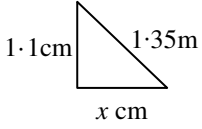


Qu	Give one mark for each •	Illustrations for awarding mark
1	ans: $3y - 2x = -24$ [or equiv.] 3 marks <ul style="list-style-type: none"> <li>•<sup>1</sup> subs into equation</li> <li>•<sup>2</sup> starts to rearrange / subs to find <math>c</math></li> <li>•<sup>3</sup> answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>y + 6 = \frac{2}{3}(x - 3)</math> or <math>y = \frac{2}{3}x + c</math></li> <li>•<sup>2</sup> <math>3y + 18 = 2x - 6</math> or <math>-6 = \frac{2}{3}(3) + c</math></li> <li>•<sup>3</sup> <math>3y - 2x = -24</math> or <math>y = \frac{2}{3}x - 8</math></li> </ul>
2	ans: $a = -\frac{2}{3}$ 2 marks <ul style="list-style-type: none"> <li>•<sup>1</sup> knows how to find gradient</li> <li>•<sup>2</sup> simplifies</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>m = \frac{10 - 6}{-3 - 3}</math></li> <li>•<sup>2</sup> <math>\frac{4}{-6} = -\frac{2}{3}</math></li> </ul>
3a	ans: $x^{\frac{5}{2}} + x^{-\frac{9}{2}}$ 2 marks <ul style="list-style-type: none"> <li>•<sup>1</sup> first term correct</li> <li>•<sup>2</sup> second term correct</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>x^{\frac{5}{2}}</math>..... [or equivalent]</li> <li>•<sup>2</sup> ..... + <math>x^{-\frac{9}{2}}</math> [ “ ” ]</li> </ul>
b	ans: 343 2 marks <ul style="list-style-type: none"> <li>•<sup>1</sup> knows meaning of fractional index</li> <li>•<sup>2</sup> processes answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(\sqrt{49})^3</math></li> <li>•<sup>2</sup> 343</li> </ul>
4	ans: $V = \frac{\pi r^2 h}{3}$ 3 marks <ul style="list-style-type: none"> <li>•<sup>1</sup> removes square root</li> <li>•<sup>2</sup> removes fraction</li> <li>•<sup>3</sup> answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>r^2 = \frac{3V}{\pi h}</math></li> <li>•<sup>2</sup> <math>3V = \pi r^2 h</math></li> <li>•<sup>3</sup> <math>V = \frac{\pi r^2 h}{3}</math></li> </ul>
5a	ans: $3\sqrt{2}$ 3 marks <ul style="list-style-type: none"> <li>•<sup>1</sup> simplifies <math>\sqrt{50}</math></li> <li>•<sup>2</sup> simplifies <math>\sqrt{8}</math></li> <li>•<sup>3</sup> answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>5\sqrt{2}</math></li> <li>•<sup>2</sup> <math>2\sqrt{2}</math></li> <li>•<sup>3</sup> <math>3\sqrt{2}</math></li> </ul>
b	ans: $\frac{\sqrt{2}}{2}$ 3 marks <ul style="list-style-type: none"> <li>•<sup>1</sup> simplifies <math>\sqrt{18}</math></li> <li>•<sup>2</sup> knows to multiply by <math>\frac{\sqrt{2}}{\sqrt{2}}</math> or <math>\frac{\sqrt{18}}{\sqrt{18}}</math></li> <li>•<sup>3</sup> final answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{3}{3\sqrt{2}}</math></li> <li>•<sup>2</sup> <math>\frac{3}{3\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}</math> or <math>\frac{3}{\sqrt{18}} \times \frac{\sqrt{18}}{\sqrt{18}}</math></li> <li>•<sup>3</sup> <math>\frac{3\sqrt{2}}{6} = \frac{\sqrt{2}}{2}</math></li> </ul>

Qu	Give one mark for each •	Illustrations for awarding mark
6a	ans: $y = (x - 3)^2 + 5$ <b>2 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> subs correctly for <math>a</math></li> <li>•<sup>2</sup> subs correctly for <math>b</math></li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>y = (x - 3)^2 \dots</math></li> <li>•<sup>2</sup> <math>y = (x - 3)^2 + 5</math></li> </ul>
