

METHODS UNIT 2

HIGHER TIER

Methods Unit 2 Higher Tier January 2015	Mark	Comment
1.(a) $100 \times 249.6/960$ 26(%) (b) 0.061 or 6.1×10^{-2} (c) $9.6 - \frac{5 \times 88}{16}$ or $9.6 - 27.5$ - 17.9 (d) 0.042	M1 A1 B1 M1 A1 B3 8	Not for reversed unless answer is correct showing intention. <i>If no marks award SC1 for an answer of 17.9</i> B2 for sight of 0.042151... rounded or truncated, OR B1 for sight of (1/23.724....
2. Examples: (a) $(8 + 4) \times 5$ or $7 \times 8 + 4$ or $5 \times 8 + 24 - 4$ (=60) (b) $24 \div 4 - (8 + 5)$ or $2 - (5 + 4)$ or $(5 + 2) \div 7 - 8$ (= -7) (c) $7 \times (5 - 2)$ or $7 \times (8 - 5)$ or $24 + 2 - 5$ (= 21)	 B1 B1 B1 3	Accept equivalent correct responses using ONLY the cards given, not repeats within a single calculation Brackets must be used correctly <i>Accept use of brackets for multiplication e.g. 2(24) (=48)</i> Accept use of the – sign to create negative numbers e.g. -24 $\div$ 2 + 5 or 24 $\div$ -2 + 5
3.(a) ... $\times$... $\times$ 11 = 385 or $385 \div 11$ Attempt to find two whole numbers to multiply to 35 7(cm) and 5(cm) OR 35(cm) and 1(cm) Look for spelling clarity of text explanations, the use of notation and units QWC2: Candidates will be expected to present work clearly, with words explaining start, 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 start, process or steps OR make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer (b) $\frac{1}{2} (4.5 + 8.8) \times 1.9$ 12.6(35) cm^2	S1 M1 A1 QWC 2 M1 A1 U1 8	Idea towards area of the base Correct answers awarded all 3 marks. 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. Independent mark
4. Area smaller circle = $\pi \times 6.2^2$ Process to find part shaded, e.g. $\times 5 \div 4$ or $\times 9 \div 4$ to find area of larger circle (and subtract area of the smaller circle) Area shaded = $\pi \times 6.2^2 \times 5 \div 4$ or $\pi \times 6.2^2 \times 9 \div 4 - \pi \times 6.2^2$ Area shaded = 151 (cm^2)	M1 B1 m1 A2 5	(271.71... - 120.76...) A1 for answers between 150.87... to 151.014... <i>If M1 only, then also award SC1 for 121</i>

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5.(a) Indication of: <table><tr><td>C</td><td>1.23×600</td></tr><tr><td>K</td><td>1/6 × 400</td></tr><tr><td>D</td><td>2/5 × 500</td></tr><tr><td>A</td><td>1²/5 × 700</td></tr></table> (b) (x) × 1.2(0) or equivalent, where x ≠ 0 (x × 1.2(0)) × 0.8(0) or equivalent, where x ≠ 0 x×1.2(0)×0.8(0) correctly evaluated	C	1.23×600	K	1/6 × 400	D	2/5 × 500	A	1 ² /5 × 700	B3 M1 M1 A1 6	All 4 correct calculations, or B2 for any 3 correct, or B1 for any 1 or 2 correct Need not be shown as a measure with units, ignore units Accept algebraic working throughout FT their value of (x × 1.2(0)) provided >x Accept sight of ×1.2 for M1 and ×0.8 for M1, or sight of ×0.96 for M2 x × 0.96 correctly evaluated Accept a conclusion that less than the original because decrease amount > increase amount, provided both amounts have been correctly evaluated.
C	1.23×600									
K	1/6 × 400									
D	2/5 × 500									
A	1 ² /5 × 700									
6. (a) (x =) 4 (b) 12x – 27 = 33 OR 4x – 9 = 33/3 12x = 60 OR 4x = 20 x = 5 (c) x + 17 = 5 × 3 x = -2 (d) x < 349/66 or x < 5.2878.... or x < 5 ^{19/66} Answer of 5 (e) 5x < 22 + 188 x < 42	B1 B1 B1 B1 M1 A1 M1 A1 M1 A1 10	Accept embedded answers in (a) , (b) & (c) FT until 2 nd error Or x/3 = 5 - 17/3 An answer of 5 implies ‘<’ applied, so M1, A1 No marks for ‘=’ unless final replaced to give x<42 then award M1, A1. An answer of x<210/5 gets M1, A0 CAO Mark final answer If no marks award SC1 for 5x<166 (x<166/5) with an answer x<33.2, or for 5x < 200 with an answer x < 40								
7. (p ² =) 2.7 ² + 4.1 ² p ² = 24.1 or p = √24.1 (q ² =) 14.6 ² – 6.2 ² or 14.6 ² = q ² + 6.2 ² q ² = 174.72 or q= √174.72 (p =) 4.9(09175...cm) AND (q =) 13.2(18... cm)	M1 A1 M1 A1 A1 5	Correct statement Power 2 or intention to take square root must be shown Correct statement Power 2 or intention to take square root must be shown Accept rounded or truncated from correct working Alternative method using trigonometry: M1 complete method to obtain an expression involving p e.g. angle = tan ⁻¹ (2.7/4.1) AND sin(angle) = 2.7/p A1 expression with p as subject: e. g. p = 2.7/sin(angle) M1 complete method to obtain expression involving q, e.g. angle = sin ⁻¹ (6.2/14.6) AND cos(angle) = q/14.6 A1 expression with q as subject: e.g. q = 14.6cos(angle)								
8.(a) Correct reflection (b) Correct rotation (c) 0, 0 -½ or -0.5 or ‘negative half’ or equivalent	B2 B2 B1 B2 7	B1 for reflection in the y-axis OR B1 for 4 of the vertices reflected correctly B1 for clockwise 90° rotation about (1, -1) OR B1 for anticlockwise 90° rotation about (-1, 1) B1 for sight of ½ or 0.5 or half (including +½)								

