

Algebraic Expressions

Exercise 8A

Q1

Answer :

(i) x increased by 12 is $(x+12)$.

(ii) y decreased by 7 is $(y-7)$.

(iii) The difference of a and b, when $a > b$ is $(a-b)$.

(iv) The product of x and y is xy .

The sum of x and y is $(x+y)$.

So, product of x and y added to their sum is $xy+(x+y)$.

(v) One third of x is $\frac{x}{3}$.

The sum of a and b is $(a+b)$.

∴ One-third of x multiplied by the sum of a and b = $\frac{x}{3} \times (a+b) = \frac{x(a+b)}{3}$

(vi) 5 times x added to 7 times y = $(5 \times x) + (7 \times y)$, which is equal to $5x + 7y$.

(vii) Sum of x and the quotient of y by 5 is $x + \frac{y}{5}$.

(viii) x taken away from 4 is $(4-x)$.

(ix) 2 less than the quotient of x by y is $\frac{x}{y} - 2$.

(x) x multiplied by itself is $x \times x = x^2$.

(xi) Twice x increased by y is $(2 \times x) + y = 2x + y$.

(xii) Thrice x added to y squared is $(3 \times x) + (y \times y) = 3x + y^2$.

(xiii) x minus twice y is $x - (2 \times y) = x - 2y$.

(xiv) x cubed less than y cubed is $(y \times y \times y) - (x \times x \times x) = y^3 - x^3$.

(xv) The quotient of x by 8 is multiplied by y is $\frac{x}{8} \times y = \frac{xy}{8}$.

Q2

Answer :

Ranjit's score in English = 80 marks

Ranjit's score in Hindi = x marks

Total score in the two subjects = (Ranjit's score in English + Ranjit's score in Hindi)

∴ Total score in the two subjects = $(80 + x)$ marks

Q3

Answer :

(i) $b \times b \times b \times \dots$ 15 times = b^{15}

(ii) $y \times y \times y \times \dots$ 20 times = y^{20}

(iii) $14 \times a \times a \times a \times a \times a \times b \times b \times b = 14 \times (a \times a \times a \times a \times a) \times (b \times b \times b) = 14a^4b^3$

(iv) $6 \times x \times x \times x \times y \times y = 6 \times (x \times x \times x) \times (y \times y) = 6x^2y^2$

(v) $3 \times z \times z \times z \times z \times y \times y \times x = 3 \times (z \times z \times z \times z) \times (y \times y) \times x = 3z^3y^2x$

Q4

Answer :

(i) $x^2y^4 = (x \times x) \times (y \times y \times y \times y) = x \times x \times y \times y \times y \times y$

(ii) $6y^5 = 6 \times (y \times y \times y \times y \times y) = 6 \times y \times y \times y \times y \times y$

(iii) $9xy^2z = 9 \times x \times (y \times y) \times z = 9 \times x \times y \times y \times z$

(iv) $10a^3b^3c^3 = 10 \times (a \times a \times a) \times (b \times b \times b) \times (c \times c \times c) = 10 \times a \times a \times a \times b \times b \times b \times c \times c \times c$

Algebraic Expressions

Exercise 8B

Q1

Answer :

(i) $a+b$

Substituting $a = 2$ and $b = 3$ in the given expression:
 $2+3 = 5$

(ii) $a^2 + ab$

Substituting $a = 2$ and $b = 3$ in the given expression:
 $(2)^2 + (2 \times 3) = 4 + 6$
 $= 10$

(iii) $ab - a^2$

Substituting $a = 2$ and $b = 3$ in the given expression:
 $(2 \times 3) - (2)^2 = 6 - 4$
 $= 2$

(iv) $2a-3b$

Substituting $a = 2$ and $b = 3$ in the given expression:
 $(2 \times 2) - (3 \times 3) = 4 - 9$
 $= -5$

(v) $5a^2 - 2ab$

Substituting $a=2$ and $b=3$ in the given expression:
 $5 \times (2)^2 - 2 \times 2 \times 3 = 5 \times 4 - 12 = 20 - 12$
 $= 8$

(vi) $a^3 - b^3$

Substituting $a=2$ and $b=3$ in the given expression:
 $2^3 - 3^3 = 2 \times 2 \times 2 - 3 \times 3 \times 3 = 8 - 27$
 $= -19$

Q2

Answer :

(i) $3x-2y+4z$

Substituting $x = 1$, $y = 2$ and $z = 5$ in the given expression:
 $3 \times (1) - 2 \times (2) + 4 \times (5) = 3 - 4 + 20$
 $= 19$

