

Chapter 7 Algebraic Expressions

Exercise - 7.1

Algebraic Expressions.

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Solution-01:-

→ Monomial: An algebraic expression containing only one term is called a monomial.

→ Binomial:- An algebraic expression containing two terms is called a Binomial.

→ Trinomial:- An algebraic expression containing three terms is called a Trinomial.

→ Quadri-nomial → An algebraic expression containing four terms is called a Quadri-nomial

(i) a^2 - monomial - one term

(ii) $a^2 - b^2$ - Binomial - two terms.

(iii) $x^3 + y^3 + z^3$ - Trinomial - Three terms.

(iv) $x^3 + y^3 + z^3 + 3xyz$ - Quadri-nomial - four terms.

(v) $7 + 5$ - Monomial - one term

(vi) $abc + 1$ - Binomial - two terms.

(vii) $3x - 2 + 5$ - Binomial - two terms.

(viii) $2x - 3y + 4$ - Trinomial - Three terms

(ix) $xy + yz + zx$ - Trinomial - Three terms.

(x) $ax^3 + bx^2 + cx + d$ - Quadri-nomial - four terms

Solution-02 :-

(i) $3x$

(ii) $2x, -3$

(iii) $2x^2, -7$

(iv) $2x^2, y^2, -3xy, 4$

Solution-03:-

(i) In the given algebraic expression

Like terms $4xy, -3yx$ and coefficients $4, -3$

(ii) In the given algebraic expressions

Like terms coefficients $\rightarrow 7, -3, \frac{-4}{3}, \frac{-5}{2}, \frac{3}{2}$

(iii) $7a^2bc, -3ca^2b, \frac{-4}{3}cba^2, \frac{-5}{2}ab^2, \frac{3}{2}abc^2$

~~(iv)~~

~~(v)~~

Solution-04:-

(i) Like terms $\rightarrow a^2, -2a^2$

(ii) Like terms $\rightarrow -2yz, \frac{5}{2}yz$

(iii) Like terms $\rightarrow ab^2c, 2a^2cb^2, b^2ac, 3cab^2$

Solution-05:-

(i) Coefficient of x in $-12x$ is '12'

(ii) $-7y$

(iii) y^2

(iv) $-7a$

Solution-06:-

(i) coefficient of x^2 in $-3x^2$ is -3

(ii) $5yz$

(iii) $\frac{5}{7}z$

(iv) $-\frac{3}{2}a$

Solution-07:-

(i) coefficient of y in $-3y$ is -3

(ii) $2b$

(iii) $-7xy$

(iv) $-3yz$

(v) $9xz$

(vi) 1

(vii) -1

Solution-08:-

(i) 1

(ii) -6

(iii) 7

(iv) -2

Solution-09:-

(i) $4, -3/2, 5/2$

(ii) $-5/3, 7/4, 3.$

Solution-10:-

(i) -3

(ii) 5

Solution-11:-

(i) $1/6$ $\left[\because \frac{-2}{-1} + \frac{(-1)}{3} - \frac{3}{2} = \frac{1}{6} \right]$

(ii) $(-2)^2 + (-1)^2 + (3)^2 - (-2)(-1) - (-1)(3) - 3(-2)$
 $= 4 + 1 + 9 - 2 + 3 + 6$
 $= 21$

Solution-12:-

(i) $ax + by + cz = (-2)(1) + 1(-1) + 2(-2)$

$\left[\because \text{G/T } a = -2, b = 1, c = 2, \right.$

$x = 1, y = -1 \text{ and } z = -2]$

$ax + by + cz = -2 - 1 - 4$

$= -7.$

(ii) $ax^2 + by^2 - cz^2 = (-2)(1)^2 + (1)(-1)^2 - (-2)(2)^2$

$= -2 + 1 + 8$

$= 7$

(iii) $axy + byz + cxy = (-2)(1)(-1) + (1)(-1)(2) + (-2)(1)(-1)$
 $= 2.$

Exercise-1.2.

