

RD SHARMA

Solutions

Class 10 Maths

Chapter 8

Ex 8.5

Q.1: Find the discriminant of the following quadratic equations :

1: $2x^2 - 5x + 3 = 0$

Soln: $2x^2 - 5x + 3 = 0$

The given equation is in the form of $ax^2 + bx + c = 0$

Here, $a = 2$, $b = -5$ and $c = 3$

The discriminant, $D = b^2 - 4ac$

$$D = (-5)^2 - 4 \times 2 \times 3$$

$$D = 25 - 24 = 1$$

Therefore, the discriminant of the following quadratic equation is 1.

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

Soln: $x^2 + 2x + 4 = 0$

The given equation is in the form of $ax^2 + bx + c = 0$

Here, $a = 1$, $b = 2$ and $c = 4$

The discriminant is :-

$$D = (2)^2 - 4 \times 1 \times 4$$

$$D = 4 - 16 = -12$$

The discriminant of the following quadratic equation is $= -12$.

3) $(x - 1)(2x - 1) = 0$

Soln: $(x - 1)(2x - 1) = 0$

The provided equation is $(x - 1)(2x - 1) = 0$

By solving it, we get $2x^2 - 3x + 1 = 0$

Now this equation is in the form of $ax^2 + bx + c = 0$

Here, $a = 2$, $b = -3$, $c = 1$

The discriminant is :-

$$D = (-3)^2 - 4 \times 2 \times 1$$

$$D = 9 - 8 = 1$$

The discriminant of the following quadratic equation is = 1.

$$4) x^2 - 2x + k = 0$$

Soln: $x^2 - 2x + k = 0$

The given equation is in the form of $ax^2 + bx + c = 0$

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

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

$$D = (-2)^2 - 4(1)(k)$$

$$= 4 - 4k$$

Therefore, the discriminant, D of the equation is $(4 - 4k)$

$$5) \sqrt{3}x^2 + 2\sqrt{2}x - 2\sqrt{3} = 0 \quad \sqrt{3}x^2 + 2\sqrt{2}x - 2\sqrt{3} = 0$$

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

The given equation is in the form of $ax^2 + bx + c = 0$

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

The discriminant is, $D = b^2 - 4ac$

$$(2\sqrt{2})^2 - (4 \times \sqrt{3} \times -2\sqrt{3}) \quad (2\sqrt{2})^2 - (4 \times \sqrt{3} \times -2\sqrt{3})$$

$$D = 8 + 24 = 32$$

The discriminant, D of the following equation is 32.

$$6) x^2 - x + 1 = 0$$

$$\text{Soln: } x^2 - x + 1 = 0$$

The given equation is in the form of $ax^2 + bx + c = 0$

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

The discriminant is $D = b^2 - 4ac$

$$(-1)^2 - 4 \times 1 \times 1$$

$$1 - 4 = -3$$

Therefore, The discriminant D of the following equation is -3 .

$$\text{Q.2: 1) } 16x^2 = 24x + 1$$

$$\text{Soln: } 16x^2 - 24x - 1 = 0$$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = 16$, $b = -24$ and $c = -1$

Therefore, the discriminant is given as,

$$D = (-24)^2 - 4(16)(-1)$$

$$= 576 + 64$$

$$= 640$$

For a quadratic equation to have real roots, $D \geq 0$.

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the following equation are as follows,

$$x = \frac{-(-24) \pm \sqrt{640}}{2(16)} \quad x = \frac{24 \pm 8\sqrt{10}}{32} \quad x = \frac{3 \pm \sqrt{10}}{4}$$

The values of x for both the cases will be :

$$x = \frac{3 + \sqrt{10}}{4} \text{ and,}$$

$$x = \frac{3 - \sqrt{10}}{4}$$

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

Soln: $x^2 + x + 2 = 0$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

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

Therefore, the discriminant is given as,

$$D = (1)^2 - 4(1)(2)$$

$$= 1 - 8$$

$$= -7$$

For a quadratic equation to have real roots, $D \geq 0$.

Here we find that the equation does not satisfy this condition, hence it does not have real roots.

