RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6: Chapter 8, Exercise 8.6 of RD Sharma Class 10 Maths focuses on solving quadratic equations using the method of completing the square. In this exercise, students learn to transform a given quadratic equation into a perfect square trinomial by adding or subtracting terms.

This method helps in finding the roots of the equation. It also emphasizes the importance of understanding the properties of quadratic equations and their real-life applications.

RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 Overview

RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 focuses on solving quadratic equations using the factorization method. The key idea is to factorize the quadratic equation of the form $ax^2 + bx + c = 0$ and then find the values of x that satisfy the equation.

RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 helps students understand the core concepts of quadratic equations, enhancing their problem-solving skills and laying the foundation for more advanced algebraic techniques. Mastery of quadratic equations is crucial for competitive exams and real-life applications, making it an essential topic in both academic and professional contexts.

RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 Quadratic Equations

Below is the RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 Quadratic Equations -

1. Determine the nature of the roots of the following quadratic equations.

Important Notes:

– A quadratic equation is in the form $ax^2 + bx + c = 0$

– To find the nature of roots, first, find determinant “D”

– $D = b^2 - 4ac$

– If $D > 0$, the equation has real and distinct roots.

– If $D < 0$, the equation has no real roots.

– If D = 0, the equation has 1 root.

(i) $2x^2 -3x + 5 =0$

Solution:

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

$D = b^2 – 4ac$

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

= 9 – 40

= -31<0

It's seen that D<0, and hence, the given equation does not have any real roots.

(ii) $2x^2 -6x + 3=0$

Solution:

Here, a= 2, b= -6, c= 3

$D = (-6)^2 -4(2)(3)$

= 36 – 24

= 12>0

It's seen that D>0, and hence, the given equation have real and distinct roots.

(iii) $(3/5)x^2 – (2/3) + 1 = 0$

Solution:

Here, a= 3/5, b= -2/3, c= 1

$D = (-2/3)^2 -4(3/5)(1)$

= 4/9 – 12/5

= -88/45<0

It's seen that D<0, and hence, the given equation does not have any real roots.

(iv) $3x^2 – 4\sqrt{3}x + 4 = 0$

Solution:

Here, a= 3, b= – 4√3, c= 4

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

= 48 – 48

= 0

It's seen that D = 0, and hence, the given equation has only 1 real and equal root.

(v) $3x^2 – 2\sqrt{6}x + 2 = 0$

Solution:

Here, a= 3, b= – 2√6, c= 2

D = $(- 2\sqrt{6})^2$ – 4(3)(2)

= 24 – 24

= 0

It's seen that D = 0, and hence, the given equation has only 1 real and equal root.

2. Find the values of k for which the roots are real and equal in each of the following equations.

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

Solution:

The given equation $kx^2 + 4x + 1 = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = k, b = 4, c = 1

For the equation to have real and equal roots, the condition is

D = $b^2 – 4ac = 0$

⇒ $4^2 – 4(k)(1) = 0$

⇒ 16 – 4k = 0

⇒ k = 4

The value of k is 4.

(ii) $kx^2 – 2\sqrt{5}x + 4 = 0$

Solution:

The given equation $kx^2 – 2\sqrt{5}x + 4 = 0$ is in the form of $ax^2 + bx + c = 0$

Where $a = k$, $b = – 2\sqrt{5}$, $c = 4$

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

$\Rightarrow (- 2\sqrt{5})^2 – 4(k)(4) = 0$

$\Rightarrow 20 – 16k = 0$

$\Rightarrow k = 5/4$

The value of k is 5/4.

(iii) $3x^2 – 5x + 2k = 0$

Solution:

The given equation $3x^2 – 5x + 2k = 0$ is in the form of $ax^2 + bx + c = 0$

Where $a = 3$, $b = -5$, $c = 2k$

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

$\Rightarrow (-5)^2 – 4(3)(2k) = 0$

$\Rightarrow 25 – 24k = 0$

$\Rightarrow k = 25/24$

The value of k is 25/24.

