative method 2		
	40 – 6 or 34	M1	their 6 from (a)
	their 34 ÷ 2 – 2 × their 6 or 17 – 12	M1dep	their 6 from (a) their 2 from (b)
	5	A1ft	ft their 6 from (a) and their 2 from (b) SC2 Answer 7

Q	Answer	Mark	Comments
11	**Alternative method 1**		
	6.5 × 1000 ÷ 500 or 6500 ÷ 500 or 6.5 ÷ 0.5 or 13	M1	
	5 × 1000 ÷ 500 or 5000 ÷ 500 or 5 ÷ 0.5 or 10	M1	
	their 13 × their 10 or 130	M1dep	dep on M2
	their 130 ÷ 16 or 8.1…	M1dep	dep on M3
	9 with no incorrect working seen	Q1	Strand (iii) Rounds up to nearest integer with M4 scored
	Alternative method 2		
	6.5 × 5 or 32.5	M1	
	(500 ÷ 1000) × (500 ÷ 1000) or 0.5 × 0.5 or 0.25	M1	
	their 32.5 ÷ their 0.25 or 130	M1dep	dep on M2
	their 130 ÷ 16 or 8.1…	M1dep	dep on M3
	9 with no incorrect working seen	Q1	Strand (iii) Rounds up to nearest integer with M4 scored
	Alternative method 3		
	6.5 × 1000 × 5 × 1000 or 6500 × 5000 or 32 500 000	M1	
	500 × 500 or 250 000	M1	
	their 32 500 000 ÷ their 250 000 or 130	M1dep	dep on M2
	their 130 ÷ 16 or 8.1…	M1dep	dep on M3
	9 with no incorrect working seen	Q1	Strand (iii) Rounds up to nearest integer with M4 scored

Q	Answer	Mark	Comments
12(a)	15 (min) or 24 (min) or 9 (min)	M1	oe eg $\frac{1}{4}$h
	39	A1	
12(b)	8.4 km	B1	
12(c)	$10 \div \frac{1}{2}$ or 10×2 or $10 \div 30$ or 0.33... or $10 \div 0.3(0)$	M1	oe
	20	A1	
13	$20 \div (1 + 3)$ or $20 \div 4$ or 5	M1	red in 20 litres of light pink
	their 5×3 or 15	M1dep	white in 20 litres of light pink
	their 15×2 or 30	M1dep	dep on M2 red needed for dark pink
	25	A1	

Q	Answer	Mark	Comments
14(a)	1.2 × 0.8 × 2 + 1.2 × 0.6 × 2 + 0.8 × 0.6 × 2 = 4.32 or 0.96 × 2 + 0.72 × 2 + 0.48 × 2 = 4.32 or 2(0.96 + 0.72 + 0.48) = 4.32 or 1.92 + 1.44 + 0.96 = 4.32	B2	B1 1.2 × 0.8 (× 2) or 0.96 or 1.92 or 1.2 × 0.6 (× 2) or 0.72 or 1.44 or 0.8 × 0.6 (× 2) or 0.48 or 0.96
	Additional Guidance		
	1.2 × 0.8 × 0.6		B0

14(b)	**Alternative method 1**				
	4.32 × 3 × 8 or 103.68			M1	oe
	15 × 6.5 or 97.5			M1	
	103.68 and 97.5 and No			A1	
	Alternative method 2				
	4.32 × 3 or 12.96	4.32 × 8 or 34.56	4.32 ÷ 6.5 or 0.66…	M1	
	their 12.96 × 8 ÷ 6.5	their 34.56 × 3 ÷ 6.5	their 0.66... × 3 × 8	M1dep	oe
	[15.9, 16] and No			A1	