3) $\sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$

Soln: $\sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = \sqrt{3}$, $b = 10$ and $c = -8\sqrt{3}$

Therefore, the discriminant is given as,

$$D = (10)^2 - 4(\sqrt{3})(-8\sqrt{3}) = 100 + 96 = 196$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$x = \frac{-10 \pm \sqrt{196}}{2\sqrt{3}} \quad x = \frac{-10 \pm 14}{2\sqrt{3}} \quad x = \frac{-5 \pm 7}{\sqrt{3}}$$

The values of x for both the cases will be :

$$x = \frac{-5+7}{\sqrt{3}}$$

$$x = \frac{2}{\sqrt{3}} \quad \text{and,}$$

$$x = \frac{-5-7}{\sqrt{3}} \quad x = \frac{-12}{\sqrt{3}}$$

4) $3x^2 - 2x + 2 = 0$

Soln: $3x^2 - 2x + 2 = 0$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = 3$, $b = -2$ and $c = 2$.

Therefore, the discriminant is given as,

$$D = (-2)^2 - 4(3)(2)$$

$$= 4 - 24 = -20$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation does not satisfy this condition, hence it has no real roots.

5) $2x^2 - 2\sqrt{6}x + 3 = 0$

Soln: $2x^2 - 2\sqrt{6}x + 3 = 0$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = 2$, $b = -2\sqrt{6}$ and $c = 3$.

Therefore, the discriminant is given as,

$$D = (-2\sqrt{6})^2 - 4(2)(3) \\ = 24 - 24 = 0$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad x = \frac{-(-2\sqrt{6}) \pm 0}{2(2)} \quad x = \frac{(2\sqrt{6}) \pm 0}{4} \quad x = \frac{2\sqrt{6}}{4} \quad x = \frac{\sqrt{6}}{2}$$

$$6) \quad 3a^2x^2 + 8abx + 4b^2 = 0$$

$$\text{Soln: } 3a^2x^2 + 8abx + 4b^2 = 0$$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = 3a^2$, $b = 8ab$ and $c = 4b^2$

Therefore, the discriminant is given as,

$$D = (8ab)^2 - 4(3a^2)(4b^2) \\ = 64a^2b^2 - 48a^2b^2 = 16a^2b^2$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$x = \frac{-(8ab) \pm \sqrt{16a^2b^2}}{2(3a^2)} \quad x = \frac{-(8ab) \pm 4ab}{6a^2} \quad x = \frac{-(4b) \pm 2b}{3a}$$

The values of x for both the cases will be :

$$X = \frac{-(4b) + 2b}{3a}$$

$$X = \frac{-(2b)}{3a} \quad \text{and}$$

$$X = \frac{-(4b) - 2b}{3a} \quad X = \frac{-2b}{a}$$

$$7.) \quad 3x^2 + 2\sqrt{5}x - 5 = 0$$

$$\text{Soln.:} \quad 3x^2 + 2\sqrt{5}x - 5 = 0$$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = 3$, $b = 2\sqrt{5}$ and $c = -5$.

Therefore, the discriminant is given as,

$$D = (2\sqrt{5})^2 - 4(3)(-5)$$

$$= 20 + 60$$

$$= 80$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$X = \frac{-b \pm \sqrt{D}}{2a} \quad X = \frac{-(2\sqrt{5}) \pm \sqrt{80}}{2(3)} \quad X = \frac{-(2\sqrt{5}) \pm 4\sqrt{5}}{2(3)}$$

$$X = \frac{-(2\sqrt{5}) + 4\sqrt{5}}{2(3)} \quad X = \frac{-\sqrt{5} + 2\sqrt{5}}{3} \quad X = \frac{\sqrt{5}}{3}$$

The values of x for both the cases will be :

$$X = \frac{-\sqrt{5} + 2\sqrt{5}}{3} \quad X = \frac{\sqrt{5}}{3}$$

And,

$$X = \frac{-\sqrt{5} - 2\sqrt{5}}{3}$$

$$x = -\sqrt{5}$$

8.) $x^2 - 2x + 1 = 0$

Soln.: $x^2 - 2x + 1 = 0$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

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

Therefore, the discriminant is given as,

$$D = (-2)^2 - 4(1)(1)$$

$$= 4 - 4$$

$$= 0$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a} \quad x = \frac{-(-2) \pm \sqrt{0}}{2(1)}$$

$$x = 2/2$$

$$x = 1$$

Therefore, the equation real roots and its value is 1

9.) $2x^2 + 5\sqrt{3}x + 6 = 0$

Soln.: $2x^2 + 5\sqrt{3}x + 6 = 0$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = 2$, $b = 5\sqrt{3}$ and $c = 6$.

