# Factorization of Quadratic Trinomials

## Understanding of Factorization of Quadratic Trinomials

- A quadratic trinomial is an algebraic expression of the form $ax^2 + bx + c$.

- Factorization involves writing it as a product of two binomials.

- It can be done by splitting the middle term or using standard identities.

## Important Points

- Look for two numbers whose product is $a \times c$ and sum is $b$.

- Split the middle term using these two numbers.

- Group terms and take out common factors.

- Write the expression as a product of two binomials.

- Always verify the factorization by expanding.

## Examples with Solutions

### Example: Simple Quadratic Trinomial

> **Factorize $x^2 + 7x + 10$.**

**Solution:** Product = 10, Sum = 7

Numbers are 5 and 2

$x^2 + 5x + 2x + 10 = x(x + 5) + 2(x + 5) = (x + 2)(x + 5)$

### Example: Leading Coefficient Not 1

> **Factorize $2x^2 + 7x + 3$.**

**Solution:** Product = 2×3 = 6, Sum = 7

Numbers are 6 and 1

$2x^2 + 6x + 1x + 3 = 2x(x + 3) + 1(x + 3) = (x + 3)(2x + 1)$

### Example: Negative Middle Term

> **Factorize $x^2 - 5x + 6$.**

**Solution:** Product = 6, Sum = –5

Numbers are –2 and –3

$x^2 - 2x - 3x + 6 = x(x - 2) - 3(x - 2) = (x - 3)(x - 2)$

## Example: Negative Constant Term

> **Factorize $x^2 + 2x - 8$.**

**Solution:** Product = –8, Sum = 2

Numbers are 4 and –2

$x^2 + 4x - 2x - 8 = x(x + 4) - 2(x + 4) = (x - 2)(x + 4)$

## Example: Leading Coefficient and Negative Terms

> **Factorize $3x^2 - 14x - 5$.**

**Solution:** Product = 3×(–5) = –15, Sum = –14

Numbers are –15 and 1

$3x^2 - 15x + 1x - 5 = 3x(x - 5) + 1(x - 5) = (3x + 1)(x - 5)$

## Summary Points

- Identify two numbers whose product is a × c and sum is b.

- Split the middle term accordingly.

- Group the terms and factorize.

- Always expand back to verify the factorization.

- Be careful with signs when dealing with negative terms.