Free-Standing Mathematics Qualification

Mathematics

4985 Shape and Space
Mark scheme

4985
June 2016

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 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

Key to mark scheme abbreviations

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
√or ft or F	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
oe	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
–*x* EE	deduct *x* marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

Question	Solution	Mark	Total	Comment
1	12 (cm)	B1	3	[11.9,12.1] May be implied by the sequence of digits 48… or 484…. or 476….
	their 12 cm × 40 000 or 480 000 (cm)	M1		Or their 12 × 0.4
	their 480 000 ÷ 100 000 = 4.8 (km)	A1ft		[4.76,4.84] Answer of 0.4 SC1 Answer of 400 metres scores zero
	Total		**3**	

Question	Solution	Mark	Total	Comment
2	Arcs at L (8 cm), M (6 cm), N (4 cm)		3	± 1 mm
	Any one correct arc	B1		or 8 cm or 6 cm or 4 cm seen
	All 3 correct arcs	B1		All drawn correctly
	Correct area shaded	B1ft		ft from their three arcs centred at L M and N
	Total		**3**	

Question	Solution	Mark	Total	Comment
3	18^2 and 15^2 or 324 and 225 or 549	M1	3	
	$\sqrt{\text{their } 549}$ or 23.4…	M1		Alt $23^2 = 529$
	23.4… **and** No	A1		549 and 529 and No Accurate scale drawing (± 1 mm) and No SC3
	Total		**3**	

Question	Solution	Mark	Total	Comment
4(a)	Equal intersecting arcs from C and D	**M1**	2	
	Line joining intersections of arcs	**A1**		$\pm$ 1 mm
4(b)	Y	**B1**	1	
	Total		**3**	

Question	Solution	Mark	Total	Comment
5(a)	$\frac{1}{2} \times (12 + 10) \times 7$	**M1**	2	oe
	77 (cm^2)	**A1**		
5(b)	their 77 × 22	**M1**	3	
	1694	**A1 ft**		accept 1690
	cm^3	**B1**		
	Total		**5**	

Question	Solution	Mark	Total	Comment
6(a)	(r =) 11		2	
	$\pi \times 11^2 (\times 6)$	**M1**		
	[2279.6, 2282] (cm^3)	**A1**		Or 726 π [9118, 9124] SC1
6(b)	$\frac{4.5}{6} (= 0.75)$	**M1**	3	Or $\frac{6}{4.5} (= 1.333..)$
	their $2280.8 \times \left(\frac{4.5}{6}\right)^3$	**M1**		their $2280.8 \div \left(\frac{6}{4.5}\right)^3$
	=962 (cm^3)	**A1ft**		awrt 962
				6b Alt:
				$\frac{4.5}{6}$ or 0.75 or 8.25 or 16.5 M1
				$V = \pi \times (\text{their } 0.75 \times 11)^2 \times 4.5$ M1
				= 962 (cm^3) A1
	Total		**5**	

Question	Solution	Mark	Total	Comment
7	(1.7L =)1700 (cm^3)	**B1**	4	
	$22.5 \times 22.5 = 506.25$	**M1**		(506.25 not used as part of volume calculation) or $V = 22.5 \times 22.5 \times h$
	Depth = $\frac{\text{their } 1700}{\text{their } 506.25}$ or 3.358..or 3.4 or 34	**M1**		
	= 3.4 cm or 34 mm	**A1**		Must be to nearest mm.
	Alt; method			
	(1.7L =)1700 (cm^3)	**B1**		
	their 1700/(22.5× 22.5 × 4.2) or their 1700/2126.35 or 0.7995 or 2126.25/their 1700 or 1.2507	**M1**		
	0.7995× 4.2 or 4.2/1.2507 or 3.358…or 3.4 or 34.	**M1**		
	= 3.4 cm or 34 mm	**A1**		Must be to nearest mm
	Total		**4**	

Question	Solution	Mark	Total	Comment
8(a)	105 (m)	**B1**	2	Or 105.1…or 105.2
	67.7 (m)	**B1**		Or 67.6… or 68
8(b)	their 105.156 × their 67.6656	**M1**	2	PI or $8510 \times 0.9144 \times 0.9144$
	7120 (3 sig fig)	**A1ft**		Must be 3 sf ft not from 115×74
8(c)	0.02 × their 7120 or 20 × their 7120 or 142.4 or 142400	**M1**	4	All 8c: ft from 8b Digits 1424 seen
	their 142.4 ÷ 22.7 or their 142400 ÷ 22700	**M1**		Digits 1424 ÷ digits 227 seen or digits 627… or 63
	6.2(7…) or 6.3	**A1ft**		ft from (b)
	7 bags	**A1ft**		ft from answer if >1
				Alt method
				1 kg covers 50 m^2 PI B1
				22.7 × their 50 or 1135 M1
				Their 7120 ÷ their 1135 or 6.27 or 6.3 M1
				6.27... or 6.3 and 7 A1(ft if > 1)
	Total		**8**	

Question	Solution	Mark	Total	Comment
9	2 × 110 + 3 × 72 or 436 or 2 × 110 + 2 × 72 or 364	M1	7	Perimeter (plus halfway line)
	π × 9.15 or 28.7 or 2 ×π × 9.15 or 18.3π or 57.5	M1		Centre circle
	π or 3.14 or 2 × π or 2π or 6.28 or 6.3	M1		Corner arcs
	2 × 16.5 or 33 or 4 × 16.5 or 66	M1 M1		Penalty areas Award M1M0 for any 3 or 4 of the 5 and M1M1 for all 5 Each penalty box is 73.3 + 29.3 + 16.94 For both: 146.6 + 58.6 + 33.88
	40.3 or 2 × 40.3 or 80.6			
	40.3 – 22 or 18.3 or 2 × 18.3 or 36.6			
	16.94 or 2 ×16.94 or 33.88 (allow [33.8, 33.9])			
	2 × 5.5 or 11 or 4 × 5.5 or 22			
	Total = 739	A1		Allow [738, 740]
	10 × 100 or 1000	B1		
	Total		**7**	

Question	Solution	Mark	Total	Comment
10	107.5 and 69.5 seen	B1	3	
	2 × their 107.5 + 2 × their 69.5	M1		Their 107.5 must be < 108 and their 69.5 must be < 70
	354 (m)	A1		Correct answer gets all 3 marks
	Total		**3**	

Question	Solution	Mark	Total	Comment
11	Horizontal handle 1.5 cm by 0.2 cm	B1	6	All ± 1 mm
	Diagonal handle 7 cm by 0.2 cm **and** meets box between 1.2 cm and 1.7 cm from top	B1		
	Inclined at 50°	B1		(angle ± 2°)
	Width of box 5 cm	B1		
	Height 2.5 cm, box symmetrical	B1		
	Sides of box height 1 cm	B1		Possible to get any of the last three marks if part of a 3-d drawing.
	Total		**6**	
	TOTAL		**50**	