NCERT Solutions for Class 10 Maths Chapter 4 Exercise 4.3: NCERT Solutions for Class 10 Maths Chapter 4, Exercise 4.3, focuses on solving quadratic equations using the quadratic formula. This exercise introduces students to applying the formula.

It emphasizes understanding the discriminant to determine the nature of roots—real and distinct, real and equal, or imaginary. The solutions are methodically explained to aid conceptual clarity, making it easier for students to tackle quadratic equations effectively in exams and build a strong mathematical foundation.

NCERT Solutions for Class 10 Maths Chapter 4 Exercise 4.3 Overview

NCERT Solutions for Class 10 Maths Chapter 4, Exercise 4.3, provide a detailed approach to solving quadratic equations using the quadratic formula. This exercise is crucial as it lays the foundation for higher-level algebra and its applications in real-world scenarios like physics, finance, and engineering.

Understanding the discriminant helps determine the nature of roots, enhancing analytical skills. These solutions ensure conceptual clarity, improving problem-solving abilities and exam readiness. Mastering quadratic equations is essential for competitive exams and advanced studies, making this exercise a vital stepping stone in a student's mathematical journey.

NCERT Solutions for Class 10 Maths Chapter 4 Exercise 4.3 Quadratic Equations

Below is the NCERT Solutions for Class 10 Maths Chapter 4 Exercise 4.3 Quadratic Equations -

1. Find the roots of the following quadratic equations, if they exist, by the method of completing the square:

(i) $2x^2 - 7x + 3 = 0$

(ii) $2x^2 + x - 4 = 0$
(iii) $4x^2 + 4\sqrt{3}x + 3 = 0$

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

Solutions:

(i) $2x^2 - 7x + 3 = 0$

⇒ $2x^2 - 7x = -3$

Dividing by 2, on both sides, we get,

⇒ $x^2 - 7x/2 = -3/2$

⇒ $x^2 - 2 \times x \times 7/4 = -3/2$

On adding $(7/4)^2$ to both sides of the equation, we get,

⇒ $(x)^2 - 2 \times x \times 7/4 + (7/4)^2 = (7/4)^2 - 3/2$

⇒ $(x-7/4)^2 = (49/16) - (3/2)$

⇒ $(x-7/4)^2 = 25/16$

⇒ $(x-7/4)^2 = \pm 5/4$

⇒ $x = 7/4 \pm 5/4$

⇒ $x = 7/4 + 5/4$ or $x = 7/4 - 5/4$

⇒ $x = 12/4$ or $x = 2/4$

⇒ $x = 3$ or $x = 1/2$

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

⇒ $2x^2 + x = 4$

Dividing both sides of the equation by 2, we get,

⇒ $x^2 + x/2 = 2$

Now on adding $(1/4)^2$ to both sides of the equation, we get,

⇒ $(x)^2 + 2 \times x \times 1/4 + (1/4)^2 = 2 + (1/4)^2$

⇒ $(x + 1/4)^2 = 33/16$

⇒ $x + 1/4 = \pm \sqrt{33}/4$

⇒ $x = \pm \sqrt{33}/4 - 1/4$

⇒ $x = (\pm \sqrt{33} - 1)/4$

Therefore, either $x = (\sqrt{33}-1)/4$ or $x = (-\sqrt{33}-1)/4$

(iii) $4x^2 + 4\sqrt{3}x + 3 = 0$

Converting the equation into $a^2+2ab+b^2$ form, we get,

⇒ $(2x)^2 + 2 \times 2x \times \sqrt{3} + (\sqrt{3})^2 = 0$

⇒ $(2x + \sqrt{3})^2 = 0$

⇒ $(2x + \sqrt{3}) = 0$ and $(2x + \sqrt{3}) = 0$

Therefore, either $x = -\sqrt{3}/2$ or $x = -\sqrt{3}/2$.

