

# **GCSE MARKING SCHEME**

# **MATHEMATICS - UNITISED**

# **JANUARY 2013**

#### INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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## **UNIT 1 - FOUNDATION TIER**

UNIT 1	1	Mork	Final Mark Scheme
Foundation Tier	•	Mark	Comments
1(a) (i) 72034		B1	
I(a)(11). Five hundred and forty thousand, two hundred		BI	
1(b). (Ten percent =) 6657	$\checkmark$	B1	
$6657 \times (\text{f})3$	$\checkmark$	M1	F.T. 'their 6657'.
$=(\pounds)19971$	$\checkmark$	A1	
(To nearest thousand) (£)20000.	$\checkmark$	A1	F.T. 'their 19971'.
2(a). 38		B1	
2(b). Indicates ' $2^{nd}$ notch to the right of 80'.		B1	Allow unambiguous intent.
<ol> <li>An <u>attempt</u> to find values that may be directly compared.</li> <li>Finding (25%) 30% and 20%</li> </ol>		M1	All %, OR all fractions with common denominator, OR all decimals, OR using a common amount for sales made, OR a valid combination.
OR $25/100$ $30/100$ and $20/100$ or equivalent. OR $0.25$ $0.3$ and $(0.2)$		A1	Accept $2.5/10$ if comparing 'tenths'.
(Best bonus scheme from) Company B		A1	F.T. if only one error made. Accept any unambiguous indication that Company B has been chosen (e.g. '3/10 is best'). SC1 if Company B chosen but with no supporting work.
4. $(75-99)$ $(100-124)$ <b>125 - 149</b> $(150-174)$	$\checkmark$	B1	
Using a tally convention.	$\checkmark$	B1	Need not be accurate.
(6) 8 12 4	<b>√</b>	B2	B2 for all three correct.
<b>Dibbon</b> marking for $5(a)$ and $5(b)$	v		BI for 1 of 2 correct.
S(a). Cost = $24 \times (\pounds)35 + (\pounds)70$		M1	Correctly substituted. M0 if $24 \times (\pounds)105$ attempted.
$=(\pounds)910$		A1	
5(b). Monthly payment = $\frac{(\pounds)530 - (\pounds)50}{24}$		M1	Correct substitution showing subtraction and division.
$=(\pounds)20$		A1	Allow embedded reference to the correct answer.
6.PositionName of DogWeight1Nell(10.6kg)2Smot(9kg 624gm)3Buster(8.72kg)4Rover(8.572kg)		В3	Mark the order of names only. Disregard any weights that are not given in the question. Allow unambiguous use of friends' names or weights instead of dogs' names. B1 for Nell AND Peg in correct positions B1 if 'Smot > Buster'. B1 if 'Buster > Rover'.
5 Peg (7964gm)			SC1 for complete reversal of names.
7(a). 6		B1	
Ribbon marking for 7(b), 7(c) and 7(d).			
7(b). 4 (min) 8 (sec)		B1	SC1 : Chath assumed an annual (a) and (a) and a
7(c). 3 (min) 47 (sec)		<b>B</b> 1	(Award this SC1 in part (c).)
7(d). 21 s(econds)		B2	F.T. the time difference between their (b) and their (c). B1 for 21 OR B1 for -21 s(econds) B0 for -21
8. Showing an understanding of range.		S1	Must be for runs scored.
(Maximum range for Adam = ) 59 (Minimum range for Ben = ) $41$		B1 B1	OK B2 for finding a possible range for Adam that is greater than a possible range for Ben.

UNIT 1		Monk	Final Mark Scheme
Foundation Tier		матк	Comments
9. (Water used in shower = ) $15 \times 60$	$\checkmark$	M1	
10			
= 90 (litres)	$\checkmark$	A1	
			<u>Alternative methods</u>
$(40\% \text{ of } 150 \text{ litres} = )  150 \times 0.4$	$\checkmark$	MI	OR
CO(1)		A 1	$\frac{90}{150} \times 100 \qquad M1 \qquad Using 60\% B1$
= 60  (litres)	$\checkmark$		130 = 60% (of Liam's amount) 41 = 150 × 0.6 ML
50,00% of the water $-50$ (littles)	$\checkmark$	AI	$- 00(70) (0) Lium Sumouni) A1 150 \times 0.0 M1(which is) A0(\%) lass = A1 = - 00(litros) A1$
			$(which is) \neq 0(70) tess \qquad 111 \qquad = 90(titres) 111$
			OR
			60(litres) less B1
			$\underline{60} \times 100$ M1
			150
			= 40(%) A1
'Ves Tina's claim was correct '	1	Δ1	ET their values
res, rina s'elann was correct.	•		1.1. then values.
Look for		QWC	QWC2. Presents relevant material in a coherent and
• spelling	$\checkmark$	2	logical manner, using acceptable mathematical form,
• clarity of text explanations,	$\checkmark$		and with few if any errors in spelling, punctuation and
• the use of hotation (watch for the use of =, litres, %			grammar.
being appropriate)			OWC1 Presents relevant material in a schement and
QWC2: Candidates will be expected to			logical manner, but with some errors in use of
<ul> <li>present work clearly, with words explaining process</li> </ul>			mathematical form spelling punctuation or grammar
or steps			OR
AND • make few if any mistakes in mathematical form			Evident weakness in organisation of material but using
spelling, punctuation and grammar and include units			acceptable mathematical form, and with few if any
in their final answer			errors in spelling, punctuation and grammar.
QWC1: Candidates will be expected to			
• present work clearly, with words explaining process			QWC0. Evident weakness in organisation of material
OR			and errors in use of mathematical form, spelling,
• make few if any mistakes in mathematical form.			punctuation and grammar
spelling, punctuation and grammar and include units			
in their final answer			
10 Repeated attempt to find 1/10 followed by a		M1	M1 awarded for intent
subtraction of two different amounts.			
OR Attempt to find 9/10 of two different amounts.			
(The send the send of the send		-	
(End of $2^{nd}$ year) 360 (complaints)		B1	the second s
(End of 3 <sup></sup> year) 324 (complaints)		AI	Penalise extra work –1 (e.g. 4" year), only if M1B1A1
			already awarded.
11 A correct strategy to find area	$\checkmark$	<u>\$1</u>	Dividing floor area into rectangles
$6 \times 13 + 5 \times 4$ OR $6 \times 8 \pm 10 \times 5$ OP $10 \times 13 = 8 \times 4$	$\checkmark$	M1	Dividing froor area mile rectaligies.
$= 98(m^2)$	$\checkmark$	A1	
(Weekly rent =) $98 \times (\text{f})5$	$\checkmark$	M1	F.T. 'their 98 '.
= (£)490	$\checkmark$	A1	
12. A		B1	
В			
U U		ы	

UNIT 1		Maul	Final Mark Scheme	
Foundation Tier		магк	Comments	
Ribbon marking for 13(a) and 13(b).13(a).Bearing of 058° from Cherbourg.		M1	Use overlay. $\pm 2^{\circ}$ (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings	
Bearing of 135° from Portsmouth.		M1	have been offered.	
Position marked OR two lines intersecting.		A1	F.T. if at least M1 and two intersecting lines.	
13(b).			Use measuring tool.	
$3.9 \times 20$		M1	F.T. their ship's position. Accept $\pm 0.2$ cm.	
78 (km)		A1	Answers in the range 74 to 82 (km) gain M1A1.	
14. Three different valid comments.		B3	B1 for each different valid comment.	
e.g. 'Not representative.' 'Should only be distributed to car owners', 'Does not ask about the age of the car',	✓ ✓		Accept equivalent statements e.g. 'biased' (by location).	
'Does not specify over what period of time',			Do not give more than one mark for the same	
'How are the questionnaires returned?'	$\checkmark$		criticism(s).	
'People might confuse quantity with cost',				
'Engine size'				
15 I ype of fuel (diesel/petrol)				
15. Least value Greatest value			R1 for each correct entry	
265 275			Accept 274.9 recurring but not 274.9	
205 215		B4	The cept 274 y recurring but not 274 y.	
27.5 28.5		21	Accept $28.49$ recurring but not $28.49$ .	
16. 6000	$\checkmark$	B1	For the evaluation of a correct $2\%$ OR Sight of $1.02$	
120			(360 and 6360 imply use of $3 \times 120$ and gain B1)	
6120				
122.4(0)	$\checkmark$	M1	For attempting to find 3 different 2%.	
6242.4(0)			OR $6000 \times 1.02^{\circ}$ .	
$\frac{124.84(8)}{(2257.244(8))}$		. 1		
6367.24(8)	$\checkmark$	Al		
(L) 0307.23 OK 030723(p)	$\checkmark$	AI	F.I. One error. Accept £6367.25p. Do not accept 6367.25p	
			Mark final value of investment	
			(i.e. do not penalise if they continue to give $f367.25$ )	
	I	1	(net do not pendinoe it they continue to give 2507.25)	

### **UNIT 1 - HIGHER TIER**

UNIT 1	1	Mark	Final Mark Scheme
Higher Tier	• магк		Comments
1. $(F =) 100 \times 100 - 100^2$		M1	
= 0		A1	
2(a). Attempt at $\sum f \times x$ (162)		M1	
Division by $\sum f$ (20)		m1	
(Mean =) 8.1 (goals)		A1	C.A.O. Accept 8 (goals) only if 162/20 seen.
Ribbon marking for 2(b)(i) and 2(b)(ii).			
2(b)(i).			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			'Blank spaces' to be taken as 0.
		B2	For all 0 correct entries
1-10 11-20 21-30		D2	B1 for 7 or 8 correct entries
13 6 1			Allow F T from ' <i>Kick</i> ' table to ' <i>Penalty</i> ' table.
2(b)(ii) E.g.		E1	
<i>Kick</i> because it is more detailed'.			Reason must be valid for their choice.
<i>Penalty!</i> because its less cluttered'.			
3. Three different valid comments.		B3	B1 for each different valid comment.
e.g. 'Not representative.'	$\checkmark$		Accept equivalent statements e.g.
Should only be distributed to car owners',			blased (by location).
Does not ask about the age of the car,	$\checkmark$		Denoted a second fragment for the second
Does not specify over what period of time,			Do not give more than one mark for the same
'Deeple might confuse quantity with cost'	$\checkmark$		crucisin(s).
'Engine size'			
'Type of fuel (diesel/netrol)'			
Ribbon marking for 4(a) and 4(b).			Use overlav.
4(a). Bearing of 058° from Cherbourg.		M1	$+ 2^{\circ}$ (use overlay). Allow the M marks for dots, crosses
			or any unambiguous indication that the correct bearings
Bearing of 135° from Portsmouth.		M1	have been offered.
Position marked OR two lines intersecting.		A1	F.T. if at least M1 and two intersecting lines.
4(b).			Use measuring tool.
$(Distance =)  3.9 \times 20 \ (= 78)$		M1	F.T. their ship's position. Accept $\pm 0.2$ cm.
(Speed =) $3.9 \times 20$		M1	
4		4.1	
= 19.5 (km/n)		Al	Dependent on both M marks.
5. (Jack receives) $450 \div 1.2$	<b>√</b>	M1	<u>Alternative method</u> $450 \div 400$ M1
$=(\pounds)375$	V V	Al M1	$= 1.125 \qquad A1$
(Gillian receives) $400 \times 1.08$	v /		$1.08 < 1.125 < 1.2 \qquad E1$
= 432(euros)	v	AI	1.125 < 1.2 Deter for Jack El
			1.123 > 1.08 better for Gillian EI
A clearly stated explanation that each would have	./	E1	Explanation should refer to amounts
received more of their required currency by swapping.	ľ		Allow one arithmetical slip when awarding E mark.