Mark scheme for Q14(b) continues on the next page

Q	Answer	Mark	Comments

14(b)	**Alternative method 3**				
	4.32 × 3 or 12.96	4.32 × 8 or 34.56	4.32 ÷ 15 or 0.288	M1	
	their 12.96 × 8 ÷ 15	their 34.56 × 3 ÷ 15	their 0.288 × 3 × 8	M1dep	oe
	6.9… and No			A1	
	Alternative method 4				
	4.32 × 3 or 12.96			M1	
	15 × 6.5 ÷ their 12.96 or 97.5 ÷ their 12.96			M1dep	
	7.5… and No			A1	
	Alternative method 5				
	4.32 × 8 or 34.56			M1	
	15 × 6.5 ÷ their 34.56 or 97.5 ÷ their 34.56			M1dep	
	2.8… and No			A1	

15(a)	Pam has $(80 + x)$ beads Ellie has $(44 - x)$ beads	B1	

Q	Answer	Mark	Comments
15(b)	**Alternative method 1**		
	$80 + x = 3(44 - x)$	B1ft	Correct equation or ft their (a) Missing brackets may be recovered
	$80 + x = 132 - 3x$	M1	Expands their bracket, allow one error
	$x + 3x = 132 - 80$	M1	Collects terms for their equation Allow one sign error their equation must have x on both sides
	13	Q1ft	Strand (ii) Their equation solved correctly ft their (a) if M2 and no errors SC3 13 with no equation
	Alternative method 2		
	$3y + y = 80 + 44$ or $4y = 124$	B1	oe correct equation y is the number of beads Ellie now has
	(y =) $124 \div 4$ or 31	M1	
	44 – their 31 or 3 × their 31 – 80 or 93 – 80	M1dep	
	13	Q1	Strand (ii) Correct answer with correct equation seen SC3 13 with no equation

Additional Guidance on next page

Q	Answer	Mark	Comments

	Additional Guidance	
15(b)	$80 + x = 3(44 + x)$	B1
	$80 + x = 132 + 3x$	M1
	$80 - 132 = 3x - x$	M1
	-26 (do not ft if solution is negative)	Q0
	$80 - x = 3(44 + x)$	B1ft
	$80 - x = 132 + 3x$	M1
	$80 - 132 = 3x + x$	M1
	-13 (do not ft if solution is negative)	Q0
	$80 - x = 3(44 - x)$	B1ft
	$80 - x = 132 - 3x$	M1
	$3x - x = 132 - 80$	M1
	26	Q1ft
	$80 + x = 3(44 + x)$	B1ft
	$80 + x = 132 + 3x$	M1
	$80 + 132 = 3x - x$ (1 error)	M1
	106 (do not ft if error(s) made)	Q0

Q	Answer	Mark	Comments
16	**Alternative method 1**		
	22 × 15 × 5 or 1650	M1	
	3.96 ÷ their 1650 or 0.0024 or their 1650 ÷ 3.96 or [416.6, 416.7]	M1dep	oe
	π × 10 × 10 × 5 or 500π or [1570, 1571]	M1	
	their [1570, 1571] × their 0.0024 or their [1570, 1571] ÷ their [416.6, 416.7] or [3.76, 3.771]	M1dep	oe dep on M3
	their [3.76, 3.771] × 1.5(0) or [5.64, 5.66]	M1dep	oe dep on M4
	5.64 or 5.65 or 5.66	Q1	Strand (i) Must use correct money notation
	Alternative method 2		
	22 × 15 × 5 or 1650	M1	
	π × 10 × 10 × 5 or 500π or [1570, 1571]	M1	
	their [1570, 1571] ÷ their 1650 or 0.95… or their 1650 ÷ their [1570, 1571] or [1.05, 1.051]	M1dep	dep on M2
	their 0.95… × 3.96 or 3.96 ÷ their [1.05, 1.051] or [3.76, 3.771]	M1dep	oe dep on M3
	their [3.76, 3.771] × 1.5(0) or [5.64, 5.66]	M1dep	oe dep on M4
	5.64 or 5.65 or 5.66	Q1	Strand (i) Must use correct money notation

