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Completing the Square

Unit 9 Lesson 5

COMPLETING THE SQUARE

Students will be able to:

Understand how to solve quadratic equations by completing the squares.

Key Vocabulary:

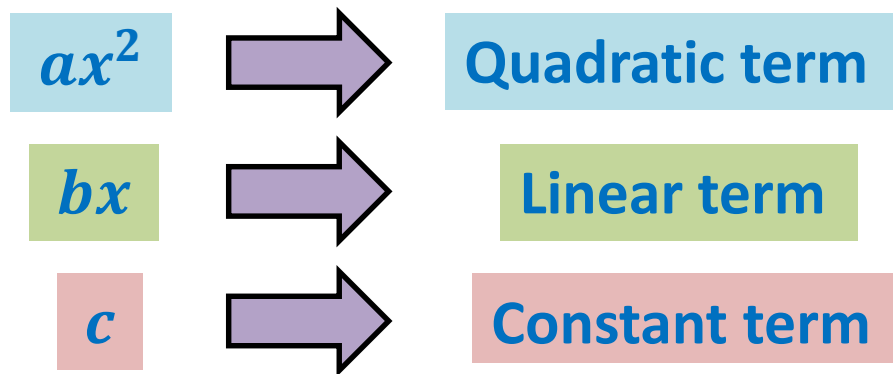
- Quadratic Equation
- Trinomial
- Completing the Square

COMPLETING THE SQUARE

A **quadratic equation** is of the form:

$$f(x) = ax^2 + bx + c = 0$$

Where, $a \neq 0$.



COMPLETING THE SQUARE

A **trinomial equation** is an equation having three terms or monomials on one side of the equation. The other side of the equation can be zero or a non-zero constant. It is written as:

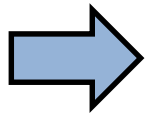
$$ax^2 + bx + c = d$$

Where, $a \neq 0$.

COMPLETING THE SQUARE

Completing Squares

This method is used when finding the solution of quadratic equations using square roots. If one side of the equation (having the trinomial) is not a perfect square, we can make it a perfect square by adding a suitable constant number on both sides of the equation.


$$x^2 + bx + \left(\frac{b}{2}\right)^2 = \left(x + \frac{b}{2}\right)^2$$

Note that the term being added is the square of half the coefficient of linear term i.e. ***b*** in ***x***.

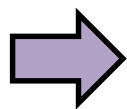
COMPLETING THE SQUARE

Problem 1: What is the value of b such that $x^2 - 14x + b$ is a perfect square trinomial?

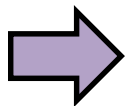
COMPLETING THE SQUARE

Problem 1: What is the value of b such that $x^2 - 14x + b$ is a perfect square trinomial?

Here the coefficient of x is -14 .

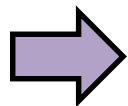


$$b = \left(\frac{-14}{2}\right)^2$$



$$b = (-7)^2 = 49$$

So the perfect square trinomial is,



$$x^2 - 14x + 49$$



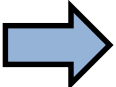
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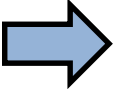
Problem 2: What are the solutions of the equation $x^2 + 2x = 35$?

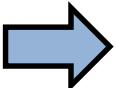
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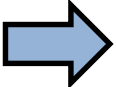
Problem 2: What are the solutions of the equation $x^2 + 2x = 35$?

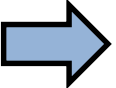
Here the coefficient of x is 2, so the term to add is $\left(\frac{2}{2}\right)^2 = 1$

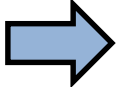

$$x^2 + 2x + 1 = 35 + 1$$

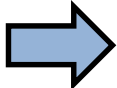

$$(x + 1)^2 = 36$$


$$\sqrt{(x + 1)^2} = \sqrt{36}$$


$$x + 1 = 6$$


$$x = 5$$


$$x + 1 = -6$$


$$x = -7$$