1	$\frac{6-\sqrt{8}}{\sqrt{2}-1}\times\frac{\sqrt{2}+1}{\sqrt{2}+1}$ $\frac{-6\sqrt{2}+6-\sqrt{8}\sqrt{2}-\sqrt{8}}{2-1}$ $=6\sqrt{2}+6-4-2\sqrt{2}$	$2+4\sqrt{2}$	M1 M1 A1	for correct first step eg multiplies numerator and denominator by $\sqrt{2}+1$ condone missing brackets (dep) for expansion of numerator with 4 terms correct with or without signs **or** 3 out of exactly 4 terms correct for $2+4\sqrt{2}$ oe **or** for stating $a=2$ and $b=4$	

2	5	M1 M1 A1	for $\sqrt{40}$ **or** $\sqrt{90}$ **OR** $2\sqrt{2}$ **or** $3\sqrt{2}$ for $2\sqrt{10}$ **or** $3\sqrt{10}$ **or** $\sqrt{4}\times\sqrt{10}$ **or** $\sqrt{9}\times\sqrt{10}$ **or** $\sqrt{4\times10}$ **or** $\sqrt{9\times10}$ **OR** $2\sqrt{2}+3\sqrt{2}$ cao	Answer of $5\sqrt{10}$ from correct working gets M2 A0

3	(a)	explanation	C1	for a correct explanation, eg $\sqrt{3}\times-\sqrt{3}=-3$, not 3	
	(b)	explanation	C1	for correct explanation, eg $\sqrt{12}=2\sqrt{3}$, not $3\sqrt{2}$	

4	fully correct working leading to $16\left(1+\sqrt{2}\right)$	C1 C1 C1	for expanding the numerator, eg $18+2\sqrt{2}\sqrt{18}+2$ or $\sqrt{324}+\sqrt{36}+\sqrt{36}+\sqrt{4}$ (= 32) **or** for simplifying $\sqrt{18}$, eg. $\sqrt{18}=3\sqrt{2}$ or $\sqrt{18}+\sqrt{2}=4\sqrt{2}$ (indep) for method to rationalise the denominator, eg. $\frac{\text{"numerator"}}{\sqrt{8}-2}\times\frac{\sqrt{8}+2}{\sqrt{8}+2}$ for fully correct working leading to $16\left(1+\sqrt{2}\right)$	Expanded terms need not be simplified Accept $a=16$, $b=1$

5	(a)	$3\sqrt{3}$	M1 A1	for working unambiguously with $\sqrt{12}$, eg $\sqrt{4\times3}$ **or** $\sqrt{4}\times\sqrt{3}$ **or** $2\sqrt{3}$ cao	
	(b)	$\frac{\sqrt{3}}{81}$	M1 M1 A1	for simplifying the power eg $(\sqrt{3})^7=27\sqrt{3}$ for method to rationalise the denominator eg multiplying by $\frac{\sqrt{3}}{\sqrt{3}}$ for $\frac{\sqrt{3}}{81}$ **or** equivalent fraction in form $\frac{\sqrt{b}}{c}$, eg $\frac{\sqrt{2187}}{2187}$	May be seen as the first step

6	(a)	$2\sqrt{11}$	M1 A1	for method to multiply numerator and denominator by $\sqrt{11}$ or a multiple of $\sqrt{11}$, eg $\frac{22}{\sqrt{11}}\times\frac{\sqrt{11}}{\sqrt{11}}$ for $2\sqrt{11}$	
	(b)	$\frac{6+\sqrt{3}}{11}$	M1 M1 A1	for method to multiply numerator and denominator by $2\sqrt{3}+1$ or a multiple of $2\sqrt{3}+1$, eg $\frac{\sqrt{3}}{2\sqrt{3}-1}\times\frac{2\sqrt{3}+1}{2\sqrt{3}+1}$ (dep) for $\sqrt{3}\times2\sqrt{3}=6$ or $2\sqrt{3}\times2\sqrt{3}=12$ for $\frac{6+\sqrt{3}}{11}$ (accept $a=6$ and $b=11$)	

7	$1+\frac{\sqrt{5}}{5}$	P1	for writing $\sqrt{180}$ as $6\sqrt{5}$	This process mark can be awarded whenever this is seen, which might be later in the process.
		P1	for process to rationalising the denominator eg $\frac{\sqrt{180}-2\sqrt{5}}{5\sqrt{5}-5}\times\frac{5\sqrt{5}+5}{5\sqrt{5}+5}$ **or** $\frac{4\sqrt{5}}{5\sqrt{5}-5}\times\frac{5\sqrt{5}+5}{5\sqrt{5}+5}$ oe	
		P1	(dep on previous P1) for expanding terms eg $\frac{5\sqrt{5}\sqrt{180}+5\sqrt{180}-50-10\sqrt{5}}{125-25}$ **or** $\frac{100+20\sqrt{5}}{100}$ oe	
		A1	for $1+\frac{\sqrt{5}}{5}$	Accept written as $a = 1$, $b = 5$

8	Result shown	M1	(indep) for writing $\sqrt{12}$ as $2\sqrt{3}$	This mark can be awarded whenever this is seen, which might be later in the process.
		M1	for method to rationalise the denominator eg $\frac{8+\sqrt{12}}{5+\sqrt{3}}\times\frac{5-\sqrt{3}}{5-\sqrt{3}}$ **or** $\frac{8+2\sqrt{3}}{5+\sqrt{3}}\times\frac{5-\sqrt{3}}{5-\sqrt{3}}$ oe	
		M1	(dep on previous M1) for expanding terms, condone one error in numerator or denominator eg $\frac{40-8\sqrt{3}+5\sqrt{12}-\sqrt{12}\sqrt{3}}{25-5\sqrt{3}+5\sqrt{3}-\sqrt{3}\sqrt{3}}$ **or** $\frac{40-8\sqrt{3}+10\sqrt{3}-2\sqrt{3}\sqrt{3}}{25-5\sqrt{3}+5\sqrt{3}-\sqrt{3}\sqrt{3}}$ **or** $\frac{34+2\sqrt{3}}{22}$ oe	
		A1	for a complete chain of reasoning leading to $\frac{17+\sqrt{3}}{11}$	