

# Mathematics

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(Chapter – 12) (Algebraic Expressions)

(Class – VII)

## Exercise 12.2

### Question 1:

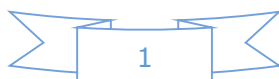
Simplify combining like terms:

- (i)  $21b - 32 + 7b - 20b$
- (ii)  $-z^2 + 13z^2 - 5x + 7z^3 - 15z$
- (iii)  $p - (p - q) - q - (q - p)$
- (iv)  $3a - 2b - ab - (a - b + ab) + 3ab + b - a$
- (v)  $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$
- (vi)  $(3y^2 + 5y - 4) - (8y - y^2 - 4)$



### Answer 1:

- (i)  $21b - 32 + 7b - 20b = 21b + 7b - 20b - 32$   
 $= 28b - 20b - 32 = 8b - 32$
- (ii)  $-z^2 + 13z^2 - 5z + 7z^3 - 15z = 7z^3 + (-z^2 + 13z^2) - (5z + 15z)$   
 $= 7z^3 + 12z^2 - 20z$
- (iii)  $p - (p - q) - q - (q - p) = p - p + q - q - q + p$   
 $= p - p + p + q - q - q = p - q$
- (iv)  $3a - 2b - ab - (a - b + ab) + 3ab + b - a = 3a - 2b - ab - a + b - ab + 3ab + b - a$   
 $= 3a - a - a - 2b + b + b - ab - ab + 3ab$   
 $= (3a - a - a) - (2b - b - b) - (ab + ab - 3ab)$   
 $= a - 0 - (-ab)$   
 $= a + ab$
- (v)  $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2 = 5x^2y + 3yx^2 + 8xy^2 - 5x^2 + x^2 - 3y^2 - y^2 - 3y^2$   
 $= (5x^2y + 3x^2y) + 8xy^2 - (5x^2 - x^2) - (3y^2 + y^2 + 3y^2)$   
 $= 8x^2y + 8xy^2 - 4x^2 - 7y^2$
- (vi)  $(3y^2 + 5y - 4) - (8y - y^2 - 4) = 3y^2 + 5y - 4 - 8y + y^2 + 4$   
 $= (3y^2 + y^2) + (5y - 8y) - (4 - 4)$   
 $= 4y^2 - 3y - 0 = 4y^2 - 3y$



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### Question 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 2:

$$\begin{aligned} \text{(i)} \quad 3mn, -5mn, 8mn, -4mn &= 3mn + (-5mn) + 8mn + (-4mn) \\ &= (3 - 5 + 8 - 4)mn = 2mn \end{aligned}$$

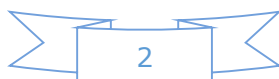
$$\begin{aligned} \text{(ii)} \quad t - 8tz, 3tz - z, z - t &= t - 8tz + 3tz - z + z - t \\ &= t - t - 8tz + 3tz - z + z \\ &= (1 - 1)t + (-8 + 3)tz + (-1 + 1)z \\ &= 0 - 5tz + 0 = -5tz \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad -7mn + 5, 12mn + 2, 9mn - 8, -2mn - 3 &= -7mn + 5 + 12mn + 2 + 9mn - 8 + (-2mn) - 3 \\ &= -7mn + 12mn + 9mn - 2mn + 5 + 2 - 8 - 3 \\ &= (-7 + 12 + 9 - 2)mn + 7 - 11 \\ &= 12mn - 4 \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad a + b - 3, b - a + 3, a - b + 3 &= a + b - 3 + b - a + 3 + a - b + 3 \\ &= (a - a + a) + (b + b - b) - 3 + 3 + 3 \\ &= a + b + 3 \end{aligned}$$

(v)

$$\begin{aligned} 14x + 10y - 12xy - 13, 18 - 7x - 10y + 8xy, 4xy &= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8xy + 4xy \\ &= 14x - 7x + 10y - 10y - 12xy + 8xy + 4xy - 13 + 18 \\ &= 7x + 0y + 0xy + 5 = 7x + 5 \end{aligned}$$



