NCERT Solutions for 11th Class Maths: Chapter 5-Complex Numbers and Quadratic Equations

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Class 11: Maths Chapter 5 solutions. Complete Class 11 Maths Chapter 5 Notes.

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NCERT 11th Maths Chapter 5, class 11 Maths Chapter 5 solutions

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Exercise 5.1

Question 1:

Express the given complex number in the form $a + ib$: $(5i)\left(-\frac{3}{5}i\right)$

Ans:

$$(5i)\left(\frac{-3}{5}i\right) = -5 \times \frac{3}{5} \times i \times i$$
$$= -3i^2$$
$$= -3(-1) \qquad [i^2 = -1]$$
$$= 3$$

Question 2:

Express the given complex number in the form $a + ib$: $i^9 + i^{19}$

Ans:

$$i^9 + i^{19} = i^{4\times2+1} + i^{4\times4+3}$$
$$= \left(i^4\right)^2 \cdot i + \left(i^4\right)^4 \cdot i^3$$
$$= 1 \times i + 1 \times (-i) \qquad [i^4 = 1,\ i^3 = -i]$$
$$= i + (-i)$$
$$= 0$$

Question 3:

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Express the given complex number in the form $a + ib$: i^{-39}

Ans:

$$i^{-39} = i^{-4\times9-3} = \left(i^4\right)^{-9}\cdot i^{-3}$$
$$= (1)^{-9}\cdot i^{-3} \qquad \left[i^4 = 1\right]$$
$$= \frac{1}{i^3} = \frac{1}{-i} \qquad \left[i^3 = -i\right]$$
$$= \frac{-1}{i}\times\frac{i}{i}$$
$$= \frac{-i}{i^2} = \frac{-i}{-1} = i \qquad \left[i^2 = -1\right]$$

Question 4:

Express the given complex number in the form $a + ib$: $3(7 + i7) + i(7 + i7)$

Ans:

$$3(7+i7)+i(7+i7) = 21+21i+7i+7i^2$$
$$= 21+28i+7\times(-1) \qquad \left[\because i^2 = -1\right]$$
$$= 14+28i$$

Question 5:

Express the given complex number in the form $a + ib$: $(1 - i) - (-1 + i6)$

Ans:

$$(1-i)-(-1+i6) = 1-i+1-6i$$
$$= 2-7i$$

Question 6:

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Express the given complex number in the form $a + ib$: $\left(\frac{1}{5}+i\frac{2}{5}\right)-\left(4+i\frac{5}{2}\right)$

Ans:

$$\left(\frac{1}{5}+i\frac{2}{5}\right)-\left(4+i\frac{5}{2}\right)$$
$$=\frac{1}{5}+\frac{2}{5}i-4-\frac{5}{2}i$$
$$=\left(\frac{1}{5}-4\right)+i\left(\frac{2}{5}-\frac{5}{2}\right)$$
$$=\frac{-19}{5}+i\left(\frac{-21}{10}\right)$$
$$=\frac{-19}{5}-\frac{21}{10}i$$

Question 7:

Express the given complex number in the form $a + ib$: $\left[\left(\frac{1}{3}+i\frac{7}{3}\right)+\left(4+i\frac{1}{3}\right)\right]-\left(-\frac{4}{3}+i\right)$

Ans:

$$\left[\left(\frac{1}{3}+i\frac{7}{3}\right)+\left(4+i\frac{1}{3}\right)\right]-\left(\frac{-4}{3}+i\right)$$
$$=\frac{1}{3}+\frac{7}{3}i+4+\frac{1}{3}i+\frac{4}{3}-i$$
$$=\left(\frac{1}{3}+4+\frac{4}{3}\right)+i\left(\frac{7}{3}+\frac{1}{3}-1\right)$$
$$=\frac{17}{3}+i\frac{5}{3}$$

Question 8:

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Express the given complex number in the form $a + ib$: $(1 - i)^4$

Ans:

$$\begin{aligned}(1-i)^4 &= \left[(1-i)^2\right]^2 \\ &= \left[1^2 + i^2 - 2i\right]^2 \\ &= \left[1-1-2i\right]^2 \\ &= (-2i)^2 \\ &= (-2i)\times(-2i) \\ &= 4i^2 = -4 \qquad [i^2 = -1]\end{aligned}$$

