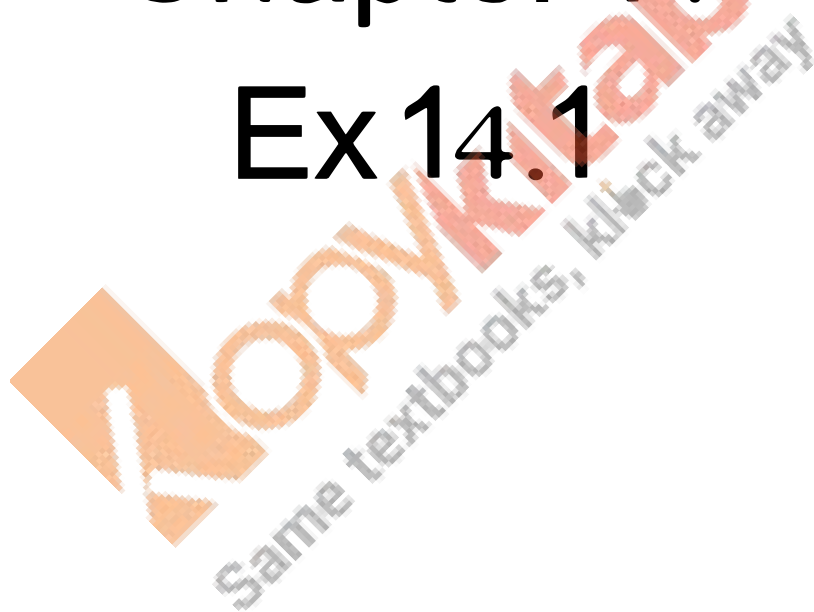


RD Sharma  
Solutions  
Class 11 Maths  
Chapter 14  
Ex 14.1



### Quadratic Equations Ex 14.1 Q1

$$x^2 + 1 = 0$$

$$\Rightarrow x^2 + i^2 = 0 \quad [\because i^2 = -1]$$

$$\Rightarrow (x + i)(x - i) = 0 \quad [a^2 - b^2 = (a + b)(a - b)]$$

$$\Rightarrow x = i, -i$$

### Quadratic Equations Ex 14.1 Q2

$$9x^2 + 4 = 0$$

$$\Rightarrow (3x)^2 - (2i)^2 = 0 \quad [\because i^2 = -1]$$

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

$$\Rightarrow 3x + 2i = 0 \quad \text{or} \quad 3x - 2i = 0$$

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

$$\therefore x = \frac{-2}{3}i, \frac{2}{3}i$$

### Quadratic Equations Ex 14.1 Q3

$$x^2 + 2x + 5 = 0$$

Now, completing the squares, we get

$$(x + 1)^2 + 4 = 0$$

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

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

$$\Rightarrow (x + 1 + 2i) = 0 \quad \text{or} \quad (x + 1 - 2i) = 0$$

$$\therefore x = -1 - 2i, \quad -1 + 2i$$

### Quadratic Equations Ex 14.1 Q4

$$4x^2 - 12x + 25 = 0$$

Now, completing the squares, we get

$$(2x - 3)^2 + 16 = 0$$

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

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

$$\Rightarrow (2x - 3 + 4i) = 0 \quad \text{or} \quad (2x - 3 - 4i) = 0$$

$$\therefore x = \frac{3}{2} + 2i, \quad \frac{3}{2} - 2i$$

### Quadratic Equations Ex 14.1 Q5

$$x^2 + x + 1 = 0$$

Now, completing the squares, we get

$$\begin{aligned} & \left(x + \frac{1}{2}\right)^2 + \frac{3}{4} = 0 \\ \Rightarrow & \left(x + \frac{1}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}i\right)^2 = 0 \\ \Rightarrow & \left(x + \frac{1}{2} + \frac{\sqrt{3}}{2}i\right)\left(x + \frac{1}{2} - \frac{\sqrt{3}}{2}i\right) = 0 \\ \Rightarrow & \left(x + \frac{1}{2} + \frac{\sqrt{3}}{2}i\right) = 0 \quad \text{or} \quad \left(x + \frac{1}{2} - \frac{\sqrt{3}}{2}i\right) = 0 \\ \therefore x = & \frac{-1}{2} + \frac{\sqrt{3}}{2}i, \quad \frac{-1}{2} - \frac{\sqrt{3}}{2}i \end{aligned}$$

