REVISE
.wales

Mensuration & 3D solids

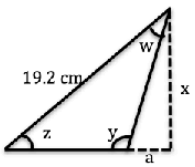
Mark schemes for the Mensuration & 3D solids question pack

WJEC Level 2 Additional Mathematics (9550) · Geometry

Official WJEC mark schemes for the 18 questions in the matching revise.wales question pack (121 marks total), from the 2011–2024 papers.

4	$\frac{48}{360} \times \pi \times 4.1^2$ or $\frac{1681}{750}\pi$	M1	
	(=) 7(.04... cm^2)	A1	
		2	

11	(Height of can 23.8 ÷ 6.8) 3.5 (cm) $\pi \times \text{radius}^2 = 6.8$ or equivalent (Diameter) 2.9(4...) or 3 (cm) $\text{Rod}^2 = 3.5^2 + 2.9(4...)^2$ or $\text{Rod} = \sqrt{(3.5^2 + 3^2)}$ 4.57(... cm) or 4.6 (cm)	B1 B1 B1 M1 A1	Allow 3.5(0…) from appropriate working (Radius =1.4712... cm) Do not accept from incorrect working Accept use of diameter = 3 (cm) FT provided at least B2 previously awarded Do not accept truncation to 4.5 (cm) Use of 3 cm diameter gives 4.6(09... cm) *Note:* *Use of the radius leads to* $\text{Rod}^2 = 3.5^2 + (1.47...)^2$, *and* $\text{Rod} = 3.796...$ *(cm) or 3.8 (cm)*
	QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps **AND** • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to present work clearly, with words explaining process or steps **OR** • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	QWC 2 7	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. 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. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

20	$\cos y = \frac{9.7^2 + 10.8^2 - 19.2^2}{2\times9.7\times10.8}$ or $\cos y = -0.753675...$ $(y =)\ 138.9(097...°)$ or $139(°)$	M2 A1	M1 for $19.2^2 = 9.7^2 + 10.8^2 - 2\times9.7\times10.8\times\cos y$
	$\sin(180 - 138.9) = \frac{x}{9.7}$ or $\sin 41 = \frac{x}{9.7}$ or $x = 9.7 \times \sin(180 - 138.9)$ or $x = 9.7 \times \sin 41.1$	m1	Or alternative **full** method FT provided M1 previously awarded provided $90 <$ 'their 139' <180