Therefore, the discriminant is given as,

$$D = (5\sqrt{3})^2 - 4(2)(6)$$

$$= 75 - 48$$

$$= 27$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows

$$x = \frac{-(5\sqrt{3}) \pm \sqrt{27}}{2} \quad x = \frac{-(5\sqrt{3}) \pm 3\sqrt{3}}{2}$$

The values of x for both the cases will be :

$$x = \frac{-(5\sqrt{3}) + 3\sqrt{3}}{2} \quad x = -\sqrt{3}$$

And,

$$x = \frac{-(5\sqrt{3}) - 3\sqrt{3}}{2} \quad x = -2\sqrt{3}$$

$$10.) \sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$$

$$\text{Soln.: } \sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

$$\text{here, } a = \sqrt{2}, b = 7, c = 5\sqrt{2}$$

Therefore, the discriminant is given as,

$$D = (7)^2 - 4(\sqrt{2})(5\sqrt{2})$$

$$D = 49 - 40$$

$$D = 9$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$x = \frac{-(-7) \pm \sqrt{9}}{2(\sqrt{2})} \quad x = \frac{-7 \pm 3}{2(\sqrt{2})}$$

The values of x for both the cases will be :

$$x = \frac{-7+3}{2(\sqrt{2})} \quad x = -\sqrt{2} \quad x = -\sqrt{2}$$

And

$$x = \frac{-7-3}{2(\sqrt{2})} \quad x = -5\sqrt{2} \quad x = -\frac{5}{\sqrt{2}}$$

$$11.) \quad 2x^2 - 2\sqrt{2}x + 1 = 0 \quad 2x^2 - 2\sqrt{2}x + 1 = 0$$

$$\text{Soln.:} \quad 2x^2 - 2\sqrt{2}x + 1 = 0 \quad 2x^2 - 2\sqrt{2}x + 1 = 0$$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

$$\text{here, } a = 2, \quad b = -2\sqrt{2}, \quad c = 1$$

Therefore, the discriminant is given as,

$$D = (-2\sqrt{2})^2 - 4(2)(1)$$

$$= 8 - 8$$

$$= 0$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$x = \frac{-(-2\sqrt{2}) \pm \sqrt{0}}{2(2)} \quad x = \frac{2\sqrt{2}}{4} \quad x = \frac{1}{\sqrt{2}}$$

$$12.) 3x^2 - 5x + 2 = 0$$

$$\text{Soln.: } 3x^2 - 5x + 2 = 0$$

The given equation can be written in the form of, $ax^2 + bx + c = 0$

the discriminant is given by the following equation, $D = b^2 - 4ac$

here, $a = 3$, $b = -5$ and $c = 2$.

Therefore, the discriminant is given as,

$$D = (-5)^2 - 4(3)(2)$$

$$= 25 - 24$$

$$= 1$$

For a quadratic equation to have real roots, $D \geq 0$

Here it can be seen that the equation satisfies this condition, hence it has real roots.

