

# Exercise 19-(B)

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

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

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

$$\begin{aligned} \text{iv) } & (a^2 - ab + bc) + (2ab + bc - 2a^2) + (-3bc + 3a^2 + ab) \\ & = a^2 - ab + bc + 2ab + bc - 2a^2 - 3bc + 3a^2 + ab \\ & = a^2 - 2a^2 + 3a^2 - ab + 2ab + ab + bc + bc - 3bc \\ & = 2a^2 + 2ab - 1bc \end{aligned}$$

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

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

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$$\begin{aligned}
 2. \text{ i) } & (-17x^2 - 2xy + 23y^3) + (-9y^2 + 15x^2 + 7xy) + \\
 & (13x^2 + 3y^2 - 4xy) \\
 & = -17x^2 - 2xy + 23y^3 - 9y^2 + 15x^2 + 7xy + 13x^2 + 3y^2 - 4xy \\
 & = -17x^2 + 15x^2 + 13x^2 - 2xy + 7xy - 4xy + 23y^3 - 9y^2 + 3y^2 \\
 & = 11x^2 + xy - 6y^2 + 23y^3
 \end{aligned}$$

$$\begin{aligned}
 \text{ii) } & (-9y^2 + 15x^2 + (-x^2 - 3xy + 3y^2 + 8) + (3x^2 - 5y^2 - 3 + \\
 & 4xy) + (-6xy + 2x^2 - 2 + y^2)) \\
 & = -x^2 - 3xy + 3y^2 + 8 + 3x^2 - 5y^2 - 3 + 4xy - 6xy + \\
 & 2x^2 - 2 + y^2 \\
 & = -x^2 + 3x^2 + 2x^2 - 3xy + 4xy - 6xy + 3y^2 - 5y^2 + y^2 + \\
 & 8 - 3 - 2 \\
 & = 4x^2 - 5xy - 1y^2 + 3
 \end{aligned}$$

$$\begin{aligned}
 \text{iii) } & (a^3 - 2b^3 + a) + (b^3 - 2a^3 + b) + (-2b + 2b^3 - 5a + 4a^3) \\
 & = a^3 - 2b^3 + a + b^3 - 2a^3 + b - 2b + 2b^3 - 5a + 4a^3 \\
 & = a^3 - 2a^3 + 4a^3 - 2b^3 + b^3 + 2b^3 + a + b - 5a \\
 & = 3a^3 + 1b^3 + a + b - 5a
 \end{aligned}$$

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

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

$$\begin{aligned}
 \text{iii) } & (8a + 15b) - (3b - 7a) \\
 & = 8a + 15b - 3b + 7a \\
 & = 8a + 7a + 15b - 3b \\
 & = 15a + 12b
 \end{aligned}$$

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$$\begin{aligned}
 \text{iv)} \quad & (8x + 7y) - (4y - 3x) \\
 & = 8x + 7y - 4y + 3x \\
 & = 8x + 3x + 7y - 4y \\
 & = 11x + 3y
 \end{aligned}$$

$$\begin{aligned}
 \text{v)} \quad & 7 - (4a - 5) \\
 & = 7 - 4a + 5 \\
 & = \cancel{7} - \cancel{5} - 4a \quad 7 + 5 - 4a \\
 & = 12 - 4a
 \end{aligned}$$

$$\begin{aligned}
 \text{vi)} \quad & (6y - 13) - (4 - 7y) \\
 & = 6y + 13 - 4 + 7y \\
 & = 6y + 7y + 13 - 4 \\
 & = 13y + 9
 \end{aligned}$$

$$\begin{aligned}
 \text{4i)} \quad & 5a - 3b + 2c \text{ from } a - 4b - 2c \\
 & + (a - 4b - 2c) - (5a - 3b + 2c) \\
 & = (a - 4b - 2c) - (5a - 3b + 2c) \\
 & = a - 4b - 2c - 5a + 3b - 2c \\
 & = a - 5a - 4b + 3b - 2c - 2c \\
 & = -4a - 1b - 4c
 \end{aligned}$$

$$\begin{aligned}
 \text{ii)} \quad & 4x - 6y + 3z \text{ from } 12x + 7y - 21z \\
 & = (4x - 6y + 3z) - (12x + 7y - 21z) \\
 & = 4x - 6y + 3z - 12x - 7y + 21z \\
 & = 4x - 12x - 6y - 7y + 3z + 21z \\
 & = -8x - 13y + 24z
 \end{aligned}$$

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

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

$$\begin{aligned}
 \text{v)} & \quad 2ab + cd - ac - 2bd \text{ from } ab - 2cd + 2ac + bd \\
 & = (2ab + cd - ac - 2bd) - (ab - 2cd + 2ac + bd) \\
 & = 2ab + cd - ac - 2bd - ab + 2cd - 2ac - bd \\
 & = 2ab - ab + cd + 2cd - ac - 2ac - 2bd - bd \\
 & = 1ab + 3cd - 3ac - 3bd
 \end{aligned}$$

$$\begin{aligned}
 \text{5. i)} & \quad (bc - ca + ab) - (ab + bc - ca) \\
 & = bc - ca + ab + ab - bc + ca \\
 & = bc - bc - ca + ca + ab + ab \\
 & = 2ab
 \end{aligned}$$

$$\begin{aligned}
 \text{ii)} & \quad \cancel{(5x + 6y - 7z)} - \cancel{(5x + 6y - 3z)} - (bc - ca + ab) \\
 & \quad (3x + 5y - 4z) - (5x + 6y - 3z) \\
 & = 3x + 5y - 4z - 5x + 6y - 3z \\
 & = 3x - 5x + 5y + 6y - 4z - 3z \\
 & = -2x + 11y - 7z
 \end{aligned}$$

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

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$$\begin{aligned}
 \text{iv) } & (a^2 + a + 1) - (1 - a + a^2) \\
 & = a^2 + a + 1 - 1 + a - a^2 \\
 & = a^2 - a^2 + a + a + 1 - 1 \\
 & = 2a
 \end{aligned}$$

$$\begin{aligned}
 6 \quad & x + y - 2z \text{ and } 2x - y + z \\
 & = (x + y - 2z) + (2x - y + z) \\
 & = x + y - 2z + 2x - y + z \\
 & = x + 2x + y - y - 2z + z \\
 & = 3x - 1z
 \end{aligned}$$

$$\begin{aligned}
 & (3x - 1z) - (x + y + z) \\
 & = 3x - 1z - x - y - z \\
 & = 3x - x - 1z - z - y \\
 & = 2x - 2z - y \\
 & = 2x - y - 2z
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & (3a - 2b + 4c) + (3b - 2c) - (a - b - c) \\
 & = 3a - 2b + 4c + 3b - 2c - a + b + c \\
 & = 3a - a - 2b + 3b + 4c - 2c + c \\
 & = 2a + 2b + 3c
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & (3x - y + z) + (x + y - 3z) - (x - 2y - z) \\
 & = 3x - y + z + x + y - 3z - x + 2y + z \\
 & = 3x + x - x - y + y + 2y + z - 3z + z \\
 & = 3x + 2y - 1z
 \end{aligned}$$

$$\begin{array}{lll}
 9. \quad (x + y) + (x - y - z) & (x - 2z) + (x + y + z) & (2x + y - z) + (2x + y - z) \\
 = x + y + x - y - z & = x - 2z + x + y + z & = 2x + y - z + 2x + y - z \\
 = x + x + y - y - z & = x + x + y - 2z + z & = 2x - 2x + y - y - z + z \\
 = 2x + y - z & = 2x + y - z & = 0
 \end{array}$$