# MATHEMATICS

Chapter 9: Algebraic Expressions and Identities
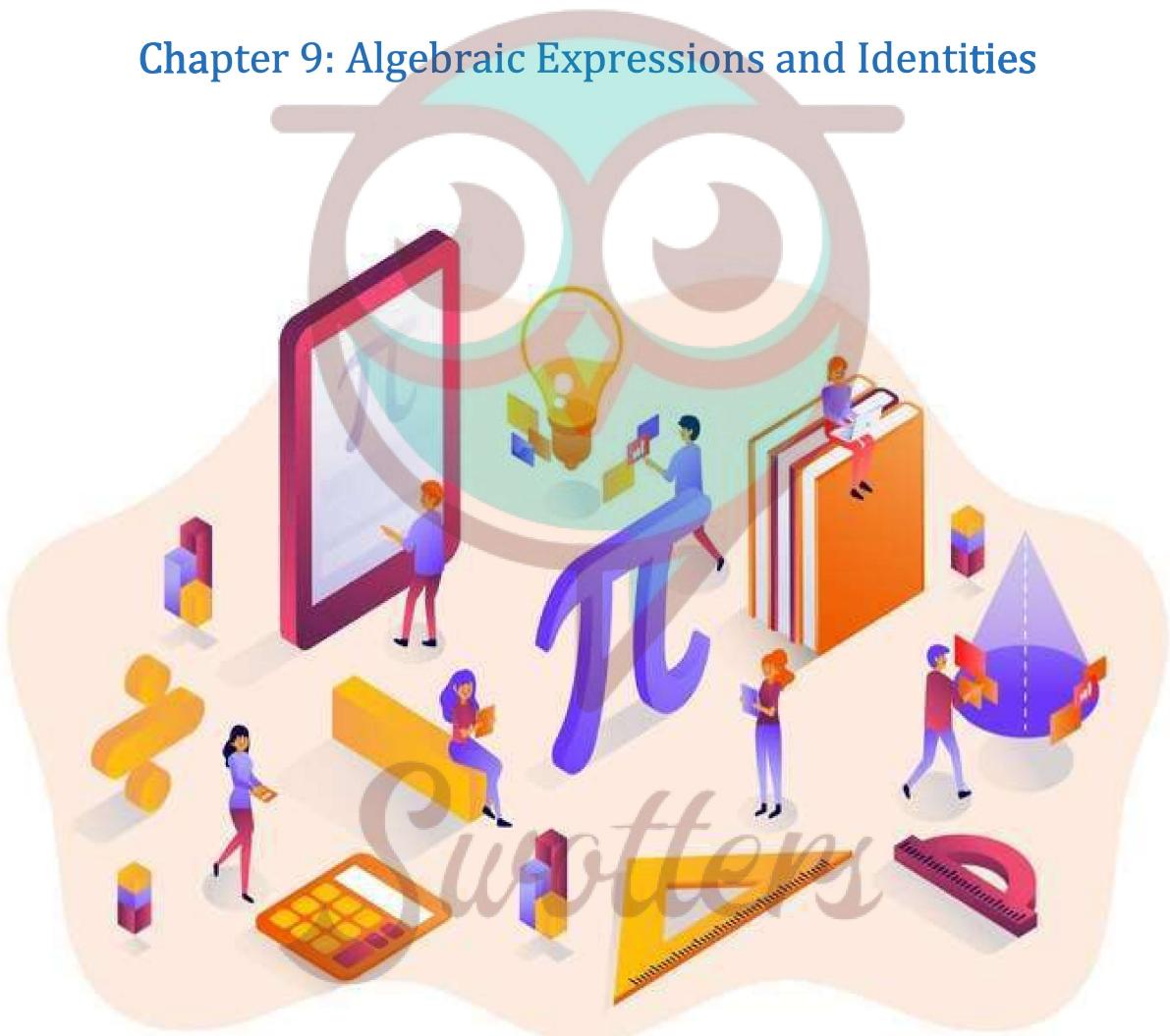
Important Questions

Multiple Choice Questions-

Question 1. The expression x + 3 is in

(a) one variable

(b) two variables

(c) no variable

(d) none of these.