(ii) $x^2 + y^2 + z^2$

Substituting $x = 1$, $y = 2$ and $z = 5$ in the given expression:
 $1^2 + 2^2 + 5^2 = (1 \times 1) + (2 \times 2) + (5 \times 5) = 1 + 4 + 25$
 $= 30$

(iii) $2x^2 - 3y^2 + z^2$

Substituting $x = 1$, $y = 2$ and $z = 5$ in the given expression:
 $2 \times (1)^2 - 3 \times (2)^2 + 5^2 = 2 \times (1 \times 1) - 3 \times (2 \times 2) + (5 \times 5) = 2 - 12 + 25$
 $= 15$

(iv) $xy + yz - zx$

Substituting $x = 1$, $y = 2$ and $z = 5$ in the given expression:

$$(1 \times 2) + (2 \times 5) - (5 \times 1) = 2 + 10 - 5 \\ = 7$$

(v) $2x^2y - 5yz + xy^2$

Substituting $x = 1$, $y = 2$ and $z = 5$ in the given expression:

$$2 \times (1)^2 \times 2 - 5 \times 2 \times 5 + 1 \times (2)^2 = 4 - 50 + 4 \\ = -42$$

(vi) $x^3 - y^3 - z^3$

Substituting $x = 1$, $y = 2$ and $z = 5$ in the given expression:

$$1^3 - 2^3 - 5^3 = (1 \times 1 \times 1) - (2 \times 2 \times 2) - (5 \times 5 \times 5) = 1 - 8 - 125 \\ = -132$$

Q3

Answer :

(i) $p^2 + q^2 - r^2$

Substituting $p = -2$, $q = -1$ and $r = 3$ in the given expression:

$$(-2)^2 + (-1)^2 - (3)^2 = (-2 \times -2) + (-1 \times -1) - (3 \times 3) \\ \Rightarrow 4 + 1 - 9 = -4$$

(ii) $2p^2 - q^2 + 3r^2$

Substituting $p = -2$, $q = -1$ and $r = 3$ in the given expression:

$$2 \times (-2)^2 - (-1)^2 + 3 \times (3)^2 = 2 \times (-2 \times -2) - (-1 \times -1) + 3 \times (3 \times 3) \\ \Rightarrow 8 - 1 + 27 = 34$$

(iii) $p - q - r$

Substituting $p = -2$, $q = -1$ and $r = 3$ in the given expression:

$$(-2) - (-1) - (3) = -2 + 1 - 3 \\ = -4$$

(iv) $p^3 + q^3 + r^3 + 3pqr$

Substituting $p = -2$, $q = -1$ and $r = 3$ in the given expression:

$$(-2)^3 + (-1)^3 + (3)^3 + 3 \times (-2 \times -1 \times 3) \\ = (-2 \times -2 \times -2) + (-1 \times -1 \times -1) + (3 \times 3 \times 3) + 3 \times (6) \\ = (-8) + (-1) + (27) + 18 \\ = 36$$

(v) $3p^2q + 5pq^2 + 2pqr$

Substituting $p = -2$, $q = -1$ and $r = 3$ in the given expression:

$$3 \times (-2)^2 \times (-1) + 5 \times (-2) \times (-1)^2 + 2 \times (-2 \times -1 \times 3) \\ = 3 \times (-2 \times -2) \times (-1) + 5 \times (-2) \times (-1 \times -1) + 2 \times (-2 \times -1 \times 3) \\ = -12 - 10 + 12 \\ = -10$$

(vi) $p^4 + q^4 - r^4$

Substituting $p = -2$, $q = -1$ and $r = 3$ in the given expression:

$$(-2)^4 + (-1)^4 - (3)^4 \\ = (-2 \times -2 \times -2 \times -2) + (-1 \times -1 \times -1 \times -1) - (3 \times 3 \times 3 \times 3) \\ = 16 + 1 - 81 \\ = -64$$

Q4

Answer :

- (i) Coefficient of x in $13x$ is 13.
- (ii) Coefficient of y in $-5y$ is -5.
- (iii) Coefficient of a in $6ab$ is 6b.
- (iv) Coefficient of z in $-7xz$ is $-7x$.
- (v) Coefficient of p in $-2pqr$ is $-2qr$.
- (vi) Coefficient of y^2 in $8xy^2z$ is $8xz$.
- (vii) Coefficient of x^3 in x^3 is 1.
- (viii) Coefficient of x^2 in $-x^2$ is -1.

Q5

Answer :

- (i) Numerical coefficient of ab is 1.
- (ii) Numerical coefficient of $-6bc$ is -6.
- (iii) Numerical coefficient of $7xyz$ is 7.
- (iv) Numerical coefficient of $-2x^3y^2z$ is -2.