UNIT 1	1	Mark	Final Mark Scheme
Higher Her		D1	Comments
0. (10tal income =) $(t)$ 44000 (Tayabla income =) $(f)$ 37125	v v	BI B1	ET 'their total income? 7475
A correct method of finding 20% or 40% of a relevant	✓	M1	$\Gamma.1.$ then total mediate $-7473.$
value.		1011	
(Tax due =) (£) 850	$\checkmark$	A1	FT 40% of ['their 37125' - 35000]
$(+7000) = (\pounds)7850.$	$\checkmark$	A1	F.T. 'their $850'$ + 'their 7000'.
(Tax paid =) (£)8920	$\checkmark$	A2	F.T. 20% of 'their 44600'.
	$\checkmark$		OR showing £7850 to be 17.6% of £44600.
AND a correct statement for their amount			A1 if no statement or an incorrect statement.
Look for		OWC	
<ul> <li>spennig</li> <li>clarity of text explanations</li> </ul>	$\checkmark$	QwC	QWC2. Presents relevant material in a coherent and logical
<ul> <li>the use of notation (watch for the use of '=', £, %)</li> </ul>	$\checkmark$	2	if any among in analyzing numerical form, and with few
being appropriate)			if any errors in spering, punctuation and grammar.
			OWC1 Presents relevant material in a coherent and logical
OWC2: Condidates will be expected to			manner, but with some errors in use of mathematical form.
• present work clearly with words explaining process			spelling, punctuation or grammar.
or steps			OR
AND			Evident weakness in organisation of material but using
• make few if any mistakes in mathematical form,			acceptable mathematical form, and with few if any errors in
spelling, punctuation and grammar and include units			spelling, punctuation and grammar.
OWC1: Candidates will be expected to			OWC0 Evident mechanics in completion of metanicland
• present work clearly, with words explaining process			QWC0. Evident weakness in organisation of material and
or steps			and grammar
OR			und grunning.
• make few if any mistakes in mathematical form,			
in their final answer			
7. (The following are for using the two times linked to			
Carol as a starting point).			
Looking at time differences.	$\checkmark$	M1	Award M1 if any one of the following is being considered,
			Sat/Thurs OR 5pm/10am OR 40/30.
(Differences) 2days, /hours, 10min	$\checkmark$	A2	Al for one correct difference. Units not required as long as
(Bryn phoned on 'Wed 6 $24am + 2days$ 7 hrs 10 min')	V		each value is unamolguously identifiable.
Friday at 1 · 34 n m	V	12	ET their differences A1 for one correct
<u></u>	v	A2	Must have n m (or a m on a FT) or correct 24-hour time
			for the A?
OR		OR	OR
(The following are for using the two times linked to			
the answering machine as a starting point).		M1	Award M1 if any one of the following is being considered
Looking at time differences.	$\checkmark$	1011	Wed/Thurs OR 6am/10am OR 24/30.
(Differences) 1 dams there are an			A1 for one correct difference. Units not required as long as
(Differences) Idays, 4nours, 6min	$\checkmark$	A2	each value is unambiguously identifiable
(Bryn nhoned on 'Sat 5.40nm - 1 day Ahrs 6min')	V		each value is unamorgaously identifiable.
Friday at 1 · 34 n m	V	12	F.T. their differences. A1 for one correct.
<u>1110uy</u> at <u>1</u> : <u>34</u> p.m.	V	A2	Must have p.m. (or a.m. on a FT) or correct 24-hour time
			for the A2.
8. $87\% \equiv (\pounds)4760000$	$\checkmark$	B1	Accept any indication.
(Last year's profit) $\underline{4760000} \times 100$	$\checkmark$	M1	
87			
$= (\pounds)5471264(.368)$	✓	A1	
= (£)5470000	$\checkmark$	B1	F.T. from above if of equivalent difficulty.