b	ans: <b>(0, 14)</b> <b>2 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> knows to sub <math>x = 0</math></li> <li>•<sup>2</sup> states point</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>y = (0 - 3)^2 + 5</math></li> <li>•<sup>2</sup> (0, 14) [must be written as coordinates]</li> </ul>
c	ans: $x = 3$ <b>1 mark</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>x = 3</math></li> </ul>
7	ans: $x = 20$ <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> subtracts fractions</li> <li>•<sup>2</sup> multiplies through by 20</li> <li>•<sup>3</sup> solves for <math>x</math></li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{3x}{20} = 3</math></li> <li>•<sup>2</sup> <math>3x = 60</math></li> <li>•<sup>3</sup> <math>x = 20</math></li> </ul>
8	ans: <b>36.84cm</b> <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> subs correct values into formula</li> <li>•<sup>2</sup> starts to evaluate</li> <li>•<sup>3</sup> completes evaluation and adds radii</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{120}{360} \times 3 \cdot 14 \times 18</math></li> <li>•<sup>2</sup> <math>\frac{1}{3} \times 3 \cdot 14 \times 18 = 3 \cdot 14 \times 6</math></li> <li>•<sup>3</sup> <math>18 \cdot 84 + 18 = 36 \cdot 84 \text{ cm}</math> [units required]</li> </ul>
9	ans: $b = \pm 8$ <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> knows condition for equal roots</li> <li>•<sup>2</sup> substitutes values</li> <li>•<sup>3</sup> solves</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>b^2 - 4ac = 0</math> for equal roots</li> <li>•<sup>2</sup> <math>b^2 - 4 \times 2 \times 8 = 0</math></li> <li>•<sup>3</sup> <math>b^2 = 64; b = \pm 8</math></li> </ul>
10	ans: $\frac{2x + 33}{(x + 3)(x - 6)}$ <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> correct denominator</li> <li>•<sup>2</sup> correct numerator</li> <li>•<sup>3</sup> simplifies numerator</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(x + 3)(x - 6)</math></li> <li>•<sup>2</sup> <math>5(x + 3) - 3(x - 6)</math></li> <li>•<sup>3</sup> <math>2x + 33</math></li> </ul>
11	ans: <b>sketch graph</b> <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> correct shape</li> <li>•<sup>2</sup> correct amplitude</li> <li>•<sup>3</sup> fully annotated with roots shown</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> two reflected sine waves drawn in <math>360^\circ</math></li> <li>•<sup>2</sup> 3 and <math>-3</math> marked on diagram/axes</li> <li>•<sup>3</sup> <math>0^\circ, 90^\circ, 180^\circ, 270^\circ, 360^\circ</math> marked</li> </ul>
12	ans: $\sin x^\circ$ <b>2 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> replaces <math>1 - \cos^2 x^\circ</math></li> <li>•<sup>2</sup> simplifies</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{\sin^\circ x} (\sin^2 x^\circ)</math></li> <li>•<sup>2</sup> <math>\sin x^\circ</math></li> </ul>
		<b>Total</b> <b>40 marks</b>

Qu	Give one mark for each •	Illustrations for awarding mark
