Question Number	Scheme	Marks
6.	(a) (i) $\alpha+\beta=-p$	B1
	(ii) *or* $\begin{cases}\alpha^2+p\alpha+1=0\\ \beta^2+p\beta+1=0\end{cases}$	
	$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$ $\quad$ $\alpha^2+\beta^2+p(\alpha+\beta)+2=0$	M1
	$=p^2-2$ $\quad$ $\alpha^2+\beta^2=p^2-2$	A1
	(iii) $(\alpha+\beta)^3=\alpha^3+3\alpha^2\beta+3\alpha\beta^2+\beta^3$	M1
	$\Rightarrow\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)=(-p)^3-3(-p)$	M1 A1
	$=3p-p^3$	
	alternatives $\begin{cases}\alpha^3+p\alpha^2+\alpha=0\\ \beta^3+p\beta^2+\beta=0\end{cases}$	
	$\alpha^3+\beta^3=(\alpha+\beta)(\alpha^2-\alpha\beta+\beta^2)$ $\quad$ $\alpha^3+\beta^3+p(\alpha^2+\beta^2)+(\alpha+\beta)=0$ M1	
	$=-p(p^2-2-1)$ $\quad$ $\alpha^3+\beta^3+p(p^2-2)-p=0$ M1	
	$=3p-p^3$ $\quad$ $\alpha^3+\beta^3=3p-p^3$ A1	
	(b) $x^2-(3p-p^3)x+1=0$	M1ft A1ft
		(8)

Notes

Question 6

(a) (i) B1 for $\alpha+\beta=-p$ or $\left(-\frac{p}{1}\right)$

(Note $\alpha\beta=1$)

(ii) M1 for $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$ and substituting in values for $\alpha+\beta$, and $\alpha\beta$

Or for $\begin{cases}\alpha^2+p\alpha+1=0\\ \beta^2+p\beta+1=0\end{cases}$

$\Rightarrow\alpha^2+\beta^2+p(\alpha+\beta)+2=0$

A1 for $\alpha^2+\beta^2=p^2-2$ oe (Simplification is not required for this mark)

(iii) M1 for expanding $(\alpha+\beta)^3=\alpha^3+3\alpha^2\beta+3\alpha\beta^2+\beta^3$ (allow some slips in algebra for this mark). Do **NOT** accept $(\alpha+\beta)^3=\alpha^3+\beta^3$ for this mark

M1 leading to $\alpha^3+\beta^3=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)$ fully correct

A1 for $\alpha^3+\beta^3=3p-p^3$ oe (Simplification is not required for this mark)

Please refer to ms for alternative methods

(b)

M1 for using x^2 – their sum × x + product (= 0 not needed for this mark)

`A1ft for $x^2-(3p-p^3)x+1=0$ (follow through their values for this mark)

Note: = 0 must be seen with a correct equation for this mark

Simplification is not required for this mark