1. Simplify combining like terms:

(i) 21b – 32 + 7b – 20b

Solution:-

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

Then,

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

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

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

= $7z^3 + 12z^2 – 20z + 7z^3$

(iii) p – (p – q) – q – (q – p)

Solution:-

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

Then,

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

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

= x²y (8) + x² (-4) + y² (-7) + 8xy²

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

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

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

Solution:-

When term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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, – $10 p^2q^2$, 15 + 9pq + $7p^2q^2$

Solution:-

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

Then, we have to add the like terms

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

$= 3p^2q^2 - 10p^2q^2 + 7p^2q^2 - 4pq + 9pq + 5 + 15$

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

$= p^2q^2 (0) + pq (5) + 20$

$= 5pq + 20$

(ix) ab – 4a, 4b – ab, 4a – 4b

Solution:-

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

Then, we have to add the like terms

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

$= ab - 4a + 4b - ab + 4a - 4b$

$= ab - ab - 4a + 4a + 4b - 4b$

$= ab (1 - 1) + a (4 - 4) + b (4 - 4)$

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

$= 0$

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

Solution:-

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

Then, we have to add the like terms

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

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

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

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

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

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

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

3. Subtract:

(i) $–5y^2$ from y^2

Solution:-

When term 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 term 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 term 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 term 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 term 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

= 3m^2 – 8mn + 8

(vi) – x^2 + 10x – 5 from 5x – 10

Solution:-

When term 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 term 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 term 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 … [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 … [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