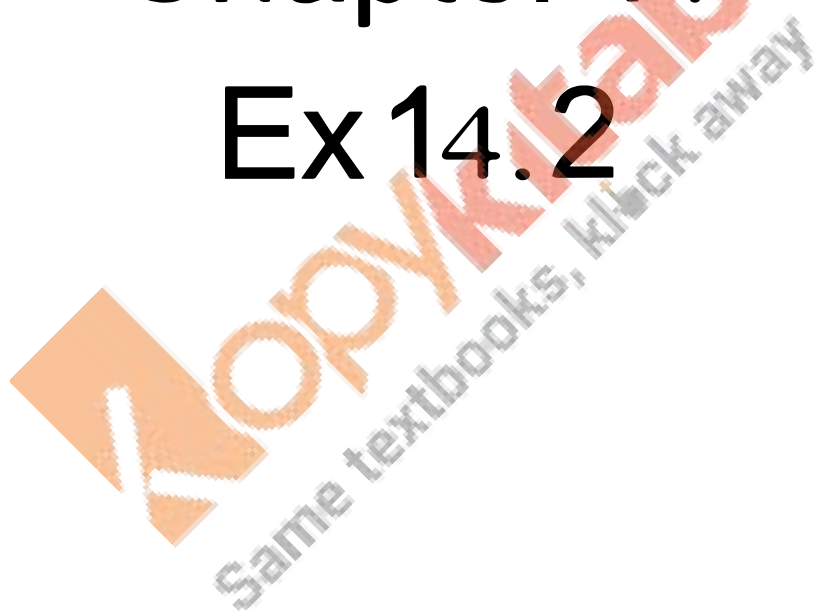# RD Sharma Solutions

Class 11 Maths

Chapter 14

Ex 14. 2

Quadratic Equations Ex 14.2 Q1(i)

$x^2 + 10ix - 21 = 0$

$\Rightarrow \quad x^2 + 10ix + 21i^2 = 0 \qquad \left[\because i^2 = -1\right]$

$\Rightarrow \quad x^2 + 7ix + 3ix + 21i^2 = 0$

$\Rightarrow \quad x(x + 7i) + 3i(x + 7i) = 0$

$\Rightarrow \quad (x + 3i)(x + 7i) = 0$

$\therefore \quad x = -3i, -7i$

Quadratic Equations Ex 14.2 Q1(ii)

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

$\Rightarrow \quad x^2 + x - 2i - 2i = 0$

$\Rightarrow \quad x(x + 1) - 2i(x + 1) = 0$

$\Rightarrow \quad (x - 2i)(x + 1) = 0$

$\Rightarrow \quad x = 2i, -1$

Quadratic Equations Ex 14.2 Q1(iii)

$x^2 - (2\sqrt{3} + 3i)x + 6\sqrt{3}i = 0$

$\Rightarrow \quad x^2 - 2\sqrt{3}x - 3ix + 6\sqrt{3}i = 0$

$\Rightarrow \quad x(x - 2\sqrt{3}) - 3i(x - 2\sqrt{3}) = 0$

$\Rightarrow \quad (x - 3i)(x - 2\sqrt{3}) = 0$

$\Rightarrow \quad x = 3i, 2\sqrt{3}$

Quadratic Equations Ex 14.2 Q1(iv)

$6x^2 - 17ix - 12 = 0$

$\Rightarrow \quad 6x^2 - 17ix + 12i^2 = 0 \qquad \left[\because i^2 = -1\right]$

$\Rightarrow \quad 6x^2 - 9ix - 8ix + 12i^2 = 0$

$\Rightarrow \quad 3x(2x - 3i) - 4i(2x - 3i) = 0$

$\Rightarrow \quad (3x - 4i)(2x - 3i) = 0$

$\Rightarrow \quad x = \dfrac{4}{3}i \qquad \text{or} \qquad \dfrac{3}{2}i$

Quadratic Equations Ex 14.2 Q2(i)

$$x^2 - \left(3\sqrt{2} + 2i\right)x + 6\sqrt{2i} = 0$$

$$\Rightarrow \quad x^2 - 3\sqrt{2}x - 2ix + \sqrt{2}i = 0$$
$$\Rightarrow \quad x\left(x - 3\sqrt{2}\right) - 2i\left(x - 3\sqrt{2}\right) = 0$$
$$\Rightarrow \quad (x - 2i)\left(x - 3\sqrt{2}\right) = 0$$

$$\Rightarrow \quad x = 2i \quad \text{or} \quad 3\sqrt{2}$$

Quadratic Equations Ex 14.2 Q2(ii)

$$x^2 - (5 - i)x + (18 + i) = 0$$

$$\Rightarrow \quad x^2 - 5x - ix + 18 + i = 0$$
$$\Rightarrow \quad x^2 - (3 - 4i)x - (2 + 3i)x + (18 + i) = 0$$
$$\Rightarrow \quad x\left(x - (3 - 4i)\right) - (2 + 3i)\left(x - (3 - 4i)\right) = 0$$
$$\Rightarrow \quad \left(x - (2 + 3i)\right)\left(x - (3 - 4i)\right) = 0$$

$$\Rightarrow \quad x = 2 + 3i \quad \text{or} \quad 3 - 4i$$

Quadratic Equations Ex 14.2 Q2(iii)