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✓ Solution-01:-

(i) Add $3x$ and $7x = (3+7)x = 10x$

(ii) $-5xy + 9xy = (-5+9)xy = (9-5)xy$
 $= 4xy.$

(iii) Solution-02:-

(i) $7x^3y + 9yx^3 = (7+9)yx^3$
 $= 16yx^3.$

(ii) $12a^2b + 3ba^2 = (12+3)a^2b$
 $= 15a^2b.$

Solution-03:-

(i) $7abc, -5abc, 9abc, -8abc = (7-5+9-8)abc$
 $= (16-5-8)abc$
 $= 3abc.$

(ii) $2x^2y, -4x^2y, 6x^2y, -5x^2y = (2-4+6-5)x^2y$
 $= (8-9)x^2y$
 $= -x^2y.$

Solution-04:-

(i). $x^3 - 2x^2y + 3xy^2 - y^3 + 2x^3 - 5xy^2 + 3x^2y - 4y^3$
 $= x^3 + 2x^3 - 2x^2y + 3x^2y + 3xy^2 - 5xy^2 - y^3 - 4y^3$
 $= (1+2)x^3 + (-2+3)x^2y + (3-5)xy^2 + (-1-4)y^3$
 $= 3x^3 + x^2y - 2xy^2 - 5y^3.$

$$\begin{aligned}
 \text{(ii)} \quad & a^4 - 2a^3b + 3ab^3 + 4a^2b^2 + 3b^4 - 2a^4 - 5ab^3 + 7a^3b - 6a^2b^2 + b^4 \\
 &= a^4 - 2a^4 - 2a^3b + 7a^3b + 3ab^3 - 5ab^3 + 4a^2b^2 - 6a^2b^2 + 3b^4 + b^4 \\
 &= (1-2)a^4 + (-2+7)a^3b + (3-5)ab^3 + (4-6)a^2b^2 + (3+1)b^4 \\
 &= -a^4 + 5a^3b + (-2)ab^3 + (-2)a^2b^2 + 4b^4 \\
 &= -a^4 + 5a^3b - 2a^2b^2 - 2ab^3 + 4b^4.
 \end{aligned}$$

Solution-05:-

$$\begin{aligned}
 \text{(i)} \quad & 8a - 6ab + 5b - 6a - ab - 8b - 4a + 2ab + 3b \\
 &= 8a - 6a - 4a - 6ab - ab + 2ab + 5b - 8b + 3b \\
 &= 4a - 6a - 5ab \\
 &= (4-6)a - 5ab \\
 &= -2a - 5ab \\
 &= -2a - 5ab.
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & 5x^3 + 7 + 6x - 5x^2 + 2x^2 - 8 - 9x + 4x - 2x^2 + 3x^3 + 3x^3 - 9x - x^2 \\
 & \quad + x - x^2 - x^3 - 4 = \\
 & 5x^3 + 3x^3 + 3x^3 - x^3 + 7 - 8 - 4 + 6x - 9x + 4x - 9x + x - 5x^2 \\
 & \quad + 2x^2 - 2x^2 - x^2 - x^2 \\
 &= (5+3+3-1)x^3 + (-5) + (6-9+4-9+1)x + (-5+2-2-1)x^2 \\
 &= 10x^3 - 7x^2 - 7x - 5.
 \end{aligned}$$

Solution-06:

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

$$5x + 7y - 8z$$

$$3x - 2y + 5z$$

$$= x + 5x + 3x - 3y + 7y - 2y - 2z - 8z + 5z$$

$$= (1+5+3)x + (-3+7-2)y + (-2-8+5)z$$

$$= 9x + 2y - 5z.$$

(ii) $4ab - 5bc + 7ca$

$$-3ab + 2bc - 3ca$$

$$5ab - 3bc + 4ca$$

$$= (4-3+5)ab + (-5+2-3)bc + (7-3+4)ca$$

$$= 6ab - 6bc + 8ca.$$

Solution-07:-

$$2x^2 - 3x + 1 + [3x^2 - 2x + 3x + 7]$$

$$= 2x^2 - 3x + 1 + 3x^2 + x + 7$$

$$= 2x^2 + 3x^2 - 3x + x + 7 + 1$$

$$= (2+3)x^2 + (-3+1)x + 8$$

$$= 5x^2 - 2x + 8.$$

Solution-08:

