

EXERCISE 19(B)

1. Find the sum of:

(i) $3a + 4b + 7c, -5a + 3b - 6c$
and $4a - 2b - 4c$

(ii) $2x^2 + xy - y^2, -x^2 + 2xy + 3y^2$
and $3x^2 - 10xy + 4y^2$

(iii) $x^2 - x + 1, -5x^2 + 2x - 2$
and $3x^2 - 3x + 1$

(iv) $a^2 - ab + bc, 2ab + bc - 2a^2$
and $-3bc + 3a^2 + ab$

(v) $4x^2 + 7 - 3x, 4x - x^2 + 8$
and $-10 + 5x - 2x^2$

Solution:

(i) $3a + 4b + 7c, -5a + 3b - 6c$
and $4a - 2b - 4c$

The sum of $3a + 4b + 7c, -5a + 3b - 6c$ and $4a - 2b - 4c$ is calculated as shown below

$$(3a + 4b + 7c) + (-5a + 3b - 6c) + (4a - 2b - 4c)$$

$$= 3a + 4a - 5a + 4b + 3b - 2b + 7c - 6c - 4c$$

We get,

$$= 2a + 5b - 3c$$

Hence, the sum of $3a + 4b + 7c, -5a + 3b - 6c$ and $4a - 2b - 4c$ is $3c$

(ii) $2x^2 + xy - y^2, -x^2 + 2xy + 3y^2$
and $3x^2 - 10xy + 4y^2$

The sum of $2x^2 + xy - y^2, -x^2 + 2xy + 3y^2$ and $3x^2 - 10xy + 4y^2$ is calculated as shown below

$$(2x^2 + xy - y^2) + (-x^2 + 2xy + 3y^2) + (3x^2 - 10xy + 4y^2)$$

$$= 2x^2 - x^2 + 3x^2 + xy + 2xy - 10xy + 3y^2 + 4y^2 - y^2$$

We get,

$$= 4x^2 - 7xy + 6y^2$$

Hence, the sum of $2x^2 + xy - y^2, -x^2 + 2xy + 3y^2$ and $3x^2 - 10xy + 4y^2$ is $4x^2 - 7xy + 6y^2$

(iii) $x^2 - x + 1, -5x^2 + 2x - 2$ and $3x^2 - 3x + 1$

The sum of $(x^2 - x + 1), (-5x^2 + 2x - 2)$ and $(3x^2 - 3x + 1)$ is calculated as shown below

$$(x^2 - x + 1) + (-5x^2 + 2x - 2) + (3x^2 - 3x + 1)$$

$$= x^2 - 5x^2 + 3x^2 + 2x - x - 3x + 1 + 1 - 2$$

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

Hence, the sum of $(x^2 - x + 1), (-5x^2 + 2x - 2)$ and $(3x^2 - 3x + 1)$ is $-x^2 - 2x$

(iv) $a^2 - ab + bc, 2ab + bc - 2a^2$ and $-3bc + 3a^2 + ab$

The sum of $(a^2 - ab + bc), (2ab + bc - 2a^2)$ and $(-3bc + 3a^2 + ab)$ is calculated as shown below

$$(a^2 - ab + bc) + (2ab + bc - 2a^2) + (-bc + 3a^2 + ab)$$

$$= a^2 - 2a^2 + 3a^2 + 2ab + ab - ab + bc + bc - bc$$

We get,

$$= 2a^2 + 2ab + bc$$

Hence, the sum of $(a^2 - ab + bc)$, $(2ab + bc - 2a^2)$ and $(-3bc + 3a^2 + ab)$ is $2a^2 + 2ab + bc$

(v) $4x^2 + 7 - 3x$, $4x - x^2 + 8$ and $-10 + 5x - 2x^2$

The sum of $(4x^2 + 7 - 3x)$, $(4x - x^2 + 8)$ and $(-10 + 5x - 2x^2)$ is calculated as shown below

$$(4x^2 + 7 - 3x) + (4x - x^2 + 8) + (-10 + 5x - 2x^2)$$

$$= 4x^2 - x^2 - 2x^2 + 7 + 8 - 10 + 4x + 5x - 3x$$

We get,

$$= x^2 + 5 + 6x$$

Hence, the sum of $(4x^2 + 7 - 3x)$, $(4x - x^2 + 8)$ and $(-10 + 5x - 2x^2)$ is $x^2 + 5 + 6x$

2. Add the following expressions:

(i) $-17x^2 - 2xy + 23y^2$, $-9y^2 + 15x^2 + 7xy$

and $13x^2 + 3y^2 - 4xy$

(ii) $-x^2 - 3xy + 3y^2 + 8$, $3x^2 - 5y^2 - 3 + 4xy$

and $-6xy + 2x^2 - 2 + y^2$

(iii) $a^3 - 2b^3 + a$, $b^3 - 2a^3 + b$

and $-2b + 2b^3 - 5a + 4a^3$

Solution:

(i) The sum of $(-17x^2 - 2xy + 23y^2)$, $(-9y^2 + 15x^2 + 7xy)$ and $(13x^2 + 3y^2 - 4xy)$ is calculated as follows

$$(-17x^2 - 2xy + 23y^2) + (-9y^2 + 15x^2 + 7xy) + (13x^2 + 3y^2 - 4xy)$$

$$= -17x^2 + 15x^2 + 13x^2 - 2xy - 4xy + 7xy + 23y^2 + 3y^2 - 9y^2$$

We get,

$$= 11x^2 + xy + 17y^2$$

Therefore, the sum of $(-17x^2 - 2xy + 23y^2)$, $(-9y^2 + 15x^2 + 7xy)$ and $(13x^2 + 3y^2 - 4xy)$ is $11x^2 + xy + 17y^2$

(ii) $-x^2 - 3xy + 3y^2 + 8$, $3x^2 - 5y^2 - 3 + 4xy$ and $-6xy + 2x^2 - 2 + y^2$

The sum of $(-x^2 - 3xy + 3y^2 + 8)$, $(3x^2 - 5y^2 - 3 + 4xy)$ and $(-6xy + 2x^2 - 2 + y^2)$ is calculated as follows

$$(-x^2 - 3xy + 3y^2 + 8) + (3x^2 - 5y^2 - 3 + 4xy) + (-6xy + 2x^2 - 2 + y^2)$$

$$= -x^2 + 3x^2 + 2x^2 - 3xy - 6xy + 4xy + 3y^2 + y^2 - 5y^2 + 8 - 3 - 2$$

We get,

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

Therefore, the sum of $(-x^2 - 3xy + 3y^2 + 8)$, $(3x^2 - 5y^2 - 3 + 4xy)$ and $(-6xy + 2x^2 - 2 + y^2)$ is $4x^2 - 5xy - y^2 + 3$

(iii) $a^3 - 2b^3 + a$, $b^3 - 2a^3 + b$ and $-2b + 2b^3 - 5a + 4a^3$

The sum of $(a^3 - 2b^3 + a)$, $(b^3 - 2a^3 + b)$ and $(-2b + 2b^3 - 5a + 4a^3)$ is calculated as follows

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

We get,

$$= 3a^3 + b^3 - 4a - b$$

Therefore, the sum of $(a^3 - 2b^3 + a)$, $(b^3 - 2a^3 + b)$ and $(-2b + 2b^3 - 5a + 4a^3)$ is $3a^3 + b^3 - 4a - b$

3. Evaluate:

(i) $3a - (a + 2b)$

(ii) $(5x - 3y) - (x + y)$

(iii) $(8a + 15b) - (3b - 7a)$

(iv) $(8x + 7y) - (4y - 3x)$

(v) $7 - (4a - 5)$

Solution:

(i) $3a - (a + 2b)$

The value of the given expression is calculated as below

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

$$= 3a - a - 2b$$

$$= 2a - 2b$$

Taking 2 as common, we get

$$= 2(a - b)$$

(ii) $(5x - 3y) - (x + y)$

The value of the given expression is calculated as below

$$(5x - 3y) - (x + y)$$

$$= 5x - x - 3y - y$$

$$= 4x - 4y$$

Taking 4 as common, we get

$$= 4(x - y)$$

(iii) $(8a + 15b) - (3b - 7a)$

The value of the given expression is calculated as below

$$(8a + 15b) - (3b - 7a)$$

$$= 8a + 7a + 15b - 3b$$

On calculation, we get

$$= 15a + 12b$$

(iv) $(8x + 7y) - (4y - 3x)$

The value of the given expression is calculated as below

$$(8x + 7y) - (4y - 3x)$$
$$= 8x + 3x + 7y - 4y$$

On further calculation, we get

$$= 11x + 3y$$

(v) $7 - (4a - 5)$

The value of the given expression is calculated as below

$$7 - (4a - 5)$$

$$= 7 - 4a + 5$$

We get,

$$= 12 - 4a$$

4. Subtract:

(i) $5a - 3b + 2c$ from $a - 4b - 2c$

(ii) $4x - 6y + 3z$ from $12x + 7y - 21z$

(iii) $5 - a - 4b + 4c$ from $5a - 7b + 2c$

(iv) $-8x - 12y + 17z$ from $x - y - z$

(v) $2ab + cd - ac - 2bd$ from $ab - 2cd + 2ac + bd$

Solution:

(i) $5a - 3b + 2c$ from $a - 4b - 2c$

The value of the subtraction is calculated as follows

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

$$= a - 5a - 4b + 3b - 2c - 2c$$

We get,

$$= -4a - b - 4c$$

(ii) $4x - 6y + 3z$ from $12x + 7y - 21z$

The value of the subtraction is calculated as follows

$$(12x + 7y - 21z) - (4x - 6y + 3z)$$

$$= 12x - 4x + 7y + 6y - 21z - 3z$$

On further calculation, we get

$$= 8x + 13y - 24z$$

(iii) $5 - a - 4b + 4c$ from $5a - 7b + 2c$

The value of the subtraction is calculated as follows

$$(5a - 7b + 2c) - (5 - a - 4b + 4c)$$

$$= 5a + a - 7b + 4b + 2c - 4c - 5$$

We get,

$$= 6a - 3b - 2c - 5$$

(iv) $-8x - 12y + 17z$ from $x - y - z$

The value of the subtraction is calculated as follows

$$(x - y - z) - (-8x - 12y + 17z)$$

$$= x + 8x + 12y - y - z - 17z$$

We get,

$$= 9x + 11y - 18z$$

(v) $2ab + cd - ac - 2bd$ from $ab - 2cd + 2ac + bd$

The value of the subtraction is calculated as follows

$$(ab - 2cd + 2ac + bd) - (2ab + cd - ac - 2bd)$$

$$= ab - 2ab - 2cd - cd + 2ac + ac + bd + 2bd$$

On calculating further, we get

$$= -ab - 3cd + 3ac + 3bd$$

5.

(i) Take $-ab + bc - ca$ from $bc - ca + ab$.

(ii) Take $5x + 6y - 3z$ from $3x + 5y - 4z$.

(iii) Take $(-3/2)p + q - r$ from $(1/2)p - (1/3)q - (3/2)r$

(iv) Take $1 - a + a^2$ from $a^2 + a + 1$

Solution:

(i) The value of the subtraction is calculated as,

$$(bc - ca + ab) - (-ab + bc - ca)$$

$$= bc - bc - ca + ca + ab + ab$$

We get,

$$= 2ab$$

Hence, $(bc - ca + ab) - (-ab + bc - ca) = 2ab$

(ii) The value of the subtraction is calculated as,

$$(3x + 5y - 4z) - (5x + 6y - 3z)$$

$$= 3x - 5x + 5y - 6y - 4z + 3z$$

On simplification, we get

$$= -2x - y - z$$

Hence, $(3x + 5y - 4z) - (5x + 6y - 3z) = -2x - y - z$

(iii) The value of the subtraction is calculated as,

$$[(1/2)p - (1/3)q - (3/2)r] - [(-3/2)p + q - r]$$

$$= (1/2)p + (3/2)p - (1/3)q - q - (3/2)r + r$$

We get,

$$= [(3p + 9p - 2q - 6q - 9r + 6r) / 6]$$

On further calculation, we get

$$= 2p - (4/3)q - (1/2)r$$

Hence, $[(1/2)p - (1/3)q - (3/2)r] - [(-3/2)p + q - r] = 2p - (4/3)q - (1/2)r$

(iv) The value of the subtraction is calculated as,

$$(a^2 + a + 1) - (1 - a + a^2)$$

$$= a^2 - a^2 + a + a + 1 - 1$$

We get,
 $= a + a$
 $= 2a$

6. From the sum of $x + y - 2z$ and $2x - y + z$ subtract $x + y + z$.

Solution:

The value of terms as per the question is calculated as follows

$$(x + y - 2z) + (2x - y + z) - (x + y + z)$$
$$= x + 2x - x + y - y - y - 2z - z + z$$

We get,

$$= 2x - y - 2z$$

Therefore, $(x + y - 2z) + (2x - y + z) - (x + y + z) = 2x - y - 2z$

7. From the sum of $3a - 2b + 4c$ and $3b - 2c$ subtract $a - b - c$.

Solution:

The value of terms as per the question is calculated as shown below

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

On further calculation, we get

$$= 3a - a + 3b + b - 2b + 4c + c - 2c$$
$$= 2a + 2b + 3c$$

Hence, $(3a - 2b + 4c) + (3b - 2c) - (a - b - c) = 2a + 2b + 3c$

8. Subtract $x - 2y - z$ from the sum of $3x - y + z$ and $x + y - 3z$.

Solution:

The value of terms as per the question is calculated as follows

$$(3x - y + z) + (x + y - 3z) - (x - 2y - z)$$
$$= 3x + x - x - y + y + 2y + z - 3z + z$$

We get,

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

Therefore, $(3x - y + z) + (x + y - 3z) - (x - 2y - z) = 3x + 2y - z$

9. Subtract the sum of $x + y$ and $x - z$ from the sum of $x - 2z$ and $x + y + z$

Solution:

The value of terms as per the question is calculated as follows

$$(x - 2z) + (x + y + z) - \{(x + y) + (x - z)\}$$

On further calculation, we get

$$= x + x - x - x + y - y + z + z - 2z$$

We get,

$$= 0$$

$$\text{Therefore, } (x - 2z) + (x + y + z) - \{(x + y) + (x - z)\} = 0$$

10. By how much should $x + 2y - 3z$ be increased to get $3x$?

Solution:

The terms calculated as per the question is as follows

$$3x - (x + 2y - 3z)$$

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

We get,

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

11. The sum of two expressions is $5x^2 - 3y^2$. If one of them is $3x^2 + 4xy - y^2$, find the other.

Solution:

The other expression is calculated as follows

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

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

We get,

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

12. The sum of two expressions is $3a^2 + 2ab - b^2$. If one of them is $2a^2 + 3b^2$, find the other.

Solution:

The other expression is calculated as follows

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

On simplification, we get

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

$$= a^2 - 4b^2 + 2ab$$