Question 9:

Express the given complex number in the form $a + ib$: $\left(\frac{1}{3}+3i\right)^3$

Ans:

$$\begin{aligned}\left(\frac{1}{3}+3i\right)^3 &= \left(\frac{1}{3}\right)^3 + (3i)^3 + 3\left(\frac{1}{3}\right)(3i)\left(\frac{1}{3}+3i\right) \\ &= \frac{1}{27} + 27i^3 + 3i\left(\frac{1}{3}+3i\right) \\ &= \frac{1}{27} + 27(-i) + i + 9i^2 \qquad [i^3 = -i] \\ &= \frac{1}{27} - 27i + i - 9 \qquad [i^2 = -1] \\ &= \left(\frac{1}{27} - 9\right) + i(-27+1) \\ &= \frac{-242}{27} - 26i\end{aligned}$$

Question 10:

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Express the given complex number in the form $a + ib$: $\left(-2-\frac{1}{3}i\right)^3$

Ans:

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

$$= -\left[2^3+\left(\frac{i}{3}\right)^3+3(2)\left(\frac{i}{3}\right)\left(2+\frac{i}{3}\right)\right]$$

$$= -\left[8+\frac{i^3}{27}+2i\left(2+\frac{i}{3}\right)\right]$$

$$= -\left[8-\frac{i}{27}+4i+\frac{2i^2}{3}\right] \qquad \left[i^3 = -i\right]$$

$$= -\left[8-\frac{i}{27}+4i-\frac{2}{3}\right] \qquad \left[i^2 = -1\right]$$

$$= -\left[\frac{22}{3}+\frac{107i}{27}\right]$$

$$= -\frac{22}{3}-\frac{107}{27}i$$

Question 11:

Find the multiplicative inverse of the complex number $4 - 3i$

Ans:

Let $z = 4 - 3i$

Then, $\overline{z} = 4 + 3i$ and $|z|^2 = 4^2 + (-3)^2 = 16 + 9 = 25$

Therefore, the multiplicative inverse of $4 - 3i$ is given by

$$z^{-1} = \frac{\overline{z}}{|z|^2} = \frac{4+3i}{25} = \frac{4}{25}+\frac{3}{25}i$$

Question 12:

Find the multiplicative inverse of the complex number $\sqrt{5}+3i$

Ans:

Let $z = \sqrt{5}+3i$

Then, $\overline{z} = \sqrt{5}-3i$ and $|z|^2 = \left(\sqrt{5}\right)^2 + 3^2 = 5+9 = 14$

Therefore, the multiplicative inverse of $\sqrt{5}+3i$ is given by

$$z^{-1} = \frac{\overline{z}}{|z|^2} = \frac{\sqrt{5}-3i}{14} = \frac{\sqrt{5}}{14} - \frac{3i}{14}$$

Question 13:

Find the multiplicative inverse of the complex number $-i$

Ans:

Let $z = -i$

Then, $\overline{z} = i$ and $|z|^2 = 1^2 = 1$

Therefore, the multiplicative inverse of $-i$ is given by

$$z^{-1} = \frac{\overline{z}}{|z|^2} = \frac{i}{1} = i$$

Question 14:

Express the following expression in the form of $a + ib$.

$$\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+\sqrt{2}i)-(\sqrt{3}-i\sqrt{2})}$$

Ans:

$$\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+\sqrt{2}i)-(\sqrt{3}-i\sqrt{2})}$$

$$= \frac{(3)^2-(i\sqrt{5})^2}{\sqrt{3}+\sqrt{2}i-\sqrt{3}+\sqrt{2}i} \qquad \left[(a+b)(a-b)=a^2-b^2\right]$$

$$= \frac{9-5i^2}{2\sqrt{2}i}$$

$$= \frac{9-5(-1)}{2\sqrt{2}i} \qquad \left[i^2=-1\right]$$

$$= \frac{9+5}{2\sqrt{2}i}\times\frac{i}{i}$$

$$= \frac{14i}{2\sqrt{2}i^2}$$

$$= \frac{14i}{2\sqrt{2}(-1)}$$

$$= \frac{-7i}{\sqrt{2}}\times\frac{\sqrt{2}}{\sqrt{2}}$$

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

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Exercise 5.2

Question 1:

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Find the modulus and the argument of the complex number $z = -1 - i\sqrt{3}$

Ans:

$z = -1 - i\sqrt{3}$

Let $r\cos\theta = -1$ and $r\sin\theta = -\sqrt{3}$

On squaring and adding, we obtain

$$(r\cos\theta)^2 + (r\sin\theta)^2 = (-1)^2 + \left(-\sqrt{3}\right)^2$$

$$\Rightarrow r^2\left(\cos^2\theta + \sin^2\theta\right) = 1 + 3$$

$$\Rightarrow r^2 = 4 \qquad \left[\cos^2\theta + \sin^2\theta = 1\right]$$

$$\Rightarrow r = \sqrt{4} = 2 \qquad [\text{Conventionally, } r > 0]$$

$\therefore$ Modulus $= 2$

$\therefore\ 2\cos\theta = -1$ and $2\sin\theta = -\sqrt{3}$

$$\Rightarrow \cos\theta = \frac{-1}{2} \text{ and } \sin\theta = \frac{-\sqrt{3}}{2}$$

Since both the values of sin θ and cos θ are negative and sinθ and cosθ are negative in III quadrant,

$$\text{Argument} = -\left(\pi - \frac{\pi}{3}\right) = \frac{-2\pi}{3}$$

Thus, the modulus and argument of the complex number $-1 - \sqrt{3}\,i$ are 2 and $\frac{-2\pi}{3}$ respectively.

Question 2:

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Find the modulus and the argument of the complex number $z = -\sqrt{3} + i$

Ans:

$z = -\sqrt{3} + i$

Let $r\cos\theta = -\sqrt{3}$ and $r\sin\theta = 1$

On squaring and adding, we obtain

$r^2\cos^2\theta + r^2\sin^2\theta = \left(-\sqrt{3}\right)^2 + 1^2$

$\Rightarrow r^2 = 3 + 1 = 4$ $\quad [\cos^2\theta + \sin^2\theta = 1]$

$\Rightarrow r = \sqrt{4} = 2$ $\quad [\text{Conventionally, } r > 0]$

$\therefore$ Modulus $= 2$

$\therefore\ 2\cos\theta = -\sqrt{3}$ and $2\sin\theta = 1$

$\Rightarrow \cos\theta = \frac{-\sqrt{3}}{2}$ and $\sin\theta = \frac{1}{2}$

$\therefore \theta = \pi - \frac{\pi}{6} = \frac{5\pi}{6}$ $\quad [\text{As } \theta \text{ lies in the II quadrant}]$

Thus, the modulus and argument of the complex number $-\sqrt{3} + i$ are 2 and $\frac{5\pi}{6}$ respectively.

Question 3:

Convert the given complex number in polar form: $1 - i$

Ans:

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$1 - i$

Let $r \cos \theta = 1$ and $r \sin \theta = -1$

On squaring and adding, we obtain

$$r^2 \cos^2 \theta + r^2 \sin^2 \theta = 1^2 + (-1)^2$$
$$\Rightarrow r^2 (\cos^2 \theta + \sin^2 \theta) = 1 + 1$$
$$\Rightarrow r^2 = 2$$
$$\Rightarrow r = \sqrt{2} \qquad [\text{Conventionally, } r > 0]$$
$$\therefore \sqrt{2} \cos \theta = 1 \text{ and } \sqrt{2} \sin \theta = -1$$
$$\Rightarrow \cos \theta = \frac{1}{\sqrt{2}} \text{ and } \sin \theta = -\frac{1}{\sqrt{2}}$$
$$\therefore \theta = -\frac{\pi}{4} \qquad [\text{As } \theta \text{ lies in the IV quadrant}]$$

$$\therefore 1 - i = r \cos \theta + i r \sin \theta = \sqrt{2} \cos\left(-\frac{\pi}{4}\right) + i\sqrt{2} \sin\left(-\frac{\pi}{4}\right) = \sqrt{2}\left[\cos\left(-\frac{\pi}{4}\right) + i \sin\left(-\frac{\pi}{4}\right)\right]$$

This is the required polar form.