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

⇒ $2x^2 + x = -4$

Dividing both sides of the equation by 2, we get

⇒ $x^2 + 1/2x = 2$

⇒ $x^2 + 2 \times x \times 1/4 = -2$

By adding $(1/4)^2$ to both sides of the equation, we get

⇒ $(x)^2 + 2 \times x \times 1/4 + (1/4)^2 = (1/4)^2 – 2$

⇒ $(x + 1/4)^2 = 1/16 – 2$

⇒ $(x + 1/4)^2 = -31/16$

As we know, the square of numbers cannot be negative.

Therefore, there is no real root for the given equation, $2x^2 + x + 4 = 0$.

2. Find the roots of the quadratic equations given in Q.1 above by applying the quadratic formula.

(i) $2x^2 – 7x + 3 = 0$

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

a = 2, b = -7 and c = 3

By using the quadratic formula, we get,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

⇒ x = (7±√(49 – 24))/4

⇒ x = (7±√25)/4

⇒ x = (7±5)/4

⇒ x = (7+5)/4 or x = (7-5)/4

⇒ x = 12/4 or 2/4

∴ x = 3 or 1/2

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

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

a = 2, b = 1 and c = -4

By using the quadratic formula, we get,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

⇒x = (-1±√1+32)/4

⇒x = (-1±√33)/4

∴ x = (-1+√33)/4 or x = (-1-√33)/4

(iii) $4x^2 + 4\sqrt{3}x + 3 = 0$

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

a = 4, b = 4√3 and c = 3

By using the quadratic formula, we get,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

⇒ x = (-4√3±√48-48)/8

⇒ x = (-4√3±0)/8

∴ x = -√3/2 or x = -√3/2

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

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

a = 2, b = 1 and c = 4

By using the quadratic formula, we get

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

⇒ x = (-1±√1-32)/4

⇒ x = (-1±√-31)/4

As we know, the square of a number can never be negative. Therefore, there is no real solution for the given equation.

3. Find the roots of the following equations:

(i) x-1/x = 3, x ≠ 0
(ii) 1/x+4 – 1/x-7 = 11/30, x = -4, 7

Solution:

(i) x-1/x = 3

⇒ $x^2 – 3x - 1 = 0$

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

a = 1, b = -3 and c = -1

By using the quadratic formula, we get

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

⇒ x = (3±√9+4)/2

⇒ x = (3±√13)/2

∴ x = (3+√13)/2 or x = (3-√13)/2

(ii) 1/x+4 – 1/x-7 = 11/30

⇒ x-7-x-4/(x+4)(x-7) = 11/30

⇒ -11/(x+4)(x-7) = 11/30

⇒ (x+4)(x-7) = -30

⇒ x^2 – 3x – 28 = 30

⇒ x^2 – 3x + 2 = 0

We can solve this equation by factorisation method now,

⇒ x^2 – 2x – x + 2 = 0

⇒ x(x – 2) – 1(x – 2) = 0

⇒ (x – 2)(x – 1) = 0

⇒ x = 1 or 2

4. The sum of the reciprocals of Rehman's ages (in years) 3 years ago and 5 years from now is 1/3. Find his present age.

Solution:

Let us say the present age of Rehman is *x* years.

Three years ago, Rehman's age was (*x* – 3) years.

Five years after, his age will be (*x* + 5) years.

Given, the sum of the reciprocals of Rehman's ages 3 years ago and after 5 years is equal to 1/3.

∴ $1/x-3 + 1/x-5 = 1/3$

$(x+5+x-3)/(x-3)(x+5) = 1/3$

$(2x+2)/(x-3)(x+5) = 1/3$

⇒ $3(2x + 2) = (x-3)(x+5)$

⇒ $6x + 6 = x^2 + 2x – 15$

⇒ $x^2 – 4x – 21 = 0$

⇒ $x^2 – 7x + 3x – 21 = 0$

⇒ $x(x – 7) + 3(x – 7) = 0$

⇒ $(x – 7)(x + 3) = 0$

⇒ $x = 7, -3$

As we know, age cannot be negative.