	Vertical height (x), answer in the range 6.36(cm) to 6.4 (cm)	A1	Must be from correct working
	Alternatives:  	5	*Alternative method* $a^2 + x^2 = 9.7^2$ AND $x^2 + (a + 10.8)^2 = 19.2^2$ M1 $(a + 10.8)^2 - a^2 = 19.2^2 - 9.7^2$ m1 $21.6a = 19.2^2 - 9.7^2 - 10.8^2$ m1 $a = 7.3(106...$ cm) A1 (Vertical height $x =$) 6.36(cm) to 6.4(cm) B1 (from correct working)
	$\cos z = \frac{19.2^2 + 10.8^2 - 9.7^2}{2\times19.2\times10.8}$ or $\cos z = 0.94326...$ $z = 19.393...(°)$ or $19.4(°)$ $\sin z = \frac{x}{19.2}$ or $x = 19.2 \times \sin 19.393..$ Vertical height (x), answer in the range 6.36(cm) to 6.4 (cm)	M2 A1 m1 A1 5	M1 for $9.7^2 = 19.2^2 + 10.8^2 - 2\times19.2\times10.8\times\cos z$ Allow rounded to 19(°) FT provided M1 previously awarded Must be from correct working
	$\cos z = \frac{19.2^2 + 10.8^2 - 9.7^2}{2\times19.2\times10.8}$ or $\cos z = 0.94326...$ $z = 19.393...(°)$ or $19.4(°)$ $\sin y = 19.2 \times \frac{\sin 19.393...}{9.7}$ or $y = 138.9(097...°)$ or $180 - 138.9(097...°)$ $(= 41.1..)$ **AND** $\sin(180 - 138.9..) = \frac{x}{9.7}$ or $x = 9.7 \times \sin 41.1$ or $x = 9.7 \times \sin(180 - 138.9..)$ Vertical height (x), answer in the range 6.36(cm) to 6.4 (cm)	M2 A1 m1 A1 5	M1 for $9.7^2 = 19.2^2 + 10.8^2 - 2\times19.2\times10.8\times\cos z$ Allow rounded to 19(°) FT provided M1 previously awarded Allow $\sin 138.9.. = \frac{x}{9.7}$ or $x = 9.7 \times \sin 138.9...$ Must be from correct working
	$\cos w = \frac{19.2^2 + 9.7^2 - 10.8^2}{2\times19.2\times9.7}$ or $w = 21.697...(°)$ AND $\sin y = 19.2 \times \frac{\sin w}{10.8}$ $(y =) 138.9(097...°)$ or $139(°)$ or $180 - 138.9(097...°)$ $(= 41.09...°)$	M2 A1	M1 for $10.8^2 = 19.2^2 + 9.7^2 - 2\times19.2\times9.7\times\cos w$ AND $\frac{\sin y}{19.2} = \frac{\sin w}{10.8}$