(iv) $4x^2 + kx + 9 = 0$

Solution:

The given equation $4x^2 + kx + 9 = 0$ is in the form of $ax^2 + bx + c = 0$

Where $a = 4$, $b = k$, $c = 9$

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow k^2 - 4(4)(9) = 0$

$\Rightarrow k^2 - 144 = 0$

$\Rightarrow k = \pm 12$

The value of k is 12 or -12.

(v) $2kx^2 - 40x + 25 = 0$

Solution:

The given equation $2kx^2 - 40x + 25 = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 2k, b = -40, c = 25

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow (-40)^2 - 4(2k)(25) = 0$

$\Rightarrow 1600 - 200k = 0$

$\Rightarrow k = 8$

The value of k is 8.

(vi) $9x^2 - 24x + k = 0$

Solution:

The given equation $9x^2 - 24x + k = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 9, b = -24, c = k

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow (-24)^2 - 4(9)(k) = 0$

$\Rightarrow 576 - 36k = 0$

$\Rightarrow$ k = 16

The value of k is 16.

(vii) $4x^2 - 3kx + 1 = 0$

Solution:

The given equation $4x^2 - 3kx + 1 = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 4, b = -3k, c = 1

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow (-3k)^2 - 4(4)(1) = 0$

$\Rightarrow 9k^2 - 16 = 0$

$\Rightarrow k = \pm 4/3$

The value of k is ± 4/3.

(viii) $x^2 - 2(5 + 2k)x + 3(7 + 10k) = 0$

Solution:

The given equation $x^2 - 2(5 + 2k)x + 3(7 + 10k) = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 1, b = -2(5 + 2k), c = 3(7 + 10k)

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow (-2(5 + 2k))^2 - 4(1)(3(7 + 10k)) = 0$

$\Rightarrow 4(5 + 2k)^2 - 12(7 + 10k) = 0$

$\Rightarrow 25 + 4k^2 + 20k - 21 - 30k = 0$

$\Rightarrow 4k^2 - 10k + 4 = 0$

$\Rightarrow 2k^2 - 5k + 2 = 0$ [dividing by 2]

Now, solving for k by factorisation, we have

⇒ $2k^2 - 4k - k + 2 = 0$

⇒ $2k(k - 2) - 1(k - 2) = 0$

⇒ $(k - 2)(2k - 1) = 0$,

$k = 2$ and $k = 1/2$,

So, the value of k can either be 2 or 1/2.

(ix) $(3k + 1)x^2 + 2(k + 1)x + k = 0$

Solution:

The given equation $(3k + 1)x^2 + 2(k + 1)x + k = 0$ is in the form of $ax^2 + bx + c = 0$

Where $a = (3k + 1)$, $b = 2(k + 1)$, $c = k$

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

⇒ $(2(k + 1))^2 - 4(3k + 1)(k) = 0$

⇒ $4(k + 1)^2 - 4(3k^2 + k) = 0$

⇒ $(k + 1)^2 - k(3k + 1) = 0$

⇒ $2k^2 - k - 1 = 0$

Now, solving for k by factorisation, we have

⇒ $2k^2 - 2k + k - 1 = 0$

⇒ $2k(k - 1) + 1(k - 1) = 0$

⇒ $(k - 1)(2k + 1) = 0$,

$k = 1$ and $k = -1/2$,

So, the value of k can either be 1 or -1/2.

(x) $kx^2 + kx + 1 = -4x^2 - x$

Solution:

The given equation $kx^2 + kx + 1 = -4x^2 - x$

This can be rewritten as,

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

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

Where $a = (k +4)$, $b = (k + 1)$, $c = 1$

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

$\Rightarrow (k + 1)^2 – 4(k +4)(1) = 0$

$\Rightarrow (k +1)^2 – 4k – 16 = 0$

$\Rightarrow k^2 + 2k + 1 – 4k – 16 = 0$

$\Rightarrow k^2 – 2k – 15 = 0$

Now, solving for k by factorisation, we have

$\Rightarrow k^2 – 5k + 3k – 15 = 0$

$\Rightarrow k(k – 5) + 3(k – 5) = 0$

$\Rightarrow (k + 3)(k – 5) = 0,$

$k = -3$ and $k = 5$,

So, the value of k can either be -3 or 5.