#### Quadratic Equations Ex 14.1 Q6

$$4x^2 + 1 = 0$$

$$\begin{aligned} \Rightarrow & (2x)^2 - i^2 = 0 \quad [\because i^2 = -1] \\ \Rightarrow & (2x + i)(2x - i) = 0 \\ \Rightarrow & \text{either } 2x + i = 0 \quad \text{or} \quad 2x - i = 0 \\ \Rightarrow & x = \frac{-i}{2} \quad \text{or} \quad x = \frac{i}{2} \end{aligned}$$

$$\therefore x = \frac{-i}{2}, \frac{i}{2}$$

#### Quadratic Equations Ex 14.1 Q7

$$x^2 - 4x + 7 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\text{where } D = b^2 - 4ac = (-4)^2 - 4.1.7 = -12$$

from (A)

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

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

$$= 2 \pm \sqrt{3}i$$

$$\therefore x = 2 + \sqrt{3}i, 2 - \sqrt{3}i$$

**Quadratic Equations Ex 14.1 Q8**

$$x^2 + 2x + 2 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$= 2^2 - 4.1.2$$

$$= 4 - 8$$

$$= -4$$

from (A)

$$x = \frac{-2 \pm \sqrt{-4}}{2}$$

$$= \frac{-2 \pm 2i}{2}$$

$$= -1 \pm i$$

$$\therefore x = -1 + i, \quad -1 - i$$

**Quadratic Equations Ex 14.1 Q9**

$$5x^2 - 6x + 2 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$= (-6)^2 - 4.5.2$$

$$= 36 - 40$$

$$= -4$$

from (A)

$$x = \frac{-(-6) \pm \sqrt{-4}}{2.5}$$

$$= \frac{6 \pm 2i}{10}$$

$$= \frac{3 \pm i}{5}$$

$$\therefore x = \frac{3}{5} + \frac{i}{5}, \quad \frac{3}{5} - \frac{i}{5}$$

**Quadratic Equations Ex 14.1 Q10**

$$21x^2 + 9x + 1 = 0$$

Comparing the given equation with the general form

$$ax^2 + bx + c = 0, \text{ we get } a = 21, b = 9, c = 1$$

Substituting a and b in,

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

$$\alpha = \frac{-9 + \sqrt{81 - 84}}{42} \text{ and } \beta = \frac{-9 - \sqrt{81 - 84}}{42}$$

$$\Rightarrow \alpha = \frac{-9 + \sqrt{-3}}{42} \text{ and } \beta = \frac{-9 - \sqrt{-3}}{42}$$

$$\Rightarrow \alpha = \frac{-9 + i\sqrt{3}}{42} \text{ and } \beta = \frac{-9 - i\sqrt{3}}{42}$$

$$\text{The roots are } x = \frac{-9}{42} \pm \frac{i\sqrt{3}}{42}$$

#### Quadratic Equations Ex 14.1 Q11

$$x^2 - x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\text{where } D = b^2 - 4ac$$

$$= (-1)^2 - 4.1.1$$

$$= 1 - 4$$

$$= -3$$

from (A)

$$\therefore x = \frac{-(-1) \pm \sqrt{-3}}{2}$$

$$= \frac{1 \pm \sqrt{3}i}{2}$$

$$\therefore x = \frac{1}{2} + \frac{\sqrt{3}}{2}i, \quad \frac{1}{2} - \frac{\sqrt{3}}{2}i$$

#### Quadratic Equations Ex 14.1 Q12

$$x^2 + x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\begin{aligned} \text{where } D &= b^2 - 4ac \\ &= 1^2 - 4.1.1 \\ &= 1 - 4 \\ &= -3 \end{aligned}$$

from (A)

$$\begin{aligned} x &= \frac{-1 \pm \sqrt{-3}}{2} \\ &= \frac{-1 \pm \sqrt{3}i}{2} \end{aligned}$$

$$\therefore x = \frac{-1}{2} + \frac{\sqrt{3}}{2}i, \quad \frac{-1}{2} - \frac{\sqrt{3}}{2}i$$