	$\sin(180-138.9) = \frac{x}{9.7}$ or $x = 9.7 \times \sin 41.1$ or equivalent Vertical height (x), answer in the range 6.36(cm) to 6.4 (cm)	m1 A1 5	FT provided M1 previously awarded provided $90 <$ 'their 139' < 180 Must be from correct working

7	(Surface area) $326.4 = \pi \times 5.6\,(5.6 + l)$ or $326.4 = \pi \times 5.6^2 + \pi \times 5.6 \times l$	M1	
	$l = \frac{326.4}{\pi \times 5.6} - 5.6$ or $\frac{326.4 - 5.6^2 \times \pi}{\pi \times 5.6}$	m1	(= 12.95.... cm or 12.96… or 13 cm) Allow l = 12.95, 12.96 or 13 from trial & improvement
	$(h^2 =)\ (12.95....)^2 - 5.6^2$	M1	FT 'their derived l'
	$h^2 = 136.418...$ or $(h =) \sqrt{136.418...}$	A1	FT 'their derived l' provided `> 5.6
	(Vertical height) $h = 11.6798...$ (cm)	A1	Allow rounding or truncation of h FT M1 A0 to allow A1 for square root of 'their 136.418...' provided leads to 'their h' < 'their l' *Note:* *l* / h^2 / *h*: 12.95 / 136.34... / 11.676..; 12.96 / 136.60... / 11.687...; 12.9 / 135.05 / 11.62...; 13 / 137.64 / 11.73...
	(Volume V =) $\frac{1}{3} \times \pi \times 5.6^2 \times 11.6798...$	M1	FT 'their h' > 0, provided at least M1 previously awarded Not for use of 'their l'
	Answers in the range 383.2 (cm^3) to 385.3 (cm^3)	A1	CAO, not a FT Do not FT from allowance of premature rounding or truncation of h for previous A1 as 'their answer' will now be outside the range allowed
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12	(Diagonal^2 =) $3^2 + 3^2$ (Diagonal =) $\sqrt{18}$ or $3\sqrt{2}$ or 4.24...(cm)	M1 A1	Or ((½ diagonal)^2 =) $(3^2 + 3^2) \div 2$ Or (½ diagonal =) $\frac{\sqrt{18}}{2}$ or $\frac{3\sqrt{2}}{2}$ or 2.12...(cm)
	(Angle x =) $\cos^{-1} \frac{½\sqrt{18}}{6}$ or $\cos^{-1} \frac{6^2 + (\sqrt{18})^2 - 6^2}{2\times6\times\sqrt{18}}$ (= $\cos^{-1}$ 0.35355...)	M2	FT 'their derived diagonal' or 'their derived ½diagonal' M1 for $6^2 = 6^2 + (\sqrt{18})^2 - 2\times6\times\sqrt{18}\times\cos x$ or cos x = $\frac{½\sqrt{18}}{6}$ or $\frac{\sqrt{18}}{12}$ or $\frac{\sqrt{2}}{4}$ *Note: If $3\sqrt{2}$ is used in the cosine rule, need $(3\sqrt{2})^2$ or correct intention implied by further working*
	An answer in the range 69.29(°) to 69.31(°)	A1	Allow an answer rounded or truncated to 69(°) provided it is from working that would lead an angle in the range 69.29(°) to 69.31(°)
	Alternative: *((½ diagonal)^2 =) $(3^2 + 3^2) \div 2$* *(½ diagonal =) $\frac{\sqrt{18}}{2}$ or $\frac{3\sqrt{2}}{2}$ or 2.12...(cm)*	*M1* *A1*	*Or (Diagonal^2 =) $3^2 + 3^2$* *Or (Diagonal =) $\sqrt{18}$ or $3\sqrt{2}$ or 4.24...(cm)*
	(Height^2 =) $6^2 - (\frac{\sqrt{18}}{2})^2$ *or (Height^2 =) $6^2 - 2.12..^2$ (= 31.5 cm)* *or (Height^2 =) $6^2 - (3/2)^2 - (3/2)^2$* *or (Height =) $\sqrt{31.5}$ (= 5.61... cm)*	*M1*	*FT 'their derived ½diagonal' or 'their derived diagonal'*
	sin x = 5.61... / 6 (= 0.935..) *or* *tan x = 5.61... / 2.12 (= 2.646...)*	*m1*	*Depends on previous M1 awarded*
	An answer in the range *69.29(°) to 69.31(°)*	*A1*	*Allow an answer rounded or truncated to 69(°) provided it is from working that would lead to an angle in the range 69.29(°) to 69.31(°)*
		5	

