12

FACTORISATION

Q. 1. Find the common factors of the given terms :

(i) $15x$, 25

(ii) $3y$, $33xy$

(iii) $7pq$, $28p^2q^2$

(iv) $2x$, $3x^2$, 5

(v) $4abc$, $24ab^2 - 12a^2b$

(vi) $12x^3$, $- 6x^2$, $36x$

(vii) $4xy^3$, $10x^3y^2$, $8x^2y^2z$

(viii) $3x^2$, $5x$, 9

Solution.

(i) Here, $15x = 3 \times 5 \times x$

$$25 = 5 \times 5$$

Hence, the common factors of $15x$ and 25

$$= 5 \text{ Ans.}$$

(ii) Here, $3y = 3 \times y$
$$33xy = 3 \times 11 \times x \times y$$
Hence, the common factors of $3y$ and $33xy$
$$= 3 \times y = 3y \text{ Ans.}$$

(iii) Here, $7pq = 7 \times p \times q$
$$28p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$$
Hence, the common factors of $7pq$ and
$$28p^2q^2 = 7 \times p \times q$$
$$= 7pq \text{ Ans.}$$

(iv) Here, $2x = 2 \times x$
$$3x^2 = 3 \times x \times x$$
$$5 = 5$$
We observe that there is no common factor in the given three terms. In such cases, 1 is common factor.

Hence, common factors of $2x$, $3x^2$ and 5
$$= 1 \text{ Ans.}$$

(v) Here, $4abc = 2 \times 2 \times a \times b \times c$
$$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$$
$$12a^2b = 2 \times 2 \times 3 \times a \times a \times b$$
$$= 4ab \text{ Ans.}$$
Hence, the common factors of $4abc$, $24ab^2$ and
$$12a^2b = 2 \times 2 \times a \times b = 4ab \text{ Ans.}$$

(vi) Here, $12x^3 = 2 \times 2 \times 3 \times x \times x \times x$
$$- 6x^2 = (-1) \times 2 \times 3 \times x \times x$$
$$36x = 2 \times 2 \times 3 \times 3 \times x$$
Hence, the common factors of $12x^3$, $-6x^2$ and
$36x = 2 \times 3 \times x = 6x$ **Ans.**

(vii) Here, $4xy^3 = 2 \times 2 \times x \times y \times y \times y$
$$10x^3y^2 = 2 \times 5 \times x \times x \times x \times x \times y \times y$$
$$8x^2y^2z = 2 \times 2 \times 2 \times x \times x \times x \times y \times y \times z$$
Hence, the common factors of $4xy^2$, $10x^3y^2$
and $8x^2y^2z = 2 \times x \times x \times y \times y$
$$= 2xy^2 \text{ Ans.}$$

(viii) Here, $3x^2 = 3 \times x \times x$
$$5x = 5 \times x$$
$$9 = 3 \times 3$$
We observe that there is no common factor in the given three terms. In such cases, 1 is common factor.

Hence, the common factor of x^2, $5x$ and 9
$$= 1 \text{ Ans.}$$

Q. 2. Factorise the following expressions :

(i) $6x - 48$

(ii) $7p - 14q$

(iii) $- 24z + 30z^2$

(iv) $18l^2m + 27alm$

(v) $25x^2y^2z - 15x^2yz^2$

(vi) $a^2bc + ab^2c + abc^2$

(vii) $px^2y + qxy^2 + rxyz$

(viii) $10pq - 15qr + 20rp$

Solution.

(i) Here, $6x = 2 \times 3 \times x$
and $48 = 2 \times 2 \times 2 \times 2 \times 3$
Both terms have '2' and '3' as common factors
Hence, $6x - 48 = 2 \times 3 \times x - (2 \times 2 \times 2 \times 2 \times 3)$
$$= 2 \times 3 \times (x - 2 \times 2 \times 2)$$
$$= 6 (x - 8) \text{ Ans.}$$

(ii) Here, $7p = 7 \times p$
$$14q = 2 \times 7 \times q$$
Both terms have '7' as common factor
Hence, $7p - 14q = 7 \times p - 2 \times 7 \times q$
$$= 7 \times (p - 2q)$$
$$= 7 (p - 2q) \text{ Ans.}$$

