



**General Certificate of Secondary Education
June 2012**

Mathematics

43603H

Higher

Unit 3

Final

Mark Scheme

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The following abbreviations are used on the mark scheme:

M	Method marks awarded for a correct method.
M dep	A method mark which is dependent on a previous method mark being awarded.
A	Accuracy marks awarded when following on from a correct method. It is not necessary always to see the method. This can be implied.
B	Marks awarded independent of method.
Q	Marks awarded for Quality of Written Communication
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special Case. Marks awarded for a common misinterpretation which has some mathematical worth.
oe	Or equivalent.
[<i>a</i>, <i>b</i>]	Accept values between <i>a</i> and <i>b</i> inclusive.

UNIT 3

HIGHER TIER

43603H

1	$2x + 3x + 4x = 180$	M1	$180 \div (2 + 3 + 4)$ or 180 seen and one trial worked out correctly eg $2 \times 5 + 3 \times 5 + 4 \times 5 = 45$
	$9x = 180$ or $x = 20$	M1 dep	$180 \div 9 (\times 2)$ or a different trial worked out correctly
	40	A1	
	Steps in setting up and solving equation clearly shown	Q1	Strand (ii) Dependent on both method marks scored from an algebraic method

2a	-4, -3 and 5 All three in correct position in table	B2 ft	B1 one correct in correct position
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2b	Their seven points plotted	B2 ft	$\pm \frac{1}{2}$ square B1 for 5 or 6 points correct
	Six or seven points joined by smooth curve	B1 ft	Must be a U shape

2c	Line drawn at $y = 2$	B1	
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2d	$(x =) -2.45$	B1 ft	ft their graphs $\pm \frac{1}{2}$ square Accept $[-2.6, -2.3]$ Accept $-\sqrt{6}$
	$(x =) 2.45$	B1 ft	ft their graphs $\pm \frac{1}{2}$ square Accept $[2.3, 2.6]$ Accept $\sqrt{6}$ Note: if coordinates are given mark the x coordinates only Award B1 B0 if both x coordinates are correct.

3	$\frac{55}{100} \times 3.8 (= 2.09 \text{ or } 2.1)$	M1	oe
	$6 \times 5 \div \text{their } 2.09 (= 14.3\dots)$	M1 dep	Two of: $14 \times 2.09 = 29.26$ $15 \times 2.09 = 31.35$ 30
	14	A1 ft	Must be rounded down from their 14.3(...) ft only if 2 nd method mark not awarded SC1 for rounding down if no method marks have been awarded

4	12×4	M1	oe Correct enlargement SF2 drawn
	48	A1	
	cm ²	B1	

5	Any indication that all sides equal 5.2	M1	7×5.2 or 9×5.2 or 10×5.2 5.2 labelled on one sloped side of shape
	8×5.2	M1 dep	
	41.6	A1	

6a	$55 + 180$	M1	
	235	A1	

6b	Valid reason	B1	eg $180 + 180 = 360$ (so cannot be greater than 180) $190 + 180 = 370$ (impossible) max possible 360 $180 \times 2 = 360$
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6c	$342 - 180$	M1	$180 - 18$ or $360 - 342 (= 18)$ and $180 - \text{their } 18$
	162	A1	

7	$(AB^2 =) 9^2 + 7^2 (= 130)$	M1	$A = \tan^{-1} (7/9)$ or $B = \tan^{-1} (9/7)$
	$\sqrt{9^2 + 7^2}$ or $\sqrt{\text{their } 130}$	M1 dep	$\frac{7}{\sin 37.87}$ or $\frac{9}{\cos 37.87}$ oe
	11.4(...)	A1	

8	$w + 40 = 72$	M1	May be on diagram
	$(w =) 32$ seen	A1	
	$2w = 64$ or $2w = 2 \times \text{their } 32$ or third angle = 72	M1	or $2w + t + 72 = 180$ oe
	$180 - 72 - 64$ or $180 - 72 - \text{their } 32 \times 2$	M1	oe $108 - 64$
	44	A1	

9	Vertices at (0, 1) (2, 0) (0, -2)	B2	B1 for any 90° rotation
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10	$\pi \times 3^2 (\div 2) (= 14.137)$	M1	[28.2, 28.4], [14.1, 14.2]
	$15 \times 10 - \text{their } \pi \times 3^2 \div 2$ or $150 - \text{their } 14.137$	M1 dep	[135.8, 135.9]
	their $135.86 \div 0.3$	M1	Their area $\div 0.3$ [452, 453]
	452 or allow 453	A1	Must be a whole number SC3 for [311, 312] from use of $r = 6$
	Correct method clearly shown	Q1	Strand (iii) M3 awarded