CommentsCommentsSight of (diancer = 19+9.5 (cm)Sight of (length = 14-5.5 (cm) AND (width =) 32-5(cm)VB1Dor (radius =) 24-75 (cm)OR (Perimer =) 2 × (45.5 + 32.5)VM1F.1 their values as long as 'diameter' < 50, (long = 15.4 to 15.5 6 (cm) AND (Perime =) 156(cm)A clear statement that the length of tupe around the treatingular base can be longer than the length around the circular base.M1Or equivalent work.10.12 × 72000 54000 × $\frac{1}{2}$ M1Or equivalent work.11(a). $\frac{80}{20} \times 2 \times 15^2$ 360M1Or equivalent work.11(b). $\frac{360-80 \times \pi \times 15^2}{360}$ M1Or equivalent work.12 $\frac{-8}{1000}$ (rm) OR 20π/3A1Accept 20-9 to 21 inclusive.11(b). $\frac{360-80 \times \pi \times 15^2}{360}$ M1Or equivalent work.12 $\frac{360-80 \times \pi \times 15^2}{360}$ M1M113 $\frac{60}{1000 \times 1-56 \times 3}$ M1Candidates may earn these M marks (or some of them)14 $\frac{360-80 \times \pi \times 15^2}{300}$ M1M115 $\frac{60}{1000 \times 1-56 \times 3}$ M1 $\frac{7}{1000 \times 1-56 \times 3}$ 13.(Volume of come =) ½ × \pi × 12^2 × hVM113.(Volume of come =) ½ × \pi × 12^2 × hVM114 $\frac{32.20000}{1000 \times 1-56 \times 3}$ M1Candidates may earn theolds are earned $E_{2,2}$ 201000(m <sup>1</sup> )14 $\frac{2.20000}{1000 \times 1-56 \times 3}$ M1F.T their "20000'. F.T. their work the condictare must have corners 'AND work may are methods are earned $E_{2,2}$ 20000 (m	UNIT 1	~	Mark	Final Mark Scheme
9. Sight of (diameter =) 49.5 (cm) Sight of (diameter =) 49.5 (cm) AND (widh =) 32.5 (cm) (Circumference =) $\pi \times 49.5$ (cm) AND (widh =) 32.5 (cm) OR (Perimeter =) 2 × (45.5 + 32.5) OR (Perimeter =) 2 × (45.5 + 32.5) (Crean =) 15.5 (cm) AND (widh =) 32.5 (cm) A clear statement that the length of tape around the rectangular base. 10. 12 × 72000 $\times 1\frac{1}{2}$ = 8 (hrs) Rubon marking for 11(a) and 11(b). 11(b). $\frac{300}{20.9} \times 2 \times \pi \times 15^{-3}$ = 6 (hrs) Rubon marking for 11(a) and 11(b). 11(b). $\frac{300}{20.9} \times 2 \times \pi \times 15^{-3}$ $= 549(.77) (cm2) OR 175 \pi$ 12 Use made of 1 mile = 1 (km). Use made of 1 mile = 1 (km). Use made of 1 mile = 1 (km). $12 \times 72000$ $= 5490(.77) (cm2) OR 175 \pi$ 12 12 12 12 12 13 10 $13$ (Volume of come =) $\frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ 13 $(Volume of come =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $14 \times \pi \times 16$ $16 = \frac{3} \times 20000$ (cm <sup>3</sup> ) $16 = \frac{3} \times 20000$ (cm <sup>3</sup> ) V $16 = \frac{3}{2} \times 20000$ (cm <sup>3</sup> ) V $16 = \frac{3}{2} \times 20000$ (cm <sup>3</sup> ) V $17 = \frac{1}{6} \times 160^{2} \times 12^{2} \times h$ $18 = 1 (wo olume son its in the is the part includs as the soluta as \frac{1}{3} \times 10^{2} \times h16 = \frac{1}{6} \times 10^{2} \times 10^{2} \times h17 = \frac{1}{6} \times 10^{2} \times 10^{2} \times h18 = 1 (wo olume son its in chand back as \frac{1}{6} \times 10^$	Higher Tier			Comments
Sugnot (length = ) 4.5 (cm) AND (width =) 32-5(cm)✓B1Ignore other values.(Circumference -) π×49-5 OR (Perimet =) 2×(45.5+32.5) (Cremt =) 155.5(cm) AND (Perim =) 156(cm) A clear statement that the length of tape around the rectingular base can be longer than the length around the circular base.F.T. their values as long as 'diameter' < 50, 'length' > 43 and 'width' > 32. (A ccept 155.4 to 155.6 for circumference. A ccept 155.4 to 155.6 for circumference.10.12 × 72000 54000M1110.12 × 72000 54000M1110.20 × 21 × π × 15 360 = 20 * 9(4) (cm) OR 20π/3M1110.360 - 80 × π × 15 <sup>2</sup> 360 = 549(.77) (cm') OR 175 πM112-2 0 * 9(4) (cm) OR 20π/3M112VM1 for <u>80 × π × 15<sup>2</sup></u> 360 = 549(.77) (cm') OR 175 πM112VM1Gradulates may earn these M marks (or some of them) in the order that they undertake each step. V12VM1Gradulates may earn these M marks (or some of them) in the order that they undertake each step. V13(Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume of come =) ½ × π × 12 <sup>2</sup> × h (Volume o	9. Sight of (diameter = ) $49.5$ (cm)	<b>√</b>	B1	Or (radius =) $24.75$ (cm)
$ \begin{array}{c cl} (Circumference =) \pi \times 49 \cdot 5 \\ OR (Perimeter =) 2 \times (45 \cdot 5 + 32 \cdot 5) \\ OR (Perimeter =) 2 \times (45 \cdot 5 + 32 \cdot 5) \\ OR (Perimeter =) 2 \times (45 \cdot 5 + 32 \cdot 5) \\ OR (Perimeter =) 2 \times (45 \cdot 5 + 32 \cdot 5) \\ A 1 \\ A cere statement that the length of tape around the rectangular base can be longer than the length around the circular base.  10. 12 \times 72000 \\ 54000 \times \frac{1}{2} \\ = 8 \text{ (hrs)} \\ \hline M1 \\ 11(a)  \frac{80}{500} \times 2 \times \pi \times 15 \\ 360 \\ = 20 \cdot 9(4) (cm) OR 20\pi/3 \\ 11(b)  \frac{360 - 80}{360} \times \pi \times 15^2 \\ 360 \\ = 549(\cdot77) (cm^2) OR 175 \pi \\ \hline M1 \\ Use made of '10istance / Time'. \\ Use made of '10iot ers in 1 km'. \\ Use made of '10iot ers in $	Sight of (length = ) $45.5$ (cm) AND (width =) $32.5$ (cm)	$\checkmark$	B1	Ignore other values.
$ \begin{array}{c} (1)  curve are solved by a set of the solution of th$				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	(Circumference =) $\pi \times 49.5$		24	F. I. their values as long as 'diameter' $< 50$ ,
$ \begin{array}{c} (\operatorname{Crent}_{i=1}) 15^{-3}(\operatorname{cm}) \text{ AND (Ferm, =)} 156(\operatorname{cm}) \\ \neq & AI A clear statement that the length of tupe around the rectangular base can be longer than the length around the circular base. \\ \hline A clear statement that the length of tupe around the circular base. \\ \hline A clear statement that the length of tupe around the circular base. \\ \hline A clear statement that the length of tupe around the circular base. \\ \hline A clear statement that the length of tupe around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the length around the circular base. \\ \hline A clear statement that the statement of the the statement of the circular base. \\ \hline A clear statement the the statement of the the statement of the the statement of the circular base. \\ \hline A clear statement that the statement of the the statement of the statement of the statement of the circular base. \\ \hline A clear statement that the statement of the circular base. \\ \hline A clear statement of the statement of the statement of the circular base. \\ \hline A clear statement of the statement of the circular base. \\ \hline A clear statement of the statement of the circular base. \\ \hline A clear statement of the statement of the circular base. \\ \hline A clear statement of t$	OR (Perimeter =) $2 \times (45 \cdot 5 + 32 \cdot 5)$	$\checkmark$	MI	The second shares $45$ and switch $> 32$ .
A clear statement that the length of tape around the creatingular bases can be longer than the length around the circular base. 10. $12 \times 22000$ $\times \frac{1}{2}$ <b>Ribbon marking for 11(a) and 11(b).</b> 11(a) $\frac{30}{50} \times 2 \times 1 \times 15^{-3}$ $\frac{360}{360} = 20 \cdot 9(4) (cm) OR 20\pi/311(b) \frac{360 - 80}{360} \times \pi \times 15^{2}\frac{360}{360} = 549(.77) (cm^{3}) OR 175 \pi12Use made of '10istance / Time'.Use made of '1000 metres in 1 km'.Use made of '1000 metres in 1 km'.Use made of '1000 metres in 1 km'.Use made of '3600 seconds in 1 hour'.\frac{60}{1000 \times 1.6 \times 3}\frac{60}{1000 \times 1.6 \times 3}\frac{13}{200000} = \frac{-45}{3} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) \frac{15}{5} \times \pi \times 12^{2} \times h\frac{13}{2} (Volume of cone =) $	(Crcmf. =) 155.5(cm) AND (Perim. =) 156(cm)	$\checkmark$	AI	Accept 155.4 to 155.6 for circumference.
rectangular base can be longer than the length around the circular base. 10. $12 \times \frac{21000}{54000}$ $\times \frac{1}{2}$ = 8 (hrs) <b>Ribbon marking for 11(a) and 11(b).</b> 11(a). $\underline{S0} \times 2 \times \pi \times 15^{2}$ 360 $= 20 \cdot 9(4) (cm) OR 20\pi/311(b). \frac{300 - 80}{360} \times \pi \times 15^{2}= 549(.77) (cm^{2}) OR 175 \pi12Use made of '1000 metres in 1 km'.Use made of '1000 metres in 1 km'.Use made of '1000 metres in 1 km'. MI\frac{60 \times 35000}{1000 \times 1.6 \times 3}\frac{60 \times 35000}{1000 \times 1.6 \times 3}\frac{-45}{1000} (rm)^{2} \times 12^{2} \times h$ MI $\frac{60 \times 35000}{1000 \times 1.6 \times 3}$ MI 	A clear statement that the length of tape around the	$\checkmark$	AI	Accept equivalent wording as long as it is consistent
10.       12       22000         10.       12       22000         11.       12       10.         11.       12       10.         11.       12       11.         11.       12       11.         11.       11.       11.         11.       11.       11.         11.       11.       11.         11.       11.       11.         11.       11.       11.         11.       11.       11.         11.       11.       11.         11.       11.       11.         12.       11.       11.         13.       11.       11.         14.       12.       11.         15.       12.       11.         16.       12.       12.         12.       12.       11.         13.       13.       14.       Accept 20-9 to 21 inclusive.         14.       14.       14.       14.       Accept 549 to 550 inclusive.         12.       12.       13.       Candidates may earn these M marks (or some of them)         13.       13.       14.       14.       14. <td>rectangular base can be longer than the length around</td> <td></td> <td></td> <td>with 'Perimeter' &gt; 'Circumference'.</td>	rectangular base can be longer than the length around			with 'Perimeter' > 'Circumference'.
$ \begin{array}{c cccc} 10 & 12 \times \underline{2000} & \times \frac{1}{2} & & & \\ & & & & 1 \\ & & & & & & \\ & & & &$	the circular base.		2.64	
$\frac{12}{2}$ $= 8 (hrs)$ $\frac{1}{2}$ $= 8 (hrs)$ $\frac{1}{2}$ $= 8 (hrs)$ $\frac{1}{2}$ $\frac{1}{2}$ $= 20 9(4) (cm) OR 20\pi/3$ $11(a). \frac{80}{360} \times 2 \times \pi \times 15^{2}$ $360$ $= 549(\cdot77) (cm^{2}) OR 175 \pi$ $\frac{1}{3}$ $\frac{12}{2}$ $12$	10. $12 \times \frac{72000}{54000}$		MI	Or equivalent work.
$\frac{1}{2}$ $\frac{1}$	54000		24	
$\frac{2}{8 \text{ (hrs)}}$ <b>A1</b> C.A.O. <b>Ribbon marking for 11(a) and 11(b).</b> 11(a). $\frac{80}{360} \times 2 \times \pi \times 15$ 360 $= 20.9(4) (cm) OR 20\pi/311(b). \frac{360 - 80}{360} \times \pi \times 15^2360= 549(.77) (cm^2) OR 175 \pi12Use made of '10 inter = 1.6km'.Use made of '10 mile = 1.6km'.Use made of '3600 seconds in 1 hour'.\frac{60 \times 3600}{1000 \times 1.6 \times 3}\frac{60 \times 3600}{1000 \times 1.6 \times 3}13. (Volume of cone = \frac{1}{3} \times \pi \times 12^2 \times h(Volume of cone = )\frac{1}{3} \times \pi \times 12^2 \times h20000 = \frac{1}{3} \times \pi \times 12^2 \times h + \pi \times 12^2 \times hh = \frac{3 \times 20000}{144 \times \pi \times 16} or equivalenth = \frac{3 \times 20000}{144 \times \pi \times 16} or equivalenth = \frac{3 \times 20000}{144 \times \pi \times 16} or equivalent= 828(93.)(Total height = ) 49.7() (cm)41A1A1A1A2A1A1A2A1A2A1A2A1A2A1A2A2A1A2A2A1A2A2A1A2A2A2A1A2A1A2A2A1A2A2A1A2A2A2A2A2A2A2A3A2A2A3A2A2A3A2A3A2A2A3A3A2A4A2A1A2A2A2A2A3A2A2A3A3A2A2A4A2A2A3A3A2A2A3A4$	× <u>1</u>		MI	Or equivalent work.
Ribbon marking for 11(0) and 11(0). 11(a). $\underline{300} \times 2 \times \pi \times 15$ AlC.A.O.11(a). $\underline{300} \times 2 \times \pi \times 15$ $\underline{800} \times 2 \times \pi \times 15$ MI11(b). $\underline{360} = 20.9(4)$ (cm) OR $20\pi/3$ AlAccept 20.9 to 21 inclusive.11(b). $\underline{360} = 549(\cdot77)$ (cm <sup>2</sup> ) OR $175 \pi$ AlAccept 549 to 550 inclusive.12Use made of 'Distance / Time'. Use made of '1000 metres in 1 km'. Use made of '3600 seconds in 1 hour'. $\checkmark$ MI13. $(Volume of cone =) \frac{1}{16} \times \pi \times 12^2 \times 5h$ $\checkmark$ MI14. $= 45 \text{ (mph)}$ $\checkmark$ BI $\times$ 13.(Volume of cone =) \frac{1}{16} \times \pi \times 12^2 \times 5h $\checkmark$ BI $\times \pi \times 12^2 \times 12^2 \times 5h$ 20 litres = 20000 (cm <sup>3</sup> ) $\checkmark$ Al20 litres = 20000 (cm <sup>3</sup> ) $\checkmark$ BI $\times \pi \times 12^2 \times 5h$ 20 litres = 20000 (cm <sup>3</sup> ) $\checkmark$ Al20 litres = 20000 (cm <sup>3</sup> ) $\checkmark$ Al	2			
<b>kbbon marking for 11(a) and 11(b).</b> 11(a) . $\underline{30} \times 2 \times \pi \times 15$ $360$ $= 20 \cdot 9(4,) (cm) OR 20\pi/3MI11(b). \underline{360} \times \pi \times 15^2 360A1Accept 20.9 to 21 inclusive.11(b). \underline{360} \times \pi \times 15^2 360M1A1Accept 20.9 to 21 inclusive.12Use made of 'Distance / Time'. Use made of '100 metres in 1 km'. Use made of '100 metres in 1 km'. Use made of '3600 seconds in 1 hour'.VM1\underbrace{000} \times 1.6 \times 3\underbrace{000} \times 1.6 \times 3VM1\underbrace{000} \times 1.6 \times 3\underbrace{000} \times 1.6 \times 3VM1\underbrace{13.} (Volume of cone =) \frac{1}{5} \times \pi \times 12^2 \times h 12 (Volume of cone =) \frac{1}{5} \times \pi \times 12^2 \times h 13. (Volume of cone =) \frac{1}{5} \times \pi \times 12^2 \times h 13. (Volume of cone =) \frac{1}{5} \times \pi \times 12^2 \times h 13. (Volume of cone =) \frac{1}{5} \times \pi \times 12^2 \times h 13. (Volume of cone =) \frac{1}{5} \times \pi \times 12^2 \times h 20 litres = 20000 (cm^3) 41A1Accept any notation or word(s) for 'height'. B1 B1 given only when its height is noted as 5 \times height of cone.h = \frac{3 \times 20000}{144 \times \pi \times 16} or equivalent 144 \times \pi \times 16 = 8\cdot 28(93.) (Total height =) 49.7() (cm)VA1Accept correct to 1dp. 41$	= 8  (hrs)		Al	C.A.O.
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Ribbon marking for 11(a) and 11(b).			
$\frac{360}{1000} = 20.9(4) (cm) OR 20\pi/3$ 11(b). $\frac{360-80}{360} \times \pi \times 15^{2}$ $= 549(\cdot77) (cm^{2}) OR 175 \pi$ 12 Use made of 'Distance / Time'. Use made of '1000 metres in 1 km'. Use made of '1000 metres in 1 km'. Use made of '1000 metres in 1 km'. Use made of '3600 seconds in 1 hour'. $\begin{bmatrix} 60 \times 3600\\1000 \times 1.6 \times 3 \end{bmatrix}$ Candidates may earn these M marks (or some of them) in the order that they undertake each step. (Watch out for embedded "nultiple method' steps.) (Watch out for methods are earned E.g. 2000(mt^{-1}) 120×3000 = 7200(mt^{-1}) 120×3000 = 7200(mt^{-1}) 120×3000 = 7200(mt^{-1}) 120×3000 = 720(mt^{-1}) 120×3000 = 72(mt^{-1})	11(a). $\underline{80} \times 2 \times \pi \times 15$		M1	
