NOTES:

4: Expansion and Factorization using Special Algebraic Identities:

Expansion and Factorization using Special Algebraic Identities:

1, We can expand certain algebraic expressions, which are of a similar nature, using three **special algebraic identities** as follows:

(i) $(a + b)^2 = a^2 + 2ab + b^2$ (perfect square)
(ii) $(a - b)^2 = a^2 - 2ab + b^2$ (perfect square)
(iii) $(a + b)(a - b) = a^2 - b^2$ (difference of two squares)

Important notes:

- $(a+b)^2 \neq a^2+b^2$

  since $(a+b)^2 = (a+b)(a+b) = a^2+2ab+b^2$

  $\therefore (a+b)^2 - 2ab = a^2+b^2$

- $(a-b)^2 \neq a^2-b^2$

  since $(a-b)^2 = (a-b)(a-b) = a^2-2ab+b^2$

  $\therefore (a-b)^2 + 2ab - 2b^2 = a^2-b^2$

*similarly, $(a - b)^2 + 2ab = a^2 + b^2$

2. As factorization is the reverse process of expansion, we can factorize certain algebraic expressions using the special algebraic identities:

(i) $a^2 + 2ab + b^2 = (a + b)^2$
(ii) $a^2 - 2ab + b^2 = (a - b)^2$
(iii) $a^2 - b^2 = (a + b)(a - b)$

Factorization by Grouping:
3. We can factorize by grouping special algebraic identities such as perfect square, difference of two squares etc.

For example:

$1 + 6p + 9p^2 - q^2 = (1 + 6p + 9p^2) - q^2$ ⇒ Grouping
$= [(1)^2 + 2(1)(3p) + (3p)^2] - q^2$ ⇒ $a^2 + 2ab + b^2 = (a + b)^2$
$= (1 + 3p)^2 - (q)^2$ ⇒ $a^2 - b^2 = (a + b)(a - b)$
$= (1 + 3p + q)(1 + 3p - q)$

Version 2