Class 10 Quadratic Equations Notes

Being a class 10th student, you must have come across different types of equations in Mathematics such as linear equations, linear equations in two variables, cubic equations, and many more. But the 4th chapter of the class 10 maths syllabus will introduce you to a new set of equations called Quadratic Equations. Quadratic equations differ from the normal equation and involve unique mathematical concepts for finding solutions. If you are a class 10th student and want to learn the chapter in detail, then, we will walk you through the class 10 quadratic equations.

Understanding Class 10 Quadratic Equations

The word 'Quadratic Equations' is derived from the combination of 'quad', which means square, and 'equation', which states the (=) sign. Hence, the quadratic equation always has a second degree where the exponent is square and always equal to zero. The standard quadratic equation is in the following format: ax^2 + bx + c. Where a, b, and c are real numbers, and a is never equal to zero. To represent two identical expressions, an equal sign is introduced between both.

For Example: 2 × 2 + 1 = 2 + 3

Technically, this form of expression is known as an equation. It may contain variables that are represented by the alphabet. A linear equation is a basic equation having limited variables, and its power is always one. Its general expression is- 2y + 3 = 15 – x.

The quadratic equation is an equation having one variable with a power of 2. Its general expression is- ax^2 + by + c = 0.

Solving Quadratic Equations

As per class 10 quadratic equations, the value variable that satisfies the equation is known as zero or roots of the equation. Let us consider an example, in 2×2 – 3× + 1 = 0. If we undertake the value of x as 1, then the equation becomes 0, hence, it shows that the value on the LHS is equal to the RHS. i.e., *LHS* = *RHS*

If you draw a graph of this equation, you will get a curve that touches the X-axis. And, as the power of the equation is raised to two, it will touch the axis twice.

The next method to solve a quadratic equation that we will discuss in our class 10 quadratic notes is one of the simplest methods called the Factor Method. In the factor method, the factor for each variable is set equal to zero and addresses each one of them. The quadratic formulas use a, b, and c from the equation.

Here, a, b, and c are numbers and numerical coefficients of the given equation. The quadratic formula can be derived from completing the square solving process.

For the given equation, ax2 + b + c, value of x is given as $(-b \pm \sqrt{(b^2-4ac)})/(2a)$

Example 1:
Solve: x2-18x+45 = 0

The numbers that can be added up to -18 and provide +45 once multiplied are -15 and -3

According to the question

→ x^2– 15x- 3x+ 45 = 0

As per the factor method, we will split the middle term and,

→ x(x-15)-3(x-15) = 0

→ (x-15) (x-3) = 0

Which gives us two values,

→ x-15 = 0 or x-3 = 0

So, the value of x is either 15 or 3

→ *x = 15 or x = 3*

Difference Between Quadratic Equations and Quadratic Polynomials

Through our class 10 quadratic equations notes, you are familiar with what is a quadratic equation, so now let's move on and understand the difference between quadratic polynomials and quadratic equations. If a polynomial is of degree two, then it is called a quadratic polynomial. When a quadratic polynomial is equated to zero, it forms a quadratic equation. In standard form, quadratic formulas are followed as ax2 bx

+ c = 0, a> 0. Here, a, b, and c are known as constants, and x is a variable. Now, we can say that a quadratic equation can be formed using a quadratic polynomial.

Polynomials and Quadratic Equations

The class 10 quadratic equations chapter conveys that all the types of quadratic equations have a polynomial of degree 2 equals zero. It means that when a polynomial has 2 as the highest value of an exponent equating to 0, it is a quadratic equation.

Let us understand this with an example when the degree of the polynomial 2×2 + 3x + 4 equals 0 it becomes quadratic equations.

Roots of Class 10 Quadratic Equations

For any quadratic equation, b2 – 4ac helps to determine if it has real roots or not. The formula b2 – 4ac is also known as the discriminant of the equation. Hence, the quadratic equation, ax2 + b + c has:

- Two equal and real roots only ifb2 – 4ac = 0.
- No real roots if b2 – 4ac < 0.
- Two distinct or real roots if b2- 4ac > 0.

From this determinant factor, the nature of the quadratic roots can be understood easily.