$= 20^{\circ}9(4) (cm) OR 20\pi/3$ A1 Accept 20.9 (2 10 m clusive. 11(b). $\frac{360 - 80}{360} \times \pi \times 15^{2}$ $= 549(\cdot77) (cm^{2}) OR 175 \pi$ A1 Accept 20.9 (5 21 inclusive. M1 for <u>80</u> × \pi × 15 <sup>2</sup> and A1 for 157(·07) <u>360</u> ACcept 549 to 550 inclusive. 5 Candidates may earn these M marks (or some of them) in the order that they undertake each step. (Watch out for embedded 'multiple method' steps.) (Watch out for embedded 'multiple method' steps.) (Watch out for embedded 'multiple method' steps.) (Use made of '3600 seconds in 1 hour'. (Watch out for embedded 'multiple method' steps.) (Watch out for ambedded 'multiple method' steps.) (Use made of '1600 = 2000(mh <sup>-1</sup> ). 72000/1000 = 72(kmh <sup>-1</sup> ) 72000/1000 = 72(kmh <sup>-1</sup> ). 72000/1000 = 72(kmh <sup>-1</sup> ). 72000(ml -1). 72000(ml -1). 72	360			
11(b). $\frac{360-80}{360} \times \pi \times 15^2$ $= 549(\cdot77) (cm²) OR 175 \pi$ M2M1 for $\frac{80}{360} \times \pi \times 15^2$ and A1 for $157(\cdot07)$ $\frac{360}{360}$ 12Candidates may earn hese M marks (or some of them) in the order that they undertake each step. (Watch out for embedded 'multiple method' steps.) (Watch out for embedded 'multiple for 'multiple of the collider 'multiple for 'multiple of the collider 'multiple of the collider 'multiple of the collider 'multiple expressed as a multiple of the cylinder 'multiple of the	$= 20.9(4)$ (cm) OR $20\pi/3$		Al	Accept 20.9 to 21 inclusive.
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	11(1) 250 00 152			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	11(b). $360 - 80 \times \pi \times 15^{2}$		M2	M1 for $\frac{80}{250} \times \pi \times 15^2$ and A1 for $157(.07)$
$= 549(-7/) (cm^{-1}) OR 175 \pi$ $= 549(-7/) (cm^{-1}) OR 175 \pi$ $= 349(-7/) (cm^{-1}) OR 175 \pi$ $= 45 (mph)$ $= 41 (mh)$	360 Stor 77 OD 175			
125Candidates may earn these M marks (or some of them) in the order that they undertake each step.12Use made of '1000 metres in 1 km'. Use made of '3600 seconds in 1 hour'. $\checkmark$ M1 $\checkmark$ $(M1 \text{ order that they undertake each step.)}$ (( $(Baror units at this stage.)$ E.g. (i) $60/3 = 20(000^{-1})$ $20 \times 3600 = 72000(nh^{-1})$ $7200/1000 = 72(kmh^{-1})$ $7200/1000 = 72(kmh^{-1})$ $72000/1000 = 0.0125)$ $M1 miplied by 20)3600/800 (4th M1)(To gain all four M marks then candidates must makecorrect use of each one.)Note when part methods are earnedE.g. 20/1600 (= 0.0125)M1, M1, M0A0 if any pre-approximations used.13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^2 \times h20 \text{ litres} = 20000 (cm^3)\checkmark4120 litres = 20000 (cm^3)144 \times \pi \times 12^2 \times h + \pi \times 12^2 \times 5h= 8\cdot 28(93)\checkmark41h =\frac{3 \times 20000}{144 \times \pi \times 16}= 8\cdot 28(93)\checkmark41h =\frac{3 \times 20000}{144 \times \pi \times 16}= 8\cdot 28(93)\checkmark41h =(Total height =) 49.7() (cm)\checkmark41$	$= 549(\cdot 7/)$ (cm <sup>2</sup> ) OR 1/5 $\pi$		AI	Accept 549 to 550 inclusive.
12Candidates may carn these M marks (or some of them) in the order that they undertake each step. ( <i>Watch out for embedded 'multiple method' steps.</i> ) ( <i>Watch out for embedded 'multiple method' steps.</i> ) ( <i>Rance and the stage.</i> ) E.g. (i) 60/3 = 20(ms <sup>-1</sup> ) 20 × 3600 = 72000(mh <sup>-1</sup> ) 72000/1000 = 72(kmh <sup>-1</sup> ) 7200000 = 72(kmh <sup>-1</sup> ) 720000 = 72(kmh <sup></sup>	12		5	
Use made of '1000 metres in 1 km'. Use made of '1000 metres in 1 km'. Use made of '3600 seconds in 1 hour'. $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\ 1000 \\ 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \\ \times 3600 \\ 1000 \\$			N/1	Candidates may earn these M marks (or some of them)
Use made of '1000 metres in 1 km'. Use made of '3600 seconds in 1 hour'. $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000\\ 1000\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000\\ 1000\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000\\ 1000\\ 1000\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} 60 \times 3600\\ 1000\\ $	Use made of 'Distance / Time'.	✓	MI	in the order that they undertake each step.
Use made of '1 mile \$\$ 1-6km'. Use made of '3600 seconds in 1 hour'. $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \underline{60 \times 3600} \\ 1000 \times 1.6 \times$	Use made of 1000 metres in 1 km <sup>2</sup> .	✓	MI	(Watch out for embedded 'multiple method' steps.)
Use made of '3600 seconds in 1 hour'. $\begin{bmatrix} 60 \times 3600 \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $= 45 \text{ (mph)}$ $= 410 \text{ (mph)}$ $= $	Use made of 1 mile $\approx 1.6 \text{ km}^2$ .	✓	MI	(Ignore units at this stage.)
$\begin{bmatrix} \underline{60 \times 3600}\\ \underline{1000 \times 1.6 \times 3} \end{bmatrix}$ $= 45 \text{ (mph)}$ $= 410 \text{ (mph)}$	Use made of '3600 seconds in I hour'.	$\checkmark$	MI	E.g. (1)
$\begin{bmatrix} 60 \times 3600\\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $= 45 \text{ (mph)}$ $= 41 \text$				$60/3 = 20(ms^{-1})$
$\begin{bmatrix} \frac{60}{1000 \times 1.6 \times 3} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $\begin{bmatrix} \frac{60}{1000 \times 1.6 \times 3} \\ 1000 \times 1.6 \times 3 \end{bmatrix}$ $= 45 \text{ (mph)}$ $= 45 \text{ (mph)}$ $= 45 \text{ (mph)}$ $= 45 \text{ (mph)}$ $\begin{bmatrix} -41 \\ -8 \\ -8 \\ 20 \\ 13. \\ (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h \\ (Volume of cylinder =) \pi \times 12^{2} \times 5h \\ 20 \\ 13. \\ (Volume of cylinder =) \pi \times 12^{2} \times 5h \\ 20 \\ 14 \\ \times \pi \times 16 \\ = 8.28(93.) \\ (Total height =) 49.7() \text{ (cm)}$ $\begin{bmatrix} \frac{600 \times 3600}{2^{n}} \\ -8 \\ -8 \\ 28(93.) \\ -8 \\ -8 \\ -8 \\ -8 \\ -8 \\ -8 \\ -8 \\ -$				$20 \times 3600 = 72000(\text{mh}^{-1})$
$\begin{bmatrix} 1000 \times 1.6 \times 3 \end{bmatrix}$ $= 45 \text{ (mph)}$ $= 41 \text{ (mph)}$ $= 43 \text{ (mph)}$ $= 43 \text{ (mph)}$ $= 43 \text{ (mph)}$ $= 43 \text{ (mph)}$ $= 41 \text{ (mph)}$	$\frac{60 \times 3600}{10000}$			$72000/1000 = 72(\text{kmh}^{-1})$
$= 45 \text{ (mph)}$ $= 41 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 5 \text{ (mph)}$ $= 45 \text{ (mph)}$ $= 41 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 7 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $= 8 \text{ (Nolume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times 12^{2} \times$	$1000 \times 1.6 \times 3$			72/1.6
$\frac{1600/20 = 80 (1^{8} \text{ M1 implied by 20})}{3600/80 \qquad (4^{16} \text{ M1})}$ $\frac{1600/20 = 80 (1^{8} \text{ M1 implied by 20})}{3600/80 \qquad (4^{16} \text{ M1})}$ $\frac{3600/80 \qquad (4^{16} \text{ M1})}{(10 \text{ gain all four M marks then candidates must make correct use of each one.})}$ $\frac{41}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $\frac{113. (Volume of cone =) \frac{1}{\sqrt{3} \times \pi \times 12^2 \times 5h}}}{\sqrt{41}} = 45 \text{ (mph)}$ $11$				E.g. (ii) $1 \text{ mile} = 1600 \text{ m} (2^{\text{nd}} \text{ M1 and } 3^{\text{rd}} \text{ M1})$
$\frac{3600/80}{(14^{40} \text{ M1})}$ (To gain all four M marks then candidates must make correct use of each one.) $\frac{45 \text{ (mph)}}{\sqrt{41}}$ (Volume of cone =) $\frac{1}{3} \times \pi \times 12^2 \times h$ (Volume of cylinder =) $\pi \times 12^2 \times 5h$ 20 litres = 20000 (cm <sup>3</sup> ) $\frac{12}{20000} = \frac{1}{3} \times \pi \times 12^2 \times h + \pi \times 12^2 \times 5h$ $h = \frac{3 \times 20000}{144 \times \pi \times 16}$ $= 8\cdot 28(93)$ (Total height =) 49.7() (cm) $\frac{3600/80}{4^{40} \text{ M1}}$ (To gain all four M marks then candidates must make correct to 1dp. $\frac{3600/80}{(160 \text{ marks} + \text{marks} + m$				$1600/20 = 80 \ (1^{st} M1 \text{ implied by } 20)$
$\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $\frac{13. (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $13. (Volume of$				3600/80 (4 <sup>th</sup> M1)
$\frac{(correct use}{2} of each one.)$ $Note when part methods are earned E.g. 20/1600 (= 0.0125)$ $MI, MI, MI, MO$ $A0 \text{ if any pre-approximations used.}$ $13.  (Volume of cone =) \frac{1}{3} \times \pi \times 12^{2} \times h$ $(Volume of cylinder =) \pi \times 12^{2} \times 5h$ $20 \text{ litres} = 20000 \text{ (cm}^{3})$ $20000 = \frac{1}{3} \times \pi \times 12^{2} \times h + \pi \times 12^{2} \times 5h$ $(Volume of cylinder =) \pi \times $				(To gain <u>all four</u> M marks then candidates must make
Note when part methods are earned E.g. 20/1600 (= 0.0125) M1, M1, M1, M013. (Volume of cone =) $\frac{1}{3} \times \pi \times 12^2 \times h$ (Volume of cylinder =) $\pi \times 12^2 \times 5h$ $\checkmark$ B1 $\checkmark$ Accept any notation or word(s) for 'height'. B1 given only when its height is noted as $5 \times$ height of cone.20 litres = 20000 (cm <sup>3</sup> ) $\checkmark$ B1 $\checkmark$ F.T their '20000'. F.T. their two volumes only if of equivalent form (i.e. contains ' $\pi'$ AND the height of the cylinder expressed as a multiple of the height of the cone.)h = $\frac{3 \times 20000}{144 \times \pi \times 16}$ $= 8\cdot 28(93)$ $\checkmark$ A1 $\checkmark$ A1 $\checkmark$ (Total height =) 49.7() (cm) $\checkmark$ A1 $\checkmark$ F.T. 6 $\times$ 'their 8·28(93)'.				<u>correct use</u> of each one.)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				Note when part methods are earned
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				$E.g.\ 20/1600\ (=0.0125)$
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			Δ 1	<i>M1, M1, M1, M0</i>
-45 (upp)13. (Volume of cone =) $\frac{1}{3} \times \pi \times 12^2 \times h$ $\checkmark$ B1Accept any notation or word(s) for 'height'.(Volume of cylinder =) $\pi \times 12^2 \times 5h$ $\checkmark$ B1B1 given only when its height is noted as $5 \times$ height of cone.20 litres = 20000 (cm <sup>3</sup> ) $\checkmark$ B1F.T their '20000'.20000 = $\frac{1}{3} \times \pi \times 12^2 \times h + \pi \times 12^2 \times 5h$ $\checkmark$ M1h = $\frac{3 \times 20000}{144 \times \pi \times 16}$ or equivalent $\checkmark$ A1 $\checkmark$ A1(Total height =) 49.7() (cm) $\checkmark$ A1F.T. 6 $\times$ 'their 8.28(93)'. $\checkmark$	-15 (mph)	✓	AI	A0 if any pre-approximations used.
$\begin{array}{c c} 1 & (\text{Volume of cold} -) / 3 \times \pi \times 12^{2} \times 11 \\ (\text{Volume of cylinder} =) & \pi \times 12^{2} \times 5h \\ 20 \text{ litres} = 20000 \text{ (cm}^{3}) \\ 20000 = \frac{1}{3} \times \pi \times 12^{2} \times h + \pi \times 12^{2} \times 5h \\ h = & \frac{3 \times 20000}{144 \times \pi \times 16} \\ & = 8 \cdot 28(93) \\ (\text{Total height} =) 49 \cdot 7() \text{ (cm)} \\ \end{array}$	$\frac{-43 \text{ (IIIII)}}{13} \qquad (\text{Volume of cone} =) \frac{1}{4} \times \frac{\pi}{4} \times \frac{12^2}{4} \times \frac{12}{4}$	1	R1	Accept any notation or word(s) for 'beight'
$20 \text{ litres} = 20000 \text{ (cm}^{3})$ $20000 = \frac{1}{3} \times \pi \times 12^{2} \times h + \pi \times 12^{2} \times 5h$ $h = \frac{3 \times 20000}{144 \times \pi \times 16} \text{ or equivalent}$ $(\text{Total height} =) 49.7() \text{ (cm)}$ $h = \frac{3 \times 20000}{144 \times \pi \times 16} \text{ or equivalent}$ $\int \text{A1} \text{A1} \text{Accept correct to 1dp.}$ $\int \text{A1} \text{A1} \text{Accept correct to 1dp.}$	(Volume of cylinder =) $\pi \times 12^2 \times 5h$	<b>`</b>	B1	B1 given only when its height is noted as
$20 \text{ litres} = 20000 \text{ (cm}^{3})$ $20000 = \frac{1}{3} \times \pi \times 12^{2} \times h + \pi \times 12^{2} \times 5h$ $h = \frac{3 \times 20000}{144 \times \pi \times 16} \text{ or equivalent}$ $= 8 \cdot 28(93)$ $(\text{Total height} =) 49.7() \text{ (cm)}$ $A1$ $F.T. their two volumes only if of equivalent form (i.e. contains '\pi' AND the height of the cylinder expressed as a multiple of the height of the cone.)$ $A1$ $F.T. 6 \times '\text{their } 8 \cdot 28(93)'.$	(volume of cylinder –) $\pi \times 12 \times 50$	·	DI	5 beight of cone
$h = \frac{3 \times 20000}{144 \times \pi \times 16}$ $(Total height =) 49.7() (cm)$ $V = BT$	$20 \text{ litres} = 20000 \text{ (cm}^3)$	1	R1	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	20 miles – 20000 (cm )	ľ		
$h = \frac{3 \times 20000}{144 \times \pi \times 16} \qquad \qquad$	$20000 = \frac{1}{2} \times \pi \times 12^2 \times h + \pi \times 12^2 \times 5h$	/	M1	E T their '20000'
$h = \frac{3 \times 20000}{144 \times \pi \times 16}  \forall  A1$ $(Total height =) 49.7() (cm)$	$20000  73 \land n \land 12 \land 11  n \land 12 \land 311$	Ý	1111	ET their two volumes only if of equivalent form
$h = \frac{3 \times 20000}{144 \times \pi \times 16}  \text{or equivalent}$ $= 8 \cdot 28(93)$ $(\text{Total height =) } 49.7() \text{ (cm)}$ $(Total height =) 49.7() \text{ (cm)}$				(i.e. contains ' $\pi$ ' AND the height of the cylinder
$h = \frac{3 \times 20000}{144 \times \pi \times 16}  \checkmark  A1$ $(Total height =) 49.7() (cm)  \checkmark  A1$ $(Total height =) 49.7() (cm)$				expressed as a multiple of the height of the cone.)
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$h = 3 \times 20000$ or equivalent		A1	
$= 8 \cdot 28(93)$ (Total height =) 49.7() (cm) $\checkmark \qquad A1 \qquad Accept correct to 1dp.$ $\checkmark \qquad A1 \qquad F.T. 6 \times `their 8 \cdot 28(93)'.$	$144 \times \pi \times 16$	$\checkmark$		
(Total height =) 49.7() (cm) $\checkmark$ A1 F.T. 6 × 'their 8.28(93)'.	= 8.28(93)		A1	Accept correct to 1dp.
(Total height =) $49.7()$ (cm) $\checkmark$ A1 F.T. 6 × 'their $8.28(93)$ '.	- 0 20(75)	$\checkmark$		
	(Total height =) $49.7(\dots)$ (cm)	$\checkmark$	A1	F.T. $6 \times$ 'their 8.28(93)'.

