

EXERCISE 12.2

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1. Simplify combining like terms.

(i) $21b - 32 + 7b - 20b$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

$$= (21b + 7b - 20b) - 32$$

$$= b(21 + 7 - 20) - 32$$

$$= b(28 - 20) - 32$$

$$= b(8) - 32$$

$$= 8b - 32$$

(ii) $-z^2 + 13z^2 - 5z + 7z^3 - 15z$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

$$= 7z^3 + (-z^2 + 13z^2) + (-5z - 15z)$$

$$= 7z^3 + z^2(-1 + 13) + z(-5 - 15)$$

$$= 7z^3 + z^2(12) + z(-20)$$

$$= 7z^3 + 12z^2 - 20z$$

(iii) $p - (p - q) - q - (q - p)$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

$$= p - p + q - q - q + p$$

$$= p - q$$

$$(iv) 3a - 2b - ab - (a - b + ab) + 3ab + b - a$$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

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

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

$$= a(1 - 1 - 1) + b(-2 + 1 + 1) + ab(-1 - 1 + 3)$$

$$= a(1 - 2) + b(-2 + 2) + ab(-2 + 3)$$

$$= a(1) + b(0) + ab(1)$$

$$= a + ab$$

$$(v) 5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

$$= 5x^2y + 3yx^2 - 5x^2 + x^2 - 3y^2 - y^2 - 3y^2$$

$$= x^2y(5 + 3) + x^2(-5 + 1) + y^2(-3 - 1 - 3) + 8xy^2$$

$$= x^2y(8) + x^2(-4) + y^2(-7) + 8xy^2$$

$$= 8x^2y - 4x^2 - 7y^2 + 8xy^2$$

$$(vi) (3y^2 + 5y - 4) - (8y - y^2 - 4)$$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

$$= 3y^2 + 5y - 4 - 8y + y^2 + 4$$

$$= 3y^2 + y^2 + 5y - 8y - 4 + 4$$

$$= y^2(3 + 1) + y(5 - 8) + (-4 + 4)$$

$$= y^2 (4) + y (-3) + (0)$$

$$= 4y^2 - 3y$$

2. Add:

(i) $3mn, -5mn, 8mn, -4mn$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$= 3mn + (-5mn) + 8mn + (-4mn)$$

$$= 3mn - 5mn + 8mn - 4mn$$

$$= mn (3 - 5 + 8 - 4)$$

$$= mn (11 - 9)$$

$$= mn (2)$$

$$= 2mn$$

(ii) $t - 8tz, 3tz - z, z - t$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$= t - 8tz + (3tz - z) + (z - t)$$

$$= t - 8tz + 3tz - z + z - t$$

$$= t - t - 8tz + 3tz - z + z$$

$$= t (1 - 1) + tz (-8 + 3) + z (-1 + 1)$$

$$= t (0) + tz (-5) + z (0)$$

$$= -5tz$$

(iii) $-7mn + 5, 12mn + 2, 9mn - 8, -2mn - 3$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$= -7mn + 5 + 12mn + 2 + (9mn - 8) + (-2mn - 3)$$

$$= -7mn + 5 + 12mn + 2 + 9mn - 8 - 2mn - 3$$

$$= -7mn + 12mn + 9mn - 2mn + 5 + 2 - 8 - 3$$

$$= mn (-7 + 12 + 9 - 2) + (5 + 2 - 8 - 3)$$

$$= mn (-9 + 21) + (7 - 11)$$

$$= mn (12) - 4$$

$$= 12mn - 4$$

(iv) $a + b - 3$, $b - a + 3$, $a - b + 3$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$= a + b - 3 + (b - a + 3) + (a - b + 3)$$

$$= a + b - 3 + b - a + 3 + a - b + 3$$

$$= a - a + a + b + b - b - 3 + 3 + 3$$

$$= a (1 - 1 + 1) + b (1 + 1 - 1) + (-3 + 3 + 3)$$

$$= a (2 - 1) + b (2 - 1) + (-3 + 6)$$

$$= a (1) + b (1) + (3)$$

$$= a + b + 3$$

(v) $14x + 10y - 12xy - 13$, $18 - 7x - 10y + 8xy$, $4xy$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$= 14x + 10y - 12xy - 13 + (18 - 7x - 10y + 8xy) + 4xy$$