Tips To Ace Class 10 Quadratic Equations

You will come across a plethora of questions based on the factorization method, hence, you must practice this topic. To solve a quadratic equation using the factorization method, you have to understand the following aspects:

- Split the middle equation and find the numbers such that their addition is equal to the coefficient of x and multiplication is equal to the product of the coefficient of x2 and a constant term
- The multiplication of the number zero means that either one or both are zero
- Always read the equation carefully and identify what needs to be found. In the end, there must only be one variable in the final answer
- You can apply the Pythagoras theorem to form a relevant equation
- While applying the quadratic formula to the equation, do put the exact value of the variables to avoid discrepancies in the answer

Mentioned below are some of the solved examples from the class 10 quadratic equations chapter which elucidates the use of the factorization method.

Example:
3x2 + 2x = 1

Rewriting our equation, we get 3x^2+2x-1= 0

Here, the coefficient of x^2 is 3. To resolve this, we have to multiply the constant c with the coefficient of x2. Hence, the product of the chosen numbers should be equivalent to -3 (-1*3). We will first express 2x as the sum of -x and +3x

→ 3x2 + 3x -x – 1 = 0

Now we, will take out the common variable from the equation

→ 3x(x+1)-1(x+1) = 0

→ (3x-1)(x+1) = 0

Now, we will have 2 values of x

→ 3x-1 = 0 or x+1 = 0

→ *x = 1/3 or x = -1*

Example:
Solve the equation using factorisation method x2-3x-10 = 0

The first step to begin with would be expressing -3x as a sum of -5x and +2x

→ x2– 5x + 2x – 10 = 0

→ x(x-5) +2(x-5) = 0

→ (x-5) (x+2) = 0

→ x-5 = 0 or x+2 = 0

→ *x = 5 or x = -2*

Example:
Solve the equation using factorisation method 11x^2+18x+7 = 0

As per the equation, the sum of the chosen numbers must be 18 and the product of it will be 11*7 = 77.

The first step would be expressing 18x as the sum of 7x and 11x.

→ $11x^2 + 11x + 7x + 7 = 0$

→ $11 x (x+1) + 7(x+1) = 0$

→ $(x+1) (11x+7) = 0$

→ $x+1 = 0$ or $11x+7 = 0$

→ $x = -1$ or $x = -7/11$

Class 10 Quadratic Equations- MCQs

1. Every quadratic polynomial can have at most:

A. three zeros

B. one zero

C. two zeros

D. none of these

2. The roots of the equation $9x2 – bx + 81 = 0$ will be equal if the value of b is:

A. ± 9

B. ± 54

C. ± 27

D. ± 18

3. Positive value of p for which equation $x^2 + px + 64 = 0$ and $x^2 – 8x + p = 0$ will both have real roots will be:

A. p ≥ 16

B. p = 16

C. p ≤ 16

D. none of these

4. A natural number, when increased by 12, equals 160 times its reciprocal. Find the number.

A. 7

B. 8

C. 4

D. 3

5. If 1/2 is a root of the equation $x^2 + kx - (5/4) = 0$ then the value of k is:

A. 3

B. -3

C. 2

D. – 2

6. If $p^2x^2 - q^2 = 0$, then x =?

A. p

B. q

C. ±p/q

D. ± q/p

7. The product of two successive integral multiples of 5 is 300. Then the numbers are:

A.15, 20

B. 30, 35

C.10, 15

D. 40, 45

8. Aman takes 6 days less than Bhanu to finish a piece of work. If both Aman and Bhanu together can finish the work in 4 days, find the time taken by Bhanu to finish the work.

A. 15 days

B. 16 days

C. 12 days

D. 11 days

9. A bi-quadratic equation has degree

A. 1

B. 2

C. 3

D. 4

10. The sum of the roots of the quadratic equation $3\times2 – 9x + 5 = 0$ is

A. – 3

B. – 6

C. 2

D. 6

11. Aarushi and Nitika solve an equation. In solving Aarushi commits a mistake in constant term and finds the roots 8 and 2. Nitika commits a mistake in the coefficient of x. The correct roots are:

A. 9, – 1

B. – 9, – 1

C. – 9, – 1

D. 9, 1

12. If the roots of px^2 + qx + 2 = 0 are reciprocal of each other, then

A. P = 2

B. P = 0

C. P = -1

D. P = – 4

Answers:

1. C
2. B
3. B
4. B
5. C
6. D
7. A
8. C
9. D
10. A
11. D
12. A