# **UNIT 2 - FOUNDATION TIER**

UNIT 2 (Non calculator) Eoundation Tier	Marks	Final Mark Scheme Comments
1. (a) (i) 19526	B1	
1. (a) (ii) Thirty thousand and fifty four	B1	Ignore extra words such as 'pounds. Ignore slight misspellings.
1. (b) (i) 32, 38	B1	
1. (b) (ii) 57	B1	
1. (b) (iii) 35	B1	
1. (c) (i) 36800	B1	
1. (c) (ii) 36830	B1	
1. (d) (i) 42, 48	B1, B1	-1 for each extra incorrect number.
1. (d) (ii) 49	B1	B1 for $7 \times 7$ OR $7^2$ , but B0 for $7 \times 7$ =wrong number. B0 for 7.
2. mm OR cm OR m	B1 D1	
g km	BI B1	
l(itres)	B1	
3. (a) 9	B1	
3. (b) 0 A	B1	A should be at the half way mark.
	B1	B should be between 1/4 and 1/2 exclusive
0	B1	(Between the c and h of 'Rachel') C should be at 0.
4. (a) (i) Subtract 9 from the previous term	B1	Accept – 9
(ii) Multiply the previous term by 4	B1	Accept × 4
4. (b) (0).15	B1	
4. (c) $40/100 \times 70$	M1	Any correct method for finding 40%
= 28	A1	M1, A0 for incorrect units, e.g. 28% or £28
4. (d) For the '8' sequence $(+3)$	B1	8, 16, 24, (32), OR 11, 19, 27, (35),
For the '12' sequence $(+3)$	B1	12, 24, OR 15, 27,
21	БI	Award D5 for all allswer of 27. SC1 for 24.

UNIT 2 (Non calculator) Foundation Tier	)	Marks	Final Mark Scheme Comments
Indirect marking - Tick marked         5. Cost of entrance fee for children = (£)8;         = (£) 36         Total cost of adult tickets = (£) 523 - 3         = (£)48         Number of adults = 48/12         = 4         Look for         • spelling         • clarity of text explanations,         • the use of notation (watch for the top         QWC2: Candidates will be expected to         • present work clearly, with words expected to         • make few if any mistakes in mathematical for process or steps         AND         • make few if any mistakes in mathematical for punctuation and grammar answer         QWC1: Candidates will be expected to         • present work clearly, with words experiment of the process or steps         OR         make few if any mistakes in mathematical for punctuation and grammar in their final answer	<5×9 OR 8×45 50 360 – 115 units (£, p) explaining ematical form, r in their final explaining form, spelling, wer.	✓ M1 A1 M1 A1 M1 A1 QWC 2	<ul> <li>F.T. 'their 360'</li> <li>F.T. 'their 48'</li> <li>QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.</li> <li>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar.</li> <li>OR</li> <li>Evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.</li> <li>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation and grammar.</li> </ul>
Indirect marking - Tick marked6. Either $\frac{1}{4}$ of $\pounds 600 = (\pounds)150$ $\frac{1}{5}$ of $\pounds 600 = (\pounds)120$ Remainder = (\pounds) 330Fraction = $330/600$ = $11/20$ . If 'their $330/600$ cannot bereduced then A0	OR $\frac{1}{4} + \frac{1}{5}$ = 9/20 Remainder = 1 - 9/20 =11/20	✓ B1 B1 M1 A1	Any incorrect method for adding fractions, e.g. 2/9 gets M0 C.A.O. F.T. their first part. .55 OR 55% get M1, A0
7.		B2	B1 for each quadrant
8. (a) 4x – 2y		B2	B1 for either in an expression of the form $af(x) \pm bg(y)$ Allow B1 for 4–2y OR 4x–2 etc 4x and –2y separated gets B1 4x+–2y gets B1
8. (b) (i) (y=) 72		B1	Accept embedded answers such as $72/6 = 12$
8. (b) (ii) $7x = 28$ x = 4		B1 B1	Isolate the x term F.T. ax = b ( $a \neq 1$ ) B0 for 28/7 Accept embedded answers such as $7 \times 4 - 8 = 20$
8. (c) $5(n+4)$ OR $(n+4)5$ OR $5n+20$		B2	B1 for $5 \times n+4$ OR $n+4 \times 5$ . B0 for $5n + 4$

UNIT 2 (Non calculator) Foundation Tier	Marks	Final Mark Scheme Comments
Indirect marking - Tick marked	,	
9.(Monthly saving =) 0.15×1260 (£)189	✓ M1 A1	An answer of 18.9(0) implies M0
(Needs to save £1340 - £584 = £)756 (more) (Number of months =) 756/189 or equivalent	m1	FT 'their 189' provided M1 awarded or if place value error in digits 1890 And FT 'their 756' Or repeat addition, with 189, 378, 567 shown , or any 3 correct terms in an appropriate summation series with no more than 1 incorrect, or 2×378 seen
4 (months)	A1	As a final answer. If units are given they must be correct Depends on M1 and m1 and must FT for their values including rounding up if necessary
		Alternative:Memo $0.15 \times 1260$ M1584 $= (\pounds)189$ A1773 $584 + 189 + 189$ m1 (no extra)962 $+ 189 + 189 = 1340$ A11151OR reverse calculation working back from 13401340 $4$ (months)A1Unsupported 4 gets 00
10. (a) Realising only 1 way to score 14, i.e. 8+6 OR '8 and	B1	Do not accept $\frac{1}{6} + \frac{1}{8}$ as evidence
6' Number of possible outcomes $6 \times 8$ (=48)	B1	Accept sight of $6 + 8 = 14$ Accept sight of/48 or/8 ×/6
1/48	B1	Sight of $\frac{1}{8} \times \frac{1}{6}$ is awarded B1, B1 with no other ways CAO
(b) 1	B1	An answer of 1:48 gets B2 Accept fractions equivalent to 1 and 100% B0 for 'certain' B0 for incorrect notation such as 14 out of 14, 14:14 etc
Indirect marking - Tick marked		Watch out for work on the DIAGRAM, but work given on the
· · · · · · · · · · · · · · · · · · ·	✓	dotted lines takes precedence in any conflict.
11. $ADC = 90(^{\circ})$	B1	Any angle in the square
$FDE = 60(^{\circ})$	B1 B1	Any angle in the equilateral triangle $C \land O$
FDA = 30(°) $AED = 30(°)$	B1	F T their $\hat{FDA}$
$D\hat{F}E = 60(^{\circ})$		
Therefore $A\hat{F}E = 90(^{\circ})$ OR 270(°)	B1	F.T. $60 + \text{their } D\hat{F}A$
		Unsupported answer of 90° gets 0.
<u>All parts (a) – (c) marked at the same time</u>		
12. (a) 11	B1	
<u>Use overlay</u>		
12. (b) Plots All correct plots joined with a curve	P1 C1	Allow one error. FT 'their (a)' or 11 FT 'their (a)' or 11. If (a) blank then FT points given, otherwise must included plot at $x=-3$
12. (c) From their graph (approximately -2.2 and 1.6)	B1	FT their graph. x-values, coordinates are not required