11a	$\frac{x}{y} = \frac{5}{2}$ or $2x = 5y$	B1	oe Need not be in simplest form eg Allow $x = 2y + \frac{y}{2}$ $\frac{x}{2.5} = y$
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11b	$x + x + y + y$ or $2x + 2y$ or $2(x + y)$	B1	oe Any order
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11c	$x + x + \text{their } \frac{2}{5}x + \text{their } \frac{2}{5}x$	M1	oe
	$\frac{14}{5}x$ or $2.8x$	A1	oe

12	Identification of cosine	M1	$\frac{\sin P}{12} = \frac{\sin 90}{15}$	$\sin Q = \frac{9}{15}$
	$\cos P = \frac{9}{15}$	M1 dep	$\sin P = \frac{12}{15}(\sin 90)$ oe	$90 - \sin^{-1}\left(\frac{9}{15}\right)$ oe
	53(.1...)	A1		

13	$5x + 1 = 2x + 3 + 7$	B1	oe
	$5x - 2x = 3 + 7 - 1$	M1	oe Collecting terms from their linear equation using $5x + 1$ and $2x + 3$
	$3x = 9$ or $x = 3$	A1 ft	
	$(5 \times \text{their } 3 + 1) \times (2 \times \text{their } 3 + 3)$ $\times \text{their } 3$ their $16 \times \text{their } 9 \times \text{their } 3$	M1	Their 3 must be positive to ft Using $x(10x^2 + 2x + 15x + 3)$ i.e. their $(3 \times (10 \times 3^2 + 17 \times 3 + 3))$ or their 3×144
	432	A1	

14a	$180 - 118$ or 62 seen	M1	May be on diagram 118×2
	their 62×2	M1 dep	$360 - \text{their } (118 \times 2)$
	124	A1	May be on diagram

14b	Opposite angles in a cyclic quadrilateral total 180 or exterior angle of cyclic quad = opposite interior angle	B1	Reflex AOD = 236 $236 \div 2 = 118$ oe
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15	$\frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times -10}}{2 \times 3}$	M1	Allow one error
	$\frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times -10}}{2 \times 3}$ or $(-4 \pm \sqrt{136}) \div 6$	M1 dep	Fully correct oe
	$(x =) 1.3$ and -2.6	A1	

16a	$M \propto r^3$ or $M \div r^3 = k$ or $M = r^3 \times k$	M1	Accept any letter for k
	$200 = k \times 5^3$ or $(k =) \frac{200}{5^3}$ or $k = 1.6$	M1 dep	oe
	$8^3 \times \frac{200}{5^3}$	M1	oe $8^3 \times$ their 1.6 or $8^3 \times$ their k
	819.2 or 819	A1	

16b	$3125 = r^3 \times$ their $\frac{200}{5^3}$	M1	Accept $3125 = r^3 \times$ their 1.6
	$\sqrt[3]{\frac{5^3 \times 3125}{200}} (= r)$	M1 dep	Accept $\sqrt[3]{\frac{3125}{\text{their } 1.6}}$ or $\sqrt[3]{1953.125}$
	12.5	A1	

17	60° seen	B1	Could be seen in calculation or on diagram
	$\frac{60}{360} \times 2 \times \pi \times 8$	M1	oe
	8.3(7...)	A1	[8.3, 8.4] Allow $\frac{8}{3}\pi$

18	$\cos 57 = \frac{AD}{9}$ or $\sin 57 = \frac{AB}{9}$ seen	M1	oe Note: $AD = 9\cos 57$ or $\sqrt{9^2 - (9\sin 57)^2}$ or 4.9... $AB = 9\sin 57$ or $\sqrt{9^2 - (9\cos 57)^2}$ or 7.5...
	$\frac{1}{2} \times 9 \cos 57 \times 9 \sin 57$	M1 dep	oe Area of right-angled triangle
	[18.3, 18.8]	A1	
	$\frac{9}{\sin(180 - 82)} \times \sin 39 (= 5.71\dots)$ or $\frac{9}{\sin(180 - 82)} \times \sin 43 (= 6.198\dots)$	M1	Calculating length of CD or equiv calc using sine rule for BC
	$\frac{1}{2} \times 9 \times \text{their } 5.7 \times \sin 43$ or $\frac{1}{2} \times 9 \times \text{their } 6.198 \times \sin 39$ or $\frac{1}{2} \times \text{their } 5.7 \times \text{their } 6.198 \times \sin 98$	M1 dep	
	[17.4, 17.6]	A1	
	[35.7, 36.4]	A1	Award 7 marks if all 3 answers are in range unless there is clear evidence of incorrect working

19a	$\frac{3}{2} \mathbf{s}$	B1	Accept $1\frac{1}{2} \mathbf{s}$ or $1.5\mathbf{s}$ or $3\mathbf{s} \div 2$ or $\mathbf{s} + 0.5\mathbf{s}$ or $\mathbf{s} + \frac{1}{2} \mathbf{s}$
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19b	$-\mathbf{s} + \mathbf{t} + \text{their } 1.5\mathbf{s}$	M1	
	$\mathbf{t} + 0.5\mathbf{s}$	A1 ft	oe ft their part (a)