7	(To find the diagonal of the base) $3^2+4^2=25$ or $3^2+4^2=5^2$ OR horizontal diagonal $=5$ cm	M1	**M0** if used as the height of the cuboid
	(To find the height) (height^2=)13^2-25 or 13^2-5^2 or $13^2-(3^2+4^2)$	M1	The award of 2nd M1 implies the award of 1st M1
	Alternative methods for M1 M1 *3D Pythagoras' Theorem* $4^2+3^2+\text{height}^2=13^2$	*M1*	
	(height^2 =) $13^2-3^2-4^2$ (= 144)	*M1*	*The award of 2nd M1 implies the award of 1st M1*
	Diagonal of the right/left end face = d $d^2+4^2=13^2$ or $d^2=13^2-4^2$ or $d=3\sqrt{17}$ ***provided*** *d labelled or used appropriately*	*M1*	***M0*** *if used as the height of the cuboid*
	(height^2=) d^2-3^2 or $(3\sqrt{17})^2-3^2$	*M1*	*The award of 2nd M1* ***may*** *imply the award of 1st M1*
	Diagonal of the back/front face = c $c^2+3^2=13^2$ or $c^2=13^2-3^2$ or $c=4\sqrt{10}$ ***provided*** *c labelled or used appropriately*	*M1*	***M0*** *if used as the height of the cuboid*
	(height^2=) c^2-4^2 or $(4\sqrt{10})^2-4^2$	*M1*	*The award of 2nd M1* ***may*** *imply the award of 1st M1*
	(Height of the cuboid) 12 (cm)	A1	CAO
	(Surface area of the cuboid) $2(4\times3+12\times3+4\times12)$ or equivalent	M1	FT 'their derived 12' provided Pythagoras' Theorem has been attempted. (Note: surface area = 24 + 14 × height)
	192 (cm^2)	A1	If final M0, A0, award SC1 for a final answer of 96(cm^2) (from $4\times3+12\times3+4\times12$ or equivalent)
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5	Overall strategy that could lead to finding E$\hat{C}$B, e.g. length of 3 sides and then cosine rule	S1	Or full alternative strategy
	$EC^2 = 6.2^2 + 3.7^2$ $BC^2 = 2.5^2 + (8.4 - 6.2)^2$ $EB^2 = 8.4^2 + 3.7^2 + 2.5^2$	M1 M1 M1	($EC^2 = 52.13$, EC =7.22....cm) ($BC^2 = 11.09$, BC = 3.33....cm) May be shown in stages (e.g. $BF^2 = 8.4^2 + 3.7^2$ then $EB^2 = 2.5^2 + BF^2$) ($EB^2 = 90.5$, EB = 9.513...cm)
	With substituted values: $\cos E\hat{C}B = \frac{EC^2 + BC^2 - EB^2}{2 \times EC \times BC}$ i.e. $\cos E\hat{C}B = \frac{52.13 + 11.09 - 90.5}{2 \times 7.22... \times 3.33...}$ (= -0.567...)	M2	OR alternative full method, e.g. finding angles BEC or EBC using cosine rule followed by use of sine rule with sin E$\hat{C}$B isolated FT 'their derived lengths' provided at least 2 M marks previously awarded M1 for substituted values: $EB^2 = EC^2 + BC^2 - 2 \times EC \times BC \times \cos E\hat{C}B$ OR for alternative full method without sin E$\hat{C}$B isolated
	E$\hat{C}$B = 124.56(....°) or 124.6° or 125(°)	A1	CAO, must be from correct working Allow 124.4(... °), 124.48(°), 124.5(°) or 125.39(... °) or 125.4(°) from premature approximation
	QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	QWC 2 9	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. 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. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
6	(a) Multiplier $(6-\sqrt{3}) / (6-\sqrt{3})$ Denominator $36 + 6\sqrt{3} - 6\sqrt{3} - 3$ OR $36 - 3$ OR 33 $\frac{12 - 2\sqrt{3}}{33}$	M1 A1 A1	Allow if the multiplier is stated as $(6-\sqrt{3})$ provided it is used as $(6-\sqrt{3})/(6-\sqrt{3})$ CAO. Mark final answer *Unsupported answer is awarded no marks.*
	(b)(i) $y^{1/5}/y^{3/4}$ or alternative correct 1st step $y^{-11/20}$ or $1/y^{11/20}$	B1 B1	Or equivalent first stage of working with indices CAO. Mark final answer
	(ii) Correctly extracting $x^{2/7}$ as a factor, or $\frac{x^{2/7}}{2x^{2/7}} + \frac{6x^{3/7}}{2x^{2/7}}$ $\frac{1}{2} + 3x^{1/7}$ or $\frac{1 + 6x^{1/7}}{2}$	M1 A1 7	CAO. Mark final answer