Q	Answer	Mark	Comments
16	**Alternative method 3**		
	22 × 15 × 5 or 1650	M1	
	3.96 ÷ their 1650 or 0.0024	M1dep	oe
	their 0.0024 × 1.5(0) or 0.0036	M1dep	oe dep on M2
	π × 10 × 10 × 5 or 500π or [1570, 1571]	M1	
	their [1570, 1571] × their 0.0036 or [5.64, 5.66]	M1dep	oe dep on M4
	5.64 or 5.65 or 5.66	Q1	Strand (i) Must use correct money notation
	Alternative method 4		
	22 × 15 or 330	M1	Using total surface area M0
	3.96 ÷ their 330 or 0.012 or their 330 ÷ 3.96 or 83.3…	M1dep	oe
	π × 10 × 10 or [314, 314.2]	M1	
	their [314, 314.2] × their 0.012 or their [314, 314.2] ÷ their 83.3… or [3.76, 3.771]	M1dep	oe dep on M3
	their [3.76, 3.771] × 1.5(0) or [5.64, 5.66]	M1dep	oe dep on M4
	5.64 or 5.65 or 5.66	Q1	Strand (i) Must use correct money notation

Q	Answer	Mark	Comments
16	**Alternative method 5**		
	22 × 15 or 330	M1	Using total surface area M0
	π × 10 × 10 or [314, 314.2]	M1	
	their [314, 314.2] ÷ their 330 or 0.95… or their 330 ÷ their [314, 314.2] or [1.05, 1.051]	M1dep	dep on M2
	their 0.95… × 3.96 or 3.96 ÷ their [1.05, 1.051] or [3.76, 3.771]	M1dep	oe dep on M3
	their [3.76, 3.771] × 1.5(0) or [5.64, 5.66]	M1dep	oe dep on M4
	5.64 or 5.65 or 5.66	Q1	Strand (i) Must use correct money notation
	Alternative method 6		
	22 × 15 or 330	M1	Using total surface area M0
	3.96 ÷ their 330 or 0.012	M1dep	oe
	their 0.012 × 1.5(0) or 0.018	M1dep	oe dep on M2
	π × 10 × 10 or 100π or [314, 314.2]	M1	
	their [314, 314.2] × their 0.018 or [5.64, 5.66]	M1dep	oe dep on M4
	5.64 or 5.65 or 5.66	Q1	Strand (i) Must use correct money notation
	Additional Guidance		
	Must consistently use volumes or consistently use base areas		
	For all method marks, may work in pence		

Q	Answer	Mark	Comments
17	Two correct trials [8.55, 8.65] which bracket 780 and 8.6 as final answer	B4	B3 As B4 response but 8.6 not the final answer or two correct trials [8.5, 8.6] which bracket 780 and 8.6 as final answer B2 Two correct trials [8.1, 9] B1 One correct trial [8.1, 9]
	Additional Guidance		
	Ignore incorrect trials		

Additional Guidance continues on the next page

Q	Answer	Mark	Comments

17

Many ‘correct’ trials are shown in the table

Trial	Acceptable values
8.1	[662, 663]
8.2	[685, 686]
8.3	[709, 710]
8.4	[733, 734]
8.5	[758, 759]
8.55	[771, 771.2314]
8.56	[773, 774]
8.57	[776, 776.313]
8.58	[778,779]
8.59	[781, 781.42]
8.6	[783, 784]
8.61	[786, 787]
8.62	[789, 789.113]
8.63	[791, 792]
8.64	[794, 794.3]
8.65	[796, 797]
8.7	[809, 810]
8.8	[836, 836.4]
8.9	[863, 863.4]
9	891

Q	Answer	Mark	Comments

18	Any multiple of 60	M1	eg 60 or 120 or 180 Accept in a list of multiples
	(Number of packs of patties =) their multiple ÷ 15 or 8 or (Number of packs of bread rolls =) their multiple ÷ 20 or 6	M1dep	Implied by £65.92 or £19.5(0)
	85.42	A1	SC2 Any multiple of 42.71 apart from 85.42 eg 42.71 or 128.13 or 170.84 or 213.55