Exercise 10B

Question 8:

The given equation is $2x^2 - 9x + 7 = 0$

$a = 2, b = -9, c = 7$

So, $D = (b^2 - 4ac) = [(-9)^2 - 4 \times 2 \times 7] = 25 > 0$

So, the given equation has real roots, given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{9 + \sqrt{25}}{2 \times 2} = \frac{14}{4} = \frac{7}{2}$$

$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{9 - \sqrt{25}}{2 \times 2} = \frac{4}{4} = 1$$

Hence, $\frac{7}{2}$ and 1 are the roots of the given equation

Question 9:

The given equation is $2x^2 + x - 6 = 0$

Comparing it with $ax^2 + bx + c = 0$, we get

$a = 2, b = 1, c = -6$

$$\therefore D = (b^2 - 4ac) = [1^2 - 4 \times 2 \times (-6)]$$

$$D = 49 > 0$$

So, the given equation has real root, given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{-1 + \sqrt{49}}{2 \times 2} = \frac{6}{4} = \frac{3}{2}$$

$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{-1 - \sqrt{49}}{2 \times 2} = \frac{-8}{4} = -2$$

Hence, $\frac{3}{2}$ and -2 are the roots of the given equation

Question 10:

The given equation is $x^2 - 4x - 1 = 0$

Comparing it with $ax^2 + bx + c = 0$, we get

$a = 1, b = -4, c = -1$

$$\therefore D = \left(b^2 - 4ac\right) = \left[(-4)^2 - 4 \times 1 \times (-1)\right]$$
$$D = 20 > 0$$

Hence, the given equation has real roots, given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{4 + \sqrt{20}}{2 \times 1} = \frac{4 + 2\sqrt{5}}{2} = \frac{2\left(2 + \sqrt{5}\right)}{2}$$
$$\alpha = 2 + \sqrt{5}$$
$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{4 - \sqrt{20}}{2 \times 1} = \frac{4 - 2\sqrt{5}}{2} = \frac{2\left(2 - \sqrt{5}\right)}{2}$$
$$\beta = 2 - \sqrt{5}$$

Hence, $2 + \sqrt{5}$ and $2 - \sqrt{5}$ are the roots of the equation

Question 11:

The given equation is $x^2 - 6x + 4 = 0$

Comparing it with $ax^2 + bx + c = 0$, we get

$a = 1, b = -6, c = 4$

$$\therefore D = \left(b^2 - 4ac\right) = \left[(-6)^2 - 4 \times 1 \times 4\right]$$
$$= (36 - 16) = 20 > 0$$

Hence, the given equation has real roots given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{6 + \sqrt{20}}{2 \times 1} = \frac{6 + 2\sqrt{5}}{2} = \frac{2\left(3 + \sqrt{5}\right)}{2}$$
$$= 3 + \sqrt{5}$$
$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{6 - \sqrt{20}}{2} = \frac{6 - 2\sqrt{5}}{2} = \frac{2\left(3 - \sqrt{5}\right)}{2}$$
$$= 3 - \sqrt{5}$$

Hence, $3 + \sqrt{5}$ and $3 - \sqrt{5}$ are the roots of given equation

Question 12:

The given equation is $x^2 - 7x - 5 = 0$

Comparing it with $ax^2 + bx + c = 0$

a = 1, b = -7, c = -5

$$\therefore D = \left(b^2 - 4ac\right) = \left[(-7)^2 - 4 \times 1 \times (-5)\right]$$
$$= (49 + 20) = 69$$

Since, 69 > 0

So, the given equation has real roots, given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{7 + \sqrt{69}}{2}$$
$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{7 - \sqrt{69}}{2}$$

Hence, $\frac{7 + \sqrt{69}}{2}$ and $\frac{7 - \sqrt{69}}{2}$ are the roots of the given equation

Question 13:

The given equation is $5x^2 - 19x + 17 = 0$

Comparing it with $ax^2 + bx + c = 0$, we get

a = 5, b = -19, c = 17

$$\therefore D = \left(b^2 - 4ac\right) = \left[(-19)^2 - 4 \times 5 \times 17\right] = (361 - 340) = 21$$

21>0

So, the given equation has real roots given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{19 + \sqrt{21}}{2 \times 5} = \frac{19 + \sqrt{21}}{10}$$
$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{19 - \sqrt{21}}{2 \times 5} = \frac{19 - \sqrt{21}}{10}$$

Hence, $\frac{19 + \sqrt{21}}{10}$ and $\frac{19 - \sqrt{21}}{10}$ are roots of the given equation

Question 14:

The given equation is $3x^2 - 32x + 12 = 0$

Comparing it with $ax^2 + bx + c = 0$, we get

a = 3, b = -32, c = 12

$$\therefore D = \left(b^2 - 4ac\right) = \left[(-32)^2 - 4\times 3\times 12\right] = (1024 - 144)$$
$$= 880 > 0$$

So, the given equation has real roots given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{32 + \sqrt{880}}{2\times 3} = \frac{32 + 4\sqrt{55}}{6} = \frac{2\left(16 + 2\sqrt{55}\right)}{6}$$
$$\alpha = \frac{16 + 2\sqrt{55}}{3}$$
$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{32 - \sqrt{880}}{2\times 3} = \frac{32 - 4\sqrt{55}}{6} = \frac{2\left(16 - 2\sqrt{55}\right)}{6}$$
$$\beta = \frac{16 - 2\sqrt{55}}{3}$$

Hence, $\frac{16 + 2\sqrt{55}}{3}$ and $\frac{16 - 2\sqrt{55}}{3}$ are the roots of the given equation

Question 15:

The given equation is $25x^2 + 30x + 7 = 0$

Comparing it with $ax^2 + bx + c = 0$, we get

a = 25, b = 30, c = 7

$$\therefore D = \left(b^2 - 4ac\right) = \left[(30)^2 - 4\times 25\times 7\right] = 200 > 0$$

Hence, the given equation has real roots, given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} = \frac{-30 + \sqrt{200}}{2\times 25} = \frac{-30 + 10\sqrt{2}}{50} = \frac{10\left(-3 + \sqrt{2}\right)}{50} = \frac{\left(-3 + \sqrt{2}\right)}{5}$$
$$\beta = \frac{-b - \sqrt{D}}{2a} = \frac{-30 - \sqrt{200}}{2\times 25} = \frac{-30 - 10\sqrt{2}}{50} = \frac{10\left(-3 - \sqrt{2}\right)}{50} = \frac{-3 - \sqrt{2}}{5}$$

Hence, $\frac{\left(-3 + \sqrt{2}\right)}{5}$ and $\frac{\left(-3 - \sqrt{2}\right)}{5}$ are the roots of the given equation

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