6	Sight of sin 60° = √3/2 (Perpendicular height =) 8 × sin60° OR sin60° = (perpendicular) height/8 (Area of the parallelogram =) 17 × 8 × √3/2 (Area of the parallelogram =) 68√3 (cm^2) QWC2: • Candidates will be expected to present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	B1 M1 m1 A1 QWC 2 6	 OR perpendicular height = $\frac{8\sqrt{3}}{2}$ (cm) Or equivalent, e.g. 13 × 4√3 + 4 × 4√3 CAO *Alternative (split as 2 triangles with ½ abSinC used):* *Sight of sin 60° = √3/2* *B1* *(Area of triangle(s) =)(2 ×) ½ × 8 × 17 × sin60°* *M1* *(Area parallelogram =)2 × ½ × 8 × 17 × √3/2* *m1* *(Area of the parallelogram=) 68√3 (cm^2)* *A1 CAO* 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. 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. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

9	Diagonal = 5 (cm) or ½ diagonal = 2.5 (cm)	B1	
	Perpendicular height^2 = $6^2 - 2.5^2$ or Perpendicular height= $\sqrt{(6^2 - 2.5^2)}$ (=$\sqrt{29.75}$)	M1	FT 'their derived 2.5', provided ≠ 3, 4 or 5
	Perpendicular height is 5.45(.. cm) or 5.5(cm)	A1	
		3	

	Summer 2017		
7	(Arc length =) $2 \times \pi \times 5 \times 110/360$ $= 55\pi/18$ (cm)	M1 A1	(= 9.599…cm) May be implied in later working
	(Circumference) $55\pi/18 = 2 \times \pi \times$ cone radius or equivalent	M1	FT 'their derived arc length' Allow for $55\pi/18 = \pi \times$ diameter, if clearly diameter
	(Cone radius =) 55/36 or 1.527(77…cm)	A1	
	(Perpendicular height^2 =) 5^2 – cone radius^2	M1	FT 'their derived cone radius', provided $\neq 5$
	(Perpendicular height =) 4.7608…(cm)	A1	FT 'their derived cone radius' and 'their derived perpendicular' provided neither value $\neq 5$
	(Volume of the cone =) $\frac{1}{3} \times \pi \times$ cone radius$^2 \times$ perpendicular height	M1	May be shown in stages, e.g. method to find area first
	(=) 11.6 (cm^3)	A1	CAO. Award M1 only for 11.636… cm^3 or 12 cm^3
			Alternative (for 1st 4 marks) (not requiring arc length) *(Area of sector =) $\pi \times 5^2 \times 110/360$ with intention to find the surface area of the cone* M1 *$= 275\pi/36$ (cm^2) (=23.998..cm^2)* A1 *(Surface area of cone $= \pi rl$)* *$275\pi/36 = \pi \times$ cone radius $\times 5$* M1 *(cone radius =) 55/36 or 1.527(77... cm)* A1
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		10	

5	(Area of circle(s) =) $(2\times)\ \pi\times4^2$ or $(2\times)16\pi$	M1	
	(Curved surface =) $2\times\pi\times4\times18$ or 144π	M1	
	(Area of card =) $(18+8+8)\times2\times\pi\times4$ $(=34\times8\pi)$	M2	M1 for sight of $(\ldots+8+8)\times2\times\pi\times4$ or $(18+\ldots+\ldots)\times2\times\pi\times4$
	(Area wasted =) $((18+8+8)\times2\pi\times4)$ - $(2\times\pi\times4\times18+2\times\pi\times4^2)$	m1	Intention to subtract areas of 2 circles and a rectangle from the card, depends on at least M3 previously awarded
	(=) 96π (cm^2) or answer in the range 300 (cm^2) to 302(cm^2)	A1	CAO. Accept an answer in the range provided supported by correct working *Alternative:* *(Width of card =) $2\times\pi\times4$ (= 25·1327 cm)* *M1* *(M0 if stated as 'area of the circle' unless clearly used as width of the card)* *(Area of the small rectangle =) $8\times2\times\pi\times4$* *M1* *(Area of a circle(s) =) $(2\times)\ \pi\times4^2$* *M1* *(Area wasted =) $2\times8\times2\times\pi\times4-2\times\pi\times4^2$* *M2* *(or M1 for $8\times2\times\pi\times4-\pi\times4^2$)* *(Area wasted =) 96π (cm^2) or 300 to 302 (cm^2) CAO A1*
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		8	