1	ans : $14^\circ$ <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> knows OEF is right and finds OEC</li> <li>•<sup>2</sup> knows OCE = OEC and finds ECF</li> <li>•<sup>3</sup> finds required angle</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> angle OEC = <math>52^\circ</math></li> <li>•<sup>2</sup> angle OCE = <math>52^\circ</math> and angle ECF = <math>128^\circ</math></li> <li>•<sup>3</sup> EFC = <math>180 - (38 + 128) = 14^\circ</math> [stated explicitly]</li> </ul>
2	ans : $(x - 2.5)^2 - 5.25$ <b>2 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> starts process</li> <li>•<sup>2</sup> completes process</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(x - 2.5)^2 \dots\dots</math> [or equivalent]</li> <li>•<sup>2</sup> <math>(x - 2.5)^2 - 6.25 + 1</math></li> </ul>
3	ans: $1.31 \times 10^{10}$ <b>3 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> calculation</li> <li>•<sup>2</sup> answer</li> <li>•<sup>3</sup> answer correctly rounded</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>2.3 \times 10^6 \times 0.65 \times 24 \times 365</math></li> <li>•<sup>2</sup> <math>1.30962 \times 10^{10}</math></li> <li>•<sup>3</sup> <math>1.31 \times 10^{10}</math></li> </ul>
4	ans : $110^\circ$ <b>4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> finds area of circle</li> <li>•<sup>2</sup> equates two fractions</li> <li>•<sup>3</sup> cross multiplies</li> <li>•<sup>4</sup> processes answer</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>A = \pi \times 10^2 = 100\pi</math> [or equivalent]</li> <li>•<sup>2</sup> <math>\frac{x}{360} = \frac{96}{100\pi}</math></li> <li>•<sup>3</sup> <math>x = \frac{96 \times 360}{100\pi}</math></li> <li>•<sup>4</sup> <math>110^\circ</math></li> </ul>
5	ans : <b>0.2, 2.8</b> <b>4 marks</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> knows to use quadratic formula</li> <li>•<sup>2</sup> calculates <math>b^2 - 4ac</math></li> <li>•<sup>3</sup> processes roots</li> <li>•<sup>4</sup> states both roots correctly rounded</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{9 \pm \sqrt{(-9)^2 - 4 \times 3 \times 2}}{2 \times 3}</math></li> <li>•<sup>2</sup> 57</li> <li>•<sup>3</sup> <math>\frac{9 \pm \sqrt{57}}{6} = 2.7583\dots; 0.2416\dots</math></li> <li>•<sup>4</sup> 2.8, 0.2 [unrounded values must appear first]</li> </ul>

Qu	Give one mark for each •	Illustrations for awarding mark
6a	ans: 3·5 <span style="float: right;">2 marks</span>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>f(30) = 5 \sin 30^\circ + 1</math></li> <li>•<sup>2</sup> 3·5</li> </ul>
	<ul style="list-style-type: none"> <li>•<sup>1</sup> substitutes value</li> <li>•<sup>2</sup> evaluates</li> </ul>	
b	ans: 233·1°, 306·9° <span style="float: right;">4 marks</span>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>5 \sin x^\circ + 1 = -3</math></li> <li>•<sup>2</sup> <math>\sin x^\circ = -\frac{4}{5}</math></li> <li>•<sup>3</sup> 233·1°</li> <li>•<sup>4</sup> 306·9°</li> </ul>
	<ul style="list-style-type: none"> <li>•<sup>1</sup> equates function to -3</li> <li>•<sup>2</sup> finds <math>\sin x^\circ</math></li> <li>•<sup>3</sup> finds one solution</li> <li>•<sup>4</sup> finds second solution</li> </ul>	
