

Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
4.(Area of faces are) $2e \times 3e, 2e \times 4e, 3e \times 4e, (\text{cm}^2)$ $(2e \times 3e, 2e \times 4e, 3e \times 4e) (\text{cm}^2)$ (Simplified equation for the total surface area is) $52e^2 = 468$ $e^2 = 468/52 \quad (= 9)$ $e = 3$ (Volume = $6 \times 9 \times 12 =$) $648 (\text{cm}^3)$ Look for: - if units given, are they correct? - notation - labels and joining text 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 and include units in their final 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 and include units in their final answer	M2 A2 B1 B1 B1 QWC 2 9	M1 for any one of the 3 unique expressions These marks may be implied by correct simplified expressions FT for M2 or M1 as appropriate, provided their simplified sum includes at least two of the expressions $6e^2, 8e^2, 12e^2$ and all three terms in the form ae^2. A1 for $(2 \times) [6e^2 + 8e^2 + 12e^2]$ OR $52e^2 (\text{cm}^2)$ A1 for $ae^2 = 468$ FT 'their equation' if in the form $ae^2 = 468$ FT 'their equation' if in the form $ae^2 = 468$ FT 'their e' within $24 \times e^3$ correctly evaluated <i>If no marks, then allow SC2 for $3e \times 4e \times 2e = 468$ leading to an answer of $e = 2.69 \dots$ or 2.7, or SC1 for sight of $3e \times 4e \times 2e = 468$ or equivalent</i> 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.
5. $26.5 - 26.5 \times 0.12$ OR 26.5×0.88 $(=23.3(2))$ $23.3(2) - 23.3(2) \times 0.08$ OR $23.3(2) \times 0.92$ $(= 21.4544 \text{ or } 21.436)$ $25.3 - 21.4544$ $(= 3.8456)$ OR $25.3 - 21.436 (=3.864)$ $3.8(\dots^\circ\text{C})$ to $3.9(^\circ\text{C})$ from correct working	M1 M1 m1 A1 4	OR M2 for $26.5 \times 0.88 \times 0.92$ FT 'their 23.32', but not 26.5 Depends on both previous M marks FT for their 23(.32) and their 21(....) Accept $4(^\circ\text{C})$ from correct working
6. Sight of any quotient using values from the table for a/b or b/a $a = 2.5 \times b$ $b = 0.4 \times a$	M1 A1 A1 3	Or sight of 1 correct response, or answers reversed Or equivalent Or equivalent FT from $a = 0.4 \times b$ to give $b = 2.5 \times a$
7.(a) 5.6×10^{-5} (b) 2.3×10^9	B1 B1 2	

