

Question number	Scheme		Marks
6 (a)	Method 1 $\left(\frac{a+\sqrt{5}}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2}\right) = \frac{\sqrt{5}a+2a+5+2\sqrt{5}}{(1)}$ $= [2a+5+(2+a)\sqrt{5}]$ $a = 3$	Method 2 $((11+5\sqrt{5})(\sqrt{5}-2))$ $11\sqrt{5}-22+25-10\sqrt{5}$ $a = 3$	M1 A1 [2]
(b)	<p>(angle $PQR =$) 45°</p> $\frac{x+3}{\sin 45^\circ} = \frac{x}{\sin 30^\circ} \Rightarrow \frac{x+3}{\frac{\sqrt{2}}{2}} = \frac{x}{\frac{1}{2}} \Rightarrow x+3 = \sqrt{2}x$ $\Rightarrow 3 = x(\sqrt{2}-1) \Rightarrow x = \frac{3}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1} \Rightarrow x = \dots$ $x = 3+3\sqrt{2}$ <p>OR</p> $\frac{x+3}{\sin 45^\circ} = \frac{x}{\sin 30^\circ} \Rightarrow \frac{x+3}{\frac{\sqrt{2}}{2}} = \frac{x}{\frac{1}{2}} \Rightarrow \sqrt{2}x+3\sqrt{2} = 2x$ $x(2-\sqrt{2}) = 3\sqrt{2} \Rightarrow x = \frac{3\sqrt{2}}{2-\sqrt{2}} \times \frac{2+\sqrt{2}}{2+\sqrt{2}} \Rightarrow x =$ $x = 3+3\sqrt{2}$		M1 M1 A1* cso [3] [M1 M1 A1]
(c)	$\frac{1}{2} \times (3+3\sqrt{2}) \times (6+3\sqrt{2}) \times \sin(180-30-45)^\circ$ $\frac{1}{2} \times (3+3\sqrt{2}) \times (6+3\sqrt{2}) \times \left(\frac{\sqrt{6}+\sqrt{2}}{4}\right)$ $\frac{9}{8}(4\sqrt{6}+4\sqrt{2}+3\sqrt{12}+6) \text{ or } \frac{1}{8}(36\sqrt{6}+36\sqrt{2}+54\sqrt{12}+54)$ <p>oe with two out of four terms correct.</p> $\frac{9}{8}(4\sqrt{6}+4\sqrt{2}+6\sqrt{3}+6)$		M1 dM1 A1 cao [3]
Total 8 marks			

Part	Mark	Additional Guidance
Throughout this question allow missing degree signs.		
(a)	M1	Any three out of four terms correct in the numerator of method 1 or in the expansion of method 2. If they use method 1 we must see the expansion come from multiplying numerator and denominator by $\sqrt{5} + 2$
	A1	Cao If the answer $a = 3$ is stated without sufficient working seen award M0A0.
(b)	M1	For using a correct sine rule, either way around, using the exact values of $\sin 45$ and $\sin 30$, and attempting to simplify to $kx + 3 = \sqrt{2}x$ where k is a constant. Allow $\frac{kx}{2} + \frac{3}{2} = \frac{\sqrt{2}x}{2}$ for this mark
	M1	For factorising their $x + 3 = \sqrt{2}x$ [which must have come from using sine rule] to obtain $3 = x(\sqrt{2} - k)$, rearranging and multiplying numerator and denominator by $\sqrt{2} + k$ This is a given answer – this step must be seen explicitly
	A1*	cso, no errors or emissions.
(c)	M1	Follow general guidance, if area formula is quoted, allow one slip in substitution. If formula not quoted, must be a fully correct substitution. For this mark only allow the angle to be $(180 - 30 - 45)^\circ$ If they work in terms of x and obtain $\frac{1}{2} \times x \times (x + 3) \times \sin 105^\circ$ then do not award the first M mark until they have substituted the given value of $3 + 3\sqrt{2}$ for x .
	dM1	Replaces $\sin 105^\circ$ with the given value and attempts to multiply out. The mark can be awarded for any two terms correct, four terms must be present.
	A1cao	Must be in the given form with the terms in any order.