Therefore, Rehman's present age is 7 years.

5. In a class test, the sum of Shefali's marks in Mathematics and English is 30. If she had got 2 marks more in Mathematics and 3 marks less in English, the product of their marks would have been 210. Find her marks in the two subjects.

Solution:

Let us say the marks of Shefali in Maths be x.

Then, the marks in English will be 30 – x.

As per the given question,

$(x + 2)(30 – x – 3) = 210$

$(x + 2)(27 – x) = 210$

⇒ $-x^2 + 25x + 54 = 210$

⇒ $x^2 – 25x + 156 = 0$

⇒ $x^2 – 12x – 13x + 156 = 0$

⇒ $x(x – 12) -13(x – 12) = 0$

⇒ $(x – 12)(x – 13) = 0$

⇒ $x = 12, 13$

Therefore, if the marks in Maths are 12, then marks in English will be 30 – 12 = 18, and if the marks in Maths are 13, then marks in English will be 30 – 13 = 17**.**

6. The diagonal of a rectangular field is 60 metres more than the shorter side. If the longer side is 30 metres more than the shorter side, find the sides of the field.

Solution:

Let us say the shorter side of the rectangle is x m.

Then, larger side of the rectangle = $(x + 30)$ m

$$\text{Diagonal of the rectangle} = \sqrt{x^2 + (x+30)^2}$$

As given, the length of the diagonal is = x + 30 m

Therefore,

$$\sqrt{x^2 + (x+30)^2} = x + 60$$

⇒ $x^2 + (x + 30)^2 = (x + 60)^2$

⇒ $x^2 + x^2 + 900 + 60x = x^2 + 3600 + 120x$

⇒ $x^2 – 60x – 2700 = 0$

⇒ $x^2 – 90x + 30x – 2700 = 0$

⇒ $x(x – 90) + 30(x -90) = 0$

⇒ $(x – 90)(x + 30) = 0$

⇒ $x = 90, -30$

However, the side of the field cannot be negative. Therefore, the length of the shorter side will be 90 m, and the length of the larger side will be (90 + 30) m = 120 m.

7. The difference between the squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.

Solution:

Let us say the larger and smaller number be x and y, respectively.

As per the question given,

$x^2 – y^2 = 180$ and $y^2 = 8x$

⇒ $x^2 – 8x = 180$

⇒ $x^2 – 8x – 180 = 0$

⇒ $x^2 – 18x + 10x – 180 = 0$

⇒ $x(x – 18) +10(x – 18) = 0$

⇒ $(x – 18)(x + 10) = 0$

⇒ $x = 18, -10$

The larger number will be 18 only.

$x = 18$

∴ $y^2 = 8x = 8 × 18 = 144$

⇒ $y = ±\sqrt{144} = ±12$

∴ Smaller number = ±12

Therefore, the numbers are 18 and 12 or 18 and -12.

8. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

Solution:

It is given that

Distance = 360 km

Consider x as the speed, then the time taken

t = 360/x

If the speed is increased by 5 km/h speed will be (x + 5) km/h

Distance will be the same

t = 360/(x + 5)

We know that

Time with original speed – Time with increased speed = 1

360/x – 360/(x + 5) = 1

LCM = x (x + 5)

[360 (x + 5) – 360x]/x(x + 5) = 1

360 x + 1800 – 360x = x (x + 5)

x^2 + 5x = 1800

x^2 + 5x – 1800 = 0

x^2 + 45x – 40x – 1800 = 0

x (x + 45) – 40 (x + 45) = 0

(x – 40) (x + 45) = 0

x = 40 km/hr

As we know, the value of speed cannot be negative.

Therefore, the speed of the train is 40 km/h.

9. Two water taps together can fill a tank in

$9\frac{3}{8}$ **hours. The tap of the larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time at which each tap can separately fill the tank.**

Solution:

Let the time taken by the smaller pipe to fill the tank = x hr.