Question 4:

Convert the given complex number in polar form: $-1 + i$

Ans:

$-1+i$

Let $r\cos\theta=-1$ and $r\sin\theta=1$

On squaring and adding, we obtain

$$r^2\cos^2\theta+r^2\sin^2\theta=(-1)^2+1^2$$
$$\Rightarrow r^2\left(\cos^2\theta+\sin^2\theta\right)=1+1$$
$$\Rightarrow r^2=2$$
$$\Rightarrow r=\sqrt{2} \qquad [\text{Conventionally, } r>0]$$
$$\therefore \sqrt{2}\cos\theta=-1 \text{ and } \sqrt{2}\sin\theta=1$$
$$\Rightarrow \cos\theta=-\frac{1}{\sqrt{2}} \text{ and } \sin\theta=\frac{1}{\sqrt{2}}$$
$$\therefore \theta=\pi-\frac{\pi}{4}=\frac{3\pi}{4} \qquad [\text{As } \theta \text{ lies in the II quadrant}]$$

It can be written,

$$\therefore -1+i=r\cos\theta+ir\sin\theta=\sqrt{2}\cos\frac{3\pi}{4}+i\sqrt{2}\sin\frac{3\pi}{4}=\sqrt{2}\left(\cos\frac{3\pi}{4}+i\sin\frac{3\pi}{4}\right)$$

This is the required polar form.

Question 5:

Convert the given complex number in polar form: $-1-i$

Ans:

$-1-i$

Let $r\cos\theta=-1$ and $r\sin\theta=-1$

On squaring and adding, we obtain

$$r^2\cos^2\theta+r^2\sin^2\theta=(-1)^2+(-1)^2$$
$$\Rightarrow r^2(\cos^2\theta+\sin^2\theta)=1+1$$
$$\Rightarrow r^2=2$$
$$\Rightarrow r=\sqrt{2} \qquad [\text{Conventionally, } r>0]$$
$$\therefore \sqrt{2}\cos\theta=-1 \text{ and } \sqrt{2}\sin\theta=-1$$
$$\Rightarrow \cos\theta=-\frac{1}{\sqrt{2}} \text{ and } \sin\theta=-\frac{1}{\sqrt{2}}$$
$$\therefore \theta=-\left(\pi-\frac{\pi}{4}\right)=-\frac{3\pi}{4} \qquad [\text{As } \theta \text{ lies in the III quadrant}]$$

$$\therefore -1-i=r\cos\theta+ir\sin\theta=\sqrt{2}\cos\frac{-3\pi}{4}+i\sqrt{2}\sin\frac{-3\pi}{4}=\sqrt{2}\left(\cos\frac{-3\pi}{4}+i\sin\frac{-3\pi}{4}\right)$$

This is the required polar form.

Question 6:

Convert the given complex number in polar form: −3

Ans:

-3

Let $r\cos\theta = -3$ and $r\sin\theta = 0$

On squaring and adding, we obtain

$$r^2\cos^2\theta + r^2\sin^2\theta = (-3)^2$$
$$\Rightarrow r^2(\cos^2\theta + \sin^2\theta) = 9$$
$$\Rightarrow r^2 = 9$$
$$\Rightarrow r = \sqrt{9} = 3 \qquad [\text{Conventionally, } r > 0]$$
$$\therefore 3\cos\theta = -3 \text{ and } 3\sin\theta = 0$$
$$\Rightarrow \cos\theta = -1 \text{ and } \sin\theta = 0$$
$$\therefore \theta = \pi$$

$$\therefore -3 = r\cos\theta + ir\sin\theta = 3\cos\pi + i3\sin\pi = 3(\cos\pi + i\sin\pi)$$

This is the required polar form.