Q6

Answer :

A term of expression having no literal factors is called a constant term.

- (i) In the expression $3x^2 + 5x + 8$, the constant term is 8.
- (ii) In the expression $2x^2 - 9$, the constant term is -9.
- (iii) In the expression $4y^2 - 5y + \frac{3}{5}$, the constant term is $\frac{3}{5}$.
- (iv) In the expression $z^3 - 2z^2 + z - \frac{8}{3}$, the constant term is $-\frac{8}{3}$.

Q7

Answer :

The expressions given in (i), (iii), (vi) and (viii) contain only one term. So, each one of them is monomial.
The expressions given in (ii) and (ix) contain two terms. So, both of them are binomial.
The expressions given in (iv) and (v) contain three terms. So, both of them are trinomial.
The expression given in (vii) contains four terms. So, it does not represent any of the given types.

Q8

Answer :

- (i) Expression $4x^5 - 6y^4 + 7x^2y - 9$ has four terms, namely $4x^5$, $-6y^4$, $7x^2y$ and -9 .
- (ii) Expression $9x^3 - 5z^4 + 7z^3y - xyz$ has four terms, namely $9x^3$, $-5z^4$, $7z^3y$ and $-xyz$.

Q9

Answer :

The terms that have same literals are called like terms.

- (i) a^2 and $2a^2$ are like terms.
- (ii) $-yz$ and $\frac{1}{2}zy$ are like terms.
- (iii) $-2xy^2$ and $5y^2x$ are like terms.
- (iv) ab^2c , acb^2 , b^2ac and cab^2 are like terms.

Algebraic Expressions

Exercise 8C

Q1

Answer :

$$\begin{aligned} \text{(i) Required sum} &= 3x + 7x \\ &= (3+7)x = 10x \end{aligned}$$

$$\begin{aligned} \text{(ii) Required sum} &= 7y + (-9y) \\ &= (7-9)y = -2y \end{aligned}$$

$$\begin{aligned} \text{(iii) Required sum} &= 2xy + 5xy + (-xy) \\ &= (2+5-1)xy = 6xy \end{aligned}$$

$$\text{(iv) Required sum} = 3x+2y$$

$$\begin{aligned} \text{(v) Required sum} &= 2x^2 + (-3x^2) + 7x^2 \\ &= (2-3+7)x^2 = 6x^2 \end{aligned}$$

$$\begin{aligned} \text{(vi) Required sum} &= 7xyz + (-5xyz) + 9xyz + (-8xyz) \\ &= (7-5+9-8)xyz = 3xyz \end{aligned}$$

$$\begin{aligned} \text{(vii) Required sum} &= 6a^3 + (-4a^3) + 10a^3 + (-8a^3) \\ &= (6-4+10-8)a^3 = 4a^3 \end{aligned}$$

$$\begin{aligned} \text{(viii) Required sum} &= x^2 - a^2 + (-5x^2 + 2a^2) + (-4x^2 + 4a^2) \\ \text{Rearranging and collecting the like terms} &= x^2 - 5x^2 - 4x^2 - a^2 + 2a^2 + 4a^2 \\ &= (1-5-4)x^2 + (-1+2+4)a^2 \\ &= -8x^2 + 5a^2 \end{aligned}$$

Q2

Answer :

(i)

$$\begin{array}{r} x - 3y - 2z \\ 5x + 7y - z \\ -7x - 2y + 4z \\ \hline -x + 2y + z \end{array}$$

(ii)

$$\begin{array}{r} m^2 - 4m + 5 \\ - 2m^2 + 6m - 6 \\ - m^2 - 2m - 7 \\ \hline - 2m^2 + 0 \times m - 8 \\ = - 2m^2 + 0 - 8 = - 2m^2 - 8 \end{array}$$

(iii)

$$\begin{array}{r} 2x^2 - 3xy + y^2 \\ - 7x^2 - 5xy - 2y^2 \\ 4x^2 + xy - 6y^2 \\ \hline - x^2 - 7xy - 7y^2 \end{array}$$

(iv)

$$\begin{array}{r} 4xy - 5yz - 7zx \\ - 5xy + 2yz + zx \\ - 2xy - 3yz + 3zx \\ \hline - 3xy - 6yz - 3zx \end{array}$$

Q3

Answer :

