Factorisation: Exercise 14.1

Q.1 Find the common factors of the given terms
(i) $12x$, 36
(ii) $2y$, $22xy$
(iii) $14pq$, $28p^2q^2$
(iv) $2x$, $3x^2$, 4
(v) $6abc$, $24ab^2$, $12a^2b$
(vi) $16x^3$, $-4x^2$, $32x$
(vii) $10pq$, $20qr$, $30rp$
(viii) $3x^2y^3$, $10x^3y^2$, $6x^2y^2z$
Sol. The common factors of the given terms:
(i) Given: $12x$, 36
Factors of:
$12x = 2 \times 2 \times 3 \times x$
and $36 = 2 \times 2 \times 3 \times 3$
So, the common factors: $2 \times 2 \times 3 = 12$

(ii) Given: $2y$, $22xy$
Factors of:
$2y = 2 \times y$
and $22xy = 2 \times 11 \times x \times y$
So, the common factors: $2 \times y = 2y$

(iii) Given: $14pq$, $28p^2q^2$
Factors of:
$14pq = 2 \times 7 \times p \times q$
and $28p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$
So, the common factors: $2 \times 7 \times p \times q = 14pq$

(iv) Given: $2x$, $3x^2$, 4
Factors of:
$2x = 2 \times x \times 1$,
$3x^2 = 3 \times x \times x \times 1$
and $4 = 2 \times 2 \times 1$
So, the common factor = 1

(v) Given: $6abc$, $24ab^2$, $12a^2b$
Factors of:
$6abc = 2 \times 3 \times a \times b \times c$,
$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$,
and $124\ a^2b = 2 \times 2 \times 3 \times a \times a \times b$
So, the common factors $= 2 \times 3 \times a \times b = 6ab$

(vi) Given: $16x^3$, $-4x^2$, $32x$
Factors of:
$16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$,
$-4x^2 = (-1) \times 2 \times 2 \times x \times x$,
$32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$
So, the common factors $= 2 \times 2 \times x = 4x$

(vii) Given: $10pq$, $20qr$, $30rp$
Factors of:

$10pq = 2 \times 5 \times p \times q$,
$20qr = 2 \times 2 \times 5 \times q \times r$,
$30rp = 2 \times 3 \times 5 \times r \times p$
So, the common factors $= 2 \times 5 = 10$

(viii) Given: $3x^2y^3, 10x^3y^2, 6x^2y^2z$
Factors of: $3x^2y^3 = 3 \times x \times x \times y \times y \times y$
$10x^3y^2 = 2 \times 5 \times x \times x \times x \times y \times y$,
and $6x^2y^2z = 2 \times 3 \times x \times x \times y \times y \times z$
So, the common factors $= x \times x \times y \times y = x^2y^2$

Q.2 Factorise the following expressions.
(i) $7x - 42$
(ii) $6p - 12q$
(iii) $7a^2 + 14a$
(iv) $-16z + 20z^3$
(v) $20l^2m + 30alm$
(vi) $5x^2y - 15xy^2$
(vii) $10a^2 - 15b^2 + 20c^2$
(viii) $-4a^2 + 4ab - 4ca$
(ix) $x^2yz + xy^2z + xyz^2$
(x) $ax^2y + bxy^2 + cxyz$
Sol. Factorisation of expressions:
(i) Given: $7x - 42$
$7x - 42 = 7 \times x - 2 \times 3 \times 7$
By taking common,
$= 7 (x - 2 \times 3)$
$= 7(x - 6)$

(ii) Given: $6p - 12q$
$6p - 12q = 2 \times 3 \times p - 2 \times 2 \times 3 \times q$
By taking common,
$= 2 \times 3 (p - 2q)$
$= 6 (p - 2q)$

(iii) Given: $7a^2 + 14a$
$7a^2 + 14a = 7 \times a \times a + 2 \times 7 \times a$
By taking common,
$= 7 \times a (a + 2)$
$= 7a (a + 2)$

