8. Algebraic Expressions and Operations on them

Practice Set 32

- Classify the following algebraic expressions as monomials, binomials, trinomials or polynomials.

(i) $7x$ (ii) $5y - 7z$ (iii) $3x^3 - 5x^2 - 11$ (iv) $1 - 8a - 7a^2 - 7a^3$

(v) $5m - 3$ (vi) a (vii) 4 (viii) $3y^2 - 7y + 5$

Ans. :

Monomials	(i) $7x$, (vi) a , (vii) 4
Binomials	(ii) $5y - 7z$, (v) $5m - 3$
Trinomials	(iii) $3x^3 - 5x^2 - 11$, (viii) $3y^2 - 7y + 5$
Polynomials	(iv) $1 - 8a - 7a^2 - 7a^3$

Practice Set 33

- Add .

(i) 9p + 16q ; 13p + 2q

Solution : (9p + 16q) ; (13p + 2q)

Horizontal arrangement :

(9p + 16q) + (13p + 2q) = 9p + 16q + 13p + 2q

= 9p + 13p + 16q + 2q

= 22p + 18q

(ii) 2a + 6b + 8c ; 16a + 13c + 18b

Solution : (2a + 6b + 8c) ; (16a + 13c + 18b)

Vertical arrangement :

$$\begin{array}{rl} & 2a + 6b + 8c \\ + & \underline{16a + 18b + 13c} \\ & 18a + 24b + 21c \end{array}$$

(iii) $13x^2 - 12y^2$; $6x^2 - 8y^2$

Solution : $13x^2 - 12y^2$; $6x^2 - 8y^2$

Vertical arrangement :

$$\begin{array}{rl} & 13x^2 - 12y^2 \\ + & 6x^2 - 8y^2 \\ \hline & 19x^2 - 20y^2 \end{array}$$

(iv) $17a^2b^2 + 16c$; $28c - 28a^2b^2$

Solution : $(17a^2b^2 + 16c)$; $(28c - 28a^2b^2)$

Horizontal arrangement :

$(17a^2b^2 + 16c) + (28c - 28a^2b^2) = 17a^2b^2 + 16c + 28c - 28a^2b^2$

$= 17a^2b^2 - 28a^2b^2 + 16c + 28c$

$= (17 - 28)\, a^2b^2 + (16 + 28)c$

$= -11\, a^2b^2 + 44c$

(v) $3y^2 - 10y + 16 ; 2y - 7$

Solution : $3y^2 - 10y + 16 ; 2y - 7$

Vertical arrangement :

$3y^2 - 10y + 16$

$+ 00 + 2y - 7$

$3y^2 - 8y + 9$

(vi) $- 3y^2 + 10y - 16 ; 7y^2 + 8$

Solution : $- 3y^2 + 10y - 16 ; 7y^2 + 8$

Vertical arrangement :

$- 3y^2 + 10y - 16$

$+$

$7y^2 + 00 + 8$

$4y^2 + 10y - 8$

Practice Set 34

◘ Subtract the second expression from the first.

(i) $(4xy - 9z)$; $(3xy - 16z)$

Solution :

Horizontal arrangement :

$(4xy - 9z)$ …(1) ; $(3xy - 16z)$ …(2)

$\therefore (4xy - 9z) - (3xy - 16z)$ …subtracting eqⁿ. (2) from eqⁿ. (1)]

$= 4xy - 9z - 3xy + 16z$

$= 4xy - 3xy - 9z + 16z$

$= xy + 7z$

(ii) $(5x + 4y + 7z)$; $(x + 2y + 3z)$

Solution :

Vertical arrangement :

$(5x + 4y + 7z)$ …(1) ; $(x + 2y + 3z)$ …(2)

…..[subtracting eqⁿ .(2) from eqⁿ. (1)]

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

(iii) $(14x^2 + 8xy + 3y^2)$; $(26x^2 - 8xy - 17y^2)$

Solution :

Horizontal arrangement :

$(14x^2 + 8xy + 3y^2)\ldots(1)$; $(26x^2 - 8xy - 17y^2)\ldots(2)$

……[subtracting eq^n (2) from eq^n (1)]

$$\begin{array}{r} 14x^2 + 8xy + 3y^2 \\ - \\ 26x^2 - 8xy - 17y^2 \\ - \quad + \quad\quad + \\ \hline -12x^2 + 16xy + 20y^2 \end{array}$$

(iv) $(6x^2 + 7xy + 16y^2)$; $(16x^2 - 17xy)$

Solution :

Horizontal arrangement :

$(6x^2 + 7xy + 16y^2)$ …(1) ; $(16x^2 - 17xy)$…(2)

……..[subtracting eqⁿ .(2) from eqⁿ .(1)]

