



**General Certificate Secondary of Education
January 2013**

Applications of Mathematics (Pilot) 9370

Unit 2 Higher Tier 93702H

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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Glossary for Mark Schemes

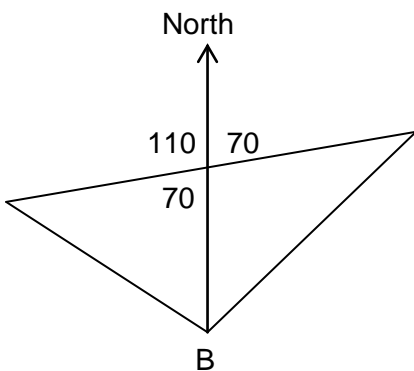
GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

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.

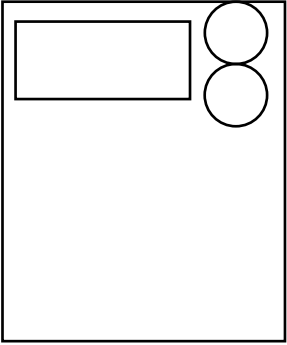
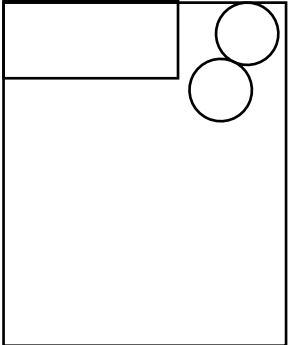
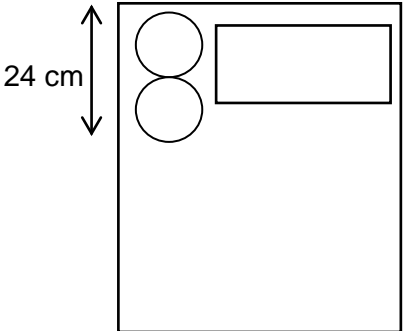
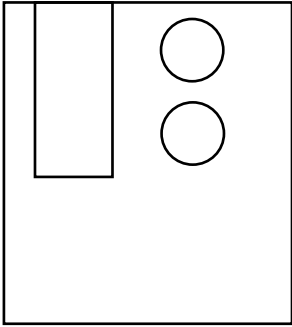
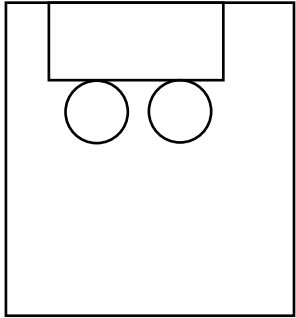
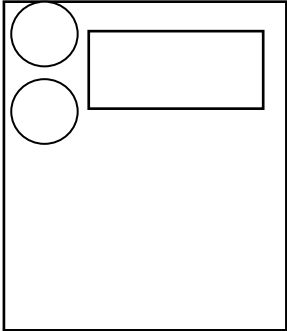
A2 Higher Tier

Q	Answer	Mark	Comments
1	$2a + 3a = 118 + 262$	M1	oe
	$5a = 380$	A1	
	76	A1 ft	ft M1 A0
	Sets up a linear equation and their equation solved correctly	Q1	Strand (ii) SC2 144
1 Alt	$118 + 262 (= 380)$	M1	oe
	their $380 \div 5$	M1	
	76	A1	
		Q0	No linear equation seen
2(a)	$\frac{1}{2} \times (40 + 24) \times 16$	M1	oe
	512	A1	
2(b)	$\pi \times 4 \times 4$	M1	oe
	[50.2, 50.3] or 16π	A1	
2(c)	$\frac{\text{their [50.2,50.3]}}{\text{their 512}}$ (= [0.098, 0.0982422])	M1	
	[9.8, 9.82422]	A1 ft	ft their 512 and their [50.2, 50.3] Allow 10 with correct method seen SC1 [90.18, 90.2]

