Quadratic Equations Ex 14.2 Q2(vii)

$2x^2+\sqrt{15}ix-i=0$

Comparing the given equation with the general form

$ax^2+bx+c=0$, we get $a=2, b=\sqrt{15}i, c=-i$

Substituting a and b in,

$$\alpha=\frac{-b+\sqrt{b^2-4ac}}{2a} \text{ and } \beta=\frac{-b-\sqrt{b^2-4ac}}{2a}$$

$$\alpha=\frac{-\sqrt{15}i+\sqrt{-15+8i}}{4} \text{ and } \beta=\frac{-\sqrt{15}i-\sqrt{-15+8i}}{4}$$

Let $\sqrt{-15+8i}=a+bi$

$\Rightarrow -15+8i=(a+bi)^2$

$\Rightarrow -15+8i=a^2-b^2+2abi$

$\Rightarrow a^2-b^2=-15$ and $2abi=8i$

Now $(a^2+b^2)^2=(a^2-b^2)^2+4a^2b^2$

$\Rightarrow (a^2+b^2)^2=(-15)^2+64=289$

$\Rightarrow a^2+b^2=17$

Solving $a^2-b^2=-15$ and $a^2+b^2=17$, we get

$a^2=1$ and $b^2=16$

$\Rightarrow a=\pm1$ and $b=\pm4$

$\Rightarrow a = \pm 1$ and $b = \pm 4$

$\Rightarrow a = 1, b = 4$ or $a = -1, b = -4$

$\therefore \sqrt{-15+8i} = 1+4i, -1-4i$

When $\sqrt{-15+8i} = 1+4i$

$$\alpha = \frac{-\sqrt{15}i + 1 + 4i}{4} = \frac{1+\left(4-\sqrt{15}\right)i}{4}$$

and $\beta = \dfrac{-\sqrt{15}i - (1+4i)}{4} = \dfrac{-1-\left(4+\sqrt{15}\right)i}{4}$

When $\sqrt{-15+8i} = -1-4i$

$$\alpha = \frac{-\sqrt{15}i - 1 - 4i}{4} = \frac{-1-\left(4+\sqrt{15}\right)i}{4}$$

and $\beta = \dfrac{-\sqrt{15}i - (-1-4i)}{4} = \dfrac{1+\left(4-\sqrt{15}\right)i}{4}$

Quadratic Equations Ex 14.2 Q2(viii)

$$x^2 - x + (1+i) = 0$$
$$x^2 - x + (1+i) = 0$$
$$x^2 - ix - (1-i)x + i(1-i) = 0$$
$$(x-i)(x-(1-i)) = 0$$
$$x = i, 1-i$$

*********** END **********