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8. Idea to show or use the perpendicular height in a right angled triangle Height = $\sin 58^\circ \times 6$ $= 5(.088\dots\text{cm})$ Area = $5(.088\dots) \times 10$ $= 50.9(\text{cm}^2)$ or $51(\text{cm}^2)$	S1 M2 A1 M1 A1 6	Award for statement such as '6(cm) is not the vertical height' M1 for $\sin 58^\circ = \text{Height}/6$ FT their $5(.088\dots\text{cm})$ provided prior M1 awarded or an attempt has been made to use a trig ratio Must be rounded. Do not accept 50.8 or 50 (from premature approximation). FT from M1 <i>If S1 only, then use of spurious perpendicular height <6, then also award SC1 for their perpendicular height $\times 10$ correctly evaluated</i> Alternative: Use of $\frac{1}{2} ab \sin C$ S1 $2 \times \frac{1}{2} \times 6 \times 10 \times \sin 58^\circ$ M3 or M2 for $\frac{1}{2} \times 6 \times 10 \times \sin 58^\circ$ $50.9(\text{cm}^2)$ or $51(\text{cm}^2)$ A2 or A1 for calculating $\frac{1}{2}$ required area
9(a) Correct translation (b) Correct rotation (c) Correct reflection in $y = x$ (d) Enlargement scale factor $\frac{1}{2}$ Correct position	B1 B2 B2 B2 B1 8	B1 near miss of grid lines, or for clockwise 90° about $(-2, -1)$, or for anticlockwise 90° about $(-1, -2)$ B1 for a reflection in $y = -x$, OR for sight of the line $y = x$ B1 for any 1 line correct, or consistent incorrect fractional scale
10. $26.7 = \pi \times d$ or $26.7 = 2 \times \pi \times r$ or $r = 26.7/\pi$ Diagonal = $8.495\dots$ to $8.5(0\dots)$ (cm) diagonal² = side² + side² side² = diagonal²/2 side length = $6(.0096\dots\text{cm})$ Perimeter = $24.(....\text{cm})$	M1 A1 M1 A1 A1 B1 6	Accept rounded or truncated FT their diagonal Do not FT from inappropriate truncation or incorrect rounding (e.g. from $d = 8.4$) Answer here for A1 should round to 6.01 FT provided both M marks awarded for $4 \times$ 'their side length'
11.(a)(i) $y = x$ and $y = -x$ indicated (2 quadrants for both) (ii) $y = x$ and $y = -x$ or equivalent (b) $x^2 + y^2 = 3^2$ or $x^2 + y^2 = 9$	B2 B2 B1 5	B1 for either indicated in 2 quadrants, or both indicated in 1 quadrant each B1 for indication of appropriate points at least 3 in each of the 4 quadrants Ignore any circles drawn CAO. B1 for either equation CAO
12. $\sin XYZ/23.8 = \sin 123^\circ/38.9$ $\sin XYZ = 23.8 \times \sin 123^\circ/38.9$ $XYZ = 30.871\dots(^\circ)$ rounded or truncated correctly	M1 M1 A1 3	OR $23.8/\sin XYZ = 38.9/\sin 123^\circ$ OR $\sin^{-1} 0.513\dots$ This M1 implies previous M1

UNIT 2 (HIGHER TIER)

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1. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
2. (a) $x = 10 \times 8 / 5$ $x = 16$ (b) $x = 4$ (c) $18x - 102 = 42$ OR $3x - 17 = 42 / 6$ $18x = 144$ $3x = 24$ or $x = 24 / 3$ $x = 8$ (d) $9x < 77 - 5$ $x < 8$ (e) $x < 85 / 5$ or $x < 17$ 16	M1 A1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) Mark final answer. Do not accept 28/7 FT until 2 nd error No marks for use of “=”, unless finally replaced to give x<8 then award M1 A1. SC1 for x<82/9 ISW Or sight of $5 \times 16 = 80$ with $5 \times 17 = 85$ Accept unsupported 16, or a unique answer of 16 from a trial and improvement method. Do not accept x<16. <i>SC1 for sight of $5x = 85$, $x = 17$ followed by selecting $x = 16$</i>
3(a) $100 \times 34 / 6800$ or $100 \times 34 \div 6800$ $0.5(\%)$ or $\frac{1}{2}(\%)$ (b) 1.0225×34000 or $34000 + 34000 \times 2.25 / 100$ or $102.25 \times 34000 / 100$ 34765 (c) 0.26×1345 or $\frac{3}{8} \times 600$ or 0.045×3600 or equivalent 349.7 (m) 225 (m) 162 (m) 160 230 350 (d) $450 \times 4 \div 9$ $= 200$ $450 \times 4 \div 5$ $= 360$ Difference 160	M1 A1 M1 A1 M1 A1 A1 A1 B1 M1 A1 M1 A1 A1 14	Accept 0.25 written as $\frac{1}{4}$ Any one correct calculation shown Accept 349 or 350 Accept 230 Accept 160 Must all be 2 significant figures FT provided at least 2 of the A marks awarded Complete method CAO Complete method CAO Depend on both M marks