$$x^2 + 2xy + y^2 + [x^2 - 3y^2 + 2x^2 - y^2 + 9]$$

$$= x^2 + x^2 + 2x^2 + 2xy + y^2 - 3y^2 - y^2 + 9$$

$$= 4x^2 + 2xy - 3y^2 + 9.$$

$$\therefore (x^2 + 2xy + y^2) + [x^2 - 3y^2 + 2x^2 - y^2 + 9]$$

$$= 4x^2 + 2xy - 3y^2 + 9.$$

Solution-09:

$$\begin{aligned}
 & a^3 + b^3 - 3 + [2a^3 - 3b^3 - 3ab + 7 + (-a^3 + b^3 + 3ab - 9)] \\
 &= a^3 + 2a^3 - a^3 + b^3 - 3b^3 + b^3 - 3ab + 3ab - 3 + 7 - 9 \\
 &= 2a^3 - b^3 - 12 + 9 \\
 &= 2a^3 - b^3 - 5.
 \end{aligned}$$

Solution-10:-

(i) $7a^2b$ from $3a^2b$

$$3a^2b - 7a^2b = (3 - 7)a^2b = -4a^2b.$$

(ii) $-3xy - 4xy = (-3 - 4)xy = -7xy$

Solution-11:

(i) $3y - 4x = 3y - 4x$

(ii) $-5y - 2x = -(5y + 2x)$

Solution-12:-

$$\begin{aligned}
 \text{(i)} \quad & 4 - 5x + 6x^2 - 8x^3 - 6x^3 + 7x^2 + 5x + 3 \\
 &= -8x^3 - 6x^3 + 6x^2 + 7x^2 - 5x - 5x + 3 + 4 \\
 &= (-8 - 6)x^3 + (6 + 7)x^2 - (5 + 5)x + 7 \\
 &= -14x^3 + 13x^2 - 10x + 7.
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & 5x^2 - y + z + 7 + x^2 + 3z = 5x^2 + x^2 - y + z + 3z + 7 \\
 &= (5 + 1)x^2 - y + 4z + 7 \\
 &= 6x^2 - y + 4z + 7
 \end{aligned}$$

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

Solution-13:-

$$(i) p^3 - 4 + 3p^2 - 5p^2 + 3p^3 - p + 6 = (1+3)p^3 + (-5+3)p^2 - p + 6 \\ = 4p^3 - 2p^2 - p + 6.$$

$$(ii) 7 + x - x^2 - 9 + (-x) - 3x^2 - 7x^3 = -7x^3 + (-3-1)x^2 + 7-9 \\ = -7x^3 - 4x^2 - 2.$$

$$(iii) 1 - 5y^2 - y^3 - 7y^2 - y - 1 = -y^3 - 5y^2 - 7y^2 - y \\ = -y^3 - 12y^2 - y.$$

$$(iv) x^3 - 5x^2 + 3x + 1 - 6x^2 + 4x^3 - 5 - 3x = (1+4)x^3 + (-5-6)x^2 \\ + 1-5 \\ = 5x^3 - 11x^2 - 4.$$

Solution-14:-

$$[3x^2 - 5x + 2 - 5x^2 - 8x + 9] - [4x^2 - 7x + 9] \\ = 3x^2 - 5x^2 - 4x^2 - 5x - 8x + 7x + 2 + 9 - 9 \\ = (3-5-4)x^2 + (-5-8+7)x + 2 \\ = -6x^2 - 6x + 2.$$

Solution-15:-

$$\textcircled{1} 13x - 4y + 7z - 6z + 6x + 3y = (13+6)x + (-4+3)y \\ + (7+3)z \\ = 19x - y + 10y - z$$

$$6x - 4y - 4z + 2x + 4y - 7 = (6+2)x - 4z - 7 \\ = 8x - 4z - 7.$$

$$-19x + y + 10y + 8x + 4z - 7 = -11x + y + (-4-1)z - 7 \\ = -11x + y - 5z - 7.$$