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9.(a) $(b =) 3/24 (=1/8)$ $(a =) 48 / \frac{1}{8}$ or $(a =) 48 \times 8/(1)$ $(a =) 384$ (b) (Scale factor =) $4/0.8 (=5)$ OR $0.8/4 (=0.2)$ OR $y = kx$ with $0.8 = k \times 4$ or $x = ky$ with $4 = k \times 0.8$ OR $\frac{x}{4} = \frac{6}{0.8}$ OR $\frac{x}{6} = \frac{4}{0.8}$ $(x =) 6 \times (4/0.8)$ OR $6 / (0.8 \div 4)$ (6×5) $(6 / 0.2)$ $= 30$	M1 M1 A1 M1 M1 A1 6	$(a =) 48 / \frac{1}{24}$ gains M2 FT 'their calculated b' CAO Allow M1 for correct substitution for their SF in their proportion equation, or for a reversed substitution in their proportion equation correctly evaluated CAO A0 if left as 30 proportional to 6
10.(a) $5.4(4) \times 10^8$ (b) 2×10^{18} (c) $1000 \times 6\,000\,000$ or $6\,000\,000\,000$ or $1000 \times 6 \times 10^6$ 6×10^9	B1 B1 M1 A1 4	
11. Correct substitution into the quadratic formula $x = (-5 \pm \sqrt{5^2 - 4 \times 1 \times 2}) / 2 \times 1$ $x = (-5 \pm \sqrt{17})/2$ $x = -0.44$ with $x = -4.56$	M1 A1 A1 3	Allow 1 slip in substitution OR sight of 0.43(84...) with -4.5(615...) <i>Alternative using completing the square:</i> M1 for $x + \frac{5}{2} = \pm \sqrt{\frac{25}{4} - 2}$ A1 for $x = -\frac{5}{2} \pm \sqrt{\frac{17}{4}}$ Must be to 2 decimal places Award all 3 marks for correct unsupported answers.
12. Label axes 'length (of tile in cm)' and 'width (of tile in cm)' Both scales uniform from 0 to 20 inclusive Sight of any two points correct, in list or plotted Straight line drawn from (0,20) to (20,0) exclusive	B1 B1 M1 A1 4	Either order. Accept l and w. Allow (0,20) and (20,0) Accept including (0,20) and (20,0) Allow if the line touches the axes, but intention clear to end at the axes (allow $\pm 2\text{mm}$). However, A0 if this line extends beyond an axis.
13.(a) $x/8.32 = 3.6/5.76$ or equivalent or sight of scale factor 1.6 or 0.625 if used appropriately $(x =) 5.2 \text{ (cm)}$ (b) Sight of 1.6^2 or 0.625^2 or equivalent (Area larger shape =) $1.6^2 \times 13.6$ or $13.6 \div 0.625^2$ $34.8(16) \text{ (cm}^2\text{)}$	M1 A1 B1 M1 A1 5	FT their scale factor from (a) provided it was >1 and <2 (or its reciprocal provided >0.5 and <1) Accept an answer of $35 \text{ (cm}^2\text{)}$ from correct working only.
14.(a) $MN = -OM + ON (= -(2a+3b) + (5a + 7b))$ $= 3a + 4b$ (b) Sight of $-\frac{1}{2}(8a-2b)$ or $\frac{1}{2}(8a-2b)$ $RN = -\frac{1}{2}OP + ON (= -\frac{1}{2}(8a-2b) + (5a + 7b))$ $= a + 8b$	M1 A1 B1 M1 A1 5	Accept <u>intention</u> of brackets CAO. Must be simplified form May be simplified at a later stage <u>Intention</u> of brackets Award SC1 for $-4a - b + 5a + 7b$ if B1 not previously awarded. CAO. Must be simplified form

