

Exercise 19(B)

1. Find the sum of:

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

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

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

Ans - $(2x^2 + xy - y^2) + (-x^2 + 2xy + 3y^2) + (3x^2 - 10xy + 4y^2)$
 $= 2x^2 + xy - y^2 - x^2 + 2xy + 3y^2 + 3x^2 - 10xy + 4y^2$
 $= (2x^2 - x^2 + 3x^2) + (xy + 2xy - 10xy) + (-y^2 + 3y^2 + 4y^2)$
 $= (5x^2 - x^2) + (3xy - 10xy) + (-1y^2 + 7y^2)$
 $= 4x^2 + (-7xy) + 6y^2$
 $= 4x^2 - 7xy + 6y^2$

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

Ans - $(x^2 - x + 1) + (-5x^2 + 2x - 2) + (3x^2 - 3x + 1)$
 $= x^2 - x + 1 - 5x^2 + 2x - 2 + 3x^2 - 3x + 1$
 $= (x^2 - 5x^2 + 3x^2) + (-x + 2x - 3x) + (1 - 2 + 1)$
 $= (x^2 + 3x^2 - 5x^2) + (2x - 1x - 3x) + (1 + 1 - 2)$
 $= (4x^2 - 5x^2) + (2x - 4x) + (2 - 2)$
 $= -1x^2 + (-2x) + 0$
 $= -x^2 - 2x + 0$
 $= -x^2 - 2x$

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

Ans - $(a^2 - ab + bc) + (2ab + bc - 2a^2) + (-3bc + 3a^2 + ab)$
 $a^2 - ab + bc + 2ab + bc - 2a^2 - 3bc + 3a^2 + ab$
 $= (a^2 - 2a^2 + 3a^2) + (-ab + 2ab + ab) + (bc + bc - 3bc)$
 $= (a^2 + 3a^2 - 2a^2) + (2ab + ab - ab) + (bc + bc - 3bc)$
 $= 4a^2 - 2a^2 + 3ab - ab + 2bc - 3bc$
 $= 2a^2 + 2ab + (-1bc)$
 $= 2a^2 + 2ab - 1bc$
 $= 2a^2 + 2ab - bc$

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

Ans - $(4x^2 + 7 - 3x) + (4x - x^2 + 8) + (-10 + 5x - 2x^2)$
 $4x^2 + 7 - 3x + 4x - x^2 + 8 - 10 + 5x - 2x^2$
 $= 4x^2 - x^2 - 2x^2 + 7 + 8 - 10 - 3x + 4x + 5x$
 $= 4x^2 - x^2 - 2x^2 + 7 + 8 - 10 + 4x + 5x - 3x$
 $= 4x^2 - 3x^2 + 15 - 10 + 9x - 3x$
 $= 1x^2 + 5 + 6x$

vi) $3x + 4xy - y^2$, $xy - 4x + 2y^2$ and $3y^2 - xy + 6x$

Ans - $(3x + 4xy - y^2) + (xy - 4x + 2y^2) + (3y^2 - xy + 6x)$
 $3x + 4xy - y^2 + xy - 4x + 2y^2 + 3y^2 - xy + 6x$
 $= 3x - 4x + 6x + 4xy + xy - xy - y^2 + 2y^2 + 3y^2$
 $= 3x + 6x - 4x + 4xy + xy - xy + 2y^2 + 3y^2 - y^2$
 $= 9x - 4x + 5xy - xy + 5y^2 - y^2$
 $= 5x + 4xy + 4y^2$

2. Add the following expressions:

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

Ans- $(-17x^2 - 2xy + 23y^2) + (-9y^2 + 15x^2 + 7xy) + (13x^2 + 3y^2 - 4xy)$
 $= -17x^2 - 2xy + 23y^2 - 9y^2 + 15x^2 + 7xy + 13x^2 + 3y^2 - 4xy$
 $= -17x^2 + 15x^2 + 13x^2 - 2xy + 7xy - 4xy + 23y^2 - 9y^2 + 3y^2$
 $= 15x^2 + 13x^2 - 17x^2 + 7xy - 2xy - 4xy + 23y^2 + 3y^2 - 9y^2$
 $= 28x^2 - 17x^2 + 7xy - 6xy + 26y^2 - 9y^2$
 $= 11x^2 + xy + 17y^2$

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

Ans- $(-x^2 - 3xy + 3y^2 + 8) + (3x^2 - 5y^2 - 3 + 4xy) + (-6xy + 2x^2 - 2 + y^2)$
 $= -x^2 - 3xy + 3y^2 + 8 + 3x^2 - 5y^2 - 3 + 4xy - 6xy + 2x^2 - 2 + y^2$
 $= -x^2 + 3x^2 + 2x^2 - 3xy + 4xy - 6xy + 3y^2 - 5y^2 + y^2 + 8 - 3 - 2$
 $= 3x^2 + 2x^2 - x^2 + 4xy - 3xy - 6xy + 3y^2 + y^2 - 5y^2 + 8 - 3 - 2$
 $= 5x^2 - x^2 + 4xy - 9xy + 4y^2 - 5y^2 + 8 - 5$
 $= 4x^2 - 5xy - y^2 + 3$

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

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

Subtraction in Polynomials

Row Method

Subtract $-5a - 3b + 2c$ from $a - 4b - 2c$

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

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

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

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

Column Method

Subtract $-5a - 3b + 2c$ from $a - 4b - 2c$

Ans-

$$\begin{array}{r} a - 4b - 2c \\ - \quad 5a - 3b + 2c \\ \hline -4a - b - 4c \end{array}$$