### **UNIT 2 - HIGHER TIER**

UNIT 2 Higher Tier	Mark	Final Mark Scheme Comments
1.(Monthly saving =) $0.15 \times 1260$	M1	An unsupported answer of 18.9(0) implies M0
(£)189	A1	
(Needs to save £1340 - £584 = £)756 (more) (Number of months =) 756/189 or equivalent	B1 m1	FT 'their 189' provided M1 awarded OR if place value error in digits 1890 and FT 'their 756' Or repeat addition, with 189, 378, 567 shown , or any 3 correct terms in an appropriate summation series with no more than 1 incorrect, or 2×378 seen
4 (months)	A1	As a final answer. If units are given they must be correct Depends on M1 and m1 and must FT for their values including rounding up if necessary Award no marks for an unsupported answer of 4(months)
		Alternative: $0.15 \times 1260$ M1 = (£)189 A1 584 + 189 + 189 m1 (no extra) + 189 + 189 = 1340 A1 <i>OR reverse calculation working back from 1340</i> 4 (months) A1
Look for		(For information: 584, 773, 962, 1151, 1340)
<ul> <li>spelling</li> <li>clarity of text explanations,</li> <li>the use of notation (watch for the units 'months' and £)</li> <li>Needs to have sufficient stages of working processed for QWC2</li> </ul>	QWC 2	QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
<ul> <li>QWC2: Candidates will be expected to</li> <li>present work clearly, with words explaining process or steps AND</li> <li>make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer</li> <li>QWC1: Candidates will be expected to</li> <li>present work clearly, with words explaining process or steps</li> </ul>		QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.
<ul> <li>make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer</li> </ul>		QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation and grammar.
2. Realising only 1 way to score 14, i.e. '8+6' OR '8 and 6'	B1	Do not accept $\frac{1}{6} + \frac{1}{8}$ or $\frac{1}{14}$
Number of possible outcomes 6×8 (=48)	B1	Accept sight of $6 + 8 = 14$ Accept sight of/48 or/8 ×/6 Sight of $\frac{1}{6} \times \frac{1}{6}$ is awarded B1. B1 with no other ways
1/48	B1	CAO An answer of 1:48 gets B2
$3(a) 3q = m - h^{2}$ $q = (m - h^{2})/3 \text{ or equivalent}$	B1 B1	FT from $3q = m + h^2$ or $3q = h^2 - m$ Allow SC1 provided no other marks awarded for missing brackets: $q = m - h^2 \div 3 \ OR \ q = m - h^2/3$ provided no previous incorrect working
3(b) $3x = 15 \times 2$ or $x/2 = 15/3$ x = 10	M1 A1	x = 30/3 gets M1 A0

UNIT 2 Higher Tier	Mark	Final Mark Scheme Comments
4(a) 11	B1	
4(b) Plots All correct plots joined with a curve	P1 C1	Allow one error. FT 'their (a)' or 11 FT 'their (a)' if reasonable or 11. If (a) blank then FT points given, otherwise must include plot at x=-3
4(c) From their graph (approximately -2.2 and 1.6)	B1	FT their graph. x-values, coordinates are not required
5(a) - 3n + 15 or equivalent	B2	B1 for sight of '-3n'
5(b) 2n + 1 or equivalent	B2	B1 for '2n +', OR for sight of 3, 5, 7 showing difference of 2, NOT for 'n+2'
6(a) Any 2 lines drawn correctly	B2	B1 for any 1 line drawn correctly Allow where ambiguous x or y as 1 or -2 unless incorrect line uniquely selected. Allow any line as correct if selected as a side of the region
Correct region identified	B1	CAO
6(b) 5x < 40  or  x < 40/5 x < 8	M1 A1	No marks for use of =, unless replaced to give x<8, then allow both marks SC1 for x<40/11
7 (a) 4c + 5p= 38.8 and 2c + 7p = 35.6 or equivalent Equating one variable One correct solution Method to find the other variable, e.g. substitution Other correct variable	B1 M1 A1 m1 A1	<u>FT from 1 slip in setting up equations</u> Allow 1 slip but not in the equated variable <i>Any change of unit must be consistent</i> FT their solution provided M1 awarded Solutions p= 3.6 (cm) and c = 5.2 (cm) <i>No marks for trial and improvement, apart from</i> <i>maybe the first B1.</i> <i>Answer only gets no marks</i>
7 (b) (80 – 38.8)/c (= 41.2/ 'their c') OR attempt 'c × value = 80 – 38.8' OR alternative full method working with 80, 38.8 and c 7 (beads)	M1 A1	<u>Must strictly FT from c=5.2 or 'their c'</u> FT number of (whole) (80-38.8)/ 'their c' Do not accept use of 'p' (as problem to solve requires thinking to use 'c') FT response must be rounded down to nearest whole Answer must be from correct working (if seen), e.g $7 \times 5.2 = 36.4$ compared with 41.2, or attempt 41.2/c Do not accept an answer of 8, however do accept answers (whole numbers) <7 if working is shown and a reason given based on fitting on the necklace
8(a) $2.4 \times 10^{-3}$ 10 <sup>3</sup> 2100 $2.4 \times 10^{3}$ or equivalent 8(b) $1.5 \times 10^{14}$	B2 B2 B2	Mark answer space, unless blank B1 for a run of 3 in the correct order ignoring the incorrect one (i.e. blank out 1 value to find 3 in the appropriate order ignoring the gap made by the incorrect value, placing on the answer spaces thus incorrect) For incorrect value written in answer space for 2400, 1000 or 0.0024 in the answer space penalise -1 only B1 for $15 \times 10^{13}$
	52	

UNIT 2	Mark	Final Mark Scheme
Higher Tier	Mark	Comments
9. $(3+-3)/2$ or $(20+16)/2$	M1	Or suitable sketch with indication of points and idea
		to locate mid-way (e.g. showing step triangles), or
First point found to be $(0.18)$	A 1	Notation not required a graccent without brackets
Reflection to give (1.10)	B1	Notation not required, e.g. accept without brackets
	DI	FT provided at least one of (0, 18), (1, 10) correct
Method to find gradient, e.g. sketch with points plotted with horizontal	M1	$\frac{1}{(18-10)/(0-1)}$
and vertical lines drawn to give an appropriate triangle		
Gradient = $-8$	A1	Gradient given as '8' gets M1 A0
Conclusion $y = -8x + 18$	A1	
		If first M1, A1 award but final M0, A0, A0 then award SC1 for their answer with $y = my + 18$ , $m \neq 0$
		award SC1 for their answer with $y=11x + 10$ , $11\neq 0$ If no marks, then SC2 for their answer with
		$v=mx + 18$ , $m \neq 0$
10(a) Correct rotation	B2	B1 for anticlockwise rotation about (2,1), OR
		For clockwise rotation about (1,2)
10(b) Enlarge scale factor $(\pm)1/2$	B1	Any placement
Correct position	BI	For their 'enlargement', i.e working with '-' and $y_{0} = (0, 0)$ as the centre
$11 (B\hat{A}C - )75(^{\circ})$	B2	using (0,0) as the centre B1 for sight of $\hat{BOC} = 150(^{\circ})$
11. $(DAC -) / J()$	D2	E marks depend on appropriate B mark awarded
		and <b>must be stated</b> (90° indicated on diagram is
Reason: Tangent meet radius 90°	E1	insufficient)
Reason: Angle at the centre is twice angle at circumference	E1	Angle sum of quadrilateral is insufficient
		Alternative:
		Equal langents (leading to isosceles triangle), $CBT = B\hat{C}T = 75^{\circ}$ followed by
		alternate segment theorem and
		$B\hat{A}C = 75^{\circ}$
		respectively E1, B1, E1 and B1 with E marks
		depending on B marks.
12(a) 1	B1	
$12(b) \sqrt{80} = \sqrt{(16 \times 5)} \text{ or } \sqrt{(4 \times 4 \times 5)} \text{ or } 4\sqrt{5}$	M1 M1	
$\{(\sqrt{80} - \sqrt{5})^2\} = (4\sqrt{5} - \sqrt{5})^2 (= (3\sqrt{5})^2) - 45$		CAO
= 45	AI	Alternative method:
		M2 for 80 - $2\sqrt{80}\sqrt{5}$ + 5 (=80 - $\sqrt{80}\sqrt{5}$ - $\sqrt{80}\sqrt{5}$ + 5)
		or M1 for 80 + 5 or 80 - $\sqrt{80\sqrt{5}}$ - $\sqrt{80\sqrt{5}}$
		$or \dots - \sqrt{80}\sqrt{5} - \sqrt{80}\sqrt{5} + 5$
		A1 45 CAO
		Method may be shown in stages
		- 180 15 may be written - 1400 or -20
12(c) $x = 0.42828$ and $100x = 42.828$ with an attempt to subtract	M1	Or 10x and 1000x, or equivalent. Or alternative
()		method
424/990 (=212/495)	A1	An answer of 42.4/99 gains M1 only.
	1.11	Mark final answer, do not ignore incorrect cancelling
$12(0) 3\pi + \pi^2 - 9 - 3\pi$	MI	Must have 3 of the 4 terms correct
$=\pi$ - 9	AI	CAO. Iviark linal answer
$13(a) 10/25 \times 9/24$	M1	
90/600 (= 9/60 = 0.15) ISW	A1	ISW means ignore incorrect final cancelling
		throughout
	1	

UNIT 2 Higher Tier	Mark	Final Mark Scheme Comments
13(b) 1 – P(no pinto beans)	M1	Or other <b>full</b> method showing intended operations
		In terms of beans, so may be replacement
$1 - 16/25 \times 15/24$	M1	Overall full method showing intention of operations
		with correct values substituted
= 360/600 (=36/60 = 0.6) ISW	A1	ISW means ignore incorrect final cancelling
		throughout
		Alternatives:
		$2 \times P(pk) = 2 \times 9/25 \times 6/24,$
		$2 \times P(pb) = 2 \times 9/25 \times 10/24,$
		$P(pp) = 9/25 \times 8/24$
		<i>OR P</i> ( <i>pinto, not pinto</i> ) = $2 \times 9/25 \times 16/24$ , <i>with</i>
		$P(pp) = 9/25 \times 8/24$