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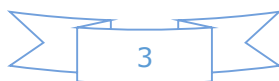
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- (vi)  $5m - 7n, 3n - 4m + 2, 2m - 3mn - 5 = 5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5$   
 $= 5m - 4m + 2m - 7n + 3n - 3mn + 2 - 5$   
 $= (5 - 4 + 2)m + (-7 + 3)n - 3mn - 3$   
 $= 3m - 4n + 3mn - 3$
- (vii)  $4x^2y, -3xy^2, -5xy^2, 5x^2y = 4x^2y + (-3xy^2) + (-5xy^2) + 5x^2y$   
 $= 4x^2y + 5x^2y - 3xy^2 - 5xy^2$   
 $= 9x^2y - 8xy^2$
- (viii)  $3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$   
 $= 3p^2q^2 - 4pq + 5 + (-10p^2q^2) + 15 + 9pq + 7p^2q^2$   
 $= 3p^2q^2 - 10p^2q^2 + 7p^2q^2 + 4pq + 9pq + 5 + 15$   
 $= (3 - 10 + 7)p^2q^2 + (-4 + 9)pq + 20$   
 $= 0p^2q^2 + 5pq + 20 = 5pq + 20$
- (ix)  $ab - 4a, 4b - ab, 4a - ab = ab - 4a + 4b - ab + 4a - ab$   
 $= -4a + 4a + 4b - 4b + ab - ab$   
 $= 0 + 0 + 0 = 0$
- (x)  $x^2 - y^2 - 1, y^2 - 1 - x^2, 1 - x^2 - y^2$   
 $= x^2 - y^2 - 1 + y^2 - 1 - x^2 + 1 - x^2 - y^2$   
 $= x^2 - x^2 - x^2 - y^2 + y^2 - y^2 - 1 - 1 + 1$   
 $= (1 - 1 - 1)x^2 + (-1 + 1 - 1)y^2 - 1 - 1 + 1$   
 $= -x^2 - y^2 - 1$

### Question 3:

Subtract:

- (i)  $-5y^2$  from  $y^2$
- (ii)  $6xy$  from  $-12xy$
- (iii)  $(a - b)$  from  $(a + b)$
- (iv)  $a(b - 5)$  from  $b(5 - a)$
- (v)  $-m^2 + 5mn$  from  $4m^2 - 3mn + 8$
- (vi)  $-x^2 + 10x - 5$  from  $5x - 10$
- (vii)  $5a^2 - 7ab + 5b^2$  from  $3ab - 2a^2 - 2b^2$
- (viii)  $4pq - 5q^2 - 3p^2$  from  $5p^2 + 3q^2 - pq$



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 **Answer 3:**

$$\begin{aligned}\text{(i)} \quad y^2 - (-5y^2) &= y^2 + 5y^2 \\ &= 6y^2\end{aligned}$$

$$\begin{aligned}\text{(ii)} \quad -12xy - (6xy) &= -12xy - 6xy \\ &= -18xy\end{aligned}$$

$$\begin{aligned}\text{(iii)} \quad (a+b) - (a-b) &= a+b-a+b \\ &= a-a+b+b \\ &= 2b\end{aligned}$$

$$\begin{aligned}\text{(iv)} \quad b(5-a) - a(b-5) \\ &= 5b - ab - ab + 5a \\ &= 5b - 2ab + 5a \\ &= 5a + 5b - 2ab\end{aligned}$$

$$\begin{aligned}\text{(v)} \quad 4m^2 - 3mn + 8 - (-m^2 + 5mn) \\ &= 4m^2 - 3mn + 8 + m^2 - 5mn \\ &= 4m^2 + m^2 - 3mn - 5mn + 8 \\ &= 5m^2 - 8mn + 8\end{aligned}$$

$$\begin{aligned}\text{(vi)} \quad 5x - 10 - (-x^2 + 10x - 5) \\ &= 5x - 10 + x^2 - 10x + 5 \\ &= x^2 + 5x - 10x - 10 + 5 \\ &= x^2 - 5x - 5\end{aligned}$$