	Summer 2015		
5	Sight of x-4 and x+1	B1	*FT 1 error in 1 side length, provided it is in the form 'x ± a' and not a single term expression, for M marks only*
	$2(x(x-4) + x(x+1) + (x-4)(x+1))$ (= 124)	M2	*Some work may be shown in stages, but implies the following M and m marks, but need to show summation* Correct expression for the total surface area Accept '×2' omitted if equated to 62 M1 for '×2' aspect omitted, or M1 for '×2' included with any 2 (of 3) area expressions correct, or M1 for '×2' included with any 4 (of 6) areas correct, or M1 if it could be correct but brackets missing and not implied in later working (if implied in later working allow M2)
	$2x^2 - 8x + 2x^2 + 2x + 2x^2 - 8x + 2x - 8 = 124$ OR $x^2 - 4x + x^2 + x + x^2 - 4x + x - 4 = 62$	m1	Equate to 124 with '×2' treated correctly, or equate to 62 if appropriate, with at least 2 of the 3 (or 4 of the 6) brackets expanded correctly; depends on M1
	$6x^2 - 12x - 8 = 124$ OR $3x^2 - 6x - 4 = 62$	A1	Depends on M2, m1 for correct manipulation and collection of terms
	Shows or sight of $x^2 - 2x = 22$ or $x^2 - 2x - 22 = 0$	A1	Depends on M2, m1. Requirement to show as asked in the question
	$(x-1)^2 = 22 + 1$ OR $x = \frac{2 \pm \sqrt{92}}{2}$	M1	Independent of other marks Must be correct to this stage of working FT for their quadratic equation of equivalent difficulty
	$x = 1 + \sqrt{23}$	A1	CAO. Do not accept $1 \pm \sqrt{23}$
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		10	

		Additional Mathematics Summer 2015			Final	

11	3D visualisation with height 12cm AND use of appropriate methods	S1	**e.g.** 3D sketch with sight of height 12cm, Pythagoras' Theorem and tan ratio, or full alternative trig method following Pythagoras' Theorem, or use of base area to find the side length followed by full alternative trig method
	Side length of base 8cm or ½ side 4cm diagonal^2 = $8^2 + 8^2$ OR (½ diagonal)^2=4^2+4^2	B1 M1	Sight of 8cm or 4cm as appropriate FT their side length, provided ≠ 64, throughout other than the final A mark.
	diagonal is $\sqrt{128}$ or $8\sqrt{2}$ (cm) OR ½ diagonal is ½$\sqrt{128}$ or $4\sqrt{2}$	A1	(diagonal=11.3137…cm, ½diagonal = 5.65685…cm rounded or truncated)
	tan 'required angle' = (12 / ½diagonal) or **full** alternative method	M1	FT their derived ½ diagonal for M1 only, not 8 or 4(cm) Full alternative method: finding perpendicular height of a sloping face then the slant edge
	64.7(6…°) or 64.8(°)	A2	CAO. Accept 65(°) from correct working A1 for $\tan^{-1}(12/½\sqrt{128})$, or for an answer from premature approximation
		7	

3			*Penalise **consistent** use of radius in place of diameter - 1 then FT*
	(Circumference small circle =) $2\times\pi\times3.5$ or 7π	M1	May be embedded
	(Fraction of circle shown =) $2.1/7\pi$ or $34.377\ldots°$ or $34.8°$	M1	FT 'their 7π'
	(Circumference of large circle=) $2\times\pi\times(3.5+2.4)$ or 11.8π	M1	May be embedded FT 'their 7π' and FT 'their 11.8π'
	(Arc large circle =) $11.8\pi\times2.1/7\pi$ or $11.8\pi\times34.377\ldots/360$ = 3.5(4cm)	A1	CAO For information: $7\pi = 21.99\ldots$ or 22 $2.1/7\pi = 0.09549\ldots$ $11.8\pi = 37.07079$ *OR alternative:* *Use of similar shapes,* *e.g. sight of (3.5+2.4)/3.5 or ×1.6857...* *M1* *DC/2.1 = (3.5+2.4)/3.5 or equivalent* *M2 FT* *'their 5.9/3.5'* *DC = (3.5+2.4) × 2.1 ÷ 3.5* *M1* *DC = 3.54(cm)* *A1* *CAO*
	(Perimeter = 2.4 + 2.4 + 2.1 + 3.54 =) 10.4(4 cm)	QWC 2	FT 'their 3.5(4)' + 6.9 evaluated correctly from premature approximation only
	QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer	8	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. 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. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

