

# GCSE

# Application of Mathematics

# (Linked Pair Pilot)

93702H  
Unit 2: Higher Tier  
Mark Scheme

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Version 1.0 Final 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](http://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.

**Q** Marks awarded for quality of written communication. (QWC)

**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.

**ft** Follow through marks. Marks awarded following a mistake in an earlier step.

**SC** Special case. Marks awarded within the scheme 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.

## A2 Higher Tier

Q	Answer	Mark	Comments																		
1(a)	5 miles	B1																			
1(b)	2.5 cm	B1																			
1(c)	4.5 litres	B1																			
2	<p>One correct evaluation for <math>t</math> value [11, 12] eg 1 <math>t = 11 \rightarrow 93.5</math> or 93 or 94 eg 2 <math>t = 12 \rightarrow 108</math></p>	M1	<p>Accept evaluations to the accuracies shown</p> <table border="1"> <tr><td>11.1</td><td>[94, 95]</td></tr> <tr><td>11.2</td><td>[96, 96.32]</td></tr> <tr><td>11.3</td><td>[97, 98]</td></tr> <tr><td>11.4</td><td>[99, 99.2]</td></tr> <tr><td>11.5</td><td>[100.6, 101]</td></tr> <tr><td>11.6</td><td>[102, 102.1]</td></tr> <tr><td>11.7</td><td>[103, 104]</td></tr> <tr><td>11.8</td><td>[105, 105.02]</td></tr> <tr><td>11.9</td><td>[106, 107]</td></tr> </table>	11.1	[94, 95]	11.2	[96, 96.32]	11.3	[97, 98]	11.4	[99, 99.2]	11.5	[100.6, 101]	11.6	[102, 102.1]	11.7	[103, 104]	11.8	[105, 105.02]	11.9	[106, 107]
	11.1	[94, 95]																			
11.2	[96, 96.32]																				
11.3	[97, 98]																				
11.4	[99, 99.2]																				
11.5	[100.6, 101]																				
11.6	[102, 102.1]																				
11.7	[103, 104]																				
11.8	[105, 105.02]																				
11.9	[106, 107]																				
<p>Two correct evaluations for <math>t</math> values [11, 12] which bracket 100 eg 1 <math>t = 11 \rightarrow 93</math> or 93.5 or 94 and <math>t = 12 \rightarrow 108</math>  eg 2 <math>t = 11.4 \rightarrow [99, 99.2]</math> and <math>t = 11.5 \rightarrow [100.6, 101]</math></p>	A1																				
2 Alt	<p><math>t^2 + 6t - 200 (= 0)</math> and <math display="block">\frac{-6 \pm \sqrt{6^2 - 4 \times 1 - 200}}{2 \times 1}</math> or <math>(t + 3)^2 = 209</math></p>	M1	oe A correct quadratic with formula applied with no errors																		
	[11.4, 11.5]	A1	Correct method must be seen																		

Q	Answer	Mark	Comments
3	Bearing of [113,117] drawn	M1	Do not award if a choice of bearings seen
	Arc radius [5.8, 6.2] cm drawn	M1	
	Two positions for island marked within tolerance	A1ft	ft M1 M0 or M0 M1 SC3 Two positions in tolerance with M1 seen and no attempt seen for other M mark SC1 Two positions in tolerance but M0 M0
4(a)	10 × 120 or 1200 or 9 × 95 or 855 or 11 × 120 or 1320 or 8 × 95 or 760	M1	
	10 × 120 and 9 × 95 or 11 × 120 and 8 × 95 or 2080	M1	1200 and 855 or 1320 and 760
	2055	A1	
4(b)	48 × 8 or 384	M1	
	0.15 × their 384 or 57.6(0)	M1	0.85
	their 384 – 0.15 × their 384	M1	0.85 × their 384
	326.40	Q1	Strand (i) Correct money notation 326.4 M3 Q0 SC2 345.60 SC1 345.6