Q	Answer	Mark	Comments
3	0.8 (kg)	B1	
	$3000 \times \text{their } 0.8 (= 2400)$	M1	
	Their $2400 \div 750 (= 3.2)$	M1Dep	$750 \times 3 (= 2250)$ or $750 \times 4 (= 3000)$
	4	A1	
3 Alt 1	750 000(g)	B1	
	$3000 \times 800 (= 2\,400\,000)$	M1	
	Their $2\,400\,000 \div \text{their } 750\,000 (= 3.2)$	M1Dep	Their $750\,000 \times 3 (= 2\,250\,000)$ or Their $750\,000 \times 4 (= 3\,000\,000)$
	4	A1	
3 Alt 2	0.8 (kg)	B1	750 000(g)
	$750 \div \text{their } 0.8 (= 937.5)$	M1	Their $750\,000 \div 800 (= 937.5)$
	$3000 \div \text{their } 937.5 (= 3.2)$	M1Dep	Their $937.5 \times 3 (= 2812.5)$ or Their $937.5 \times 4 (= 3750)$
	4	A1	

Q	Answer	Mark	Comments
4	$24 \div 6 (= 4)$	M1	20 : 4 or 4 : 20 is M1 M1
	Their $4 \times 5 (= 20)$	M1	
	Their $20 \times 5.6(0) (= 112)$ and Their $4 \times 6.2(0) (= 24.8(0))$	M1Dep	Dep on gaining at least one of the previous M marks
	Their $112 +$ their $24.8(0)$	M1	
	136.80	A1	136.8 is M4 A0 SC2 820.80 SC1 820.8
4 Alt	$5 \times 5.6(0) (= 28)$	M1	
	Their $28 + 6.2(0) (= 34.2(0))$	M1	
	Their $34.2(0) \div 6 (= 5.7(0))$	M1	$24 \div 6 (= 4)$
	Their $5.7(0) \times 24$	M1Dep	Dep on 3 rd M1 Their $4 \times$ their $34.2(0)$
	136.80	A1	136.8 is M4 A0 SC2 820.80 SC1 820.8
5(a)	110 seen	B1	May be on diagram
	70 or 110 clearly identified as one of the angles shown 	B1ft	ft their obtuse 110 Must be clear which angle is worked out (eg seen on diagram)
	070	Q1ft	ft their obtuse 110 Q0 70 Strand (i) SC3 Answer 070 SC2 Answer 70

Q	Answer	Mark	Comments
5(b)	$8 \times \frac{1}{4}$ or $8 \div 4$ or $8 \times 15 (= 120)$	M1	oe eg $8 \times \frac{15}{60}$
	[1.99, 2]	A1	
6(a)	(AB =) [9.8, 10.2] (cm) or (1 cm represents) [24.5, 25.5102041] (metres)	M1	oe eg [3.9,4.1] inches May be seen on diagram
	(AC =) $175 \div 250 \times$ their [9.8, 10.2] (= [6.86, 7.14] (cm))	M1	oe eg $175 \div$ their [24.5, 25.5102041] (= [6.86, 7.14] (cm)) May be seen on diagram
	AC drawn with C on North line through B with AC = [6.86, 7.14]	A1	SC3 AC drawn with C on North line through B within tolerance shown on the overlay
6(b)	Two arcs centre P with equal radii intersecting PQ and PS	M1	oe eg single arc intersecting PQ and PS Allow intersection at Q
	Two intersecting arcs with equal radii and line from P to point of intersection	A1	SC1 M0 but line within tolerance
7	Two correct trials [1.235, 1.245] which bracket 5 and 1.24 as the answer	B4	B3 Two correct trials [1.235, 1.245] which bracket 5 and 1.24 not the answer B3 Two correct trials [1.24, 1.25] which bracket 5 and 1.24 as the answer B2 Two correct trials $1.2 \leq x < 1.3$ B1 One correct trial $1.1 \leq x < 1.3$