Question 7:

Convert the given complex number in polar form: $\sqrt{3} + i$

Ans:

$\sqrt{3}+i$

Let $r\cos\theta=\sqrt{3}$ and $r\sin\theta=1$

On squaring and adding, we obtain

$$r^2\cos^2\theta+r^2\sin^2\theta=\left(\sqrt{3}\right)^2+1^2$$
$$\Rightarrow r^2\left(\cos^2\theta+\sin^2\theta\right)=3+1$$
$$\Rightarrow r^2=4$$
$$\Rightarrow r=\sqrt{4}=2 \qquad [\text{Conventionally, } r>0]$$
$$\therefore 2\cos\theta=\sqrt{3} \text{ and } 2\sin\theta=1$$
$$\Rightarrow \cos\theta=\frac{\sqrt{3}}{2} \text{ and } \sin\theta=\frac{1}{2}$$
$$\therefore \theta=\frac{\pi}{6} \qquad [\text{As } \theta \text{ lies in the I quadrant}]$$

$$\therefore \sqrt{3}+i=r\cos\theta+ir\sin\theta=2\cos\frac{\pi}{6}+i2\sin\frac{\pi}{6}=2\left(\cos\frac{\pi}{6}+i\sin\frac{\pi}{6}\right)$$

This is the required polar form.

Question 8:

Convert the given complex number in polar form: i

Ans:

i

Let $r\cos\theta = 0$ and $r\sin\theta = 1$

On squaring and adding, we obtain

$$r^2\cos^2\theta + r^2\sin^2\theta = 0^2 + 1^2$$
$$\Rightarrow r^2\left(\cos^2\theta + \sin^2\theta\right) = 1$$
$$\Rightarrow r^2 = 1$$
$$\Rightarrow r = \sqrt{1} = 1 \qquad [\text{Conventionally, } r > 0]$$
$$\therefore \cos\theta = 0 \text{ and } \sin\theta = 1$$
$$\therefore \theta = \frac{\pi}{2}$$

$$\therefore i = r\cos\theta + ir\sin\theta = \cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$$

This is the required polar form.

NCERT 11th Maths Chapter 5, class 11 Maths Chapter 5 solutions

Exercise 5.3

Question 1:

Solve the equation $x^2 + 3 = 0$

Ans:

The given quadratic equation is $x^2 + 3 = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = 1$, $b = 0$, and $c = 3$

Therefore, the discriminant of the given equation is

$D = b^2 - 4ac = 0^2 - 4 \times 1 \times 3 = -12$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{\pm\sqrt{-12}}{2\times 1} = \frac{\pm\sqrt{12}\,i}{2} \qquad \left[\sqrt{-1} = i\right]$$
$$= \frac{\pm 2\sqrt{3}\,i}{2} = \pm\sqrt{3}\,i$$

Question 2:

Solve the equation $2x^2 + x + 1 = 0$

Ans:

The given quadratic equation is $2x^2 + x + 1 = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = 2$, $b = 1$, and $c = 1$

Therefore, the discriminant of the given equation is

$D = b^2 - 4ac = 1^2 - 4 \times 2 \times 1 = 1 - 8 = -7$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-1 \pm \sqrt{-7}}{2 \times 2} = \frac{-1 \pm \sqrt{7}\, i}{4} \qquad \left[\sqrt{-1} = i\right]$$

Question 3:

Solve the equation $x^2 + 3x + 9 = 0$

Ans:

The given quadratic equation is $x^2 + 3x + 9 = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = 1$, $b = 3$, and $c = 9$

Therefore, the discriminant of the given equation is

$D = b^2 - 4ac = 3^2 - 4 \times 1 \times 9 = 9 - 36 = -27$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-3 \pm \sqrt{-27}}{2(1)} = \frac{-3 \pm 3\sqrt{-3}}{2} = \frac{-3 \pm 3\sqrt{3}\, i}{2} \qquad \left[\sqrt{-1} = i\right]$$

Question 4:

Solve the equation $-x^2 + x - 2 = 0$

Ans:

The given quadratic equation is $-x^2 + x - 2 = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = -1$, $b = 1$, and $c = -2$

Therefore, the discriminant of the given equation is

$D = b^2 - 4ac = 1^2 - 4 \times (-1) \times (-2) = 1 - 8 = -7$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-1 \pm \sqrt{-7}}{2 \times (-1)} = \frac{-1 \pm \sqrt{7}\, i}{-2} \qquad \left[\sqrt{-1} = i\right]$$