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15. Strategy: attempt to calculate BD, then CD and then attempt $\frac{1}{2}ab\sin C$ $BD^2 = 6.2^2 + 5.8^2 - 2 \times 6.2 \times 5.8 \times \cos 78^\circ$ $BD^2 = 57.1269912\dots$ or $BD = \sqrt{57.12\dots} (=7.558\dots\text{cm})$ $DC = \sin 65^\circ \times BD / \sin 85^\circ$ $DC = 6.876\dots(\text{cm})$ $\text{Area DEC} = \frac{1}{2} \times 3.7 \times DC \times \sin 59^\circ$ $10.9(\dots\text{cm}^2)$	S1 M1 A1 M2 A1 M1 A1 8	 Correct substitution Accept rounded or truncated M1 for correct use of sine rule with DC implicit Accept rounded or truncated FT correct evaluation with their BD provided all previous M marks awarded FT correct evaluation with their DC provided all previous M marks awarded and without PA Penalise (PA) premature approximation only by not awarding this final A mark
16.(a) $\frac{1}{2}(x+3)(y+6)$ (= 28.875) $xy + 3y + 6x + 18 = 2 \times 28.875$ OR $\frac{1}{2}xy + 1.5y + 3x + 9 = 28.875$ $xy + 3y + 6x = 39.75$ (b) $y + x + 3 + y + x + 3 = 20$ or $y + x + 3 = 10$ or $2y + 2(x+3) = 20$ or equivalent Method to solve, e.g. appropriate substitution of either $x = 7 - y$ or $y = 7 - x$ into $xy + 3y + 6x = 39.75$ $x^2 - 10x + 18.75 = 0$ or $y^2 - 4y - 2.25 = 0$ $(x - 2.5)(x - 7.5) = 0$ or $(y - 4.5)(y + 0.5) = 0$ or $(2x - 5)(2x - 15) = 0$ or $(2y - 9)(2y + 1) = 0$ or equivalent $x = 2.5(\text{cm})$ AND $y = 4.5(\text{cm})$ Dimensions of the rectangle are $(y=) 4.5(\text{cm})$ AND $(x+3 =) 5.5(\text{cm})$	B1 M1 A1 B1 M1 A1 A1 A1 B1 9	 Intention of brackets must be shown in subsequent working Must be convincing from correct working Intention of brackets may be shown in subsequent working Accept sight of unsimplified substitutions, intention clear. For the intention of substitution not the accuracy of the transformed equation, so FT $x = \text{'their } \pm 7 \pm y \text{'}$ or $y = \text{'their } \pm 7 \pm x \text{'}$ and other similar substitutions following B0, for M1 and possible final B1 only. OR $-x^2 + 10x - 18.75 = 0$ or $-y^2 + 4y + 2.25 = 0$ OR $x = (10 \pm \sqrt{25})/2$ or $y = (4 \pm \sqrt{25})/2$ Ignore inclusion of $x = 7.5$ or $y = -0.5$ A0 B0 if the only solutions given do not satisfy $-3 < x < 7$ and $0 < y < 10$ Special case: Area of rectangle = 20 B0 Eliminating y (leading to $6x = 19.75$) SC M1 $x = 3.2(9166\dots)$ AND $y = 3.1(788\dots)$ truncated or rounded A0 A0 SC A1 Only depends on the award of M1 With no extra spurious dimensions
17.(a) Idea of right angled triangle shown or used with height b, base a $\cos \theta = a/(1)$ $\tan \theta = b/a$ $\sin \theta = b/(1)$	M1 A1 A1 A1 4	 Any correct answer implies M1 OR $a / \sqrt{(a^2 + b^2)}$ OR $b / \sqrt{(a^2 + b^2)}$ Penalise -1 once only for consistent use of values other than a and b providing the hypotenuse is still 1