

Class - 8th
Mathematics

Chap - 5 Algebraic Expressions

* Factorisation: It is the process of finding factors of a given expression

eg:- $2x + 8y$ can be written as $2(x + 4y)$
 \therefore The factors of $2x + 8y$ are 2 and $(x + 4y)$

* HCF of Algebraic Expressions:

Step 1: Finding factors of individual terms

Step 2: Finding Common factors

Step 3: Hence finding HCF of the expression

This HCF can be used to divide the expression to factorise it.

eg:- $9a^2 - 6a$ (find the factors)

$$9a^2 = 3 \times \underline{3} \times \underline{a} \times a$$

$$6a = 2 \times \underline{3} \times \underline{a}$$

$$\text{HCF} = 3 \times a = 3a$$

$$\frac{9a^2}{3a} - \frac{6a}{3a} = 3a - 2$$

Thus, the factors of $9a^2 - 6a$ are $3a$ and $(3a - 2)$

* Note :- Factorisation can also be done using the three types of identities used in the previous exercise.

Ex - 5.4

Q1) MCD

i) The product of $(x+y)$, $(x-y)$ and (x^2+y^2) is

a) $x^2 - y^2$

b) $x^4 + y^4$

c) $x^4 - y^4$

d) $x^3 - y^3$

Solu

$$(x+y)(x-y)(x^2+y^2)$$

$$(x^2 - y^2)(x^2 + y^2)$$

$$(x^2)^2 - (y^2)^2$$

$$x^4 - y^4$$

$$[\because (a+b)(a-b) = a^2 - b^2]$$

ii) The value of 20.4×19.6 is

a) 399.86

b) 399.84

c) 398.6

d) 398.4

Solu

$$(20 + 0.4) \times (20 - 0.4)$$

$$[(a+b)(a-b) = a^2 - b^2]$$

$$= (20)^2 - (0.4)^2$$

$$= 400 - 0.16$$

$$= 399.84$$

$$\begin{array}{r} 3999 \\ 400.00 \\ - 0.16 \\ \hline 399.84 \end{array}$$

iii) If $pq = 6$ and $p+q = 5$, then $p^2 + q^2 = ?$

a) 10

b) 11

c) 12

d) 13

Solu

$$pq = 6, \quad \underline{p+q = 5}$$

$$(p+q)^2 = p^2 + 2pq + q^2$$

$$5^2 = p^2 + q^2 + 2 \times 6$$

$$25 = p^2 + q^2 + 12$$

$$25 - 12 = p^2 + q^2$$

$$p^2 + q^2 = 13$$

Q2) Find the greatest common factor of

i) x^2y^3 and $2x^3y^2$

Solu $x^2y^3 = \underline{x} \underline{x} \underline{y} \underline{y} \underline{y}$
 $2x^3y^2 = 2 \underline{x} \underline{x} \underline{x} \underline{y} \underline{y}$

HCF = $x \times x \times y \times y$

HCF = x^2y^2

iii) $10a^2b^3$, $14ab$ and $2a^3b^2$

Solu $10a^2b^3 = \underline{2} \times \underline{5} \times \underline{a} \underline{a} \times \underline{b} \underline{b} \underline{b}$

$14ab = \underline{2} \times \underline{7} \times \underline{a} \times \underline{b}$

$2a^3b^2 = \underline{2} \times \underline{a} \underline{a} \underline{a} \times \underline{b} \underline{b}$

HCF = $2 \times a \times b = 2ab$

ii) a^3 and $-ba^2$

Solu $a^3 = \underline{a} \underline{a} \underline{a}$
 $-ba^2 = -1 \times \underline{b} \times \underline{a} \underline{a}$

