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

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

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

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

The discriminant is, $D = b^2 – 4ac$

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

$D = 8 + 24 = 32$

The discriminant, D of the following equation is 32.

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

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.

Q.2: 1) $16x^2 = 24x + 1$

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 ≥≥ 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= −b±√D2a $x = \frac{-b\pm\sqrt{D}}{2a}$

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

x= −(−24)±√6402(16) $x = \frac{-(-24)\pm\sqrt{640}}{2(16)}$ x= 24±8√1032 $x = \frac{24\pm8\sqrt{10}}{32}$ x= 3±√104 $x = \frac{3\pm\sqrt{10}}{4}$

The values of x for both the cases will be :

x= 3+√104 $x = \frac{3+\sqrt{10}}{4}$ and,

x= 3−√104 $x = \frac{3-\sqrt{10}}{4}$

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) √3x²+10x–8√3=0 $\sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$

Soln: √3x²+10x–8√3=0 $\sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$

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 = √3 $\sqrt{3}$, b = 10 and c = −8√3 $-8\sqrt{3}$

Therefore, the discriminant is given as,

$D = (10)^2 - 4$(√3 $\sqrt{3}$)(−8√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=−b±√D2a $x = \frac{-b \pm \sqrt{D}}{2a}$

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

x=−10±√1962√3 $x = \frac{-10 \pm \sqrt{196}}{2\sqrt{3}}$ x=−10±142√3 $x = \frac{-10 \pm 14}{2\sqrt{3}}$ x=−5±7√3 $x = \frac{-5 \pm 7}{\sqrt{3}}$

The values of x for both the cases will be :

x=−5+7√3 $x = \frac{-5+7}{\sqrt{3}}$

x=2√3 $x = \frac{2}{\sqrt{3}}$ and,

x=−5−7√3 $x = \frac{-5-7}{\sqrt{3}}$ x=−4√3 $x = -4\sqrt{3}$

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) 2x²–2√6x+3=0 $2x^2 - 2\sqrt{6}x + 3 = 0$

Soln: 2x²–2√6x+3=0 $2x^2 - 2\sqrt{6}x + 3 = 0$

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 = $-2\sqrt{6}$ $-2\sqrt{6}$ and c =3.

Therefore, the discriminant is given as,

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

= 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= −b±√D2a $x = \frac{-b \pm \sqrt{D}}{2a}$ X= −(2√6)±02(2) $x = \frac{-(2\sqrt{6}) \pm 0}{2(2)}$ X= −(√6)2 $x = \frac{-(\sqrt{6})}{2}$ X=−√32 $x = -\sqrt{\frac{3}{2}}$

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

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= −b±√D2a $x = \frac{-b \pm \sqrt{D}}{2a}$

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

X= −(8ab)±√16a²b²2(3a²) $x = \frac{-(8ab) \pm \sqrt{16a^2b^2}}{2(3a^2)}$ X= −(8ab)±4ab6a² $x = \frac{-(8ab) \pm 4ab}{6a^2}$ X= −(4b)±2b3a

$x = \frac{-(4b) \pm 2b}{3a}$

The values of x for both the cases will be :

X=−(4b)+2b3a $x = \frac{-(4b)+2b}{3a}$

X=−(2b)3a $x = \frac{-(2b)}{3a}$ and

X=−(4b)−2b3a $x = \frac{-(4b)-2b}{3a}$ X=−2ba $x = \frac{-2b}{a}$

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

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

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 = $2\sqrt{5}$ $2\sqrt{5}$ and c = – 5.

Therefore, the discriminant is given as,

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

= 20 + 60

= 80

For a quadratic equation to have real roots, D ≥≥ 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=−b±√D2a $x = \frac{-b \pm \sqrt{D}}{2a}$ X=−(2√5)±√802(3) $x = \frac{-(2\sqrt{5}) \pm \sqrt{80}}{2(3)}$ X=−(2√5)±4√52(3) $x = \frac{-(2\sqrt{5}) \pm 4\sqrt{5}}{2(3)}$ X=−sqrt5±2√53 $x = \frac{-sqrt5 \pm 2\sqrt{5}}{3}$

The values of x for both the cases will be :

X=−sqrt5 +2√53 $x = \frac{-sqrt5 + 2\sqrt{5}}{3}$ X=sqrt53 $x = \frac{sqrt5}{3}$

And,

X=−sqrt5 −2√53 $x = \frac{-sqrt5 - 2\sqrt{5}}{3}$

x = – √5 $\sqrt{5}$

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,

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

x = 2/2

x = 1

Therefore, the equation real roots and its value is 1

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

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

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 = $5\sqrt{3}$ $5\sqrt{3}$ and c = 6.

Therefore, the discriminant is given as,

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

= 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

$$x = \frac{-(5\sqrt{3}) \pm \sqrt{27}}{2(2)} \quad x = \frac{-(5\sqrt{3}) \pm 3\sqrt{3}}{4}$$

The values of x for both the cases will be :

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

And,

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

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

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, $D = b^2 - 4ac$

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,

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

The values of x for both the cases will be :

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

And

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

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

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

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

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

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

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

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

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 ≥≥ 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=−b±√D2a $x = \frac{-b \pm \sqrt{D}}{2a}$

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

x=−(−5)±√12(3) $x = \frac{-(-5) \pm \sqrt{1}}{2(3)}$ x=5±16 $x = \frac{5 \pm 1}{6}$

The values of x for both the cases will be :

x=5+16 $x = \frac{5+1}{6}$

x = 1

And,

x=5−16 $x = \frac{5-1}{6}$

x = 2/3

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

Soln.: x−1x−2+x−3x−4=3 13 ,x≠2,4 $\frac{x-1}{x-2} + \frac{x-3}{x-4} = 3\frac{1}{3}, x \neq 2, 4$

The above equation can be solved as follows:

(x−1)(x−4)+(x−3)(x−2)(x−2)(x−4)=103 $\frac{(x-1)(x-4)+(x-3)(x-2)}{(x-2)(x-4)} = \frac{10}{3}$ x²–5x+4+x²–5x+6x²–6x+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=−b±√D2a $x = \frac{-b \pm \sqrt{D}}{2a}$

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

x=−(−15)±√252(2) $x = \frac{-(-15) \pm \sqrt{25}}{2(2)}$ x=15±54 $x = \frac{15 \pm 5}{4}$

The values of x for both the cases will be :

x=15+54 $x = \frac{15+5}{4}$

X = 5

Also,

x=15–54 $x = \frac{15-5}{4}$ x=52 $x = \frac{5}{2}$

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

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

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=−b±√D2a $x = \frac{-b \pm \sqrt{D}}{2a}$ x=−(−3)±√52(1) $x = \frac{-(-3) \pm \sqrt{5}}{2(1)}$ x=3±√52 $x = \frac{3 \pm \sqrt{5}}{2}$

The values of x for both the cases will be :

x=3 +√52 $x = \frac{3 + \sqrt{5}}{2}$

And, x=3 –√52 $x = \frac{3 - \sqrt{5}}{2}$

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

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

The above equation can be solved as follows:

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

(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,

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