(i) Sum of the given expressions

$$\begin{aligned} &= (3a - 2b + 5c) + (2a + 5b - 7c) + (-a - b + c) \\ &\text{Rearranging and collecting the like terms} \\ &= 3a + 2a - a - 2b + 5b - b + 5c - 7c + c \\ &= (3+2-1)a + (-2+5-1)b + (5-7+1)c \\ &= 4a + 2b - c \end{aligned}$$

(ii) Sum of the given expressions

$$\begin{aligned} &= (8a - 6ab + 5b) + (-6a - ab - 8b) + (-4a + 2ab + 3b) \\ &\text{Rearranging and collecting the like terms} \\ &= (8-6-4)a + (-6-1+2)ab + (5-8+3)b \\ &= -2a - 5ab + 0 = -2a - 5ab \end{aligned}$$

(iii) Sum of the given expressions

$$\begin{aligned} &= (2x^3 - 3x^2 + 7x - 8) + (-5x^3 + 2x^2 - 4x + 1) + (3 - 6x + 5x^2 - x^3) \\ &\text{Rearranging and collecting the like terms} \\ &= 2x^3 - 5x^3 - x^3 - 3x^2 + 2x^2 + 5x^2 + 7x - 4x - 6x - 8 + 1 + 3 \\ &= (2-5-1)x^3 + (-3+2+5)x^2 + (7-4-6)x - 4 \\ &= -4x^3 + 4x^2 - 3x - 4 \end{aligned}$$

(iv) Sum of the given expressions

$$\begin{aligned} &= (2x^2 - 8xy + 7y^2 - 8xy^2) + (2xy^2 + 6xy - y^2 + 3x^2) + (4y^2 - xy - x^2 + xy^2) \\ &\text{Rearranging and collecting the like terms} \\ &= 2x^2 + 3x^2 - x^2 + 7y^2 - y^2 + 4y^2 - 8xy + 6xy - xy - 8xy^2 + 2xy^2 + xy^2 \\ &= (2+3-1)x^2 + (7-1+4)y^2 + (-8+6-1)xy + (-8+2+1)xy^2 \\ &= 4x^2 + 10y^2 - 3xy - 5xy^2 \end{aligned}$$

(v) Sum of the given expressions

$$= (x^3 + y^3 - z^3 + 3xyz) + (-x^3 + y^3 + z^3 - 6xyz) + (x^3 - y^3 - z^3 - 8xyz)$$

Rearranging and collecting the like terms

$$= x^3 - x^3 + x^3 + y^3 + y^3 - y^3 - z^3 + z^3 - z^3 + 3xyz - 6xyz - 8xyz$$

$$= (1-1+1)x^3 + (1+1-1)y^3 + (-1+1-1)z^3 + (3-6-8)xyz$$

$$= x^3 + y^3 - z^3 - 11xyz$$

(vi) Sum of the given expressions

$$= (2 + x - x^2 + 6x^3) + (-6 - 2x + 4x^2 - 3x^3) + (2 + x^2) + (3 - x^3 + 4x - 2x^2)$$

Rearranging and collecting the like terms

$$= 6x^3 - 3x^3 - x^3 - x^2 + 4x^2 + x^2 - 2x^2 + x - 2x + 4x + 2 - 6 + 2 + 3$$

$$= (6-3-1)x^3 + (-1+4+1-2)x^2 + (1-2+4)x + 1$$

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

Q4

Answer :

Change the sign of each term of the expression that is to be subtracted and then add.

(i) Term to be subtracted = $5x$

Changing the sign of each term of the expression gives $-5x$.

On adding:

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

$$= (2-5)x$$

$$= -3x$$

(ii) Term to be subtracted = $-xy$

Changing the sign of each term of the expression gives xy .

On adding:

$$6xy + xy$$

$$= (6+1)xy$$

$$= 7xy$$

(iii) Term to be subtracted = $3a$

Changing the sign of each term of the expression gives $-3a$.

On adding:

$$5b + (-3a)$$

$$= 5b - 3a$$

(iv) Term to be subtracted = $-7x$

Changing the sign of each term of the expression gives $7x$.

On adding:

$$9y + 7x$$

(v) Term to be subtracted = $10x^2$

Changing the sign of each term of the expression gives $-10x^2$.

On adding:

$$-7x^2 + (-10x^2) = -7x^2 - 10x^2$$

$$= (-7-10)x^2$$

$$= -17x^2$$

(vi) Term to be subtracted = $a^2 - b^2$

Changing the sign of each term of the expression gives $-a^2 + b^2$.

On adding:

$$b^2 - a^2 + (-a^2 + b^2) = b^2 - a^2 - a^2 + b^2$$

$$= (1+1)b^2 + (-1-1)a^2$$

$$= 2b^2 - 2a^2$$

Q5