#### **UNIT 3 - FOUNDATION TIER**

UNIT 3 (Calculator allowed)	Marks	Final Mark Scheme
Foundation Tier	-	Comments
All parts (a) – (c) marked at the same time $\frac{1}{1}$ (c) (i) 10.70 (most)	D1	
1. (a) (l) $19.70$ (lifeat) 12.56 (broad)	DI D1	
12.50 (bread) 11.62 (milk)	DI B1	
$\frac{11.02}{4.02}  (\text{IIIIK})$	DI DI	ET their figures for 1 error
4.92 (cerear)	DI	r.1. men ngules for 1 erfor
48.8(0)		
1. (a) (ii) (f) $60 - (f) 48.8(0)$	M1	F.T. their '48.80'
$=(\pounds)(11.2(0))$	A1	
1. (a) (iii) Points = $4 \times 5$	M1	
= 20	A1	
1. (b) (i) 5.32	B1	
1 (1) ('') 75	D 1	D0 from 1, in 1, 1, 1, 25 0, 175 00, 4, 4, 100
1. (b) (ii) 75	BI	BU for any decimal places e.g. 75.0 and 75.00 etc get BU
1 (b) (iii) 66000	B1	
	DI	
All parts (a) – (b) marked at the same time		
Indirect marking - Tick marked	✓	
2. (a) $(f)$	B1	
$\Box = \Box = \Box = \Box$		
	B1	
	B1	
	DI	
$\square$ $\square$ $\square$ $\square$	B1	
(b) Weeks 1,2,3, 4 along one axis	B1	Anywhere within the base (inc.) of the corresponding bar.
	D1	
Uniform scale for the frequency axis	ы	If no scale then B0, but allow one square to represent 20.
starting at 0 and labelled		the starting at 0 will be implied for B1
		Condone frequency numbers alongside square instead of at the
		ton of the squares
		top of the squares.
Four bars at correct heights (bars must be of	B2	B1 for any 2 or 3 correct bars on F.T.
equal width). Can be in any order.		
3. Evidence of square counting	M1	
42-48 inclusive	A1	
$area = 420 - 480 \text{ (m}^2\text{)}$	B1	F.T. 10 times their 'square count'
	3	
<u>All parts (a) – (b) marked at the same time</u>		
4 (a) 26	B1	
m	U1	Independent of other marks
(b) $8 \times 5$	M1	
= 40	A1	
	4	

UNIT 3 (Calculator allo	owed)	Marks	Final Mark Scheme
Foundation Tier $5(a)$ 38 – 16		M1	Comments
= 22		A1	
5. (b) 26		B1	
5. (c) Total = $138$		M1 m1	Allow up to 2 errors in their readings for the M1
27.6		A1	C.A.O.
$\frac{\text{Use Overlay}}{6} = \frac{1}{2} \frac{1}{$		B1	Allow $+ 2^{\circ}$
$\begin{array}{c} \text{O. (a)}  \text{ABC} = 75 \\ \text{ABC} = 75 \end{array}$		B1	Allow $\pm 2^{\circ}$
$ACB = 55^{\circ}$		B1	Only if at least one B1 awarded.
Completed triangle			Complete reflection of the triangle gets B2
<u>Use Overlay</u>		-	
6. (b) Arcs for first step		B1 D1	
Line drawn		BI	
$\frac{\text{Use Overlay}}{6}$ (c) Area for 60°		<b>B</b> 1	
Bisecting $60^\circ$ arcs step 1		B1	
Bisecting 60° arcs step 1 Bisecting 60° arcs step 2 and lir	ne drawn.	B1	
7. (a) 5/8 - 2/8		M1	Accept decimals, e.g. $(0).625 - (0).25 = (0).375$
= 3/8		A1	
(b) $3x = 15$		B1	
x = 5		B1	F.T. $ax = b, a \neq 1$
(c) $32 = 3 \times 6 + 2W$		B1	Correct substitution
2W = 14		B1	Isolating the W
W = /		BI	F.1. If $ax = b$ ( $a \neq 1$ ) D1 for 1.82(8826) OD 1.82 All places given must be
6. (a) 1.629		D2	correct rounded or truncated
8. (b) 30.74		B2	B1 for 30.74(1781) All places given must be correct
			rounded or truncated
9. Adults $(\pounds) 668 + 668$	(1336)	B1	Using the adult and child prices consistently from another row
Cost per child = $668/2 + 150$		B1	of the table gets MR-1.
Children 484 $\times$ 3	(1452)	B1	
Sea view $10 \times 5 \times 14$	(700)	B1	OR B1 for 50 AND 30
Balcony $6 \times 5 \times 14$	(420)	BI	OR B1 for 140 AND 84
Total	(£)3908	ы	F.1. for one error ( i.e. if B4 awarded from first five B1s).
Look for			
• spelling		QWC	QWC2 Presents relevant material in a coherent and logical
• clarity of text explanations,		2	manner, using acceptable mathematical form, and with few if
• the use of notation (watch for	the units £)		any errors in spelling, punctuation and grammar.
QWC2: Candidates will be expected to	,		
• present work clearly, with work	ds explaining		QWC1 Presents relevant material in a coherent and logical
process or steps			manner but with some errors in use of mathematical form,
AND			spennig, punctuation or grammar.
• make few if any mistakes in m	hathematical form,		Evident weaknesses in organisation of material but using
spelling, punctuation and gran	nmar in their final		acceptable mathematical form, with few if any errors in
allswer OWC1: Candidates will be avpected to			spelling, punctuation and grammar.
present work clearly with work	ds explaining		
process or steps	us explaining		QWC0 Evident weaknesses in organisation of material, and
OR			errors in use of mathematical form, spelling, punctuation and
• make few if any mistakes in m	nathematical form,		grammar.
spelling, punctuation and gran	nmar in their final		
answer			

UNIT 3 (Calculator allowed) Foundation Tier	Marks	Final Mark Scheme Comments
10. (a) (Between) 14(:)00 and 14(:)30 or equivalent	B1	If am/pm used it must be correct, i.e. pm. Do not accept <sup>1</sup> / <sub>2</sub> hour or 30 minutes
10. (b) 20 (km)	B1	Ignore sight of incorrect units
10. (c) 2 <sup>1</sup> / <sub>2</sub> (km) / 30(minutes) OR 2 <sup>1</sup> / <sub>2</sub> / 0.5 OR equivalent 5 km/h	M1 A1 U1	Accept statement '2 ½ (km) in half hour' or similar (OR 5000) Independent of other marks (OR m/h) Accept k(m)ph
Indirect marking - Tick marked         11. 1 hat made in 2/3 hour or 40 minutes         Pay per hat (2/3 of £12.60) (£)8.4(0)         (Cost of fabric) $0.45 \times 3.4(0)$ (= £)1.53         (Total costs excluding ribbon £) $8.4(0) + 1.53$ (=£9.93)         (Ribbon cost per hat) (£)10.25 - (£)9.93 (= £0.32 or 32p)         (Ribbon costs) 64(p) (per metre)	B1 B1 M1 A1 m1 A1	If units are given they must be correct, penalise once only FT 'their 1.53' provided M1 awarded and 'their £8.40' provided $\neq$ £12.60 FT 10.25 – 'their 9.93', provided it includes pay and fabric costs CAO Alternative: (Cost of fabric for 3 hats) $3 \times 0.45 \times 3.4(0)$ M1 $= (\pounds)4.59$ A1 (or M1, A1 for cost of fabric for 1 hat £1.53) (Pay for 3 hats in 2 hours $2 \times \pounds12.60 = \pounds)25.2(0)$ B1 (Sales of 3 hats $3 \times 10.25 = \pounds)30.75$ B1 (Cost of ribbon for 3 hats) $(\pounds)30.75 - (\pounds)4.59 - (\pounds)25.2(0)$ (=96p) m1 FT provided first M1 and includes pay and sales (Cost ribbon per hat or per metre) $\div 3$ (×2) m1 FT provided first M1 and includes pay and sales (Cost of ribbon per metre) $64(p)$ or $(\pounds)0.64$ A1 CAO
12. (a) $6x + 7 = 4x + 24$ 2x = 17 $x = 8.5$ OR $8\frac{1}{2}$	B1 B1 B1	Correctly clearing bracketsF.T. until second errorCollecting terms $F.T. ax = b$ with $a \neq 1$
(b) $\frac{x}{5} = 9$ OR $x + 20 = 65$ x = 45	B1 B1	Accept embedded answers such as $45/5 = 9$ for B2, but if they go on to write x=13 for example then B1 only.
13. One correct evaluation, $2 \le x \le 3$ 2 correct evaluations, $2.55 \le x \le 2.75$ , one either side of 0 2 correct evaluations, $2.65 \le x \le 2.75$ one either side of 0	B1 B1 M1	x $x^3 + 2x - 25$ 2       -13         2.1       -11.5         2.2       -9.95         2.3       -8.2         2.4       -6.37         2.5       -4.37
2.7 No calculations shown: accept "too high", ">", etc.	A1	2.6       -2.2         2.65       -1.09         2.7       0.083         2.75       1.29         2.8       2.55         2.9       5.18         3       8

### **UNIT 3 - HIGHER TIER**

Unit 3 Higher Tier	Mark	Final Mark Scheme Comments
1(a) (Between) 14(:)00 and 14(:)30 or equivalent	B1	If am/pm used it must be correct, i.e. pm. Do not
		accept <sup>1</sup> / <sub>2</sub> hour or 30 minutes
1(b) 20 (km)	B1	Ignore sight of incorrect units
$1(c) 2\frac{1}{2} (km) / 30(minutes) OR 2\frac{1}{2} / 0.5 OR equivalent$	M1	Accept statement '2 $\frac{1}{2}$ (km) in half hour' or similar
km/h	U1	Independent of other marks (OR m/h)
		Accept k(m)ph
2. 360/6 OR 4 × 180/6 OR 720/6	M1	Need not be associated with interior or exterior angle
60(° exterior ) OR 120(° interior )	AI	Accept in working, or 120(°) <b>implied</b> in the drawing,
		120° drawn but incorrectly labelled 60°, allow M1, A0.
		Allow unless contradicted
$\underline{4}$ (of the 5) sides to be drawn forming a polygon drawn all	B1	Irrespective of angles
of length 4cm ( $\pm$ 2mm)	B1	
$\frac{4}{2}$ (of the 6) angles drawn correctly (within 2 <sup>-</sup> tolerance) A correct hexagon within tolerances allowed	B1	See overlay
r correct newagon, whilin torefunces and wea		Penalise drawing polygons with number of sides 5, 7,
		8, as -1 then FT,
3. Strategy: measure angles $120^{\circ}$ , $240^{\circ}$ in both pie charts,	51	Accept sight of 120 and 240', or $(120)^{\circ}/(360^{\circ})$ is $\frac{1}{2}$ or $(240)^{\circ}/(360^{\circ})$ is $\frac{2}{2}$
appropriate use of ratio for 1 pie chart		120(7500)1573 01 240(7500)1573
50 boys and 100 girls in year 7	B1	May be in different sections of working and implies S1
90 boys in Year 8	B1	FT 'their 50' + 40 provided S1 awarded and 'their
90/2 or $45$ girls in Year 8	B1	$50^{2} \neq 120$ FT 'their 90'/2 provided S1 awarded
(Total number of girls) 145	B1	CAO
		If incorrect angles used, they must total 360°, then
		mark as follows: S0 FT to possible B1 B1 then B0 B0
4. (£) 42.21/7	M1	50, 11 10 possible b1, b1, men b0, b0
(£)6.03 and (£)36.18	A1	
5 One connect exclusion	D1	
$2 \le r \le 3$	DI	$\begin{array}{cccc} x & x + 2x - 25 \\ 2 & -13 \end{array}$
2 _ ~ _ 3		2.1 -11.5
2 correct evaluations,	B1	2.2 -9.95
$2.55 \le x \le 2.75$ , one either side of 0		2.3 -8.2
2 correct evaluations.	M1	2.5 -4.37
$2.65 \le x \le 2.75$ , one either side of 0		
		2.55 -3.318
27	A1	<b>2.0</b> -2.2 <b>2.65</b> -1.09
No calculations shown: accept "too high", "> ", etc.		2.7 0.083
		2.75 1.29
		2.8 2.55
		2.9 5.16 3 8
	i	