(xi) $(k + 1)x^2 + 2(k + 3)x + (k + 8) = 0$

Solution:

The given equation $(k +1)x^2 + 2(k +3)x + (k +8) = 0$ is in the form of $ax^2 + bx + c = 0$

Where $a = (k +1)$, $b = 2(k + 3)$, $c = (k + 8)$

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

$\Rightarrow (2(k + 3))^2 – 4(k +1)(k + 8) = 0$

$\Rightarrow 4(k +3)^2 – 4(k^2 + 9k + 8) = 0$

⇒ $(k + 3)^2 – (k^2 + 9k + 8) = 0$

⇒ $k^2 + 6k + 9 – k^2 – 9k – 8 = 0$

⇒ $-3k + 1 = 0$

⇒ $k = 1/3$

So, the value of k is 1/3.

(xii) $x^2 – 2kx + 7k – 12 = 0$

Solution:

The given equation $x^2 – 2kx + 7k – 12 = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 1, b = -2k, c = 7k – 12

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

⇒ $(-2k)^2 – 4(1)(7k – 12) = 0$

⇒ $4k^2 – 4(7k – 12) = 0$

⇒ $k^2 – 7k + 12 = 0$

Now, solving for k by factorisation, we have

⇒ $k^2 – 4k – 3k + 12 = 0$

⇒ $(k – 4)(k – 3) = 0$,

k = 4 and k = 3,

So, the value of k can either be 4 or 3.

(xiii) $(k + 1)x^2 – 2(3k + 1)x + 8k + 1 = 0$

Solution:

The given equation $(k + 1)x^2 – 2(3k + 1)x + 8k + 1 = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = (k +1), b = -2(3k + 1), c = 8k + 1

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow (-2(3k + 1))^2 - 4(k + 1)(8k + 1) = 0$

$\Rightarrow 4(3k + 1)^2 - 4(k + 1)(8k + 1) = 0$

$\Rightarrow (3k + 1)^2 - (k + 1)(8k + 1) = 0$

$\Rightarrow 9k^2 + 6k + 1 - (8k^2 + 9k + 1) = 0$

$\Rightarrow 9k^2 + 6k + 1 - 8k^2 - 9k - 1 = 0$

$\Rightarrow k^2 - 3k = 0$

$\Rightarrow k(k - 3) = 0$

Either $k = 0$ Or, $k - 3 = 0 \Rightarrow k = 3$,

So, the value of k can either be 0 or 3

(xiv) $5x^2 - 4x + 2 + k(4x^2 - 2x + 1) = 0$

Solution:

The given equation $5x^2 - 4x + 2 + k(4x^2 - 2x + 1) = 0$

This can be rewritten as,

$x^2(5 + 4k) - x(4 + 2k) + 2 - k = 0$

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

Where $a = (4k + 5)$, $b = -(2k + 4)$, $c = 2 - k$

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow (-(2k + 4))^2 - 4(4k + 5)(2 - k) = 0$

$\Rightarrow (2k + 4)^2 - 4(4k + 5)(2 - k) = 0$

$\Rightarrow 16 + 4k^2 + 16k - 4(10 - 5k + 8k - 4k^2) = 0$

$\Rightarrow 16 + 4k^2 + 16k - 40 + 20k - 32k + 16k^2 = 0$

$\Rightarrow 20k^2 + 4k - 24 = 0$

$\Rightarrow 5k^2 + k - 6 = 0$

Now, solving for k by factorisation, we have

$\Rightarrow 5k^2 + 6k - 5k - 6 = 0$

$\Rightarrow 5k(k - 1) + 6(k - 1) = 0$

$\Rightarrow (k - 1)(5k + 6) = 0,$

k = 1 and k = -6/5,

So, the value of k can either be 1 or -6/5.

