

Exercise 14.1

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1. Find the common factors of the given terms.**(i) 12x, 36****(ii) 2y, 22xy****(iii) 14 pq, 28 p² q²****(iv) 2x, 3x², 4****(v) 6 abc, 24ab², 12 a² b****(vi) 16 x³, - 4x², 32 x****(vii) 10 pq, 20qr, 30 rp****(viii) 3x² y³, 10x³ y², 6 x² y² z****Solution:****(i) Factors of 12x and 36**

$$12x = 2 \times 2 \times 3 \times x$$

$$36 = 2 \times 2 \times 3 \times 3$$

Common factors of 12x and 36 are 2, 2, 3
and, $2 \times 2 \times 3 = 12$

(ii) Factors of 2y and 22xy

$$2y = 2 \times y$$

$$22xy = 2 \times 11 \times x \times y$$

Common factors of 2y and 22xy are 2, y
and, $2 \times y = 2y$

(iii) Factors of 14 pq and 28 p² q

$$14 pq = 2 \times 7 \times p \times q$$

$$28 p^2 q = 2 \times 2 \times 7 \times p \times p \times q$$

Common factors of 14 pq and 28 p² q are 2, 7, p, q
and, $2 \times 7 \times p \times q = 14pq$

(iv) Factors of 2x, 3x² and 4

$$2x = 2 \times x$$

$$3x^2 = 3 \times x \times x$$

$$4 = 2 \times 2$$

Common factors of 2x, 3x² and 4 is 1.

(v) Factors of 6 abc, 24ab² and 12 a² b

$$6 abc = 2 \times 3 \times a \times b \times c$$

$$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$$

$$12 a^2 b = 2 \times 2 \times 3 \times a \times a \times b$$

Common factors of $6abc$, $24ab^2$ and $12a^2b$ are 2, 3, a, b
and, $2 \times 3 \times a \times b = 6ab$

(vi) Factors of $16x^3$, $-4x^2$ and $32x$

$$16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$$

$$-4x^2 = -1 \times 2 \times 2 \times x \times x$$

$$32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$$

Common factors of $16x^3$, $-4x^2$ and $32x$ are 2, 2, x
and, $2 \times 2 \times x = 4x$

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

$$10pq = 2 \times 5 \times p \times q$$

$$20qr = 2 \times 2 \times 5 \times q \times r$$

$$30rp = 2 \times 3 \times 5 \times r \times p$$

Common factors of $10pq$, $20qr$ and $30rp$ are 2, 5
and, $2 \times 5 = 10$

(viii) Factors of $3x^2y^3$, $10x^3y^2$ and $6x^2y^2z$

$$3x^2y^3 = 3 \times x \times x \times y \times y \times y$$

$$10x^3y^2 = 2 \times 5 \times x \times x \times x \times y \times y$$

$$6x^2y^2z = 3 \times 2 \times x \times x \times y \times y \times z$$

Common factors of $3x^2y^3$, $10x^3y^2$ and $6x^2y^2z$ are x^2 , y^2
and, $x^2 \times y^2 = x^2y^2$

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) $ax^2y + bxy^2 + cxyz$

Solution:

$$(i) \quad 7x = 7 \times x$$

$$42 = 2 \times 3 \times 7$$

The common factor is 7

$$\therefore 7x - 42 = (7 \times x) - (2 \times 3 \times 7) = 7(x - 6)$$

$$(ii) \quad 6p = 2 \times 3 \times p$$

$$12q = 2 \times 2 \times 3 \times q$$

The common factors are 2 and 3

$$\therefore 6p - 12q = (2 \times 3 \times p) - (2 \times 2 \times 3 \times q)$$

$$= 2 \times 3 [p - (2 \times q)]$$

$$= 6(p - 2q)$$

$$(iii) \quad 7a^2 = 7 \times a \times a$$

$$14a = 2 \times 7 \times a$$

The common factors are 7 and a

$$\therefore 7a^2 + 14a = (7 \times a \times a) + (2 \times 7 \times a)$$

$$= 7 \times a [a + 2] = 7a(a + 2)$$

$$(iv) \quad 16z = 2 \times 2 \times 2 \times 2 \times z$$

$$20z^3 = 2 \times 2 \times 5 \times z \times z \times z$$

The common factors are 2, 2, and z.

