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27.7.21

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 $-10 + 5x - 2x^2$
- (vi) $3x + 4xy - y^2$, $xy - 4x + 2x^2$ and $3y^2 - xy + 6x$.

Solution:

$$\begin{aligned} \text{i- } & 3a + 4b + 7c + (-5a + 7b - 6c) + (4a - 2b - 4c) \\ & = 3a + 4b + 7c - 5a + 7b - 6c + 4a - 2b - 4c \\ & = 3a - 5a + 4a + 4b + 7b - 6c + 4a - 2b - 4c \\ & = 3a + 4a - 5a + 7b - 2b + 7b - 2b + 7c - 10c \\ & = 7a - 5a + 5b - 3c \\ & = 2a + 5b - 3c \end{aligned}$$

$$\begin{aligned}
 \text{ii- } & 2x^2 + xy - y^2 + (-x^2 + 2xy + 3y^2) + (3x^2 - 10xy + 4y^2) \\
 & = 2x^2 + xy - y^2 - x^2 + 2xy + 3y^2 + 3x^2 - 10xy + 4y^2 \\
 & = 2x^2 - x^2 + 3x^2 - y^2 + 3y^2 + 4y^2 + xy + 2xy - 10xy \\
 & = 4x^2 + 6y^2 - 7xy \\
 & = 2x^2 + 3x^2 - x^2 - y^2 + 3y^2 + 4y^2 + xy + 2xy - 10xy \\
 & = 4x^2 + 6y^2 - 7xy
 \end{aligned}$$

$$\text{iii- } x^2 - x + 1 + (-5x^2 + 2x - 2) + 3x^2 - 3x + 1$$

$$\begin{aligned}
 \text{iii- } & x^2 - x + 1 + (-5x^2 + 2x - 2) + 3x^2 - 3x + 1 \\
 & = x^2 - x + 1 - 5x^2 + 2x - 2 + 3x^2 - 3x + 1 \\
 & = x^2 - 5x^2 + 3x^2 - x + 2x - 3x + 1 - 2 + 1 \\
 & = -x^2 - 2x + 0 \\
 & = -x^2 - 2x
 \end{aligned}$$

$$\text{iv- } (a^2 - ab + bc) + (2ab + bc - 2a^2) + (-3bc + 3a^2 + ab)$$

$$\begin{aligned}
 \text{iv- } & (a^2 - ab + bc) + (2ab + bc - 2a^2) + (-3bc + 3a^2 + ab) \\
 & = a^2 - ab + bc + 2ab + bc - 2a^2 - 3bc + 3a^2 + ab \\
 & = 4a^2 - 2a^2 + 3ab - ab + 2abc - 3bc \\
 & = 2a^2 + 2ab - bc
 \end{aligned}$$

$$\text{v- } (4x^2 + 7 - 3x) + (4x - x^2 + 8) - (-10 + 5x - 2x^2)$$

$$\begin{aligned}
 \text{v- } & (4x^2 + 7 - 3x) + (4x - x^2 + 8) - (-10 + 5x - 2x^2) \\
 & = 4x^2 + 7 - 3x + 4x - x^2 + 8 - 10 + 5x - 2x^2 \\
 & = 4x^2 - x^2 - 2x^2 + 7 + 8 - 10 + 4x + 5x - 3x \\
 & = x^2 + 5 + 6x
 \end{aligned}$$

$$\text{vi- } (a^2 + b^2 - c^2) + (b^2 + c^2 - a^2) + (c^2 + a^2 - b^2)$$

$$\begin{aligned}
 \text{vi. } & (3x + 4xy - y^2) + (xy - 4x + 2y^2) + (3y^2 - xy - 6x) \\
 & = 3x + 4xy - y^2 + xy - 4x + 2y^2 + 3y^2 - xy - 6x \\
 & = 3x + 6x - 4x + 4xy + xy - xy + 2y^2 + 3y^2 - y^2 \\
 & = 9x - 4x + 5xy - xy + 5y^2 - y^2 \\
 & = 5x + 4xy + 4y^2
 \end{aligned}$$

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:

$$\begin{aligned}
 \text{i. } & (-17x^2 - 2xy + 23y^2) + (-9y^2 + 15x^2 + 7xy) + (13x^2 + 3y^2 + 4xy) \\
 & = -17x^2 - 2xy + 23y^2 - 9y^2 + 15x^2 + 7xy + 13x^2 + 3y^2 + 4xy - 9y^2 \\
 & = 11x^2 + xy + 17y^2
 \end{aligned}$$

$$\begin{aligned}
 \text{ii. } & (-x^2 - 3xy + 3y^2 + 8) + (3x^2 - 5y^2 - 3 + 4xy) + (-6xy + 2x^2 - 2 + y^2) \\
 & = -x^2 - 3xy + 3y^2 + 8 + 3x^2 - 5y^2 - 3 + 4xy - 6xy + 2x^2 + y^2 - 5y^2 \\
 & \quad + 8 - 3 - 2 \\
 & = 4x^2 - 5xy - y^2 + 3
 \end{aligned}$$

$$\text{iii. } (a^3 - 2b^3 + a) + (b^3 - 2a^3 + b) + (-2b + 2b^3 - 5a + 4a^3)$$

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

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

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

3. Evaluate:

- (i) $3a - (a + 2b)$ (ii) $(5x - 3y) - (x + y)$ (iii) $(8a + 15b) - (3b - 7a)$
 (iv) $(8x + 7y) - (4y - 3x)$ (v) $7 - (4a - 5)$
 (vi) $(6y - 13) - (4 + 7y)$