Unit 3	Mark	Final Mark Scheme
Higher Tier	TATCHTY	Comments
6.		If units are given they must be correct, penalise once
1 hat made in 2/3 hour or 40 minutes	B1	onty
Pay per hat $(2/3 \text{ of } \pm 12.60)$ ( $\pm )8.4(0)$	B1	
(Cost of fabric) $0.45 \times 3.4(0)$	M1	
(=£)1.53	A1	
(Total costs excluding ribbon £) $8.4(0) + 1.53 = $ (=£9.93)	m1	FT 'their 1.53' provided M1 awarded and 'their £8.40'
(Ribbon cost per hat) $(\pounds)10.25 - (\pounds)9.93$ (= £0.32 or 32p)	m1	FT 10.25 – 'their 9.93', provided it includes pay and fabric costs
(Ribbon costs) 64(p) (per metre)	A1	CAO
	OWC	Alternative:
OWC2 requires sight of the majority of the process steps	2	(Cost of fabric for 3 hats) $3 \times 0.45 \times 3.4(0)$
shown, labelled, with units and money expressed		M1
correctly, with a clear final answer		$= (\pounds)4.59 \qquad A1$
		(or M1, A1 for cost of fabric for 1 hat $\pounds 1.53$ )
QWC1 requires at least 2 of the process steps, which are labelled and units correct in a labelled final answer		(Pay for 3 hats in 2 hours $2 \times \pm 12.00 = \pm 23.2(0)$ B1 (Sales of 3 hats $3 \times 10.25 = \pm 30.75$ B1
OWC1 majority of process steps shown with units correct		(Cost of ribbon for 3 hats)
in a labelled final answer		$(\pounds)30.75 - (\pounds)4.59 - (\pounds)25.2(0)  (=96p)  m1$
		FT provided first M1 and includes pay and sales
Look for		
• spelling		(Cost ribbon per nat or per metre) $-5$ (×2) m1 ET provided first M1 and includes pay and sales
<ul> <li>clarity of text explanations,</li> <li>the use of potetion (watch for the units and '0')</li> </ul>		TT provided first WT and includes pay and sales
• the use of hotation (watch for the units and 0 for unit pence when using f)		(Cost of ribbon per metre)
for and perice when using a)		64(p) or (£)0.64 A1 CAO
QWC2: Candidates will be expected to		
<ul> <li>present work clearly, with words explaining</li> </ul>		QWC2 Presents relevant material in a coherent and
process or steps		and with few if any errors in spelling, punctuation and
AND		grammar.
<ul> <li>make rew if any mistakes in mathematical form, spelling, punctuation and grammar in their final</li> </ul>		8
answer		QWC1 Presents relevant material in a coherent and
		logical manner but with some errors in use of
QWC1: Candidates will be expected to		OR
• present work clearly, with words explaining		Evident weaknesses in organisation of material but
process or steps		using acceptable mathematical form, with few if any
• make few if any mistakes in mathematical form		errors in spelling, punctuation and grammar.
spelling, punctuation and grammar in their final		
answer		QWC0 Evident weaknesses in organisation of material,
		nunctuation and grammar
$7(a) 6x^2(x-2)$	B2	B1 for correct partial factorisation, OR B1 for correct
		highest common factor and 1 term in brackets correct
7(b)(x-7)(x+6)	B2	Mark final answer.
		B1 for $(x 7)(x 6)$
7(c) (3x+2)(5x+7)	B2	Mark final answer.
		B1 for $(3x + 7)(5x + 2)$ or $(3x 2)(5x 7)$ or
		5x(3x+2) + 7(3x+2) or equivalent
8(a) $2x + 5 = 5x + 5$	M1	Or 3x = 0
x = 0	Al	Accept $0 = x$ . Do not accept $x = 0$ from incorrect
		working, if M0 seen, then A0
8(b) $2x + 3 + 3 \times 4x = 8 \times 3$ or $2x/3 + 1 + 4x = 8$	B1	Sight of <sup>2</sup> / <sub>3</sub> written as 0.6 is an error. FT until 2 <sup>nd</sup> error
14x = 21 or $14x/3 = 7$	B1	
x = 3/2 or 1.5 or equivalent	B1	Mark final answer
$0(a) w^2 + 12 7^2 - 56 2^2$ or $(-c^2) + 56 2^2 + 12 7^2$	M1	
y(a) = 12.7 = 30.2 or $(w = 10.000 = 10.0000 = 10.000000000000000$	A1	
w = 2777.15 or $(w = 72997.15)54.7(46 cm) or 55 (cm)$	Al	

Unit 3	Mark	Final Mark Scheme
$\frac{\text{Higher Tier}}{142/246}$	 M1	Comments
$m = 24(.23^{\circ})$	A2	A1 for $m = \sin^{-1}0.4(104)$
10. $(x =) (46.2/8.4) \times 10$ (OR 5.5 × 10) (=) 55(cm)	M1 A1	Or alternative full method to find x, x not implicit
$(y =) 18.7 \div (46.2/8.4)$ (OR 18.7/5.5) (-) 3 4(cm)	M1 A1	Or alternative full method to find y, y not implicit
(-) 3. <b>4</b> (CIII)		Alternatively candidates may refer to scale factor 5.5 throughout
11. In either order:		E marks depend on B marks
D with F, in any order Reason: 3 sides or SSS	BI F1	
C with E, in any order	B1	
Reason: 2 sides and <u>included</u> angle or SAS	E1	
12(a) Intention to subtract horizontal values on x-axis for	M1	
vertical axis reading across at 45 and 15 ( $= 30 - 13$ to 14) IQR answers in the range 16 to 17	A1	
12(b) Indicates the first task due to smaller IQR	E1	FT for 'their IQR' comparison with conclusion
13(a)(i) -2.5 and 5	B1	
13(a)(ii) Sight of y=5, in working or on graph -2.2 to -2.1AND 4.6 to 4.7	M1 A1	
13(b) Strategy, set up a table or list to calculate values for $y=x^2 - 2x - 3$ with at least 1 point correct, or equate $2x^2 + 2x + 25 = x^2 - 2x - 3$	S1	
At least 3 values in their table or list correct <b>and</b> plotted, OR $3x^2$ -7x-28=0 with substitution into quadratic formula (allow 1 slip)	M1	x         -3         -2         -1         0         1         2         3         4         5         6           y         12         5         0         -3         -4         -3         0         5         12         21
All necessary correct points plotted joined with <b>correct</b> <b>curve drawn</b> to intersections, OR $x = \{7 \pm \sqrt{385}\}/6$	A1	CAO. Not a FT from incorrect points, then FT for possible A marks
Intersection approximately at $x = 4.4$ and $x = -2.1$ x = 4.4, $y = 7.8$ and $x = -2.1$ , $y = 5.6$	A1 A1	FT from points plotted but not joined FT provided M1 FT their graph, or their x calculation to evaluate y correctly
14(a) Mid points 14.5, 24.5, 34.5, 44.5	B1	
$2 \times 14.5 + 18 \times 24.5 + 29 \times 34.5 + 1 \times 44.5$ (=1515) $\Sigma fr / 50$	M1 m1	FT for their mid points from within group FT for correct sum of their fr terms /50
$(\pounds) 30.3(0)$	A1	FT their $\sum fx / 50$ correctly evaluated
		Accept (£)30 provided correct working seen
14(b) Strategy, e.g. noticing 0 to 20 same area as 20 to 30, or noticing first 2 rectangles are of equal area	S1	Or $\pounds 20$ with 8 people, or 32 squares for $\pounds 30$ , or 32 squares for 16 people, or 16 squares for 8 people
$20 \times$ frequency density = 8, or equivalent, or 16 people split 8 people and 8 people for first 2 rectangles	B1	Or sight of 0.4 Award of this B1 implies S1 also
Uniform scale, implied or shown (height of first rectangle is 0.4, 2 <sup>nd</sup> height is 0.8, etc.)	B1	Or sight of 0.4 and 0.8 appropriately, or 'each person 2 squares', or sight of 8, 8,11,12, 9,1or sight of any 4 of 10, 25, 32.5(0), 37.5(0), 42.5(0), 47.5(0) Award of this B1 implies S1 and previous B1 also
8×10+8×25+11×32.5(0)+12×37.5(0)+9×42.5(0)+1×47.5(0) OR 20×0.4×10 + 10×0.8×25 + 5×2.2×32.50 + 5×2.4×37.50 + 5×1.8×42.50 + 5×0.2×47.50	M2	<ul> <li>If M1 or M2 are awarded,</li> <li>this implies previous S1, B1 and B1</li> <li>Do not FT from incorrect frequency density scale</li> <li>M1 for <ul> <li>any 3 correct products within the overall sum</li> <li>the appropriate sum of products but with bounds used instead of mid points, or</li> </ul> </li> </ul>
(£)1517.5(0)	A1	• use of mid points 10, 25, 32.5(0), 37.5(0), 42.5(0) and 47.5(0) within a product sum CAO. Mark final answer

Unit 3 Higher Tier	Mark	Final Mark Scheme Comments
$15(a) g \alpha t^2 \text{ or } g = kt^2$	B1	Ignore incorrect use of '=' or ' $\alpha$ ' throughout
$450 = k \times 7.5^2$	M1	FT from non linear only
$g = 8t^2$	A1	May be implied in (b)
15(b)		
g         50         450         800           t         2.5         7.5         (±) 10	B2	B1 for each value. FT non linear expressions for SC1 only if both FT answers accurately evaluated
16. Use of sine rule followed by cosine rule	S1	
AC/sin49 = 142/sin62	M1	
$AC = \sin 49 \times 142/\sin 62$	A1	
AC = 121  or  121.3(76)  or  121.4  (metres)	A1	
$AD^2 = AC^2 + 224^2 - 2 \times AC \times 224 \times \cos 74$	M1	FT their AC provided $\neq$ 142 or $\neq$ 224 or spurious
$AD^2 = 49875.25$ to $49922.816$	A1	
AD = 223(.3 metres)	A1	Depends on previous M1 and A1
17. 70(°) and 290(°) with no other values	B2	B1 for either value

GCSE Mathematics - Unitised MS January 2013



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