Time taken by the larger pipe = (*x* – 10) hr

Part of the tank filled by smaller pipe in 1 hour = 1/*x*

Part of the tank filled by larger pipe in 1 hour = 1/(*x* – 10)

As given, the tank can be filled in

$9\frac{3}{8}$ = 75/8 hours by both the pipes together.

Therefore,

$1/x + 1/x-10 = 8/75$

$x-10+x/x(x-10) = 8/75$

⇒ $2x-10/x(x-10) = 8/75$

⇒ $75(2x – 10) = 8x^2 – 80x$

⇒ $150x – 750 = 8x^2 – 80x$

⇒ $8x^2 – 230x +750 = 0$

⇒ $8x^2 – 200x – 30x + 750 = 0$

⇒ $8x(x – 25) -30(x – 25) = 0$

⇒ $(x – 25)(8x -30) = 0$

⇒ $x = 25, 30/8$

Time taken by the smaller pipe cannot be 30/8 = 3.75 hours, as the time taken by the larger pipe will become negative, which is logically not possible.

Therefore, the time taken individually by the smaller pipe and the larger pipe will be 25 and 25 – 10 =15 hours, respectively.

10. An express train takes 1 hour less than a passenger train to travel 132 km between Mysore and Bangalore (without taking into consideration the time they stop at intermediate stations). If the average speed of the express train is 11 km/h more than that of the passenger train, find the average speed of the two trains.

Solution:

Let us say, the average speed of the passenger train = x km/h.

Average speed of express train = $(x + 11)$ km/h

Given, the time taken by the express train to cover 132 km is 1 hour less than the passenger train to cover the same distance. Therefore,

$(132/x) – (132/(x+11)) = 1$

$132(x+11-x)/(x(x+11)) = 1$

$132 \times 11 /(x(x+11)) = 1$

$\Rightarrow 132 \times 11 = x(x + 11)$

$\Rightarrow x^2 + 11x – 1452 = 0$

$\Rightarrow x^2 + 44x -33x -1452 = 0$

$\Rightarrow x(x + 44) -33(x + 44) = 0$

$\Rightarrow (x + 44)(x – 33) = 0$

$\Rightarrow x = – 44, 33$

As we know, speed cannot be negative.

Therefore, the speed of the passenger train will be 33 km/h and thus, the speed of the express train will be 33 + 11 = 44 km/h.

11. Sum of the areas of two squares is 468 m^2. If the difference of their perimeters is 24 m, find the sides of the two squares.

Solution:

Let the sides of the two squares be x m and y m.

Therefore, their perimeter will be $4x$ and $4y$, respectively

And the area of the squares will be x^2 and $y^{2,}$ respectively.

Given,

$4x – 4y = 24$

$x – y = 6$

$x = y + 6$

Also, $x^2 + y^2 = 468$

$\Rightarrow (6 + y^2) + y^2 = 468$

$\Rightarrow 36 + y^2 + 12y + y^2 = 468$

$\Rightarrow 2y^2 + 12y + 432 = 0$

⇒ $y^2 + 6y – 216 = 0$

⇒ $y^2 + 18y – 12y – 216 = 0$

⇒ $y(y +18) -12(y + 18) = 0$

⇒ $(y + 18)(y – 12) = 0$

⇒ $y = -18, 12$

As we know, the side of a square cannot be negative.

Hence, the sides of the squares are 12 m and (12 + 6) m = 18 m.

Benefits of Using NCERT Solutions for Class 10 Maths Chapter 4 Exercise 4.3

Step-by-Step Explanation: Provides detailed, step-by-step solutions for solving quadratic equations, enhancing understanding.

Conceptual Clarity: Builds a strong foundation in using the quadratic formula and understanding the discriminant's role.

Exam Preparation: Helps students prepare effectively for board exams by practicing standard question formats.

Time Management: Improves speed and accuracy in solving quadratic equations through structured practice.

Real-World Applications: Demonstrates practical uses of quadratic equations, boosting analytical and problem-solving skills for future learning.