(xv) $(4 - k)x^2 + (2k + 4)x + (8k + 1) = 0$

Solution:

The given equation $(4 - k)x^2 + (2k + 4)x + (8k + 1) = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = (4 – k), b = (2k + 4), c = (8k + 1)

For the equation to have real and equal roots, the condition is

$D = b^2 - 4ac = 0$

$\Rightarrow (2k + 4)^2 - 4(4 - k)(8k + 1) = 0$

$\Rightarrow 4k^2 + 16k + 16 - 4(-8k^2 + 32k + 4 - k) = 0$

$\Rightarrow 4k^2 + 16k + 16 + 32k^2 - 124k - 16 = 0$

$\Rightarrow 36k^2 - 108k = 0$

Taking common,

$\Rightarrow 9k(k - 3) = 0$

Now, either $9k = 0 \Rightarrow k = 0$ or $k - 3 = 0 \Rightarrow k = 3$,

So, the value of k can either be 0 or 3.

(xvi) $(2k + 1)x^2 + 2(k + 3)x + (k + 5) = 0$

Solution:

The given equation $(2k + 1)x^2 + 2(k + 3)x + (k + 5) = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = (2k +1), b = 2(k + 3), c = (k + 5)

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

⇒ $(2(k + 3))^2 – 4(2k +1)(k + 5) = 0$

⇒ $4(k +3)^2 – 4(2k^2 + 11k + 5) = 0$

⇒ $(k + 3)^2 – (2k^2 + 11k + 5) = 0$ [dividing by 4 both sides]

⇒ $k^2 + 5k – 4 = 0$

Now, solving for k by completing the square, we have

⇒ $k^2 + 2 \times (5/2) \times k + (5/2)^2 = 4 + (5/2)^2$

⇒ $(k + 5/2)^2 = 4 + 25/4 = \sqrt{}41/4$

⇒ $k + (5/2) = \pm \sqrt{}41/2$

⇒ $k = (\sqrt{}41 – 5)/2$ or $–(\sqrt{}41 + 5)/2$

So, the value of k can either be $(\sqrt{}41 – 5)/2$ or $–(\sqrt{}41 + 5)/2$

(xvii) $4x^2 – 2(k + 1)x + (k + 4) = 0$

Solution:

The given equation $4x^2 – 2(k +1)x + (k + 4)= 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 4, b = -2(k + 1), c = (k + 4)

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

⇒ $(-2(k + 1))^2 – 4(4)(k + 4) = 0$

⇒ $4(k +1)^2 – 16(k + 4) = 0$

⇒ $(k + 1)^2 – 4(k + 4) = 0$

⇒ $k^2 – 2k – 15 = 0$

Now, solving for k by factorisation, we have

⇒ $k^2 – 5k + 3k – 15 = 0$

⇒ $k(k – 5) + 3(k – 5) = 0$

⇒ $(k – 5)(k + 3) = 0$,

$k = 5$ and $k = -3$,

So, the value of k can either be 5 or -3.

3. In the following, determine the set of values of k for which the given quadratic equation has real roots:

(i) $2x^2 + 3x + k = 0$

Solution:

Given,

$2x^2 + 3x + k = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, $a = 2$, $b = 3$, $c = k$

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = 9 – 4(2)(k) \geq 0$

⇒ $9 – 8k \geq 0$

⇒ $k \leq 9/8$

The value of k should not exceed 9/8 to have real roots.

(ii) $2x^2 + x + k = 0$

Solution:

Given,

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

It's of the form of $ax^2 + bx + c = 0$

Where, $a = 2$, $b = 1$, $c = k$

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = 1^2 – 4(2)(k) \geq 0$

$\Rightarrow 1 – 8k \geq 0$

$\Rightarrow k \leq 1/8$

The value of k should not exceed 1/8 to have real roots.

(iii) $2x^2 – 5x – k = 0$

Solution:

Given,

$2x^2 – 5x – k = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a = 2, b = -5, c = -k

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = (-5)^2 – 4(2)(-k) \geq 0$

$\Rightarrow 25 + 8k \geq 0$

$\Rightarrow k \geq -25/8$

The value of k should be lesser than -25/8 to have real roots.