#### Quadratic Equations Ex 14.1 Q13

$$17x^2 - 8x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\begin{aligned} \text{where } D &= b^2 - 4ac \\ &= (-8)^2 - 4.17.1 \\ &= 64 - 68 \\ &= -4 \end{aligned}$$

from (A)

$$\begin{aligned} x &= \frac{-(-8) \pm \sqrt{-4}}{2.17} \\ &= \frac{8 \pm 2i}{34} \\ &= \frac{4 \pm i}{17} \end{aligned}$$

$$\therefore x = \frac{4}{17} + \frac{i}{17}, \quad \frac{4}{17} - \frac{i}{17}$$

#### Quadratic Equations Ex 14.1 Q14

$$27x^2 - 10x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$\begin{aligned} &= (-10)^2 - 4.27.1 \\ &= 100 - 108 \\ &= -8 \end{aligned}$$

from (A)

$$x = \frac{-(-10) \pm \sqrt{-8}}{54}$$

$$= \frac{10 \pm 2\sqrt{2}i}{54}$$

$$= \frac{5 \pm \sqrt{2}i}{27}$$

$$\therefore x = \frac{5}{27} + \frac{\sqrt{2}i}{27}, \quad \frac{5}{27} - \frac{\sqrt{2}i}{27}$$

#### Quadratic Equations Ex 14.1 Q15

$$17x^2 + 28x + 12 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$\begin{aligned} &= (28)^2 - 4.17.12 \\ &= 784 - 816 \\ &= -32 \end{aligned}$$

from (A)

$$x = \frac{-28 \pm \sqrt{-32}}{2.17}$$

$$= \frac{-28 \pm 4\sqrt{2}i}{34}$$

$$\therefore x = \frac{-14 \pm 2\sqrt{2}i}{17}$$

#### Quadratic Equations Ex 14.1 Q16

$$21x^2 - 28x + 10 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$\begin{aligned} &= (-28)^2 - 4.21.10 \\ &= 784 - 840 \\ &= -56 \end{aligned}$$

from (A)

$$\begin{aligned} x &= \frac{-(-28) \pm \sqrt{-56}}{2.21} \\ &= \frac{28 \pm 2\sqrt{14}i}{42} \end{aligned}$$

$$\therefore x = \frac{2}{3} \pm \frac{\sqrt{14}}{21}i$$

#### Quadratic Equations Ex 14.1 Q17

$$8x^2 - 9x + 3 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$\begin{aligned} &= (-9)^2 - 4.8.3 \\ &= 81 - 96 \\ &= -15 \end{aligned}$$

from (A)

$$\begin{aligned} x &= \frac{-b \pm \sqrt{D}}{2a} \\ &= \frac{-(-9) \pm \sqrt{-15}}{2.8} \\ &= \frac{9 \pm \sqrt{15}i}{16} \end{aligned}$$

Thus

$$\therefore x = \frac{9 \pm \sqrt{15}i}{16}$$

#### Quadratic Equations Ex 14.1 Q18

$$13x^2 + 7x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\begin{aligned} \text{where } D &= b^2 - 4ac \\ &= 7^2 - 4.13.1 \\ &= 49 - 52 \\ &= -3 \end{aligned}$$

Thus, from (A)

$$\begin{aligned} x &= \frac{-7 \pm \sqrt{-3}}{2.13} \\ &= \frac{-7 \pm \sqrt{3}i}{26} \end{aligned}$$

Thus

$$\therefore x = \frac{-7}{26} \pm \frac{\sqrt{3}}{26}i$$

#### Quadratic Equations Ex 14.1 Q19

$$2x^2 + x + 1 = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\begin{aligned} \text{where } D &= b^2 - 4ac \\ &= 1^2 - 4.2.1 \\ &= 1 - 8 \\ &= -7 \end{aligned}$$

Thus, from (A)

$$\begin{aligned} x &= \frac{-1 \pm \sqrt{-7}}{2.2} \\ &= \frac{-1 \pm \sqrt{7}i}{4} \end{aligned}$$

Thus

$$\therefore x = \frac{-1}{4} \pm \frac{\sqrt{7}}{4}i$$

#### Quadratic Equations Ex 14.1 Q20

$$\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$\begin{aligned} &= (-\sqrt{2})^2 - 4.\sqrt{3}.3\sqrt{3} \\ &= 2 - 36 \\ &= -34 \end{aligned}$$

from (A)

$$\begin{aligned} x &= \frac{-(-\sqrt{2}) \pm \sqrt{-34}}{2.\sqrt{3}} \\ &= \frac{\sqrt{2} \pm \sqrt{34}i}{2\sqrt{3}} \end{aligned}$$

