Question Number	Scheme	Notes	Marks
7(a)	$2x^2-3x+5=0 \Rightarrow \alpha+\beta=\frac{3}{2},\ \alpha\beta=\frac{5}{2}$	Either correct value. Award this mark if the value(s) are only seen embedded in calculations.	**B1**
	$(\alpha+1)^3(\beta+1)^3=(\alpha\beta+\alpha+\beta+1)^3$	States or uses $(\alpha+1)^3(\beta+1)^3=(\alpha\beta+\alpha+\beta+1)^3$	**M1**
	$=\left(\frac{5}{2}+\frac{3}{2}+1\right)^3=5^3=125*$	Achieves result via correct work with substitution seen	**A1***
Alt Working backwards	$2x^2-3x+5=0 \Rightarrow \alpha+\beta=\frac{3}{2},\ \alpha\beta=\frac{5}{2}$	As above	**B1**
	$(\alpha+1)^3(\beta+1)^3=125$ $\Rightarrow(\alpha+1)(\beta+1)=5$ $\alpha\beta+\alpha+\beta+1=5$	Cube roots and expands brackets to give an expression in terms of $\alpha+\beta$ and $\alpha\beta$	**M1**
	$\frac{5}{2}+\frac{3}{2}+1=5$ ✓	Verification that LHS=RHS. Must be some minimal conclusion, e.g. ✓, "shown", "QED", "proved", etc.	**A1***
Alt Changing variable	Let $z=x+1 \Rightarrow x=z-1$	$x=z-1$	**B1**
	$2x^2-3x+5=0$ $\Rightarrow 2(z-1)^2-3(z-1)+5=0$ $\Rightarrow 2z^2-7z+10=0$	Substitutes $x=z-1$ and obtains 3TQ in z	**M1**
	Product of roots $=\frac{10}{2}=5$ $\Rightarrow(\alpha+1)^3(\beta+1)^3\{=5^3\}=125*$	Correct completion	**A1***
Alt Expanding brackets for the last two marks	It is possible (but tricky) to complete this proof by expanding brackets. $(\alpha+1)^3(\beta+1)^3=(\alpha^3+3\alpha^2+3\alpha+1)(\beta^3+3\beta^2+3\beta+1)$ $=(\alpha\beta)^3+(\alpha^3+\beta^3)+3(\alpha\beta)^2(\alpha+\beta)+3\alpha\beta(\alpha^2+\beta^2)+9(\alpha\beta)^2$ $+9\alpha\beta(\alpha+\beta)+9\alpha\beta+3(\alpha^2+\beta^2)+3(\alpha+\beta)+1$ Then using $\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)$ and $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$: $=(\alpha\beta)^3+(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)+3(\alpha\beta)^2(\alpha+\beta)+3\alpha\beta\lfloor(\alpha+\beta)^2-2\alpha\beta\rfloor+9(\alpha\beta)^2$ $+9\alpha\beta(\alpha+\beta)+9\alpha\beta+3\lfloor(\alpha+\beta)^2-2\alpha\beta\rfloor+3(\alpha+\beta)+1$ M1: Reaches an expression they can evaluate, involving terms that they have been given or have evaluated using correct identities. A1*: Substitutes values (e.g. for $\alpha\beta$ and $(\alpha+\beta)$) and reaches 125 with no errors.		
			(3)

(b)	new sum $= \dfrac{(\alpha+1)^3+(\beta+1)^3}{(\alpha+1)^3(\beta+1)^3}$		
	$\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)\left\{=-\dfrac{63}{8}\right\}$ **or** $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta\left\{=-\dfrac{11}{4}\right\}$ **or** $(\alpha+1)^3+(\beta+1)^3=(\alpha+1+\beta+1)^3-3(\alpha+1)(\beta+1)(\alpha+1+\beta+1)$	Evaluates, states or uses at least one of these identities. May be seen or implied by working.	**B1 (M1 on epen)**
	Example 1 (expanding brackets): $(\alpha+1)^3+(\beta+1)^3$ $=\alpha^3+3\alpha^2+3\alpha+1+\beta^3+3\beta^2+3\beta+1$ $=\alpha^3+\beta^3+3(\alpha^2+\beta^2)+3(\alpha+\beta)+2$ $=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)+3\left((\alpha+\beta)^2-2\alpha\beta\right)+3(\alpha+\beta)+2$	Manipulates $(\alpha+1)^3+(\beta+1)^3$ to reach an expression involving only terms that have been evaluated using correct identities. Accept equivalents forms and condone sign errors and slips with coefficients only. Be aware that substitution of values may take place alongside the algebraic manipulation.	**M1**
	Example 2 (sum of two cubes): $(\alpha+1)^3+(\beta+1)^3$ $=(\alpha+\beta+2)(\alpha^2+\beta^2-\alpha\beta+\alpha+\beta+1)$ $=(\alpha+\beta+2)\left((\alpha+\beta)^2-3\alpha\beta+\alpha+\beta+1\right)$		
	Example 3 (working in $\alpha+1$ and $\beta+1$): $(\alpha+1)^3+(\beta+1)^3=(\alpha+1+\beta+1)^3-3(\alpha+1)(\beta+1)(\alpha+1+\beta+1)$		
	E.g. using line 4 of **Example 1**: $\left(\frac{3}{2}\right)^3-3\left(\frac{5}{2}\right)\left(\frac{3}{2}\right)+3\left(\frac{3}{2}\right)^2-2\left(\frac{5}{2}\right)+3\left(\frac{3}{2}\right)+2=-\frac{77}{8}$ Or line 3: $\left(-\frac{63}{8}\right)+3\left(-\frac{11}{4}\right)+3\left(\frac{3}{2}\right)+2=-\frac{77}{8}$ For **Example 2**: $\left(\frac{3}{2}+2\right)\left(\left(\frac{3}{2}\right)^2-3\left(\frac{5}{2}\right)+\frac{3}{2}+1\right)=-\frac{77}{8}$ For **Example 3**: $\left(\frac{3}{2}+2\right)^3-3(5)\left(\frac{3}{2}+2\right)=-\frac{77}{8}$ $\left\{\text{newsum}=\frac{\text{"}-77/8\text{"}}{125}=-\frac{77}{1000}\right\}$	Substitutes all relevant values correctly and reaches $-\frac{77}{8}$ o.e. for the numerator, or $-\frac{77}{1000}$ o.e. for the new sum. Note that $(\alpha^3+\beta^3)$, $(\alpha^2+\beta^2)$ and/or $(\alpha+1)(\beta+1)$ may have been evaluated in part (a).	**A1 (M1 on epen)**
	new product $=\dfrac{1}{125}\Rightarrow x^2+\dfrac{\text{"}77/8\text{"}}{125}x+\dfrac{1}{125}\{=0\}$	Forms a new quadratic correctly for their new sum and the product of $\frac{1}{125}$	**M1**
	$1000x^2+77x+8=0$	Any correct equation with integer coefficients	**A1**
			(5)
			Total 8