(iv) $kx^2 + 6x + 1 = 0$

Solution:

Given,

$kx^2 + 6x + 1 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a = k, b = 6, c = 1

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = 6^2 – 4(k)(1) \geq 0$

$\Rightarrow 36 – 4k \geq 0$

The given equation will have real roots if,

$36 - 4k \geq 0$

$36 \geq 4k$

$36/4 \geq k$

$9 \geq k$

$\Rightarrow$ so, $k \leq 9$

The value of k should not exceed 9 to have real roots.

(v) $3x^2 + 2x + k = 0$

Solution:

Given,

$3x^2 + 2x + k = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a =3, b = 2, c = k

For the given quadratic equation to have real roots $D = b^2 - 4ac \geq 0$

$D = (2)^2 - 4(3)(k) \geq 0$

$\Rightarrow 4 - 12k \geq 0$

$\Rightarrow 4 \geq 12k$

$\Rightarrow k \leq 1/3$

The value of k should not exceed 1/3 to have real roots.

4. Find the values of k for which the following equations have real and equal roots.

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

Solution:

Given,

$x^2 - 2(k + 1)x + k^2 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, $a = 1$, $b = -2(k + 1)$, $c = k^2$

For the given quadratic equation to have real roots $D = b^2 – 4ac = 0$

$D = (-2(k + 1))^2 – 4(1)(k^2) = 0$

$\Rightarrow 4k^2 + 8k + 4 – 4k^2 = 0$

$\Rightarrow 8k + 4 = 0$

$\Rightarrow k = -4/8$

$\Rightarrow k = -1/2$

The value of k should be -1/2 to have real and equal roots.

(ii)$k^2x^2 – 2 (2k – 1)x + 4 = 0$

Solution:

Given,

$k^2x^2 – 2 (2k – 1)x + 4 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, $a = k^2$, $b = –2 (2k – 1)$, $c = 4$

For the given quadratic equation to have real roots $D = b^2 – 4ac = 0$

$D = (-2(2k – 1))^2 – 4(4)(k^2) = 0$

$\Rightarrow 4k^2 – 4k + 1 – 4k^2 = 0$ [dividing by 4 both sides]

$\Rightarrow -4k + 1 = 0$

$\Rightarrow k = 1/4$

The value of k should be 1/4 to have real and equal roots.

(iii) $(k + 1)x^2 – 2(k – 1)x + 1 = 0$

Solution:

Given,

$(k + 1)x^2 – 2(k – 1)x + 1 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a = (k + 1), b = -2(k – 1), c = 1

For the given quadratic equation to have real roots $D = b^2 – 4ac = 0$

$D = (-2(k – 1))^2 – 4(1)(k + 1) = 0$

⇒ $4k^2 – 2k + 1 – k – 1 = 0$ [dividing by 4 both sides]

⇒ $k^2 – 3k = 0$

⇒ $k(k – 3) = 0$

⇒ k = 0 or k = 3

The value of k can be 0 or 3 to have real and equal roots.

5. Find the values of k for which the following equations have real roots.

(i) $2x^2 + kx + 3 = 0$

Solution:

Given,

$2x^2 + kx + 3 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a = 2, b = k, c = 3

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = (k)^2 – 4(3)(2) \geq 0$

⇒ $k^2 – 24 \geq 0$

⇒ $k^2 \geq 24$

⇒ $k \geq 2\sqrt{6}$ and $k \leq -2\sqrt{6}$ [After taking square root on both sides]

The value of k can be represented as $(\infty, 2\sqrt{6}]$ U $[-2\sqrt{6}, -\infty)$

(ii) kx(x – 2) + 6 = 0

Solution:

Given,

$kx(x – 2) + 6 = 0$

It can be rewritten as,

$kx^2 – 2kx + 6 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, $a = k$, $b = -2k$, $c = 6$

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = (-2k)^2 – 4(k)(6) \geq 0$

$\Rightarrow 4k^2 – 24k \geq 0$

$\Rightarrow 4k(k – 6) \geq 0$

$\Rightarrow k \geq 0$ and $k \geq 6$

$\Rightarrow k \geq 6$

The value of k should be greater than or equal to 6 to have real roots.