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10. $26.7 = \pi \times d$ or $26.7 = 2 \times \pi \times r$ or $r = 26.7/\pi$ Diagonal = 8.495... to 8.5(0...) (cm) $\text{diagonal}^2 = \text{side}^2 + \text{side}^2$ $\text{side}^2 = \text{diagonal}^2/2$ side length = 6(.0096...cm) Perimeter = 24.(....cm)	M1 A1 M1 A1 A1 B1 6	Accept rounded or truncated FT their diagonal Do not FT from inappropriate truncation or incorrect rounding (e.g. from $d = 8.4$) Answer here for A1 should round to 6.01 FT provided both M marks awarded for $4 \times$ 'their side length'
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12. $\sin XYZ/23.8 = \sin 123^\circ/38.9$ $\sin XYZ = 23.8 \times \sin 123^\circ/38.9$ $XYZ = 30.871..(^\circ)$ rounded or truncated correctly	M1 M1 A1 3	OR $23.8/\sin XYZ = 38.9/\sin 123^\circ$ OR $\sin^{-1} 0.513...$ This M1 implies previous M1
13. $y = 4 - x$ OR $x = 4 - y$ $2x^2 + x(4-x) - 5 = 0$ $2(4-y)^2 + (4-y)y - 5 = 0$ $x^2 + 4x - 5 = 0$ $y^2 - 12y + 27 = 0$ (x - 1)(x+5) = 0 (y - 3)(y - 9) = 0 x = 1, x = -5 OR y = 3, y = 9 y = 3, y = 9 x = 1, x = -5	M1 M1 A1 M1 A1 A1 6	OR For sight of $x^2 + xy = 4x$ OR Subtraction from 1 st equation OR $x^2 + 4x = 5$ FT provided quadratic from an appropriate substitution method or subtraction method OR alternative method to solve, e.g. formula with correct substitution and $b^2 - 4ac$ correctly simplified <i>If A0, A0 then SC1 for $x = 1, y = 3$ OR $x = -5, y = 9$ provided algebraic method shown with appropriate M1, M1, M1 marks</i> No marks for trial & improvement methods

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14(a) 6:2 and 7:QR or equivalent, or scale factor 7/6 QR = $2 \times 7 \div 6$ or equivalent QR = 2.3(33...cm)	B1 M1 A1	OR 6:8 and 7:PR or equivalent OR PR = $7 \times 8 \div 6$ (= 9.33...) or equivalent
(b) AE = 4x AF = 5.5 y (Perimeter =) $6x + 8.5y$ or $6x + 17y/2$ ISW	B1 B1 B1 6	CAO. Must be simplified Accept $\frac{1}{2}(12x + 17y)$ Answers of $4x + 5.5y + 2x + 3y$ imply B1, B1, B0
15. b = 45(°) c = 180(°)	B1 B1 2	
16(a) HK = HL + LK (= $5x + 6y + 3x - 6y$) = $8x (+0y)$ (b)(i) LN = $3x - 6y + 18x - 36y$ (= $21x - 42y$) k = 7 (ii) Collinear (or lie along the same straight line)	M1 A1 M1 A1 B1 5	May be embedded. Award M1, A1 for sight of k=7 Do not accept parallel as a full description
17. Area of the square base = $119.8 - 4 \times 23.6$ = $25.4(\text{cm}^2)$ (Volume pyramid) $76.4 = \frac{1}{3} \times 25.4 \times \text{height}$ height = 9.02... cm (Volume cone) $44.4 = \frac{1}{3} \times \pi \times r^2 \times \text{height}$ $r^2 = 44.4 / (\frac{1}{3} \times \pi \times \text{height})$ $r^2 = (44.4 \times \frac{1}{3} \times 25.4) / (76.4 \times \frac{1}{3} \times \pi)$ $r^2 = 4.69... \text{ to } 4.701...$ (radius) 2.17 or 2.2 (cm)	M1 A1 m1 A1* M1* M1 A1 A1 8	FT their area of square base Note $\sqrt{25.4} = 5.0398... \times 5.0398...$ Depends on all previous method marks, FT their height FT equivalent difficulty, isolating r^2 CAO. OR $r^2 = 4.7$, or an appropriate unrounded r, r = 2.1681875... to 2.17 CAO. Appropriate degree of accuracy required Alternative for A1*, M1* Equating heights, $76.4 / (\frac{1}{3} \times 25.4) = 44.4 / (\frac{1}{3} \times \pi \times r^2)$ For information: Common height = 9.02(cm) Height of a triangular face = 9.37(cm)