Question 2. The expression 4xy + 7 is in

(a) one variable

(b) two variables

(c) no variable

(d) none of these.

Question 3. The expression x + y + z is in

(a) one variable

(b) no variable

(c) three variables

(d) two variables.

Question 4. The value of 5x when x = 5 is

(a) 5

(b) 10

(c) 25

(d) -5.

Question 5. The value of $x^2 - 2x + 1$ when x = 1 is

(a) 1

(b) 2

(c) -2

(d) 0.

Question 6. The value of $x^2 + y^2$ when x = 1, y = 2 is

(a) 1

(b) 2

(c) 4

(d) 5.

Question 7. The value of $x^2 - 2yx + y^2$ when x = 1, y = 2 is

(a) 1

(b) -1

(c) 2

(d) -2.

Question 8. The value of $x^2 - xy + y^2$ when $x = 0$, $y = 1$ is

(a) 0

(b) -1

(c) 1

(d) none of these.

Question 9. Which of the following is a monomial ?

(a) $4x^2$

(b) a + 6

(c) a + 6 + c

(d) a + b + c + d.

Question 10. Which of the following is a binomial?

(a) 3xy

(b) 4l + 5m

(c) 2x + 3y − 5

(d) 4a − 7ab + 3b + 12.
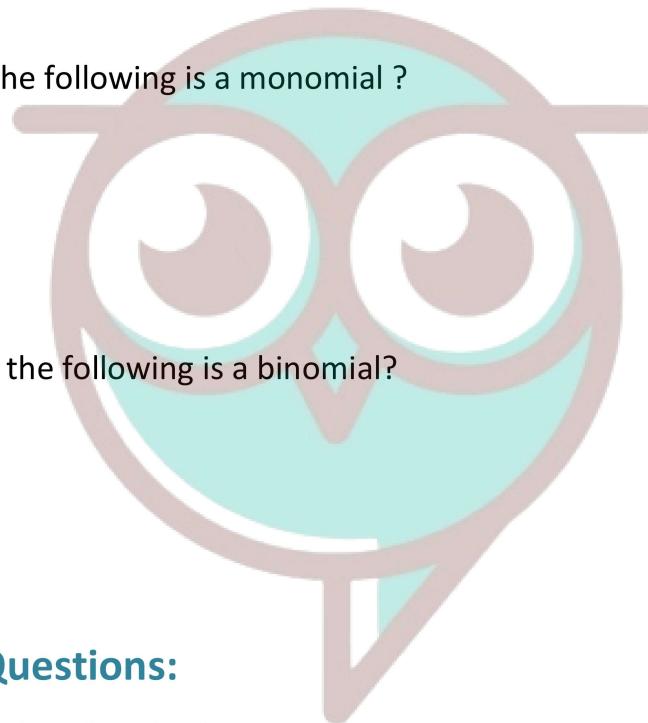
Very Short Questions:

1. Write two examples of each of

(i) Monomials

(ii) Binomials

(iii) Trinomials

2. Identify the like expressions.

5x, -14x, 3x2 + 1, x^2, $-9x^2$, xy, -3xy

3. Identify the terms and their coefficients for each of the following expressions:

(i) $3x^2y - 5x$

(ii) xyz − 2y

(iii) -x − x^2

4. Add: $-3a^2b^2$, $\frac{-5}{2}a^2b^2$, $4a^2b^2$, $\frac{2}{3}a^2b^2$

5. Add: $8x^2 + 7xy - 6y^2$, $4x^2 - 3xy + 2y^2$ and $-4x^2 + xy - y^2$

6. Subtract: (4x + 5) from (-3x + 7)

7. Subtract: $3x^2 - 5x + 7$ from $5x^2 - 7x + 9$

8. Multiply the following expressions:

   (a) $3xy^2 \times (-5x^2y)$

   (b) $\frac{1}{2} x^2yz \times \frac{2}{3} xy^2z \times 15 x^2yz$

Short Questions:

