Factors of an Algebraic Expression

Understanding of Factors of an Algebraic Expression

- Factors are quantities that divide the given expression exactly without leaving any remainder.
- Factorization means writing an algebraic expression as a product of its factors.
- Factors can be numbers, variables, or algebraic expressions.
- The process of finding factors is called factorization.

Important Points

- Common factors are taken out first when possible.
- Methods include taking common factors, grouping terms, using identities, and splitting the middle term.
- Always check for the highest common factor (HCF) first.
- Grouping helps when common factors are not visible easily.
- Use standard algebraic identities for quick factorization when applicable.

Examples with Solutions

Example: Taking Common Factors

➢ **Factorize 6x + 9.**

Solution: Common factor = 3

$6x + 9 = 3(2x + 3)$

Example: Grouping Method

➢ **Factorize ax + ay + bx + by.**

Solution: Group terms: $(ax + ay) + (bx + by)$

$= a(x + y) + b(x + y)$

$= (a + b)(x + y)$

Example: Using Standard Identity

➢ **Factorize $x^2 + 6x + 9$.**

Solution: Recognize identity: $(x + 3)^2$

$x^2 + 6x + 9 = (x + 3)(x + 3)$

Example: Taking out Variables and Numbers

➢ **Factorize $4xy + 8x^2y^2$.**

Solution: Common factor = 4xy

$4xy(1 + 2xy)$

Example: Factorizing with Splitting Middle Term

➢ **Factorize $x^2 + 5x + 6$.**

Solution: Find two numbers that multiply to 6 and add to 5 → 2 and 3

$x^2 + 2x + 3x + 6$

$= x(x + 2) + 3(x + 2)$

$= (x + 3)(x + 2)$

Summary Points

- Factorization means expressing an expression as a product of its factors.
- Always start by taking out the common factors.
- Group terms carefully if no common factor for all terms.
- Use standard identities wherever possible.
- Check by multiplying factors to verify correctness.