(iii) $x^2 – 4kx + k = 0$

Solution:

Given,

$x^2 – 4kx + k = 0$

It's of the form of $ax^2 + bx + c = 0$

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

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = (-4k)^2 – 4(1)(k) \geq 0$

$\Rightarrow 16k^2 – 4k \geq 0$

$\Rightarrow 4k(4k – 1) \geq 0$

$\Rightarrow k \geq 0$ and $k \geq 1/4$

$\Rightarrow k \geq 1/4$

The value of k should be greater than or equal to 1/4 to have real roots.

(iv) $kx(x - 2\sqrt{5}) + 10 = 0$

Solution:

Given,

$kx(x - 2\sqrt{5}) + 10 = 0$

It can be rewritten as,

$kx^2 - 2\sqrt{5}kx + 10 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, $a = k$, $b = -2\sqrt{5}k$, $c = 10$

For the given quadratic equation to have real roots $D = b^2 - 4ac \geq 0$

$D = (-2\sqrt{5}k)^2 - 4(k)(10) \geq 0$

$\Rightarrow 20k^2 - 40k \geq 0$

$\Rightarrow 20k(k - 2) \geq 0$

$\Rightarrow k \geq 0$ and $k \geq 2$

$\Rightarrow k \geq 2$

The value of k should be greater than or equal to 2 to have real roots.

(v) $kx(x - 3) + 9 = 0$

Solution:

Given,

$kx(x - 3) + 9 = 0$

It can be rewritten as,

$kx^2 - 3kx + 9 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a = k, b = -3k, c = 9

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = (-3k)^2 – 4(k)(9) \geq 0$

$\Rightarrow 9k^2 – 36k \geq 0$

$\Rightarrow 9k(k – 4) \geq 0$

$\Rightarrow k \geq 0$ and $k \geq 4$

$\Rightarrow k \geq 4$

The value of k should be greater than or equal to 4 to have real roots.

(vi) $4x^2 + kx + 3 = 0$

Solution:

Given,

$4x^2 + kx + 3 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a = 4, b = k, c = 3

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = (k)^2 – 4(4)(3) \geq 0$

$\Rightarrow k^2 – 48 \geq 0$

$\Rightarrow k^2 \geq 48$

$\Rightarrow k \geq 4\sqrt{3}$ and $k \leq -4\sqrt{3}$ [After taking square root on both sides]

The value of k can be represented as $(\infty, 4\sqrt{3}]$ U $[-4\sqrt{3}, -\infty)$.

6. Find the values of k for which the given quadratic equation has real and distinct roots.

(i) $kx^2 + 2x + 1 = 0$

Solution:

Given,

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

It's of the form of $ax^2 + bx + c = 0$

Where, a =k, b = 2, c = 1

For the given quadratic equation to have real roots $D = b^2 – 4ac > 0$

$D = (2)^2 – 4(1)(k) > 0$

⇒ $4 – 4k > 0$

⇒ $4k < 4$

⇒ $k < 1$

The value of k should be lesser than 1 to have real and distinct roots.

(ii) $kx^2 + 6x + 1 = 0$

Solution:

Given,

$kx^2 + 6x + 1 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, a =k, b = 6, c = 1

For the given quadratic equation to have real roots $D = b^2 – 4ac > 0$

$D = (6)^2 – 4(1)(k) > 0$

⇒ $36 – 4k > 0$

⇒ $4k < 36$

⇒ $k < 9$

The value of k should be lesser than 9 to have real and distinct roots.

7. For what value of k, $(4 – k)x^2 + (2k + 4)x + (8k + 1) = 0$, is a perfect square?

Solution:

Given,

$(4 – k)x^2 + (2k + 4)x + (8k + 1) = 0$

It is in the form of $ax^2 + bx + c = 0$

Where, $a = 4 – k$, $b = 2k + 4$, $c = 8k + 1$

Calculating the discriminant, $D = b^2 – 4ac$

$= (2k + 4)^2 – 4(4 – k)(8k + 1)$

$= 4k^2 + 16 + 4k – 4(32 + 4 – 8k^2 – k)$

$= 4(k^2 + 4 + k – 32 – 4 + 8k^2 + k)$

$= 4(9k^2 – 27k)$

As the given equation is a perfect square, then $D = 0$

$\Rightarrow 4(9k^2 – 27k) = 0$

$\Rightarrow (9k^2 – 27k) = 0$

$\Rightarrow 3k(k – 3) = 0$

Thus, $3k = 0 \Rightarrow k = 0$ Or, $k-3 = 0 \Rightarrow k = 3$

Hence, the value of k should be 0 or 3 for the given to be a perfect square.