HCF = $a \times a$
= a^2

Q3) Factorise each of the following

i) $6abc - 9a^2c$

Solu $3ac(2b - 3a)$

ii) $4a^2x^2 + 8a^3x^3$

Solu $4a^2x^2(1 + 2ax)$

iii) $a^2x - 4ax + 3ax^2$

Solu $a \cdot x (a - 4 + 3x)$

iv) $3p^2y^2 - 6pyx + 9x^3p$

Solu $3p(py^2 - 2yx + 3x^3)$

Q4) Factorise

i) $25x^2 - y^2$

$$(5x)^2 - (y)^2$$

$$[a^2 - b^2 = (a+b)(a-b)]$$

$$(5x)^2 - (y)^2 = (5x+y)(5x-y)$$

iii) $4 - 25x^2$

$$(2)^2 - (5x)^2$$

$$[a^2 - b^2 = (a+b)(a-b)]$$

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

v) $x^4 - y^6$

$$(x^2)^2 - (y^3)^2$$

$$[a^2 - b^2 = (a+b)(a-b)]$$

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

Q5) Factorise the following

i) $c^2 - (x-y)^2$

$$[a^2 - b^2 = (a+b)(a-b)]$$

$$c^2 - (x-y)^2 = (c+x-y)(c-x+y)$$

ii) $1 - 9x^2$

$$1^2 - (3x)^2$$

$$[a^2 - b^2 = (a+b)(a-b)]$$

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

iv) $(x+y)^2 - 1$

$$(x+y)^2 - (1)^2$$

$$[a^2 - b^2 = (a+b)(a-b)]$$

$$(x+y)^2 - (1)^2 = (x+y+1)(x+y-1)$$

ii) $a^2 - 4(b-c)^2$

$$[a^2 - b^2 = (a+b)(a-b)]$$

$$a^2 - [2(b-c)]^2 = (a+2(b-c))(a-2(b-c))$$

$$= (a+2b-2c)$$

$$(a-2b+2c)$$

$$\text{iii) } (a-b)^2 - (c-d)^2$$

$$[a^2 - b^2 = (a+b)(a-b)]$$

$$= (a-b+c-d)(a-b-c+d)$$

Q7) Factorise the following

$$\text{i) } x^2 + 6xy + 9y^2$$

$$(x)^2 + 2 \times x \times 3y + (3y)^2$$

$$[a^2 + 2ab + b^2 = (a+b)^2]$$

$$(x+3y)^2$$

$$(x+3y)(x+3y)$$

$$\text{ii) } x^2 - 4xy + 4y^2$$

$$(x)^2 - 2 \times x \times 2y + (2y)^2$$

$$[a^2 - 2ab + b^2 = (a-b)^2]$$

$$(x-2y)^2$$

$$(x-2y)(x-2y)$$

$$\text{iii) } 4x^2 - 12x + 9$$

$$(2x)^2 - 2 \times 2x \times 3 + (3)^2$$

$$[a^2 - 2ab + b^2 = (a-b)^2]$$

$$(2x-3)^2$$

$$(2x-3)(2x-3)$$

$$\text{iv) } 16x^2 - 40xy + 25y^2$$

$$(4x)^2 - 2 \times 4x \times 5y + (5y)^2$$

$$[a^2 - 2ab + b^2 = (a-b)^2]$$

$$(4x-5y)^2$$

$$(4x-5y)(4x-5y)$$

ASSIGNMENT 5.4

1. Multiple Choice Questions (MCQ) Choose the correct option.

- (i) The product of $(x + y)$, $(x - y)$ and $(x^2 + y^2)$ is
(a) $x^2 - y^2$ (b) $x^4 + y^4$ (c) $x^4 - y^4$ (d) $x^3 - y^3$
- (ii) The value of 20.4×19.6 is
(a) 399.86 (b) 399.84 (c) 398.6 (d) 398.4
- (iii) If $pq = 6$ and $p + q = 5$, then $p^2 + q^2 = ?$
(a) 10 (b) 11 (c) 12 (d) 13

2. Find the greatest common factor of the following monomials :

- (i) x^2y^3 and $2x^3y^2$ (ii) a^3 and $-ba^2$ (iii) $10a^2b^3$, $14ab$ and $2a^3b^2$
(iv) $-150x$, $15x^3$ and $-45x^2$ (v) ab^2c^3 and $-a^2bc^2$ (vi) $2ax^2$ and $-6a^2x$

3. Factorise each of the following :

- (i) $6abc - 9a^2c$ (ii) $4a^2x^2 + 8a^3x^3$ (iii) $ax + ay + az$
(iv) $ax - 2ay + 3az$ (v) $a^2x - 4ax + 3ax^2$ (vi) $6a^4b^2 - 18a^2b^3$
(vii) $2ax^2 + 6a^2x$ (viii) $a^3 - 6a^2$ (ix) $6a^4b^2 - 18a^2b^2$
(x) $ax^2 + a^2y^2$ (xi) $3p^2y^2 - 6pyx + 9x^3p$

4. Factorise :

- (i) $25x^2 - y^2$ (ii) $25x^2 - 16y^2$ (iii) $1 - 9x^2$
(iv) $4 - 25x^2$ (v) $36 - z^2$ (vi) $x^2 - 81y^2$
(vii) $(x + y)^2 - 1$ (viii) $x^4 - 1$ (ix) $x^4 - y^6$

5. Factorise the following :

- (i) $c^2 - (x - y)^2$ (ii) $a^2 - 4(b - c)^2$ (iii) $9a^2 - 4(b - c)^2$
(iv) $25(a - b)^2 - c^2$ (v) $(a - b)^2 - (c - d)^2$ (vi) $4(a - b)^2 - (c - d)^2$

6. Factorise the following :

- (i) $4x^2 + 28xy + 49y^2$ (ii) $1 + 2x + x^2$ (iii) $4 + 4(x - y) + (x - y)^2$

7. Factorise the following :

- (i) $x^2 + 6xy + 9y^2$ (ii) $x^2 - 4xy + 4y^2$ (iii) $4x^2 - 12x + 9$
(iv) $9x^2 - 24xy + 16y^2$ (v) $x^2 + 20x + 100$ (vi) $9x^2 - 12xy + 4y^2$
(vii) $1 - 2x + x^2$ (viii) $16x^2 - 40xy + 25y^2$