$(6x^2 + 7xy + 16y^2) - (16x^2 - 17xy)$

$= 6x^2 + 7xy + 16y^2 - 16x^2 + 17xy$

$= (6x^2 - 16x^2) + (7xy + 17xy) + 16y^2$

$= -10x^2 + 24xy + 16y^2$

(v) $(4x + 16z)$; $(19y - 14z + 16x)$

Solution :

Horizontal arrangement :

$(4x + 16z)$ …(1) ; $(19y - 14z + 16x)$ …(2)

…….[subtracting eqⁿ. (2) from eqⁿ. (1)]

$(4x + 16z) - (19y - 14z + 16x)$

$= 4x + 16z - 19y + 14z - 16x$

$= (4x - 16x) + (16z + 14z) - 19y$

$= -12x + 30z - 19y$

$= -12x - 19y + 30z$

Practice Set 35

1. Multiply.

(i) $16xy \times 18xy$

Solution :

$16xy \times 18xy$

$= 16 \times 18 \times xy + xy$

$= 288x^2y^2$

(ii) $23xy^2 \times 4yz^2$

Solution :

$23xy^2 \times 4yz^2$

$= 23 \times 4 \times x \times y^2 \times y \times z^2$

$= 92xy^3z^2$

(iii) $(12a + 17b) \times 4c$

Solution :

$(12a + 17b) \times 4c$

$= (12a \times 4c) + (17b \times 4c)$

$= (12 \times 4 \times a \times c) + (17 \times 4 \times b \times c)$

$= 48ac + 68bc$

(iv) $(4x + 5y) \times (9x + 7y)$

Solution :

$(4x + 5y)(9x + 7y)$

Vertical arrangement :

$$\begin{array}{l} 4x + 5y \\ \times\ 9x + 7y \\ \hline 36x^2 + 45\,xy \quad \ldots \text{[Multiplying by } 9x\text{]} \\ \quad + 28\,xy + 35y^2 \quad \ldots \text{[Multiplying by } 7y\text{]} \\ \hline 36x^2 + 73xy + 35y^2 \end{array}$$

Horizontal arrangement :

$(4x + 5y) \times (9x + 7y)$

$= 4x\,(9x + 7y) + 5y\,(9x + 7y)$

$= (4x \times 9x) + (4x \times 7y) + (5y \times 9x) + (5y \times 7y)$

$= 36x^2 + 28xy + 45xy + 35y^2$

$= 36x^2 + 73xy + 35y^2$

2. A rectangle is $(8x + 5)$ cm long and $(5x + 3)$ cm broad. Find its area.

Solution :

The area of a rectangle = Length × breadth .....(formula)

$= (8x + 5) \times (5x + 3)$

$= 8x\,(5x + 3) + 5(5x + 3)$

$= (8x \times 5x) + (8x \times 3) + (5 \times 5x) + (5 \times 3)$

$= 40x^2 + 24x + 25x + 15$

$= 40x^2 + 49x + 15$

$\therefore$ The area of a rectangle is $(40x^2 + 49x + 15)$ sqcm.

Practice Test No. 36

1. Simplify $(3x - 11y) - (17x + 13y)$ and choose the right answer.

(i) $7x - 12y$ (ii) $-14x - 54y$

(iii) $-3(5x + 4y)$ (iv) $-2(7x + 12y)$

Solution : $(3x - 11y) - (17x + 13y)$

$= 3x - 11y - 17x - 13y$

$= 3x - 17x - 11y - 13y$

$= -14x - 24y$

$= -2(7x + 12y)$

$\therefore$ The correct option is (iv) $-2(7x + 12y)$

2.The product of $(23\ x^2y^3z)$ and $(-15\ x^3yz^2)$ is .....

(i) $-345\ x^5y^4z^3$ (ii) $345\ x^2y^3z^5$

(iii) $145\ x^3y^2z$ (iv) $170\ x^3y^2z^3$

Solution : $(23x^2\ y^3\ z)\ (-15\ x^3\ y\ z^2)$

$= (23) \times (-15) \times x^2 \times x^3 \times y^3 \times y \times z \times z^2$

$= (-345) \times x^{2+3} \times y^{3+1} \times z^{1+2}$

$= (-345) \times x^5 \times y^4 \times z^3$

$= -345\ x^5\ y^4\ z^3$

$\therefore$ The correct option is (i) $-345\ x^5\ y^4\ z^3$

3. Solve the following equations.

(i) $4x + \frac{1}{2} = \frac{9}{2}$

Solution :

$4x + \frac{1}{2} = \frac{9}{2}$

$\therefore\ 4x = \frac{9}{2} - \frac{1}{2}$

$\therefore\ 4x = \frac{9-1}{2}$

$\therefore\ 4x = \frac{8}{2}$

$\therefore 4x = 4$

$\therefore \quad x = 1$

$\therefore$ The solution of the given equation is 1.