7	ans: (-2, -4) <span style="float: right;">5 marks</span>	<ul style="list-style-type: none"> <li>•<sup>1</sup> evidence</li> <li>•<sup>2</sup> <math>2x + 3y = -16; -9x + 3y = 6</math></li> <li>•<sup>3</sup> <math>x = -2</math></li> <li>•<sup>4</sup> <math>y = -4</math></li> <li>•<sup>5</sup> (-2, -4)</li> </ul>
8	ans: $12x^3 - 23x^2 + 13x - 2$ <span style="float: right;">3 marks</span>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>12x^3 - 15x^2 + 3x \dots</math></li> <li>•<sup>2</sup> <math>\dots - 8x^2 + 10x - 2</math></li> <li>•<sup>3</sup> <math>12x^3 - 23x^2 + 13x - 2</math></li> </ul>
9a	ans: 1695·6cm <sup>3</sup> <span style="float: right;">2 marks</span>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>V_{\text{cone}} = \frac{1}{3} \times \pi \times 9^2 \times 20</math></li> <li>•<sup>2</sup> 1696·5cm<sup>3</sup></li> </ul>
	<ul style="list-style-type: none"> <li>•<sup>1</sup> subs values into correct formula</li> <li>•<sup>2</sup> finds volume of cone</li> </ul>	
b	ans: 9.32cm <span style="float: right;">3 marks</span>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>1695 \cdot 6 = \frac{1}{2} \times \frac{4}{3} \times \pi \times r^3</math> [or equivalent]</li> <li>•<sup>2</sup> <math>r = \sqrt[3]{\frac{1696 \cdot 5}{\frac{2}{3} \times 3.14}}</math></li> <li>•<sup>3</sup> 9.32 cm</li> </ul>
	<ul style="list-style-type: none"> <li>•<sup>1</sup> equates above to volume of hemisphere</li> <li>•<sup>2</sup> starts to find <math>r</math></li> <li>•<sup>3</sup> completes evaluation</li> </ul>	
10	ans : A = -5; B = 2; C(-1·5, -12·25) <span style="float: right;">5 marks</span>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>x^2 + 3x - 10 = 0</math></li> <li>•<sup>2</sup> <math>(x + 5)(x - 2) = 0; x = -5; 2</math></li> <li>•<sup>3</sup> A = -5, B = 2 or A(-5, 0), B(2, 0)</li> <li>•<sup>4</sup> <math>(-1 \cdot 5)^2 + 3(-1 \cdot 5) - 10 = -12 \cdot 25</math></li> <li>•<sup>5</sup> C(-1·5, -12·25) [or equivalent]</li> </ul>
	<ul style="list-style-type: none"> <li>•<sup>1</sup> equates to 0</li> <li>•<sup>2</sup> factorises and solves</li> <li>•<sup>3</sup> states numbers at A and B</li> <li>•<sup>4</sup> subs -1·5 into equation and evaluates</li> <li>•<sup>5</sup> states coordinates of C</li> </ul>	

Qu	Give one mark for each •	Illustrations for awarding mark
11	<b>ans: 324cm<sup>2</sup></b> <b>3 marks</b>  • <sup>1</sup> finds linear scale factor for enlargement • <sup>2</sup> finds area scale factor • <sup>3</sup> multiplies by ASF to answer	• <sup>1</sup> $\frac{12}{8} = \frac{3}{2}$ or $\frac{12}{8} = 1.5$ • <sup>2</sup> $\left(\frac{3}{2}\right)^2$ • <sup>3</sup> $\left(\frac{3}{2}\right)^2 \times 144 = 324 \text{ cm}^2$
12	<b>ans: <math>\frac{4x}{y}</math></b> <b>3 marks</b>  • <sup>1</sup> substitutes into area of triangle • <sup>2</sup> rearranges • <sup>3</sup> simplifies answer	• <sup>1</sup> $6y = \frac{1}{2} \times \frac{3y^2}{x} \times h$ • <sup>2</sup> $h = 6y \times \frac{2x}{3y^2}$ • <sup>3</sup> $\frac{4x}{y}$
13	<b>ans : 1.57m</b> <b>4 marks</b>  • <sup>1</sup> assembles facts in right triangle • <sup>2</sup> knows to use Pythagoras' • <sup>3</sup> uses Pythagoras' correctly • <sup>4</sup> finds width	• <sup>1</sup>  • <sup>2</sup> $x^2 = 1.35^2 - 1.1^2$ • <sup>3</sup> $x = 0.78$ • <sup>4</sup> $w = 1.57 \text{ cm}$
		<b>Total 50 marks</b>