$$\therefore -16z + 20z^3 = -(2 \times 2 \times 2 \times 2 \times z) + (2 \times 2 \times 5 \times z \times z \times z)$$

$$= (2 \times 2 \times z) [- (2 \times 2) + (5 \times z \times z)]$$

$$= 4z(-4 + 5z^2)$$

$$(v) \ 20l^2m = 2 \times 2 \times 5 \times l \times l \times m$$

$$30alm = 2 \times 3 \times 5 \times a \times l \times m$$

The common factors are 2, 5, l and m

$$\begin{aligned} \therefore 20l^2m + 30alm &= (2 \times 2 \times 5 \times l \times l \times m) + (2 \times 3 \times 5 \times a \times l \times m) \\ &= (2 \times 5 \times l \times m) [(2 \times l) + (3 \times a)] \\ &= 10lm(2l + 3a) \end{aligned}$$

$$(vi) \ 5x^2y = 5 \times x \times x \times y$$

$$15xy^2 = 3 \times 5 \times x \times y \times y$$

The common factors are 5, x , and y

$$\begin{aligned} \therefore 5x^2y - 15xy^2 &= (5 \times x \times x \times y) - (3 \times 5 \times x \times y \times y) \\ &= 5 \times x \times y [x - (3 \times y)] \\ &= 5xy(x - 3y) \end{aligned}$$

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

$$10a^2 = 2 \times 5 \times a \times a$$

$$-15b^2 = -1 \times 3 \times 5 \times b \times b$$

$$20c^2 = 2 \times 2 \times 5 \times c \times c$$

Common factor of $10a^2$, $15b^2$ and $20c^2$ is 5

$$10a^2 - 15b^2 + 20c^2 = 5(2a^2 - 3b^2 + 4c^2)$$

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

$$-4a^2 = -1 \times 2 \times 2 \times a \times a$$

$$4ab = 2 \times 2 \times a \times b$$

$$-4ca = -1 \times 2 \times 2 \times c \times a$$

Common factor of $-4a^2$, $4ab$, $-4ca$ are 2, 2, a i.e. $4a$

So,

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

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

$$x^2yz = x \times x \times y \times z$$

$$xy^2z = x \times y \times y \times z$$

$$xyz^2 = x \times y \times z \times z$$

Common factor of x^2yz , xy^2z and xyz^2 are x , y , z i.e. xyz

$$\text{Now, } x^2 y z + x y^2 z + x y z^2 = xyz (x + y + z)$$

$$(x) \ a x^2 y + b x y^2 + c x y z$$

$$a x^2 y = a \times x \times x \times y$$

$$b x y^2 = b \times x \times y \times y$$

$$c x y z = c \times x \times y \times z$$

Common factors of $a x^2 y$, $b x y^2$ and $c x y z$ are xy

$$\text{Now, } a x^2 y + b x y^2 + c x y z = xy (ax + by + cz)$$

3. Factorise.

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

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

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

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

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

Solution:

$$(i) \ x^2 + xy + 8x + 8y = x \times x + x \times y + 8 \times x + 8 \times y$$

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

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

$$(ii) \ 15xy - 6x + 5y - 2 = 3 \times 5 \times x \times y - 3 \times 2 \times x + 5xy - 2$$

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

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

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

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

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

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

$$= 3 \times 5 \times p \times q + 3 \times 3 \times q + 5 \times 5 \times p + 3 \times 5$$

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

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

$$(v) \ z - 7 + 7xy - xyz = z - x \times y \times z - 7 + 7 \times x \times y$$

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

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