(ii) $10 = 2y + 5$

Solution :

$10 = 2y + 5$

$10 - 5 = 2y + 5 - 5$ …(Subtracting 5 from both the sides)

$5 = 2y$

$\therefore \quad \frac{5}{2} = y$ …(Transposing LHS and RHS)

$\therefore \quad y = \frac{5}{2}$

$\therefore$ The solution of the given equation is $\frac{5}{2}$.

(iii) $5m - 4 = 1$

Solution :

$5m - 4 = 1$

$\therefore \quad 5m = 1 + 4$

$\therefore \quad 5m = 5$

$\therefore$ m = 1

$\therefore$ The solution of the given equation is 1.

(iv) $6x - 1 = 3x + 8$

Solution :

$6x - 1 = 3x + 8$

$\therefore 6x - 3x = 8 + 1$

$\therefore 3x = 9$

$\therefore x = 3$

$\therefore$ The solution of the given equation is 3.

(v) $2(x - 4) = 4x + 2$

Solution :

$2(x - 4) = 4x + 2$

$\therefore 2x - 8 = 4x + 2$

$\therefore 2x - 4x = 2 + 8$

$\therefore -2x = 10$

$\therefore\ x = \frac{10}{-2}$

$\therefore\ x = -5$

$\therefore$ The solution of the given equation is - 5.

(vi) $5(x + 1) = 74$

Solution :

$5(x + 1) = 74$

$\therefore 5x + 5 = 74$

$\therefore 5x = 74 - 5$

$\therefore 5x = 69$

$\therefore\ x = \frac{69}{5}$

$x = \frac{69}{5}$

$\therefore$ The solution of the given equation is $\frac{69}{5}$.

4. Rakesh's age is less than Sania's age by 5 years. The sum of their ages is 27 years. How old are they?

Solution :

Suppose Sania's age be x years.

$\therefore$ Then Rakesh's age is $(x - 5)$ years,

The sum of their ages is 27 years. …(Given)

$$\therefore \quad [\, x + (\, x - 5\,)\,] = 27$$

$$x + x - 5 = 27$$

$$\therefore \; 2x - 5 = 27$$

$$\therefore \; 2x = 27 + 5$$

$$\therefore \; 2x = 32$$

$$\therefore \; = \frac{32}{2}$$

$$\therefore \quad x = 16$$

$\therefore$ Sania's age = x years = 16 years,

Rakesh's age = $(x - 5)$ years = $(16 - 5)$ = 11 years.

5. When planting a forest, the number of jambhul trees planted was greater than the number of ashoka trees by 60. If there are altogether 200 trees of these two types, how many jambhul trees were planted ?

Solution :

Suppose x Ashoka trees were planted. …(1)

Then $(x + 60)$ Jambhul trees were planted. …(2)

There are altogether 200 trees.

$\therefore x + (x + 60) = 200$

$\therefore x + x + 60 = 200$

$\therefore 2x + 60 = 200$

$\therefore 2x = 200 - 60$

$\therefore 2x = 140$

$\therefore x = 70$

$\therefore$ There are 70 Ashoka trees were planted.

Put the value of $x = 70$ in equation (2)

$\therefore\ x + 60 = 70 + 60 = 130$

$\therefore$ There are 130 Jambhul trees were planted.

6. Shubhangi has twice as many 20-rupee notes as she has 50-rupee notes. Altogether, she has 2700 rupees. How many 50-rupee notes does she have ?

Solution : Suppose Shubhangi have x notes of 50 rupees.

Then she has $2x$ notes of 20 rupees.

The total amount with her is 2700 rupees.

$\therefore\ x \times 50 + 2x \times 20 = 2700$

$\therefore\ 50x + 40x = 2700$

$\therefore\ 90x = 2700$

$\therefore\ x = \frac{2700}{90}$

$\therefore\ x = 30$

$\therefore$ Shubhangi has 30 notes of 50-rupees.

7 . Virat made twice as many runs as Rohit. The total of their scores is 2 less than a double century. How many runs did each of them make ?

Solution : Suppose Rohit runs score be x.

Then Virat scored $2x$ runs.

The total of their scores is 2 less than a double century.

The total of their scores is $x + 2x = 3x$

A double century means 200 runs.

$\therefore$ $3x = 200 - 2$

$\therefore$ $3x = 198$

$\therefore$ $x = \frac{198}{3}$ …(Dividing both the sides by 3)

$\therefore$ $x = 66$.

$\therefore$ Rohit scored = $x = 66$.

Virat scored = $2x = 2 \times 66 = 132$

$\therefore$ Rohit scored 66 runs and Virat scored 132 runs.