Q	Answer	Mark	Comments
8(a)	22	B1	
	$\pi \times 10$ (= [31.4, 31.42])	M1	oe
	[33.4, 33.42]	A1	
8(b)	<p>Any valid arrangement that indicates minimum length</p> <p>eg 1</p>  <p>eg 2</p>  <p>If dimensions written on, condone 2mm gap</p> <p>eg</p> 	B2 ft	<p>ft their dimensions in (a) for B2 or B1</p> <p>B1 Any valid arrangement that indicates requirement to cut from the top of the roll</p> <p>eg 1</p>  <p>eg 2</p>  <p>(with gaps between rectangle and circles this is B0 but if dimensions written on, condone 2mm gap)</p> <p>or</p> <p>Any otherwise B2 response that is not indicating minimum length due to shapes not being tightly arranged (allow gaps to be up to 2mm)</p> <p>eg</p> 

Q	Answer	Mark	Comments
9	sin used or selected	M1	M2 $180 - 90 - \cos^{-1} \frac{2.47}{27.37}$ or $\cos(y) = \frac{\sqrt{27.37^2 - 2.47^2}}{27.37}$ or $\tan(y) = \frac{2.47}{\sqrt{27.37^2 - 2.47^2}}$
	$\sin(y) = \frac{2.47}{27.37}$ or $\sin^{-1} \frac{2.47}{27.37}$	M1	
	[5.175, 5.2]	A1	
10	$80^2 - 64^2 (= 2304)$ or $AB^2 + 64^2 = 80^2$	M1	$\cos(C) = \frac{64}{80}$
	$\sqrt{\text{their } 2304} (= 48)$	M1	$\cos^{-1} \frac{64}{80} (= [36.8, 36.9])$
	$\frac{1}{2} \times 64 \times \text{their } 48 (= 1536)$	M1	$\frac{1}{2} \times 64 \times 80 \times \sin \text{their } [36.8, 36.9] (= 1536)$
	Their $1536 \div 4047 \times 6400$	M1	oe
	[2426, 2433.5]	A1	Allow 2430 with correct working seen
	2400	B1ft	ft value seen > 3sf rounded correctly to 2sf A1 is implied by 2400 if no incorrect working seen

Q	Answer	Mark	Comments	
11(a)	$4 \times 8.5 + 3 \times 0.5$ or $3 \times 8.5 + 2 \times 4 + 4 \times 0.5$	M1		
	35.5	A1		
	Attempts both ways obtaining two equal totals (35.5 if correct)	Q1	Strand (iii) Applies full method in an attempt to show width = 0.5 Must score M1 M1 A0 Q1 possible M1 A1 Q0 possible	
Alt 1 11(a)	$3m + 4 \times 8.5$ or $4m + 3 \times 8.5 + 2 \times 4$	M1		
	$3m + 4 \times 8.5 = 4m + 3 \times 8.5 + 2 \times 4$	A1	oe eg $3m + 34 = 4m + 25.5 + 8$	
	Solves their equation correctly ($m = 0.5$ if correct)	Q1	Strand (iii) Solves an equation in an attempt to show width = 0.5 Must score M1 M1 A0 Q1 possible M1 A1 Q0 possible	
Alt 2 11(a)	(1 width =) $8.5 - 2 \times 4$	$8.5 - 4 (= 4.5)$	M1	(1 width =) $4 \times 8.5 - 3 \times 8.5 - 2 \times 4$
	$8.5 - 8$	$4.5 - 4$	A1	$34 - 25.5 - 8$ or $34 - 33.5$
	Obtains a value for one width (0.5 if correct)		Q1	Strand (iii) Attempts to show width = 0.5 using dimensions 8.5 and 4 Must score M1 M1 A0 Q1 possible M1 A1 Q0 possible
Alt 3 11(a)	$4 \times 8.5 (= 34)$ or $3 \times 8.5 + 2 \times 4 (= 33.5)$	M1		
	33.5 and 34	A1		
	Subtracts their 34 and their 33.5	Q1	Strand (iii) - Attempts to show width = 0.5 using dimensions 8.5 and 4 Must score M1 M1 A0 Q1 possible M1 A1 Q0 possible	