$$\begin{aligned}\text{(vii)} \quad 3ab - 2a^2 - 2b^2 - (5a^2 - 7ab + 5b^2) \\ &= 3ab - 2a^2 - 2b^2 - 5a^2 + 7ab - 5b^2 \\ &= 3ab + 7ab - 2a^2 - 5a^2 - 2b^2 - 5b^2 \\ &= 10ab - 7a^2 - 7b^2 \\ &= -7a^2 - 7b^2 + 10ab\end{aligned}$$

$$\begin{aligned}\text{(viii)} \quad 5p^2 + 3q^2 - pq - (4pq - 5q^2 - 3p^2) \\ &= 5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2 \\ &= 5p^2 + 3p^2 + 3q^2 + 5q^2 - pq - 4pq \\ &= 8p^2 + 8q^2 - 5pq\end{aligned}$$



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### Question 4:

- (a) What should be added to  $x^2 + xy + y^2$  to obtain  $2x^2 + 3xy$ ?
- (b) What should be subtracted from  $2a + 8b + 10$  to get  $-3a + 7b + 16$  ?

### Answer 4:

- (a) Let  $p$  should be added.

Then according to question,

$$x^2 + xy + y^2 + p = 2x^2 + 3xy$$

$$\Rightarrow p = 2x^2 + 3xy - (x^2 + xy + y^2)$$

$$\Rightarrow p = 2x^2 + 3xy - x^2 - xy - y^2$$

$$\Rightarrow p = 2x^2 - x^2 - y^2 + 3xy - xy$$

$$\Rightarrow p = x^2 - y^2 + 2xy$$

Hence,  $x^2 - y^2 + 2xy$  should be added.

- (b) Let  $q$  should be subtracted.

Then according to question,

$$2a + 8b + 10 - q = -3a + 7b + 16$$

$$\Rightarrow -q = -3a + 7b + 16 - (2a + 8b + 10)$$

$$\Rightarrow -q = -3a + 7b + 16 - 2a - 8b - 10$$

$$\Rightarrow -q = -3a - 2a + 7b - 8b + 16 - 10$$

$$\Rightarrow -q = -5a - b + 6$$

$$\Rightarrow q = -(-5a - b + 6)$$

$$\Rightarrow q = 5a + b - 6$$

### Question 5:

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

### Answer 5:

Let  $q$  should be subtracted.

Then according to question,

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

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

$$\Rightarrow q = 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2 - 6xy - 20$$

$$\Rightarrow q = 3x^2 + x^2 - 4y^2 + y^2 + 5xy - 6xy + 20 - 20$$

$$\Rightarrow q = 4x^2 - 3y^2 - xy + 0$$

Hence,  $4x^2 - 3y^2 - xy$  should be subtracted.



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### Question 6:

- (a) From the sum of  $3x - y + 11$  and  $-y - 11$ , subtract  $3x - y - 11$ .  
(b) From the sum of  $4 + 3x$  and  $5 - 4x + 2x^2$ , subtract the sum of  $3x^2 - 5x$  and  $-x^2 + 2x + 5$ .

### Answer 6:

- (a) According to question,

$$\begin{aligned} & (3x - y + 11) + (-y - 11) - (3x - y - 11) = 3x - y + 11 - y - 11 - 3x + y + 11 \\ & = 3x - 3x - y - y + y + 11 - 11 + 11 \\ & = (3 - 3)x - (1 + 1 - 1)y + 11 + 11 - 11 \\ & = 0x - y + 11 = -y + 11 \end{aligned}$$

- (b) According to question,

$$\begin{aligned} & [(4 + 3x) + (5 - 4x + 2x^2)] - [(3x^2 - 5x) + (-x^2 + 2x + 5)] \\ & = [4 + 3x + 5 - 4x + 2x^2] - [3x^2 - 5x - x^2 + 2x + 5] \\ & = [2x^2 + 3x - 4x + 5 + 4] - [3x^2 - x^2 + 2x - 5x + 5] \\ & = [2x^2 - x + 9] - [2x^2 - 3x + 5] \\ & = 2x^2 - x + 9 - 2x^2 + 3x - 5 \\ & = 2x^2 - 2x^2 - x + 3x + 9 - 5 \\ & = 2x + 4 \end{aligned}$$