(iii) Here, $24z = 2 \times 2 \times 2 \times 3 \times z$
$$30z^2 = 2 \times 3 \times 5 \times z \times z$$
Both terms have '2', '3' and 'z' as common factors

Hence, $- 24z + 30z^2$
$$= - 2 \times 2 \times 2 \times 3 \times z + 2 \times 3 \times 5 \times z \times z$$
$$= - 2 \times 3 \times z \times (2 \times 2 - 5 \times z)$$
$$= - 6z (4 - 5z) \text{ Ans.}$$

(iv) Here, $18l^2m = 2 \times 3 \times 3 \times l \times l \times m$
$$27alm = 3 \times 3 \times 3 \times a \times l \times m$$
Both terms have 3, 3, l and m as common factors.

Hence, $18l^2m + 27alm = 2 \times 3 \times 3 \times l \times l$
$$\times m + 3 \times 3 \times 3 \times a \times l \times m$$
$$= 3 \times 3 \times l \times m \times (2 \times l + 3 \times a)$$
$$= 9lm (2l + 3a) \text{ Ans.}$$

(v) Here, $25x^2y^2z = 5 \times 5 \times x \times x \times y \times y \times z$
$$15x^2yz^2 = 3 \times 5 \times x \times x \times y \times z \times z$$
Both terms have 5, x, x, y and z as common factors.

Hence, $25x^2y^2z - 15x^2yz^2 = 5 \times 5 \times x \times x \times$
$$y \times y \times z - 3 \times 5 \times x \times x \times y \times z \times z$$
$$= 5 \times x \times x \times y \times z \times (5 \times x$$
$$\times y - 3 \times z)$$
$$= 5x^2yz (5xy - 3z) \text{ Ans.}$$

(vi) Here, $a^2bc = a \times a \times b \times c$

$ab^2c = a \times b \times b \times c$

$abc^2 = a \times b \times c \times c$

Three terms have a, b and c as common factors.

Hence, $a^2bc + ab^2c + abc^2 = a \times a \times b \times c$

$+ a \times b \times b \times c + a \times b \times c \times c$

$= a \times b \times c \times (a + b + c)$

$= abc\ (a + b + c)$ **Ans.**

(vii) Here, $px^2y = p \times x \times x \times y$

$qxy^2 = q \times x \times y \times y$

$rxyz = r \times x \times y \times z$

Three terms have x and y as common factors.

Hence, $px^2y + qxy^2 + rxyz = p \times x \times x \times y$

$+ q \times x \times y \times y + r \times x \times y \times z$

$= x \times y \times (p \times x + q \times y + r \times z)$

$= xy\ (px + qy + rz)$ **Ans.**

(viii) Here, $10pq = 2 \times 5 \times p \times q$

$15qr = 3 \times 5 \times q \times r$

$20rp = 2 \times 2 \times 5 \times r \times p$

Three terms have 5 as common factor.

Hence, $10pq - 15qr + 20rp = 2 \times 5 \times p \times q$

$- 3 \times 5 \times q \times r + 2 \times 2 \times 5 \times r \times p$

$= 5 \times (2 \times p \times q - 3 \times q \times r$

$+ 2 \times 2 \times r \times p)$

$= 5\ (2pq - 3qr + 4rp)$ **Ans.**

Q. 3. Factorise :

(i) $3a\ (2p - 3q) - 5b\ (2p - 3q)$

(ii) $15a\ (x^2 + y^2) - 10b\ (x^2 + y^2)$

(iii) $4\ (x + y)^2 + 2\ (x + y)$

(iv) $(2a - 5b)^2 + 10b - 4a$

(v) $(5l + 3m)^2 - 5l - 3m$

Solution. (i) Here, $3a\ (2p - 3q) - 5b\ (2p - 3q)$

$= (2p - 3q)\ (3a - 5b)$ **Ans.**

[Taking $(2p - 3q)$ common]

(ii) Here, $15a\ (x^2 + y^2) - 10b\ (x^2 + y^2)$

$= 5\ (x^2 + y^2)\ (3a - 2b)$ **Ans.**

[Taking $5\ (x^2 + y^2)$ common]

(iii) Here, $4\ (x + y)^2 + 2\ (x + y)$

$= 2\ (x + y)\ [2\ (x + y) + 1]$ **Ans.**

[Taking $2\ (x + y)$ common]