8. Find the least positive value of k for which the equation $x^2 + kx + 4 = 0$ has real roots.

Solution:

Given,

$x^2 + kx + 4 = 0$

It's of the form of $ax^2 + bx + c = 0$

Where, $a =1$, $b = k$, $c = 4$

For the given quadratic equation to have real roots $D = b^2 – 4ac \geq 0$

$D = (k)^2 – 4(1)(4) \geq 0$

$\Rightarrow k^2 – 16 \geq 0$

$\Rightarrow$ k ≥ 4 and k ≤ -4

Considering the least positive value, we have

$\Rightarrow$ k = 4

Thus, the least value of k is 4 for the given equation to have real roots.

9. Find the values of k for which the quadratic equation $(3k + 1)x^2 + 2(k + 1)x + 1 = 0$ has equal roots. Also, find the roots.

Solution:

The given equation $(3k +1)x^2 + 2(k +1)x + 1 = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = (3k +1), b = 2(k + 1), c = 1

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

$\Rightarrow (2(k + 1))^2 – 4(3k +1)(1) = 0$

$\Rightarrow (k +1)^2 – (3k + 1) = 0$ [After dividing by 4 both sides]

$\Rightarrow k^2 + 2k + 1 – 3k – 1 = 0$

$\Rightarrow k^2 – k = 0$

$\Rightarrow k(k – 1) = 0$

Either k = 0 Or, k – 3 = 0 $\Rightarrow$ k = 1,

So, the value of k can either be 0 or 1

Now, using k = 0 in the given quadratic equation, we get

$(3(0) + 1)x^2 + 2(0 + 1)x + 1 = 0$

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

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

Thus, x = -1 is the root of the given quadratic equation.

Next, by using k = 1 in the given quadratic equation, we get

$(3(1) + 1)x^2 + 2(1 + 1)x + 1 = 0$

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

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

Thus, $2x = -1 \Rightarrow x = -1/2$ is the root of the given quadratic equation.

10. Find the values of p for which the quadratic equation $(2p + 1)x^2 – (7p + 2)x + (7p – 3) = 0$ has equal roots. Also, find the roots.

Solution:

The given equation $(2p + 1)x^2 – (7p + 2)x + (7p – 3) = 0$ is in the form of $ax^2 + bx + c = 0$

Where $a = (2p +1)$, $b = -(7p + 2)$, $c = (7p – 3)$

For the equation to have real and equal roots, the condition is

$D = b^2 – 4ac = 0$

$\Rightarrow (-(7p + 2))^2 – 4(2p +1)(7p – 3) = 0$

$\Rightarrow (7p + 2)^2 – 4(14p^2 + p – 3) = 0$

$\Rightarrow 49p^2 + 28p + 4 – 56p^2 – 4p + 12 = 0$

$\Rightarrow -7p^2 + 24p + 16 = 0$

Solving for p by factorisation,

$\Rightarrow -7p^2 + 28p – 4p + 16 = 0$

$\Rightarrow -7p(p – 4) -4(p – 4) = 0$

$\Rightarrow (p – 4) (-7p – 4) = 0$

Either $p – 4 = 0 \Rightarrow p = 4$ Or, $7p + 4 = 0 \Rightarrow p = -4/7$,

So, the value of k can either be 4 or -4/7

Now, using k = 4 in the given quadratic equation, we get

$(2(4) + 1)x^2 – (7(4) + 2)x + (7(4) – 3) = 0$

$9x^2 – 30x + 25 = 0$

$\Rightarrow (3x – 5)^2 = 0$

Thus, $x = 5/3$ is the root of the given quadratic equation.