1. Find the area of the rectangle whose length and breadths are $3x^2y$ m and $5xy^2$ m respectively.

2. Multiply $x^2 + 7x - 8$ by -2y.

3. Simplify the following:

   (i) $a^2 (b^2 - c^2) + b^2 (c^2 - a^2) + c^2 (a^2 - b^2)$

   (ii) $x^2(x - 3y^2) - xy(y^2 - 2xy) - x(y^3 - 5x^2)$

4. Multiply $(3x^2 + 5y^2)$ by $(5x^2 - 3y^2)$

5. Multiply $(6x^2 - 5x + 3)$ by $(3x^2 + 7x - 3)$

6. Simplify:

   $2x^2(x + 2) - 3x (x^2 - 3) - 5x(x + 5)$

7. Multiply $x^2 + 2y$ by $x^3 - 2xy + y^3$ and find the value of the product for x = 1 and y = -1.

8. what must be added to $y^2 + 5y - 6$ to get $y^3 - y^2 + 3y - 2$?

9. What must be subtracted from $x^3 - 3x^2 + 5x - 1$ to get $2x^3 + x^2 - 4x + 2$?

Long Questions:

1. Using suitable identity find:

   (i) 482

   (ii) 962

   (iii) 2312 – 1312

   (iv) 97 × 103

   (v) 1812 – 192 = 162 × 200

2. If $x^2 + \frac{1}{x^2} = 38$, find the values of:

   (i) $x - \frac{1}{x}$ (ii) $x^4 + \frac{1}{x^4}$

3. Verify that $(11pq + 4q)^2 - (11pq - 4q)^2 = 176pq^2$

4. Find the value of $\frac{38^2 - 22^2}{16}$, using a suitable identity.

5. Find the value of x, if $10000x = (9982)^2 - (18)^2$

Answer Key-

Multiple Choice questions-

1. (a) one variable

2. (b) two variables

3. (c) three variables

4. (c) 25

5. (d) 0

6. (d) 5

7. (a) 1

8. (c) 1

9. (a) $4x^2$

10. (b) 4l + 5m

Very Short Answer:

1. (i) Monomials:

    (a) 3x

    (b) $5xy^2$

    (ii) Binomials:

    (a) p + q

    (b) -5a + 2b

    (iii) Trinomials:

    (a) a + b + c

    (b) $x^2 + x + 2$

2. Like terms: 5x and -14x, x^2 and $-9x^2$, xy and -3xy

3.
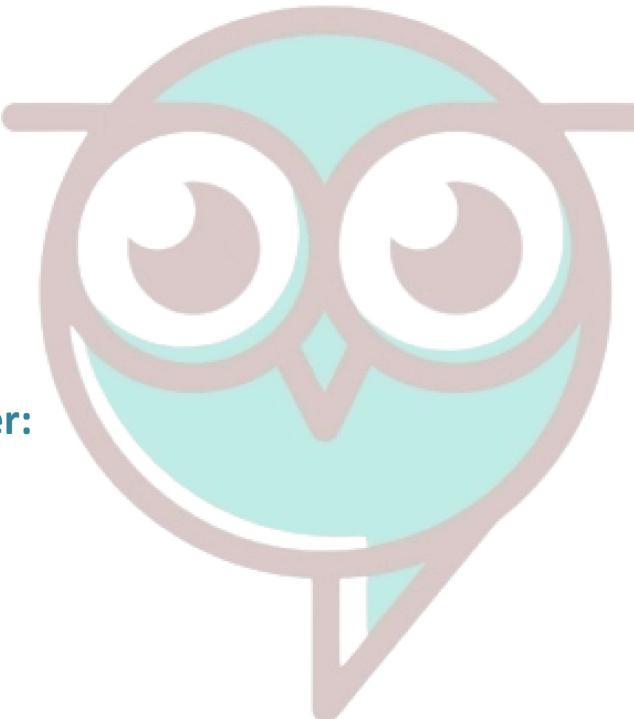
(i) Terms	Coefficients
$3x^2y$	3
$-5x$	-5
(ii) xyz	1
$-2y$	-2
(iii) $-x$	-1
$-x^2$	-1

4.

$$(-3a^2b^2) + \left(-\frac{5}{2}a^2b^2\right) + (4a^2b^2) + \left(\frac{2}{3}a^2b^2\right)$$

$$= \left(-3 - \frac{5}{2} + 4 + \frac{2}{3}\right)a^2b^2$$

$$= \left(\frac{-18 - 15 + 24 + 4}{6}\right)a^2b^2$$

$$= \frac{5}{6}a^2b^2$$

5.