$= 2\ (x + y)\ (2x + 2y + 1)$ **Ans.**

(iv) Here, $(2a - 5b)^2 + 10b - 4a$

$= (2a - 5b)\ (2a - 5b) - 2 \times (2a - 5b)$

$= (2a - 5b)\ (2a - 5b - 2)$ **Ans.**

[Taking $(2a - 5b)$ common]

(v) Here, $(5l + 3m)^2 - 5l - 3m$

$= (5l + 3m)\ (5l + 3m) - 1\ (5l + 3m)$

$= (5l + 3m)\ (5l + 3m - 1)$ **Ans.**

Q. 4. Factorise :

(i) $x^2 + xy + 6x + 6y$

(ii) $y^2 - yz - 3y + 3z$

(iii) $12xy - 8x + 3y - 2$

(iv) $a^2b - ab^2 + 4a - 4b$

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

(vi) $a^2 + ab\ (1 + b) + b^3$

(Hint : First multiply middle term)

(vii) $3px - 6py - 8qy + 4qx$

(viii) $r - 7 + 7pq - pqr$

Solution. (i) Here, $x^2 + xy + 6x + 6y$

$= x\ (x + y) + 6\ (x + y)$

$= (x + y)\ (x + 6)$ **Ans.**

[Taking $(x + y)$ common]

(ii) Here, $y^2 - yz - 3y + 3z$

$= y\ (y - z) - 3\ (y - z)$

$= (y - z)\ (y - 3)$ **Ans.**

[Taking $(y - z)$ common]

(iii) Here, $12xy - 8x + 3y - 2$

$= 4x\ (3y - 2) + 1\ (3y - 2)$

$= (3y - 2)\ (4x + 1)$ **Ans.**

(iv) Here $a^2b - ab^2 + 4a - 4b$

$= ab\ (a - b) + 4\ (a - b)$

$= (a - b)\ (ab + 4)$ **Ans.**

(v) Here, $x^3 - 6x^2 + x - 6$

$= x^2\ (x - 6) + 1\ (x - 6)$

$= (x - 6)\ (x^2 + 1)$ **Ans.**

(vi) Here, $a^2 + ab\ (1 + b) + b^3$

$= a^2 + ab + ab^2 + b^3$

$= a\ (a + b) + b^2\ (a + b)$

$= (a + b)\ (a + b^2)$ **Ans.**

(vii) Here, $3px - 6py - 8qy + 4qx$

$= 3px + 4qx - 6py - 8qy$

$= x\ (3p + 4q) - 2y(3p + 4q)$

$= (3p + 4q)\ (x - 2y)$ **Ans.**

(viii) Here, $r - 7 + 7pq - pqr$

$= r - pqr - 7 + 7pq$

$= r\ (1 - pr) - 7\ (1 - pq)$

$= (1 - pq)\ (r - 7)$ **Ans.**

Q. 5. Multiple Choice Questions :

(i) Common factor of $10xy$ and $12y$ is :

(a) $10x$

(b) $2xy$

(c) $2y$

(d) $2x$.

(ii) Common factor of $5a^2b$ and $9xy^2$ is :

(a) 1

(b) 0

(c) $ab\ xy$

(d) ax.

(iii) $8p^2 - 20pq + 28p^2q$

(a) $4p(2p + 5q - 7pq)$

(b) $4p(2p - 5q + 7p^2q)$

(c) $4q(2p - 5q + 7q)$

(d) $4p(2p - 5q + 7pq)$

(iv) $3(2l - m)^2 + (2l - m) =$

(a) $(2l - m)(6l - 3m + 1)$

(b) $(2l - m)(6l - 2m)$

(c) $3(2l - m)(2l - m + 1)$

(d) $(2l - m)(3 + 2l - m)$

(v) $p^2 - pq + pr - qr =$

(a) $(p - r)(p + q)$ (b) $(p + r)(q - p)$

(c) $(p + r)(p - q)$ (d) $(p - q)(r - p)$

Ans. (i) (c) $2y$

(ii) (a) 1

(iii) (d) $4p(2p - 5q + 7pq)$

(iv) (a) $(2l - m)(6l - 3m + 1)$

(v) (c) $(p + r)(p - q)$.