Q	Answer	Mark	Comments
<p><b>4(b)</b> <b>Alt</b></p>	<p><math>0.15 \times 8</math> or <math>1.2(0)</math></p>	<p>M1</p>	<p>0.85</p>
	<p><math>8 - 0.15 \times 8</math> or <math>6.8(0)</math></p>	<p>M1</p>	<p><math>0.85 \times 8</math> or <math>6.8(0)</math></p>
	<p>their <math>6.8(0) \times 48</math></p>	<p>M1</p>	
	<p>326.40</p>	<p>Q1</p>	<p>Strand (i) Correct money notation 326.4 M3 Q0 SC2 345.60 SC1 345.6</p>
<p><b>5</b></p>	<p>Two 3,4,5 right-angled triangles and 7 by 3 rectangle and 7 by 5 rectangle in correct positions</p>	<p>B3</p>	<p>B2 Two 3,4,5 right-angled triangles in correct positions and 7 by 3 rectangle in correct position <b>or</b> Two 3,4,5 right-angled triangles in correct positions and 7 by 5 rectangle in correct position <b>or</b> One 3,4,5 right-angled triangle in correct positions and 7 by 3 rectangle in correct position and 7 by 5 rectangle in correct position</p> <p>B1 One 3,4,5 right-angled triangle in correct position or 7 by 3 rectangle in correct position or 7 by 5 rectangle in correct position</p>

Q	Answer	Mark	Comments
<b>6(a)</b>	Yes and fully correct reason eg 1 Yes $15 + 14 = 29$ eg 2 $5 + 4 + 4 + 4 + 4 + 4 + 4 = 29$ so yes eg 3 $n + n - 1 = 29$ $n = 15$ so yes eg 4 Yes (9) 13 17 21 25 29 eg 5 Yes with correct diagram	B2	B1 Yes and partially correct reason eg 1 Yes because if you keep on adding 4 you get 29 eg 2 Yes because you don't count the middle block twice eg 3 Yes, length 15 or Fully correct reason with no decision or incorrect decision
<b>6(b)</b>	$4n + 1$	B1	oe eg $2n + 1 + 2n$
<b>7(a)</b>	$7 \times 40$ or 280 or $8 \times 4.5$ or 36	M1	oe eg $7 \times (40 + 4.5)$ or 311.5
	$7 \times 40 + 8 \times 4.5 (= 316)$ or $280 + 36 (= 316)$	A1	oe eg $311.5 + 4.5 (= 316)$ Condone 3.16 for 316
<b>7(b)</b>	Attempt at $n$ lots of 40 added to $(n + 1)$ lots of 4.5 or $(227 - 4.5) \div (40 + 4.5) (+ 1)$ or $222.5 \div 44.5 (+ 1)$	M1	$n \geq 3$
	6 (joists)	A1	
	$8 \times 227 (\times 4.5)$ or $1816 (\times 4.5)$ or their $6 \times 316 (\times 4.5)$ or $1896 (\times 4.5)$	M1	8172 or 8532
	1816 and 1896	A1ft	8172 and 8532 ft their 6 for 1896 or 8532 their 6 $\rightarrow$ 5 1896 $\rightarrow$ 1580 8532 $\rightarrow$ 7110 their 6 $\rightarrow$ 4 1896 $\rightarrow$ 1264 8532 $\rightarrow$ 5688
	First way	A1ft	Any clear indication Must have gained 2 <sup>nd</sup> M1 ft their 1816 and their 1896 or their 8172 and their 8532