3. Evaluate

i) $3a - (a + 2b)$ ii) $5x - 3y - (x + y)$

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

Ans = $5x - 3y - x - y$
 $= 5x - x - 3y - y$
 $= 4x - 4y$

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

Ans - $8a + 15b - 3b + 7a$
 $= 8a + 7a + 15b - 3b$
 $= 15a + 12b$

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

Ans = $8x + 7y - 4y + 3x$
 $= 8x + 3x + 7y - 4y$
 $= 11x + 3y$

4. Subtract (Row Method)

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

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

ii) $4x - 6y + 3z$ from $12x + 7y - 2z$

Ans - $(12x + 7y - 2z) - (4x - 6y + 3z)$
 $= 12x + 7y - 2z - 4x + 6y - 3z$
 $= 12x - 4x + 7y + 6y - 2z - 3z$
 $= 8x + 13y - 5z$

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

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

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

Ans - $(x - y - z) - (-8x - 12y + 17z)$
 $= x - y - z + 8x + 12y - 17z$
 $= x + 8x + 12y - y - z - 17z$
 $= 9x + 11y - 18z$

v) $2ab + cd - ac - 2bd$ from $ab - 2cd + 2ac + 6d$

$$\begin{aligned} \text{Ans} &= (ab - 2cd + 2ac + 6d) - (2ab + cd - ac - 2bd) \\ &= ab - 2cd + 2ac + 6d - 2ab - cd + ac + 2bd \\ &= ab - 2ab - 2cd - cd + 2ac + ac + 6d + 2bd \\ &= -ab - 3cd + 3ac + 3bd \end{aligned}$$

4. Subtract: (Column Method)

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

$$\begin{array}{r} \text{Ans} - \quad a - 4b - 2c \\ \quad - \quad 5a - 3b + 2c \\ \quad \quad - \quad + \quad - \end{array}$$

$$\hline -4a - b - 4c$$

ii) $4x - 6y + 3z$ from $12x + 7y - 2z$

$$\begin{array}{r} \text{Ans} - \quad 12x + 7y - 2z \\ \quad - \quad 4x - 6y + 3z \\ \quad \quad - \quad + \quad - \end{array}$$

$$\hline 8x + 13y - 24z$$

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

$$\begin{array}{r} \text{Ans} - \quad 5a - 7b + 2c \\ \quad - \quad 5 - a - 4b + 4c + 5 \\ \quad \quad + \quad + \quad - \quad - \end{array}$$

$$\hline 6a - 3b - 2c - 5$$

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

$$\begin{array}{r} \text{Ans} - \quad x - y - z \\ \quad - \quad -8x - 12y + 17z \\ \quad \quad + \quad + \quad - \end{array}$$

$$\hline 9x + 11y - 18z$$

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

$$\begin{array}{r} \text{Ans} - \quad ab - 2cd + 2ac + bd \\ \quad - \quad 2ab + cd - ac - 2bd \\ \quad \quad - \quad - \quad + \quad + \end{array}$$

$$\hline -ab - 3cd + 3ac + 3bd$$

5.ii) Take $-ab + bc - ca$ from $bc - ca + ab$ (Row Method)

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

i) Take $-ab + bc - ca$ from $bc - ca + ab$ (Column Method)

$$\begin{array}{r} \text{Ans-} \\ bc - ca + ab \\ - \\ bc - ca - ab \\ \hline - + + \\ \hline 2ab \end{array}$$

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

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

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

$$\begin{array}{r} \text{Ans-} \\ 3x + 5y - 4z \\ - \\ 5x + 6y - 3z \\ \hline - - + \\ \hline -2x - y - z \end{array}$$

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

$$\begin{aligned} \text{Ans- } & \left(\frac{1}{2}p - \frac{1}{3}q - \frac{3}{2}r\right) - \left(-\frac{3}{2}p + q - r\right) \\ & = \frac{1}{2}p - \frac{1}{3}q - \frac{3}{2}r + \frac{3}{2}p - q + r \\ & = \left(\frac{1}{2}p + \frac{3}{2}p\right) + \left(-\frac{1}{3}q - q\right) + \left(-\frac{3}{2}r + r\right) \\ & = \left(\frac{1p + 3p}{2}\right) + \left(\frac{-1q - 3q}{3}\right) + \left(\frac{-3r + 2r}{2}\right) \end{aligned}$$

$$= \frac{4}{2}p + \left(\frac{-4q}{3}\right) + \left(\frac{-r}{2}\right)$$

$$= 2p - \frac{4q}{3} - \frac{r}{2}$$

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

$$\text{Ans} - (a^2+a+1) - (1-a+a^2)$$

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

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

$$= 2a$$

$$= 2a$$

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

$$\text{Ans} - \begin{array}{r} a^2 + a + 1 \\ - (a^2 - a + 1) \\ \hline \end{array}$$

$$= 2a$$

$$2a$$

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

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

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

$$= \{3x-2z\} - (x+y+z)$$

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

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

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

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

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

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

$$\text{Ans} - \{(3a-2b+4c) + (3b-2c)\} - (a-b-c)$$

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

$$= \{3a+b+2c\} - (a-b-c)$$

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

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

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

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

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

$$\begin{aligned}
 \text{Ans} &= \{(3x - y + z) + (x + y - 3z)\} - (x - 2y - z) \\
 &= \{3x - y + z + x + y - 3z\} - (x - 2y - z) \\
 &= \{3x + x - y + y + z - 3z\} - (x - 2y - z) \\
 &= (4x - 2z) - (x - 2y - z) \\
 &= 4x - 2z - x + 2y + z \\
 &= 4x - x + 2y - 2z + z \\
 &= 3x + 2y - z
 \end{aligned}$$

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

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