Question 5:

Solve the equation $x^2 + 3x + 5 = 0$

Ans:

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The given quadratic equation is $x^2 + 3x + 5 = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = 1$, $b = 3$, and $c = 5$

Therefore, the discriminant of the given equation is

$D = b^2 - 4ac = 3^2 - 4 \times 1 \times 5 = 9 - 20 = -11$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-3 \pm \sqrt{-11}}{2 \times 1} = \frac{-3 \pm \sqrt{11}\, i}{2} \qquad \left[\sqrt{-1} = i\right]$$

Question 6:

Solve the equation $x^2 - x + 2 = 0$

Ans:

The given quadratic equation is $x^2 - x + 2 = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = 1$, $b = -1$, and $c = 2$

Therefore, the discriminant of the given equation is

$D = b^2 - 4ac = (-1)^2 - 4 \times 1 \times 2 = 1 - 8 = -7$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-(-1) \pm \sqrt{-7}}{2 \times 1} = \frac{1 \pm \sqrt{7}\, i}{2} \qquad \left[\sqrt{-1} = i\right]$$

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Question 7:

Solve the equation $\sqrt{2}x^2 + x + \sqrt{2} = 0$

Ans:

The given quadratic equation is $\sqrt{2}x^2 + x + \sqrt{2} = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = \sqrt{2}$, $b = 1$, and $c = \sqrt{2}$

Therefore, the discriminant of the given equation is

$D = b^2 - 4ac = 1^2 - 4 \times \sqrt{2} \times \sqrt{2} = 1 - 8 = -7$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-1 \pm \sqrt{-7}}{2 \times \sqrt{2}} = \frac{-1 \pm \sqrt{7}\, i}{2\sqrt{2}} \qquad \left[\sqrt{-1} = i\right]$$

Question 8:

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

Ans:

The given quadratic equation is $\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0$

On comparing the given equation with $ax^2 + bx + c = 0$, we obtain

$a = \sqrt{3}$, $b = -\sqrt{2}$, and $c = 3\sqrt{3}$

Therefore, the discriminant of the given equation is

$$D = b^2 - 4ac = \left(-\sqrt{2}\right)^2 - 4\left(\sqrt{3}\right)\left(3\sqrt{3}\right) = 2 - 36 = -34$$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-\left(-\sqrt{2}\right) \pm \sqrt{-34}}{2 \times \sqrt{3}} = \frac{\sqrt{2} \pm \sqrt{34}\, i}{2\sqrt{3}} \qquad \left[\sqrt{-1} = i\right]$$

Question 9:

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

Ans:

The given quadratic equation is $x^2 + x + \frac{1}{\sqrt{2}} = 0$

This equation can also be written as $\sqrt{2}x^2 + \sqrt{2}x + 1 = 0$

On comparing this equation with $ax^2 + bx + c = 0$, we obtain

$a = \sqrt{2}$, $b = \sqrt{2}$, and $c = 1$

$\therefore$ Discriminant $(D) = b^2 - 4ac = \left(\sqrt{2}\right)^2 - 4 \times \left(\sqrt{2}\right) \times 1 = 2 - 4\sqrt{2}$

Therefore, the required solutions are

Question 10:

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

Ans:

The given quadratic equation is $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$

This equation can also be written as $\sqrt{2}x^2 + x + \sqrt{2} = 0$

On comparing this equation with $ax^2 + bx + c = 0$, we obtain

$a = \sqrt{2}$, $b = 1$, and $c = \sqrt{2}$

$\therefore$ Discriminant $(D) = b^2 - 4ac = 1^2 - 4 \times \sqrt{2} \times \sqrt{2} = 1 - 8 = -7$

Therefore, the required solutions are

$$\frac{-b \pm \sqrt{D}}{2a} = \frac{-1 \pm \sqrt{-7}}{2\sqrt{2}} = \frac{-1 \pm \sqrt{7}\, i}{2\sqrt{2}} \qquad \left[\sqrt{-1} = i\right]$$

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