

# Mathematics 1 - Quadratic Equations

Topics : [Computer engineering](#)

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## 1. Definition:

- A quadratic equation is a second-degree polynomial equation in one variable. It has the form:  $ax^2 + bx + c = 0$
- Here,  $a$ ,  $b$ , and  $c$  are constants, and  $x$  is the variable.  $a$  cannot be equal to 0, otherwise, it wouldn't be a quadratic equation.

## 2. Solutions:

- Quadratic equations typically have two solutions, which can be real or complex numbers. These solutions are called roots or zeroes of the equation.
- The solutions can be found using methods like factoring, completing the square, quadratic formula, or graphical methods.

## 3. Discriminant:

- The discriminant ( $\Delta$ ) of a quadratic equation is given by:  $\Delta = b^2 - 4ac$
- The discriminant determines the nature of the roots:
  - If  $\Delta > 0$ , the equation has two distinct real roots.
  - If  $\Delta = 0$ , the equation has exactly one real root (the roots are repeated).
  - If  $\Delta < 0$ , the equation has two complex roots.

## 4. Vertex:

- The vertex of a quadratic function in the form  $y = ax^2 + bx + c$  is given by the point  $(h, k)$ , where:  $h = -b/2a$  and  $k = f(h) = ah^2 + bh + c$

## 5. Graph:

- The graph of a quadratic equation is a parabola. The direction of the parabola (upward or downward) depends on the sign of the leading coefficient  $a$ .
- The axis of symmetry of the parabola is a vertical line passing through the vertex.

## 6. Applications:

- Quadratic equations are widely used in various fields, including physics, engineering, economics, and computer science.
- They describe many natural phenomena, such as projectile motion, the shape of satellite dishes, and the pricing of products based on supply and demand.

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