Solution-16:-

$$\begin{aligned}
 & x^2 + 3y^2 - 6xy + 2x^2 - y^2 + 8xy + y^2 + 8 + x^2 - 3xy + 3x^2 - 4y^2 \\
 & + xy - x + y - 3 = (1+2+1+3)x^2 + \\
 & (3-1-4+1)y^2 - x + y + 8-3 \\
 & = 7x^2 - y^2 + y - x + 5 \\
 & = 7x^2 - y^2 - x + y + 5.
 \end{aligned}$$

Solution-17:-

The subtraction of $xy - 3yz + 4zx$ from $4xy - 3zx + 4yz + 7$.

$$\begin{aligned}
 & 4xy - 3zx + 4yz + 7 - xy + 3yz - 4zx \\
 & = (4-1)xy + (3+4)yz + (-3-4)zx + 7 \\
 & = 3xy + 7yz - 7zx + 7.
 \end{aligned}$$

Solution-18:-

$$\begin{aligned}
 & \Rightarrow x^2 - xy + y^2 - x + y + 3 + x^2 - 3y^2 + 4xy - 1 \\
 & = (1+1)x^2 + (4-1)xy + (1-3)y^2 - x + y + 2 \\
 & = 2x^2 + 3xy - 2y^2 - x + y + 2.
 \end{aligned}$$

Solution-19:-

$$\begin{aligned}
 \text{Required Expression} &= x - 2y + 3z - 3x - 5y + 7 \\
 &= (1-3)x + (-2-5)y + 3z + 7 \\
 &= -2x - 7y + 3z + 7.
 \end{aligned}$$

$$\therefore \text{Required Expression} = -2x - 7y + 3z + 7.$$

Solution-20:-

$$\begin{aligned} 2x^2 - 3y^2 + xy - x^2 + 2xy - 3y^2 &= (2-1)x^2 + (-3-3)y^2 + (1+2)xy \\ &= x^2 + 3xy - 6y^2 \end{aligned}$$

∴ Required Expression is $x^2 + 3xy - 6y^2$.

Solution-21:-

$$\begin{aligned} \text{Required Expression} &= a^2 - 3ab + 2b^2 - 2a^2 + 7ab - 9b^2 \\ &= (1-2)a^2 + (-3+7)ab + (2-9)b^2 \\ &= -a^2 + 4ab - 7b^2. \end{aligned}$$

∴ Required Expression is $-a^2 + 4ab - 7b^2$.

Re solution-22:-

$$\begin{aligned} \text{Required Expression} &= x^3 + 2x^2 - 3x + 2 - 12x^3 + 4x^2 \\ &\quad - 3x + 7 \\ &= (1-12)x^3 + (2+4)x^2 - 3x - 3x + 2 + 7 \\ &= -11x^3 + 6x^2 - 6x + 9. \end{aligned}$$

∴ Required Expression $\rightarrow -11x^3 + 6x^2 - 6x + 9$.

Solution-23:-

Required expression = $P+Q+R$

$$\begin{aligned} \Rightarrow P+Q+R &= 7x^2 + 5xy - 9y^2 + 4y^2 - 3x^2 - 6xy - 4x^2 + xy \\ &\quad + 5y^2 \\ &= (7-3-4)x^2 + (5-6+1)xy + (5+4-9)y^2 \\ &= 0 + 0 + 0 \\ &= 0 \\ \therefore \text{Hence proved} \end{aligned}$$