Q	Additional Mathematics Summer 2014	Marks	Final

	Summer 2013		
9	Strategy: e.g. need to use 14° and 6.3cm AND 3D visualised	S1	Properties of a kite and visualising where height is
	EC = 6.3/tan14	M2	M1 for Tan14 = 6.3/EC *OR Alternative method* *M1 for 12.6/sin28 = DC/sin76 (DC = 26(.04..cm)* *and then M1 for sin76 = EC/their DC*
	EC = 25(.2679…cm)	A1	If 12.6 allow SC1 for answer 50.5
	Tan ECH = 17.3/EC	M1	FT their EC
	<ECH = $\tan^{-1}$ 0.68…	M1	
	34(.39...°)	A1	
			If 12.6 used then max mark is SC1, M1,M1,A1(18.9)
			NOTES for other alternative methods: *Do not credit $17.3^2+6.3^2$ until seen as part of an overall strategy*
		7	

	Additional Mathematics Summer 2012		Final Mark Scheme
13	Strategy: Idea of 3D-ness and Pythagoras' Theorem	S1	E.g. suitable diagram & attempt Pythagoras' Theorem once
	(Base diagonal)$^2 = 4^2 + 4^2$	M1	Or for (½ diagonal)^2 equation
	Base diagonal = $\sqrt{32}$ (Or ½ base diagonal = ½ $\sqrt{32}$	A1	
	(Perpendicular height)$^2 = 6^2 - (\frac{1}{2}$ base diagonal)^2	M1	FT their (½ diagonal)^2
	$= 36 - \frac{1}{4} \times 32$	A1	
	Perpendicular height $= \sqrt{28}$	A1	Depends on M1 only
	$2\sqrt{7}$	B1	FT provided at least M2 awarded
			Alternative:
			S1 Strategy: Idea of 3D-ness, Pythagoras' Theorem once
			M1 (sloping perpendicular bisector)$^2 = 6^2 - 2^2$
			A1 sloping perpendicular bisector = $\sqrt{32}$
			M1 (Perpendicular height)^2
			=(sloping perpendicular bisector)$^2 - 2^2$
			(FT their perpendicular bisector)
			A1 (Perpendicular height)^2 = $(\sqrt{32})^2 - 2^2$
		7	*A1 Perpendicular height $\sqrt{28}$ (Depends on M1 only)*
			B1 $2\sqrt{7}$ (FT provided at least M2 awarded)

			B1 2π (FT provided at least M2 awarded)
14	$C = 2\pi x$	B1	Do not accept embedded within an incorrect equation
	Surface area = length × C	B1	FT their linear C. Allow intention
	$2\pi x(3x + 2) = 32\pi$	M1	Must be correct. Accept numerical value for π Intention of brackets must be clear in working
	$3x^2 + 2x - 16 = 0$ or equivalent	A1	Needs to have eliminated π and equate to zero *Equate to zero maybe implied by solving*
	$(3x + 8)(x - 2) = 0$	M1	FT their quadratic provided B2 awarded OR correct substitution into the formula, or use of completing the square
	$(x=-8/3)$ $x = 2$	A1	
	Height is 8 (cm)	A1	
			Unsupported correct answers, award 7 marks, otherwise ***correct*** *working needs to support answers, use of πr^2 is incorrect*
		7	

		5	B1 for one answer (un)round or truncated to 2 or more dp.
15	Idea that BC = the circumference of the base of cone BC = (140/360) ×2× π ×18 (= 43.982…) Radius = BC / 2π = 7(cm)	S1 M1 M1 A1 4	CAO *Alternative: Idea to use area of sector AND* Πrl *S1* *Area sector* = $140/360 \times \Pi \times 18^2$ *provided S1 awarded M1* $18\Pi r$ = *'their area of sector' M1* *7(cm) CAO A1*

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