Q	Answer	Mark	Comments
<b>8(a)</b>	$\pi \times 3.7 \times 3.7 \times 10.9$ or $\pi \times 6.1 \times 6.1 \times 4$	M1	oe
	[468.5, 469] or [467, 468]	A1	[149 $\pi$ , 149.221 $\pi$ ] or [148.8 $\pi$ , 148.84 $\pi$ ]
	[468.5, 469] and [467, 468] and 470	Q1	Strand (ii) Correct formula used, both correct volumes and 470 seen
<b>8(b)</b>	$\pi \times 3.7 \times 3.7$ or [42.9, 43.014] or $\pi \times 6.1 \times 6.1$ or [116.8, 116.914]	M1	[13.6 $\pi$ , 13.7 $\pi$ ] or [37.2 $\pi$ , 37.21 $\pi$ ] May also multiply by 2
	$2 \times \pi \times 3.7 \times 10.9$ or [253, 253.434] or $2 \times \pi \times 6.1 \times 4$ or [153, 153.33]	M1	[80.6 $\pi$ , 80.7 $\pi$ ] or 48.8 $\pi$
	$2 \times \pi \times 3.7 \times 3.7 +$ ( $2 \times$ ) $\pi \times 3.7 \times 10.9$ or [339, 340] or $2 \times \pi \times 6.1 \times 6.1 + (2 \times) \pi \times 6.1 \times 4$ or [386, 387.2]	M1	[108 $\pi$ , 108.1 $\pi$ ] or [123 $\pi$ , 123.22 $\pi$ ]
	[339, 340] and [386, 387.2] and A	A1	[108 $\pi$ , 108.1 $\pi$ ] and [123 $\pi$ , 123.22 $\pi$ ] and A
<b>9(a)</b>	Correct reason eg 1 The ball did not reach the ground eg 2 It was 1 metre above the ground when he caught it	B1	Any unambiguous indication
<b>9(b)</b>	[2.2, 2.4]	B1	
<b>9(c)</b>	[5.5, 5.55]	B1ft	ft their (b)

Q	Answer	Mark	Comments
10	$120 \div (9 + 11)$ or 6	M1	
	11 x their 6	M1 dep	
	66	A1	SC2 Answer 54 (: 66)
11(a)	tan used	M1	
	$\tan(x) = \frac{1.5}{25}$	M1	oe eg $\tan^{-1} \frac{1.5}{25}$ This mark implies first M1
	[3.43, 3.434] or 3	A1	
	3.4	B1ft	ft if answer seen > 1dp
11(a) Alt	$\sin(x) = \frac{1.5}{\sqrt{1.5^2 + 25^2}}$ or $\cos(x) = \frac{25}{\sqrt{1.5^2 + 25^2}}$	M2	
	[3.43, 3.434] or 3	A1	
	3.4	B1ft	ft if answer seen > 1dp
11(b)	$\cos 7 = \frac{36}{y}$ or $\sin 83 = \frac{36}{y}$	M1	
	$\frac{36}{\cos 7}$ or $\frac{36}{\sin 83}$	M1	This mark implies first M1
	[36.27, 36.3]	A1	
11(b) Alt	$36^2 + (36 \tan 7)^2$ or [1315.5386, 1315.54]	M1	
	$\sqrt{36^2 + (36 \tan 7)^2}$	M1	This mark implies first M1
	[36.27, 36.3]	A1	

Q	Answer	Mark	Comments
12(a)	9300	B1	
12(b)	Plots the 4 given points	M1	Within half a square May also plot their (20, 9300)
	Joins these points with a smooth curve	A1	Within half a square May also join to their (20, 9300)
12(c)	Line from 5000 to their graph or Mark on $x$ -axis corresponding to $V = 5000$ on their graph or Mark on curve corresponding to $V = 5000$ on their graph	M1	oe
	12	A1ft	ft their graph ( $\pm \frac{1}{2}$ square) SC1 12 with no working on graph seen
13(a)	$14 - 2x$	B1	oe eg $14 - 2 \times x$
13(b)	$20 - 2x = 2$ their $(14 - 2x)$	B1	oe
	$20 - 2x = 28 - 4x$	M1	oe Expands correctly Must be an equation $ax + b = cx + d$
	$4x - 2x = 28 - 20$	M1	oe eg $2x = 8$ Allow one sign error
	$x = 4$	A1ft	ft B0 M1 M1
	their $12 \times$ their $6 \times$ their $4$	M1 dep	dep on M1 M1 Using their positive $x$ in $L \times W \times H$ ft their $14 - 2x$
	288	A1ft	ft their $x$ and their $14 - 2x$