Q	Answer	Mark	Comments	
11(b)	$8.5 + 0.5 + 4 (= 13)$	M1	$8.5 - 4 (= 4.5)$	$8.5 + 0.5 (= 9)$
	Their $13 - 2 \times 4$	M1Dep	Their $4.5 + 0.5$	Their $9 - 4$
	5	A1	SC2 6.5	
11(c)(i)	$4 \times 2.5 + 3 \times 0.5$	M1		
	11.5	A1	SC1 17.5	
11(c)(ii)	$3n - 0.5$	B2	oe eg $n \times 2.5 + (n - 1) \times 0.5$ B1 $3 \times n$ or $n \times 2.5$ or $(n - 1) \times 0.5$ oe SC1 $n3 - 0.5$ or $n2.5 + (n - 1)0.5$	
12(a)	6	B1		
12(b)	At least 8 of the 11 given points plotted correctly ($\pm \frac{1}{2}$ square)	M1		
	Smooth curve passing through (± 1 square) all 11 given points	A1	Ignore the point at $t = 12$ even if incorrect	
12(c)	Smallest t value for $d = 9$ attempted using their graph (= approx 2.5)	M1	eg horizontal line drawn from (0,9) to first point of intersection with their graph or mark on t -axis corresponding to first time when $d = 9$	
	12.00 + their 2.5 written as a time of day	A1ft	oe ft their t value ($\pm \frac{1}{2}$ square) SC1 M0 but final answer follows through from their graph	
12(d)	Largest t value for $d = 9$ attempted using their graph (= approx 9.5)	M1	eg horizontal line drawn from (0,9) to second point of intersection with their graph or mark on t -axis corresponding to second time when $d = 9$	
	Their $9.5 - 4.25 (= 5.25)$	M1Dep	Condone their $9.5 - 4.15$	
	5 h 15 min	A1ft	ft their t value ($\pm \frac{1}{2}$ square) but do not follow through from use of 4.15 SC2 M0 but final answer follows through from their graph	

Q	Answer	Mark	Comments
13(a)	Attempts to calculate an area eg $\frac{1}{2} \times 90 \times 9.4$	M1	Attempts to calculate average speeds over equal time intervals and divides by number of intervals (and multiplies by 120)
	[545, 565]	A2	A1 [530, 580]
	m(etres)	B1	Allow correct conversion to other units if supported by an area eg 0.564 km after 564 calculated for area
13(b)	Tangent drawn at 70 seconds	B1	
	Attempt at $\frac{y_2 - y_1}{x_2 - x_1}$ for their tangent	M1	At least one of numerator or denominator correct
	[0.06, 0.14]	A1	
14(a)	(height of cylinder =) 14	B1	May be seen in method or on diagram
	$\frac{1}{3} \times \pi \times 6^2 \times$ their 14 (= 168π)	M1	oe eg [527.5, 528]
	$\frac{2}{3} \times \pi \times 6^3$ (= 144π)	M1	oe eg [452, 452.16]
	$168\pi + 144\pi$	A1	oe eg $312\pi - 168\pi = 144\pi$
14(b)	1500(g)	B1	
	$(312\pi \times) 2^3$ (= 2496π)	M1	oe eg $\frac{1}{3} \times \pi \times 12^2 \times$ their 28 + $\frac{2}{3} \times \pi \times 12^3$ or [7837.4, 7842.432]
	Their 1500 \div their 2496π	M1Dep	
	[0.19, 0.1914]	A1 ft	ft their 1500 and their 28 Accept 0.2 if correct method seen