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$x = \frac{-(-5) \pm \sqrt{1}}{2(3)} \quad x = \frac{5 \pm 1}{6}$$

The values of x for both the cases will be :

$$x = \frac{5+1}{6}$$

$$x = 1$$

And,

$$x = \frac{5-1}{6}$$

$$x = 2/3$$

$$\text{Q.3) Solve for } x : 1.) \quad x-1x-2 + x-3x-4 = 3 \cdot 13, x \neq 2, 4 \quad \frac{x-1}{x-2} + \frac{x-3}{x-4} = 3 \frac{1}{3}, x \neq 2, 4 .$$

$$\text{Soln.: } x-1x-2 + x-3x-4 = 3 \cdot 13, x \neq 2, 4 \quad \frac{x-1}{x-2} + \frac{x-3}{x-4} = 3 \frac{1}{3}, x \neq 2, 4$$

The above equation can be solved as follows:

$$(x-1)(x-4)+(x-3)(x-2)(x-2)(x-4) = 103 \frac{(x-1)(x-4)+(x-3)(x-2)}{(x-2)(x-4)} = \frac{10}{3} x^2-5x+4+x^2-5x+6x^2-6x+8 = 103$$

$$\frac{x^2-5x+4+x^2-5x+6}{x^2-6x+8} = \frac{10}{3}$$

$$6x^2 - 30x + 30 = 10x^2 - 60x + 80$$

$$4x^2 - 30x + 50 = 0$$

$$2x^2 - 15x + 25 = 0$$

The above equation is in the form of $ax^2 + bx + c = 0$

The discriminant is given by the equation, $D = b^2 - 4ac$

Here, $a = 2$, $b = -15$, $c = 25$

$$D = (-15)^2 - 4(2)(25)$$

$$= 225 - 200$$

$$= 25$$

the roots of an equation can be found out by using,

$$X = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$X = \frac{-(-15) \pm \sqrt{25}}{2(2)} \quad X = \frac{15 \pm 5}{4}$$

The values of x for both the cases will be :

$$X = \frac{15+5}{4}$$

$$X = 5$$

Also,

$$X = \frac{15-5}{4} \quad X = \frac{5}{2}$$

$$2) \quad x + \frac{1}{x} = 3, x \neq 0$$

$$\text{Soln.: } x + \frac{1}{x} = 3, x \neq 0$$

The above equation can be solved as follows:

$$x^2+1x=3\frac{x^2+1}{x} = 3$$

$$X^2 + 1 = 3x$$

$$X^2 - 3x + 1 = 0$$

The above equation is in the form of $ax^2 + bx + c = 0$

The discriminant is given by the equation, $D = b^2 - 4ac$

Here, $a = 1$, $b = -3$, $c = 1$

$$D = (-3)^2 - 4(1)(1)$$

$$D = 9 - 4$$

$$D = 5$$

the roots of an equation can be found out by using,

$$X = \frac{-b \pm \sqrt{D}}{2a} \quad X = \frac{-(-3) \pm \sqrt{5}}{2(1)} \quad X = \frac{3 \pm \sqrt{5}}{2}$$

The values of x for both the cases will be :

$$X = 3 + \sqrt{5} \quad X = \frac{3 + \sqrt{5}}{2}$$

$$\text{And, } X = 3 - \sqrt{5} \quad X = \frac{3 - \sqrt{5}}{2}$$

$$3.) \quad 16x - 1 = 15x + 1, x \neq 0, -1 \quad \frac{16}{x} - 1 = \frac{15}{x+1}, x \neq 0, -1$$

$$\text{Soln. : } 16x - 1 = 15x + 1, x \neq 0, -1 \quad \frac{16}{x} - 1 = \frac{15}{x+1}, x \neq 0, -1$$

The above equation can be solved as follows:

$$16 - x = 15x + 1 \quad \frac{16-x}{x} = \frac{15}{x+1}$$

$$(16 - x)(x + 1) = 15x$$

$$16x + 16 - x^2 - x = 15x$$

$$15x + 16 - x^2 - 15x = 0$$

$$16 - x^2 = 0$$

$$X^2 - 16 = 0$$

The above equation is in the form of $ax^2 + bx + c = 0$

The discriminant is given by the equation, $D = b^2 - 4ac$

Here, $a = 1$, $b = 0$, $c = -16$

$$D = (0)^2 - 4(1)(-16)$$

$$D = 64$$

the roots of an equation can be found out by using,

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

Therefore, the roots of the equation are given as follows,

$$x = \frac{-0 \pm \sqrt{64}}{2(1)} \quad x = \frac{\pm 8}{2} \quad x = \pm 4$$