Q	Answer	Mark	Comments
14(a)	90	B1	
14(b)	$0.5 \times 30 \times 90$	M1	oe eg $45 \times 30$
	1350	A1	
	1.35(0)	B1ft	ft their $1350 \div 1000$
14(c)	Attempt at vertical $\div$ horizontal eg 1 $90 \div 30$ eg 2 $\frac{90 - 75}{30 - 25}$	M1	Allow if clear attempt at gradient
	3	A1	
	$m/s^2$	B1	oe eg 1 metres per second per second eg 2 $ms^{-2}$ SC3 180 metres per second per minute
15(a)	$\frac{360-70}{360}$ or $\frac{290}{360}$ or [0.8, 0.81]	M1	M2 $\pi \times 1.6 \times 1.6 - \frac{70}{360} \times \pi \times 1.6 \times 1.6$
	their $\frac{360-70}{360} \times \pi \times 1.6 \times 1.6$	M1	
	[6.475, 6.5] or $[2.06\pi, 2.1\pi]$	A1	SC1 Answer [1.56, 1.56402] or [0.497 $\pi$ , 0.498 $\pi$ ]
15(b)	$1.6^2 + 1.6^2 - 2 \times 1.6 \times 1.6 \times \cos 110$ or 6.87(...)	M1	$1.6 \times \cos 35$ or $1.6 \times \sin 55$ or 1.31(...) oe eg $\sqrt{1.6^2 - (1.6 \sin 35)^2}$
	$\sqrt{1.6^2 + 1.6^2 - 2 \times 1.6 \times 1.6 \times \cos 110}$ or 2.62(...)	M1	$2 \times 1.6 \times \cos 35$ or 2.62(...)
	their 2.62(...) + 1.6	M1 dep	dep on M2
	4.22(...)	A1	Accept 4.2 with correct working

Q	Answer	Mark	Comments
<b>15(b)</b> <b>Alt</b>	$\frac{AC}{\sin 110} = \frac{1.6}{\sin 35}$	M1	BD = $\frac{1.6}{\sin 55} \times \sin 70$ oe and $\sqrt{1.6^2 - (0.5 \times \text{theirBD})^2}$ or 1.31(...)
	$\frac{1.6}{\sin 35} \times \sin 110$ or 2.62(...)	M1	$2 \times \sqrt{1.6^2 - (0.5 \times \text{theirBD})^2}$ or 2.62(...)
	their 2.62(...)+ 1.6	M1 dep	dep on M2
	4.22(...)	A1	Accept 4.2 with correct working
<b>16(a)</b>	$\sqrt{4} : \sqrt{9}$ or $\sqrt{9} : \sqrt{4}$	M1	oe eg 2 : 3 or $\frac{2}{3}$ or 1.5
	$28 \times \frac{\sqrt{9}}{\sqrt{4}}$	M1 dep	oe eg 1 28 × 1.5 eg 2 28 ÷ $\frac{2}{3}$
	42	A1	
<b>16(b)</b>	$(\sqrt{4})^3 : (\sqrt{9})^3$ or $(\sqrt{9})^3 : (\sqrt{4})^3$	M1	oe eg $(\frac{2}{3})^3$ or 1.5 <sup>3</sup> ft cube of their linear scale factor or cube of their linear ratio in (a)
	8 : 27 or 3.375	A1	oe eg $\frac{27}{8}$ May be implied eg Correct calculation involving 1.5 <sup>3</sup> seen
	3.375 and Yes	Q1ft	oe eg 27 ÷ 8 > 3 and Yes ft their linear scale factor or their linear ratio in (a) Strand (iii) Must have gained M1