$$(2 + i)x^2 - (5 - i)x + 2(1 - i) = 0$$

$$\Rightarrow \quad (2 + i)x^2 - 2x - (3 - i)x + 2(1 - i) = 0$$
$$\Rightarrow \quad x\left[2 + i)x - 2\right] - (1 - i)\left[(2 + i)x - 2\right] = 0$$
$$\Rightarrow \quad \left[x - (1 - i)\right]\left[(2 + i)x - 2\right] = 0$$
either $\left[x - (1 - i)\right] = 0$ or $\left[(2 + i)x - 2\right] = 0$

$$\Rightarrow \quad x = 1 - i \quad \text{or} \quad x = \frac{2}{2 + i}$$

$$\Rightarrow \quad x = 1 - i \quad \text{or} \quad x = \frac{2 \times 2 - i}{(2 + i)(2 - i)}$$

$$\text{or} \quad x = \frac{4 - 2i}{4 + 1} = \frac{4}{5} - \frac{2}{5}i$$

Thus,

$$x = 1 - i, \quad \frac{4}{5} - \frac{2}{5}i$$

Quadratic Equations Ex 14.2 Q2(iv)

$$x^2 - (2 + i)x - (1 - 7i) = 0$$

$\Rightarrow \qquad x^2 - (2 + i)x - (1 - 7i) = 0$

$\Rightarrow \qquad x^2 - (3 - i)x + (1 - 2i)x - (1 - 7i) = 0$

$\Rightarrow \qquad x(x - (3 - i)) + (1 - 2i)(x - (3 - i)) = 0$

$\Rightarrow \qquad [x + (1 - 2i)][x - (3 - i)] = 0$

$\Rightarrow \qquad x = -1 + 2i, \qquad 3 - i$

Quadratic Equations Ex 14.2 Q2(v)

$$ix^2 - 4x - 4i = 0$$

$\Rightarrow \qquad ix^2 + 4i^2 x + 4i^3 = 0 \qquad \left[\because i^2 = -1 \right]$

$\Rightarrow \qquad x^2 + 4ix + 4i^2 = 0$

$\Rightarrow \qquad x^2 + 2ix + 2ix + 4i^2 = 0$

$\Rightarrow \qquad x(x + 2i) + 2i(x + 2i) = 0$

$\Rightarrow \qquad (x + 2i)(x + 2i)$

$\therefore \qquad x = -2i, \quad -2i$

Quadratic Equations Ex 14.2 Q2(vi)

$$x^2 + 4ix - 4 = 0$$

$\Rightarrow \qquad x^2 + 4ix + 4i^2 = 0 \qquad \left[\because i^2 = -1 \right]$

$\Rightarrow \qquad x^2 + 2ix + 2ix + 4i^2 = 0$

$\Rightarrow \qquad x(x + 2i) + 2i(x + 2i) = 0$

$\Rightarrow \qquad (x + 2i)(x + 2i) = 0$

$\Rightarrow \qquad x = -2i, \; -2i$

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,

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

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

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 $b^2 = 16$

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

$$\Rightarrow a = \pm 1 \text{ and } b = \pm 4$$

$$\Rightarrow a = 1, b = 4 \text{ or } a = -1, b = -4$$

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

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)

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

Quadratic Equations Ex 14.2 Q2(ix)

We will apply discriminate rule on $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Now,

$$ix^2 - x + 12i = 0$$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(i)(12i)}}{2i}$$

$$= \frac{1 \pm \sqrt{1 + 48}}{2i}$$

$$= \frac{1 \pm \sqrt{49}}{2i}$$

$$= \frac{1 \pm 7}{2i}$$

$$= \frac{8}{2i}, \frac{-6}{2i}$$

$$= \frac{4}{i}, -\frac{3}{i}$$

$$= -4i, \; 3i$$

Quadratic Equations Ex 14.2 Q2(x)

We will apply discriminate rule on $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Now,

$$x^2 - \left(3\sqrt{2} - 2i\right)x - \sqrt{2}i = 0$$

$$x = \frac{\left(3\sqrt{2} - 2i\right) \pm \sqrt{\left[-\left(3\sqrt{2} - 2i\right)\right]^2 - 4(1)\left(-\sqrt{2}i\right)}}{2(1)}$$

$$= \frac{\left(3\sqrt{2} - 2i\right) \pm \sqrt{\left(3\sqrt{2} - 2i\right)^2 + 4\sqrt{2}i}}{2}$$

$$= \frac{3\sqrt{2} - 2i}{2} \pm \frac{4 - \sqrt{2}i}{2}$$

Quadratic Equations Ex 14.2 Q2(xi)

$$x^2 - \left(\sqrt{2} + i\right)x + \sqrt{2}i = 0$$
$$x^2 - \sqrt{2}x - ix + \sqrt{2}i = 0$$
$$x\left(x - \sqrt{2}\right) - i\left(x - \sqrt{2}\right) = 0$$
$$(x - i)\left(x - \sqrt{2}\right) = 0$$
$$x = i, \sqrt{2}$$

Quadratic Equations Ex 14.2 Q2(xii)

$$2x^2 - (3 + 7i)x + (9i - 3) = 0$$
$$2x^2 - 3x - 7ix + (9i - 3) = 0$$
$$(2x - 3 - i)(x - 3i) = 0$$
$$\left(x - \frac{3 + i}{2}\right)(x - 3i) = 0$$
$$x = \frac{3 + i}{2}, \ 3i$$