Solution:

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

ii- $(5x - 3y) - (x + y)$
 $= 5x - 3y - x - y$
 $= 5x - x - 3y - y$
 $= 4x - 4y = 4(x - y)$

iii- $(8a + 15b) - (3b - 7a)$
 $= 8a + 15b - 3b + 7a$
 $= 8a + 7a + 15b - 3b$
 $= 15a + 12b$

(iv)- $(8x + 7y) - (4y - 3x)$
 $= 8x + 7x + 7y - 4y$
 $= 11x + 3y$

v- $7 - (4a - 5)$
 $= 7 - 4a + 5 = 7 + 5 - 4a$
 $= 12 - 4a$

$$\begin{aligned}
 \text{vi- } & (6y-13)-(4-7y) \\
 & = 6y-13-4+7y \\
 & = 6y+7y-13-4 \\
 & = 13y-17
 \end{aligned}$$

4. Subtract :

- (i) $5a-3b+2c$ from $a-4b-2c$
- (ii) $4x-6y+3z$ from $12x+7y-2z$
- (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 :

$$\begin{aligned}
 \text{i- } & (a-4b-2c)-(5a-3b+2c) \\
 & = a-4b-2c-5a+3b-2c \\
 & = a-5a-4b+3b-2c-2c \\
 & = -4a-b-4c
 \end{aligned}$$

$$\begin{aligned}
 \text{ii- } & (12x+7y-2z)-(4x-6y+3z) \\
 & = 12x+7y-2z-4x+6y-3z \\
 & = 12x-4x+7y+6y-2z-3z \\
 & = 8x+13y-5z
 \end{aligned}$$

$$\begin{aligned}
 \text{iii- } & (5a-7b+2c)-(5-a-4b+4c) \\
 & = 5a-7b+2c-5+a+4b-4c \\
 & = 5a+a-7b+4b+2c-4c-5 \\
 & = 6a-3b-2c-5
 \end{aligned}$$

$$\begin{aligned} \text{iv- } (x-y-z) - (-8x-12y+17z) \\ = x-y-z+8x+12y-17z \\ = 9x+11y-18z \end{aligned}$$

$$\begin{aligned} \text{(v)} (ab-2cd+2ac+bd) - (2ab+cd-ac-2bd) \\ = ab-2cd+2ac+bd-2ab-cd+ac+2bd \\ = -ab-3cd+3ac+3bd \end{aligned}$$

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

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

(iii) Take $\frac{3}{2}p+q-r$ from $\frac{1}{2}p - \frac{1}{3}q - \frac{3}{2}r$.

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

solution:

$$\begin{aligned} \text{i- } (bc-ca+ab) - (ab+bc-ca) \\ = bc-ca+ab-ab-bc+ca \\ = bc-bc-ca+ca+ab+ab \\ = 2ab \end{aligned}$$

$$\begin{aligned} \text{ii- } (3x+5y-4z) - (5x+6y-3z) \\ = 3x+5y-4z-5x-6y+3z \\ = 3x-5x+5y-6y-4z+3z \\ = -2x-y-z \end{aligned}$$

$$\begin{aligned} \text{iii- } (\frac{1}{2}p - \frac{1}{3}q - \frac{3}{2}r) - (-\frac{3}{2}p + q - r) \\ = \frac{1}{2}p - \frac{1}{3}q - \frac{3}{2}r + \frac{3}{2}p - q + r \\ = \frac{1}{2}p + \frac{3}{2}p - \frac{1}{3}q - q - \frac{3}{2}r + r \\ = 2p - \frac{4}{3}q - \frac{1}{2}r \end{aligned}$$

$$= \frac{12p}{6} - \frac{3q}{6} - \frac{3r}{6}$$

$$= 2p - \frac{1}{2}q - \frac{1}{2}r$$

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

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

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

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

solution:

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

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

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

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

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

solution:

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

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

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

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

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

solution:

$$\begin{aligned} & (3x - y + z) + (x + y - 3z) - (x - 2y - z) \\ &= 3x - y + z + x + y - 3z - x + 2y + z \\ &= 3x + x - x - y + y + 2y + z + z - 3z \\ &= 3x + 2y - z \end{aligned}$$

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

solution:

$$\begin{aligned} & (x - 2z) + (x + y + z) - \{(x + y) + (x - z)\} \\ &= x - 2z + x + y + z - \{x + y + x - z\} \\ &= x - 2z + x + y + z - x - y - x + z \\ &= x + x - x - x + y - y + z + z - 2z \\ &= 0 \end{aligned}$$