Solution-24:-

$$P+Q+R+S-T = a^2-b^2+a^2+4b^2-6ab+b^2+b+a^2-4ab \\ + 2a^2-b^2+ab-a$$

$$= (1+1+1+2)a^2 + (-1+4+1-1)b^2 \\ + (-6-4+1)ab - a + b$$

$$= 5a^2+3b^2-7ab-a+b.$$

Exercise-7.3

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Solution-01:-

$$(i) \quad x+y-3y+y = (x+y-(3y-y))$$

$$(ii) \quad 3x-2y-5z-y = 3x-2y-(5z+y)$$

$$(iii) \quad 3a-2b+4c-5 = 3a-2b-(-4c+5)$$

$$(iv) \quad 7a+3b+2c+y = 7a+3b-(-2c-y)$$

$$(v) \quad 2a^2-b^2-3ab+8 = 2a^2-b^2-(3ab-8)$$

$$(vi) \quad a^2+b^2-c^2+ab-3ac = a^2+b^2+c^2-(ab+3ac)$$

Solution-02:-

$$(i) \quad a-b+3a-2b+5 = 4a-3b+5$$

$$4a+2b-7$$

$$(4a+2b-7) - \{ (a-b) + (3a-2b+5) \}$$

$$(ii) \quad (3x-4y+7) - 3 \{ (2x+y) - \{ 5-(x-3y) + (7x-4y+3) \} \}$$

$$(iii) \quad \{ (2x^2+y^2-3xy) - (x^2-y^2+4xy) \} + (9x^2-3y^2-xy)$$

Exercise-7.4

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$$\begin{aligned} 1. \quad 2x + (5x - 3y) &= (2x + 5x) - 3y \\ &= 7x - 3y \end{aligned}$$

$$\begin{aligned} 2. \quad 3x - (y - 2x) &= +2x + 3x - y \\ &= 5x - y \end{aligned}$$

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

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

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

$$\begin{aligned} 6. \quad 5a - 3a + 2 - a - 4 &= 2a - a - 2 \\ &= a - 2. \end{aligned}$$

$$\begin{aligned} 7. \quad a - b + a - b - 1 + 3a &= (1+1+3)a - 2b + 1 \\ &= 5a - 2b + 1 \end{aligned}$$

$$\begin{aligned} 8. \quad a - 2b + 3a - 2b + 3c &= 4a - 2b - 2b + 3c \\ &= 4a - 4b + 3c. \end{aligned}$$

Solution-09:-

$$\begin{aligned} -x + 5y - 2x + 3y - 5x &= (-1-2-5)x + (5+3)y \\ &= -8x + 8y. \end{aligned}$$

Solution-10:-

$$\begin{aligned} 2a - [4b - (4a - 6a + 6b)] &= 2a - 4b + 4a - 6a + 6b \\ &= (2+4-6)a + 3b - 4b \\ &= 0a - b \\ &= 0 - b \\ &= -b. \end{aligned}$$

Solution-11:-

$$\begin{aligned} -a - a - a - b + 2a + a - 2b + b \\ &= [-1-1-1+2+1]a - 3b + b \\ &= 0[a] - 2b \\ &= -2b. \end{aligned}$$

Solution-12:-

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

Solution-13:-

$$\begin{aligned}
 & 5 + [x - (2y - (6x + y - 4) + 2x) - (x - (y - 2))] \\
 &= 5 + [x - [2y - 6x - y + 4] + 2x - x + y - 2] \\
 &= 5 + x - 2y + 6x + y - 4 + 2x - x + y - 2 \\
 &= (1 + 6 + 2 - 1)x + (-2 + 1 + 1)y + 5 - 4 - 2 \\
 &= 4x - 1.
 \end{aligned}$$

Solution-14:-

$$\begin{aligned}
 x^2 - [3x + 2x - x^2 + 1 + 2] &= x^2 - 3x - 2x + x^2 + (-3) \\
 &= 2x^2 - (3 + 2)x - 3 \\
 &= 2x^2 - 5x - 3.
 \end{aligned}$$

Solution-15:-

$$\begin{aligned}
 20 - \{ 5xy + 3x^2 - 3xy + 3y - 3x + 3y \} \\
 &= 20 - 5xy - 3x^2 + 3xy - 3y + 3x - 3y \\
 &= -3x^2 - 2xy - 6y + 3x + 20.
 \end{aligned}$$

Solution-16:-

$$\begin{aligned}
 85 - 12x + 7(8x - 3) + 2(10x - 10 + 20x) \\
 &= 85 - 12x + 56x - 21 + 20x - 20 + 40x \\
 &= 116x - 12x + 85 - 41 \\
 &= 104x + 44.
 \end{aligned}$$

Solution-17:-

$$\begin{aligned} & xy [yz - zx - \{yx - (zy - xz) - (xy - yz)\}] \\ &= xy^2z - x^2yz - x^2y^2 + 3xyz - x^2yz - x^2y^2 \\ &\quad - x^2y^2 \\ &= xy + 2zx - 3y. \end{aligned}$$