$$= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8xy + 4xy$$

$$= 14x - 7x + 10y - 10y - 12xy + 8xy + 4xy - 13 + 18$$

$$= x(14 - 7) + y(10 - 10) + xy(-12 + 8 + 4) + (-13 + 18)$$

$$= x(7) + y(0) + xy(0) + (5)$$

$$= 7x + 5$$

(vi) $5m - 7n, 3n - 4m + 2, 2m - 3mn - 5$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$= 5m - 7n + (3n - 4m + 2) + (2m - 3mn - 5)$$

$$= 5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5$$

$$= 5m - 4m + 2m - 7n + 3n - 3mn + 2 - 5$$

$$= m(5 - 4 + 2) + n(-7 + 3) - 3mn + (2 - 5)$$

$$= m(3) + n(-4) - 3mn + (-3)$$

$$= 3m - 4n - 3mn - 3$$

(vii) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$= 4x^2y + (-3xy^2) + (-5xy^2) + 5x^2y$$

$$= 4x^2y + 5x^2y - 3xy^2 - 5xy^2$$

$$= x^2y(4 + 5) + xy^2(-3 - 5)$$

$$= x^2y(9) + xy^2(-8)$$

$$= 9x^2y - 8xy^2$$

(viii) $3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$\begin{aligned}&= 3p^2q^2 - 4pq + 5 + (-10p^2q^2) + 15 + 9pq + 7p^2q^2 \\&= 3p^2q^2 - 10p^2q^2 + 7p^2q^2 - 4pq + 9pq + 5 + 15 \\&= p^2q^2 (3 - 10 + 7) + pq (-4 + 9) + (5 + 15) \\&= p^2q^2 (0) + pq (5) + 20 \\&= 5pq + 20\end{aligned}$$

(ix) $ab - 4a$, $4b - ab$, $4a - 4b$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$\begin{aligned}&= ab - 4a + (4b - ab) + (4a - 4b) \\&= ab - 4a + 4b - ab + 4a - 4b \\&= ab - ab - 4a + 4a + 4b - 4b \\&= ab (1 - 1) + a (4 - 4) + b (4 - 4) \\&= ab (0) + a (0) + b (0) \\&= 0\end{aligned}$$

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$$\begin{aligned}&= x^2 - y^2 - 1 + (y^2 - 1 - x^2) + (1 - x^2 - y^2) \\&= x^2 - y^2 - 1 + y^2 - 1 - x^2 + 1 - x^2 - y^2 \\&= x^2 - x^2 - x^2 - y^2 + y^2 - y^2 - 1 - 1 + 1 \\&= x^2 (1 - 1 - 1) + y^2 (-1 + 1 - 1) + (-1 - 1 + 1) \\&= x^2 (1 - 2) + y^2 (-2 + 1) + (-2 + 1) \\&= x^2 (-1) + y^2 (-1) + (-1)\end{aligned}$$

$$= -x^2 - y^2 - 1$$

3. Subtract:**(i) $-5y^2$ from y^2** **Solution:-**

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

$$= y^2 + 5y^2$$

$$= 6y^2$$

(ii) $6xy$ from $-12xy$ **Solution:-**

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

$$= -12xy - 6xy$$

$$= -18xy$$

(iii) $(a - b)$ from $(a + b)$ **Solution:-**

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

$$= a + b - a + b$$

$$= a - a + b + b$$

$$= a(1 - 1) + b(1 + 1)$$

$$= a(0) + b(2)$$

$$= 2b$$

(iv) $a(b - 5)$ from $b(5 - a)$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

$$= b(5 - a) - a(b - 5)$$

$$= 5b - ab - ab + 5a$$

$$= 5b + ab(-1 - 1) + 5a$$

$$= 5a + 5b - 2ab$$

(v) $-m^2 + 5mn$ from $4m^2 - 3mn + 8$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