(iv) Given: $-16z + 20z^3$
$-16z + 20z^3 = (-1) \times 2 \times 2 \times 2 \times 2 \times z + 2 \times 2 \times 5 \times z \times z \times z$
By taking common,
$= 2 \times 2 \times z (-2 \times 2 + 5 \times z \times z)$
$= 4z (-4 + 5z^2)$

(v) Given: $20l^2m + 30alm$
$20l^2m + 30alm = 2 \times 2 \times 5 \times l \times l \times m + 2 \times 3 \times 5 \times a \times l \times m$
By taking common,
$= 2 \times 5 \times l \times m (2 \times l + 3 \times a)$
$= 10lm (2l + 3a)$

(vi) Given: $5x^2y - 15xy^2$
$5x^2y - 15xy^2 = 5 \times x \times x \times y + 3 \times 5 \times x \times y \times y$

By taking common,

$= 5 \times x \times y\,(x - 3 \times y)$

$= 5xy\,(x - 3y)$

(vii) Given: $10a^2 - 15b^2 + 20c^2$

$10a^2 - 15b^2 + 20c^2 = 2 \times 5 \times a \times a - 3 \times 5 \times b \times b + 2 \times 2 \times 5 \times c \times c$

By taking common,

$= 5(2 \times a \times a - 3 \times b \times b + 2 \times 2 \times c \times c)$

$= 5(2a^2 - 3b^2 + 4c^2)$

(viii) Given: $-4a^2 + 4ab - 4ca$

$-4a^2 + 4ab - 4ca = (-1) \times 2 \times 2 \times a \times a + 2 \times 2 \times a \times b - 2 \times 2 \times c \times a$

By taking common,

$= 2 \times 2 \times a\,(-a + b - c)$

$= 4a\,(-a + b + c)$

(ix) Given: $x^2yz + xy^2z + xyz^2$

$x^2yz + xy^2z + xyz^2 = x \times x \times y \times z + x \times y \times y \times z + x \times y \times z \times z$

By taking common,

$= x \times y \times z\,(x + y + z)$

$= xyz\,(x + y + z)$

(x) Given: $ax^2y + bxy^2 + cxyz$

$ax^2y + bxy^2 + cxyz = a \times x \times x \times y + b \times x \times y \times y + c \times x \times y \times z$

By taking common,

$= x \times y\,(a \times x + b \times y + c \times z)$

$= xy\,(ax + by + cz)$

Q.3 Factorise.

(i) $x^2 + xy + 8x + 8y$

(ii) $15xy - 6x + 5y - 2$

(iii) $ax + bx - ay - by$

(iv) $15pq + 15 + 9q + 25p$

(v) $z - 7 + 7xy - xyz$

***Sol.* Factorisation:**

(i) Given: $x^2 + xy + 8x + 8y$

By taking common,

$x^2 + xy + 8x + 8y = x(x + y) + 8(x + y)$

$= (x + y)\,(x + 8)$

(ii) Given: $15xy - 6x + 5y - 2$

By taking common,

$15xy - 6x + 5y - 2 = 3x\,(5y - 2) + 1(5y - 2)$

$= (5y - 2)\,(3x + 1)$

(iii) Given: $ax + bx - ay - by$

By taking common,

$ax + bx - ay - by = x\,(a + b) - y\,(a + b)$

$= (a + b)\,(x - y)$

(iv) Given: $15pq + 15 + 9q + 25p$

By taking common,

$15pq + 15 + 9q + 25p = 5p\,(3q + 5) + 3\,(3q + 5)$

$= (3q + 5)\,(5p + 3)$

(v) Given: $z - 7 + 7xy - xyz$

$z - 7 + 7xy - xyz = 7xy - 7 - xyz + z$

By taking common,

$= 7(xy - 1) - z\,(xy - 1)$

$= (xy - 1)\,(7 - z)$