Next, by using k = 1 in the given quadratic equation, we get

$(2(-4/7\ ) + 1)x^2 – (7(-4/7\ ) + 2)x + (7(-4/7\ ) – 3) = 0$

$x^2 – 14x + 49 = 0$

$\Rightarrow (x – 7)^2 = 0$

Thus, x – 7 = 0 ⇒ x = 7 is the root of the given quadratic equation.

11. If -5 is a root of the quadratic equation $2x^2 + px -15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.

Solution:

Given,

-5 is as root of $2x^2 + px – 15 = 0$

So, on substituting x = -5, the LHS will become zero and satisfy the equation.

$\Rightarrow 2(-5)^2 + p(-5) – 15 = 0$

$\Rightarrow 50 – 5p – 15 = 0$

$\Rightarrow 35 = 5p$

$\Rightarrow p = 7$

Now, substituting the value of p in the second equation, we have

$(7)(x^2 + x) + k = 0$

$\Rightarrow 7x^2 + 7x + k = 0$

It’s given that the above equation has equal roots.

Thus the discriminant, D = 0

The equation $7x^2 + 7x + k = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 7, b = 7, c = k

$D = b^2 – 4ac$

$\Rightarrow 7^2 – 4(7)(k) = 0$

$\Rightarrow 49 – 28k = 0$

⇒ $k = 49/28 = 7/4$

Therefore, the value of k is 7/4.

12. If 2 is a root of the quadratic equation $3x^2 + px - 8 = 0$ and the quadratic equation $4x^2 - 2px + k = 0$ has equal roots, find the value of k.

Solution:

Given,

2 is as root of $3x^2 + px - 8 = 0$

So, on substituting x = 2, the LHS will become zero and satisfy the equation.

⇒ $3(2)^2 + p(2) - 8 = 0$

⇒ $12 + 2p - 8 = 0$

⇒ $4 + 2p = 0$

⇒ $p = -2$

Now, substituting the value of p in the second equation, we have

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

⇒ $4x^2 + 4x + k = 0$

It's given that the above equation has equal roots.

Thus the discriminant, D = 0

The equation $4x^2 + 4x + k = 0$ is in the form of $ax^2 + bx + c = 0$

Where a = 4, b = 4, c = k

$D = b^2 - 4ac$

⇒ $4^2 - 4(4)(k) = 0$

⇒ $16 - 16k = 0$ [dividing by 16 on both sides]

⇒ $k = 1$

Therefore, the value of k is 1.

Benefits of Using RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6

The RD Sharma Solutions for Class 10 Maths Chapter 8 Exercise 8.6 on Quadratic Equations provides several benefits for students preparing for exams or strengthening their mathematical understanding. Here are the key benefits:

1. Clear Understanding of Concepts

RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 help in providing a step-by-step breakdown of each problem, which ensures that students understand the core concepts of quadratic equations. This is particularly helpful for complex problems that require multiple steps.

2. Practice with Diverse Problems

RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 contains a variety of problems that test different aspects of quadratic equations, such as factoring, solving by the quadratic formula, and applying them in word problems. This provides students with ample practice and helps them build a solid foundation in solving quadratic equations.

3. Exam Preparation

The solutions can be extremely beneficial for students preparing for exams like the CBSE Class 10 board exams. The exercise includes problems similar to what students might encounter in the exams, enabling them to test their skills and improve time management.

4. Clarification of Mistakes

By referring to the RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 , students can identify their mistakes and understand the correct approach to solving quadratic equations. This instant feedback loop helps them learn from errors and improve their problem-solving techniques.

5. Simplified Explanation

RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 provide clear and concise explanations of each step involved in solving quadratic equations. This makes it easier for students to grasp the methods used, such as factorization or applying the quadratic formula, and helps them avoid common pitfalls.

6. Better Understanding of Various Methods

Quadratic equations can be solved by multiple methods: factoring, completing the square, or using the quadratic formula. RD Sharma Solutions Class 10 Maths Chapter 8 Exercise 8.6 give students exposure to different approaches and help them choose the most appropriate method based on the type of problem.