Chapter – 12
Algebraic Expressions
Exercise 12.2

1. Simplify combining like terms:

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

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

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

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

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

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

Answer:

Like terms are terms with the same variables and exponents.

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

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

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

$= 8b - 32$

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

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

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

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

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

$= p - q$

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

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

= (3a – a – a) + (-2b + b + b) + (-ab - ab + 3ab) = (3a – 2a) + 9-2b + 2b) + (-2ab + 3ab) = a + 0 + ab

= a + ab

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

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

$= 8x^2y + 8xy^2 - 4x^2 + (-4y^2 - 3y^2)$

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

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

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

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

$= 4y^2 - 3y$

2. Add:

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

(ii) t – 8tz, 3tz – z, z – t

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

(iv) a + b – 3, b - a + 3, a – b + 3

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

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

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

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

(ix) ab – 4a, 4b – ab, 4a – 4b

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

Answer:

(i) 3mn + (-5mn) + 8mn + (-4mn)

= 3mn – 5mn + 8mn – 4mn

= 11 mn – 9mn

= 2mn

(ii) t – 8tz, 3tz – z, z – t

= t – 8tz + 3tz – z + z – t

= t – t – z + z – 8tz + 3tz

= -5tz

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

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

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

= - 9mn + 21 mn + 7 – 11

= 12mn – 4

(iv) 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 + b + 3

(v) 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

= 7x + 5

(vi) (5m – 7n) + (3n – 4m + 2) + (2m – 3mn – 5)

= 5m – 7n + 3n – 4m + 2 + 2m – 3mn – 5

= 3m – 4n – 3mn – 3

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

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

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

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

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

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

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

$= 5pq + 20$

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

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

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

$= 0$

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

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

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

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

3. Subtract:

(i) $-5y^2$ from y^2

(ii) $6xy$ form $- 12\ xy$

(iii) $(a - b)$ from $(a + b)$

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

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

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

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

Answer:

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

$= y^2 + 5y^2$

$= 6y^2$

(ii) 6xy from – 12 xy

-12 xy – 6xy = -18 xy

(iii) (a – b) from (a + b)

(a – b) – (a – b)

= a + b – a + b

= a – a + b + b

= 2b

(iv) a(b – 5) from b(5 – a)

b(5 – a) – a(b – 5)

= 5b – ab – ab + 5a

=5a + 5b – ab – ab

= 5a + 5b - 2ab

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.

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

Answer:

To Find: Expression which is to be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$

We need to subtract $x^2 + xy + y^2$ from $2x^2 + 3xy$ to obtain the required fraction.

Therefore, the expression = $2x^2 + 3xy - x^2 + xy + y^2$

Required Expression = $2^2 + 3xy - x^2 - xy - y^2$

Required Expression = $x^2 + 2xy - y^2$

Hence, $x^2 + 2xy - y^2$ is to be added to , $x^2 + 2xy + y^2$to obtain $2x^2 + 3xy$.

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

Answer:

Let "k" should be subtracted

2a + 8b + 10 – k = -3a + 7b + 16

Then,

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

k = 2a + 8b + 10 + 3a – 7b – 16

$k = 5a + b - 6$

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

Answer:

Let k should be taken away from $3x^2 - 4y^2 + 5xy + 20$

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

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

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

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

Hence value of k is $4x^2 - 3y^2 - xy$

6.

(A) From the sum of 3x - y + 11 and -y – 11, subtract 3x - y - 11.

Answer:

The algebraic equation for above problem will be as

[(3x – y + 11)+ (-y – 11)] - (3x – y – 11)]

= 3x – y + 11 - y – 11 – 3x + y + 11

= 3x – 3x – y – y + y +11 – 11 + 11

= -y + 11

Hence the value is 11 – y.

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

Answer:

The equation for the problem is

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

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

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

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

$= 4x + 4$