



## CHAPTER – 4 QUADRATIC EQUATIONS

| S.no | Terms                                             | Descriptions                                                                                                                         |
|------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <u>Quadratic Polynomial</u>                       | $P(x) = ax^2 + bx + c$ where $a \neq 0$                                                                                              |
| 2    | <u>Quadratic equation</u>                         | $ax^2 + bx + c = 0$ where $a \neq 0$                                                                                                 |
| 3    | <u>Solution or root of the Quadratic equation</u> | A real number $\alpha$ is called the root or solution of the quadratic equation if<br>$a\alpha^2 + b\alpha + c = 0$                  |
| 4    | zeroes of the polynomial $p(x)$ .                 | The root of the quadratic equation are called zeroes                                                                                 |
| 5    | Maximum roots of quadratic equations              | We know from chapter two that a polynomial of degree $n$ can have max $n$ zeroes. So a quadratic equation can have maximum two roots |
| 6    | Condition for real roots                          | A quadratic equation has real roots if $b^2 - 4ac > 0$                                                                               |

## How to Solve Quadratic equation:

| S.no | Method        | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | factorization | <p>This method we factorize the equation by splitting the middle term b</p> <p>In <math>ax^2+bx+c=0</math></p> <p>Example</p> <p><math>6x^2-x-2=0</math></p> <p>1) First we need to multiple the coefficient a and c. In this case <math>=6 \times -2 = -12</math></p> <p>2) Splitting the middle term so that multiplication is 12 and difference is the coefficient b</p> <p><math>6x^2 + 3x - 4x - 2 = 0</math></p> <p><math>3x(2x+1) - 2(2x+1) = 0</math></p> <p><math>(3x-2)(2x+1) = 0</math></p> <p>3) Roots of the equation can be find equating the factors to zero</p> <p><math>3x-2=0 \Rightarrow x=2/3</math></p> <p><math>2x+1=0 \Rightarrow x=-1/2</math></p> |

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2                                                                                                                                                                                                                                                             | Square method    | <p>In this method we create square on LHS and RHS and then find the value.</p> $ax^2 + bx + c = 0$ <p>1) <math>x^2 + (b/a)x + (c/a) = 0</math></p> <p>2) <math>(x + b/2a)^2 - (b/2a)^2 + (c/a) = 0</math></p> <p>3) <math>(x + b/2a)^2 = (b^2 - 4ac)/4a^2</math></p> <p>4) <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math></p> <p>Example</p> $x^2 + 4x - 5 = 0$ <p>1) <math>(x+2)^2 - 4 - 5 = 0</math></p> <p>2) <math>(x+2)^2 = 9</math></p> <p>3) Roots of the equation can be find using square root on both the sides</p> $x+2 = -3 \Rightarrow x = -5$ $x+2 = 3 \Rightarrow x = 1$ |
| 3                                                                                                                                                                                                                                                             | Quadratic method | <p>For quadratic equation</p> $ax^2 + bx + c = 0,$ <p>roots are given by</p> $x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}, x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p>For <math>b^2 - 4ac &gt; 0</math>, Quadratic equation has two real roots of different value</p> <p>For <math>b^2 - 4ac = 0</math>, quadratic equation has one real root</p> <p>For <math>b^2 - 4ac &lt; 0</math>, no real roots for quadratic equation</p> |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Nature Of roots of Quadratic equation:**

| S.no | Condition       | Nature of roots         |
|------|-----------------|-------------------------|
| 1    | $b^2 - 4ac > 0$ | Two distinct real roots |
| 2    | $b^2 - 4ac = 0$ | One real root           |
| 3    | $b^2 - 4ac < 0$ | No real roots           |