$$= 4m^2 - 3mn + 8 - (-m^2 + 5mn)$$

$$= 4m^2 - 3mn + 8 + m^2 - 5mn$$

$$= 4m^2 + m^2 - 3mn - 5mn + 8$$

$$= 5m^2 - 8mn + 8$$

(vi) $-x^2 + 10x - 5$ from $5x - 10$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

$$= 5x - 10 - (-x^2 + 10x - 5)$$

$$= 5x - 10 + x^2 - 10x + 5$$

$$= x^2 + 5x - 10x - 10 + 5$$

$$= x^2 - 5x - 5$$

(vii) $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

$$= 3ab - 2a^2 - 2b^2 - (5a^2 - 7ab + 5b^2)$$

$$= 3ab - 2a^2 - 2b^2 - 5a^2 + 7ab - 5b^2$$

$$= 3ab + 7ab - 2a^2 - 5a^2 - 2b^2 - 5b^2$$

$$= 10ab - 7a^2 - 7b^2$$

(viii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

$$= 5p^2 + 3q^2 - pq - (4pq - 5q^2 - 3p^2)$$

$$= 5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2$$

$$= 5p^2 + 3p^2 + 3q^2 + 5q^2 - pq - 4pq$$

$$= 8p^2 + 8q^2 - 5pq$$

4. (a) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

Solution:-

Let us assume p be the required term.

Then,

$$p + (x^2 + xy + y^2) = 2x^2 + 3xy$$

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

$$p = 2x^2 + 3xy - x^2 - xy - y^2$$

$$p = 2x^2 - x^2 + 3xy - xy - y^2$$

$$p = x^2 + 2xy - y^2$$

(b) What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?

Solution:-

Let us assume x be the required term.

Then,

$$2a + 8b + 10 - x = -3a + 7b + 16$$

$$x = (2a + 8b + 10) - (-3a + 7b + 16)$$

$$x = 2a + 8b + 10 + 3a - 7b - 16$$

$$x = 2a + 3a + 8b - 7b + 10 - 16$$

$$x = 5a + b - 6$$

5. What should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

Solution:-

Let us assume a be the required term.

Then,

$$3x^2 - 4y^2 + 5xy + 20 - a = -x^2 - y^2 + 6xy + 20$$

$$a = 3x^2 - 4y^2 + 5xy + 20 - (-x^2 - y^2 + 6xy + 20)$$

$$a = 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2 - 6xy - 20$$

$$a = 3x^2 + x^2 - 4y^2 + y^2 + 5xy - 6xy + 20 - 20$$

$$a = 4x^2 - 3y^2 - xy$$

6. (a) From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.

Solution:-

First, we have to find out the sum of $3x - y + 11$ and $-y - 11$.

$$= 3x - y + 11 + (-y - 11)$$

$$= 3x - y + 11 - y - 11$$

$$= 3x - y - y + 11 - 11$$

$$= 3x - 2y$$

Now, subtract $3x - y - 11$ from $3x - 2y$.

$$= 3x - 2y - (3x - y - 11)$$

$$= 3x - 2y - 3x + y + 11$$

$$= 3x - 3x - 2y + y + 11$$

$$= -y + 11$$

(b) From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Solution:-

First, we have to find out the sum of $4 + 3x$ and $5 - 4x + 2x^2$

$$= 4 + 3x + (5 - 4x + 2x^2)$$

$$= 4 + 3x + 5 - 4x + 2x^2$$

$$= 4 + 5 + 3x - 4x + 2x^2$$

$$= 9 - x + 2x^2$$

$$= 2x^2 - x + 9 \dots \text{[equation 1]}$$

Then, we have to find out the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$

$$= 3x^2 - 5x + (-x^2 + 2x + 5)$$

$$= 3x^2 - 5x - x^2 + 2x + 5$$

$$= 3x^2 - x^2 - 5x + 2x + 5$$

$$= 2x^2 - 3x + 5 \dots \text{[equation 2]}$$

Now, we have to subtract equation (2) from equation (1)

$$= 2x^2 - x + 9 - (2x^2 - 3x + 5)$$

$$= 2x^2 - x + 9 - 2x^2 + 3x - 5$$

$$= 2x^2 - 2x^2 - x + 3x + 9 - 5$$

$$= 2x + 4$$