Thus

$$\therefore x = \frac{\sqrt{2} \pm \sqrt{34}i}{2\sqrt{3}}$$

#### Quadratic Equations Ex 14.1 Q21

$$\sqrt{2}x^2 + x + \sqrt{2} = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

where  $D = b^2 - 4ac$

$$\begin{aligned} &= 1^2 - 4.\sqrt{2}.\sqrt{2} \\ &= 1 - 8 \\ &= -7 \end{aligned}$$

from (A)

$$\begin{aligned} x &= \frac{-1 \pm \sqrt{-7}}{2.\sqrt{2}} \\ &= \frac{-1 \pm \sqrt{7}i}{2\sqrt{2}} \end{aligned}$$

Thus

$$\therefore x = \frac{-1 \pm \sqrt{7}i}{2\sqrt{2}}$$

#### Quadratic Equations Ex 14.1 Q22

$$x^2 + x + \frac{1}{\sqrt{2}} = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\text{where } D = b^2 - 4ac$$

$$= 1^2 - 4 \cdot 1 \cdot \frac{1}{\sqrt{2}}$$

$$= 1 - 2\sqrt{2}$$

from (A)

$$x = \frac{-1 \pm \sqrt{-(2\sqrt{2} - 1)}}{2}$$

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

Thus,

$$\therefore x = \frac{-1 \pm \sqrt{2\sqrt{2} - 1}i}{2}$$

#### Quadratic Equations Ex 14.1 Q23

$$x^2 + \frac{x}{\sqrt{2}} + 1 = 0 \quad \Rightarrow \quad \sqrt{2}x^2 + x + \sqrt{2} = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$D = b^2 - 4ac$$

$$= 1^2 - 4 \cdot \sqrt{2} \cdot \sqrt{2}$$

$$= 1 - 8$$

$$= -7$$

from (A)

$$x = \frac{-1 \pm \sqrt{-7}}{2\sqrt{2}}$$

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

Thus,

$$\therefore x = \frac{-1 \pm \sqrt{7}i}{2\sqrt{2}}$$

#### Quadratic Equations Ex 14.1 Q24

$$\sqrt{5}x^2 + x + \sqrt{5} = 0$$

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\text{where } D = b^2 - 4ac$$

$$= 1^2 - 4 \cdot \sqrt{5} \cdot \sqrt{5}$$

$$= 1 - 20$$

$$= -19$$

from (A)

$$x = \frac{-1 \pm \sqrt{-19}}{2 \cdot \sqrt{5}}$$

$$= \frac{-1 \pm \sqrt{19}i}{2\sqrt{5}}$$

Thus,

$$\therefore x = \frac{-1 \pm \sqrt{19}i}{2\sqrt{5}}$$

#### Quadratic Equations Ex 14.1 Q25

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

We will apply discriminant rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \dots\dots\dots (A)$$

$$\text{where } D = b^2 - 4ac$$

$$= 1^2 - 4 \cdot (-1) \cdot (-2)$$

$$= 1 - 8$$

$$= -7$$

from (A)

$$x = \frac{-1 \pm \sqrt{-7}}{2 \cdot (-1)}$$

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

Thus,

$$\therefore x = \frac{-1 \pm \sqrt{7}i}{-2}$$

#### Quadratic Equations Ex 14.1 Q26

We will apply discriminate rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad \dots\dots(A)$$

Where  $D = b^2 - 4ac$

$$= (-2)^2 - 4(1)\left(\frac{3}{2}\right)$$

$$= 4 - 6$$

$$= -2$$

From (A)

$$x = \frac{-(-2) \pm \sqrt{-2}}{2(1)}$$

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

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

Thus,

$$\therefore x = 1 \pm \frac{i}{\sqrt{2}}$$

#### Quadratic Equations Ex 14.1 Q27

We will apply discriminate rule,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad \dots\dots(A)$$

Where  $D = b^2 - 4ac$

$$= (-4)^2 - 4(3)\left(\frac{20}{3}\right)$$

$$= 16 - 80$$

$$= -64$$

From (A)

$$x = \frac{-(-4) \pm \sqrt{-64}}{2(3)}$$

$$= \frac{4 \pm i8}{6}$$

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

Thus,

$$\therefore x = \frac{2}{3} \pm \frac{4i}{3}$$