$$
\begin{array}{r}
8x^2 + 7xy - 6y^2 \\
4x^2 - 3xy + 2y^2 \\
-4x^2 + xy - y^2 \\
+ \\
\hline
\text{Sum} \quad 8x^2 + 5xy - 5y^2
\end{array}
$$
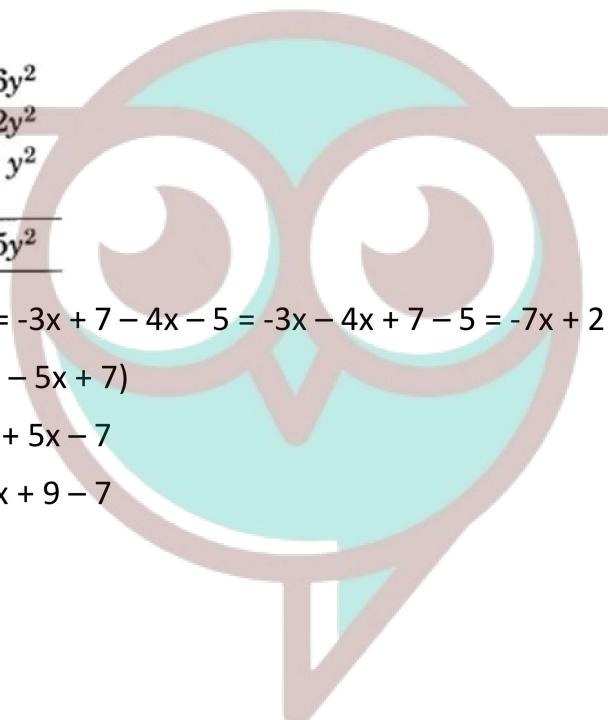
6. $(-3x + 7) - (4x + 5) = -3x + 7 - 4x - 5 = -3x - 4x + 7 - 5 = -7x + 2$

7. $(5x^2 - 7x + 9) - (3x^2 - 5x + 7)$

$= 5x^2 - 7x + 9 - 3x^2 + 5x - 7$

$= 5x^2 - 3x^2 + 5x - 7x + 9 - 7$

$= 2x^2 - 2x + 2$

8.

(a) $3xy^2 \times (-5x^2y)$

$= (3) \times (-5) \cdot x^3y^3$

$= -15x^3y^3$

(b) $\frac{1}{2}x^2yz \times \frac{2}{3}xy^2z \times \frac{1}{5}x^2yz$

$= \left(\frac{1}{2} \times \frac{2}{3} \times \frac{1}{5}\right) \cdot x^2yz \times xy^2z \times x^2yz$

$= \frac{1}{15}x^5y^4z^3$

Short Answer:

1. Length = $3x^2y$ m, breadth = $5xy^2$ m

Area of rectangle = Length × Breadth = $(3x^2y \times 5xy^2)$ sq m = $(3 \times 5) \times x^2y \times xy^2$ sq m = $15x^3y^3$ sq m

2.

$$x^2 + 7x - 8$$
$$\underline{\times - 2y}$$
$$\underline{-2x^2y - 14xy + 16y}$$

3. (i) $a^2 (b^2 - c^2) + b^2 (c^2 - a^2) + c^2 (a^2 - b^2)$

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

    $= 0$

    (ii) $x^2(x - 3y^2) - xy(y^2 - 2xy) - x(y^3 - 5x^2)$

    $= x^3 - 3x^2y^2 - xy^3 + 2x^2y^2 - xy^3 + 5x^3$

    $= x^3 + 5x^3 - 3x^2y^2 + 2x^2y^2 - xy^3 - xy^3$

    $= 6x^3 - x^2y^2 - 2xy^3$

4. $(3x^2 + 5y^2) \times (5x^2 - 3y^2)$

    $= 3x^2(5x^2 - 3y^2) + 5y^2(5x^2 - 3y^2)$

    $= 15x^4 - 9x^2y^2 + 25x2y^2 - 15y^4$

    $= 15x^4 + 16x^2y^2 - 15y^4$

5. $(6x^2 - 5x + 3) \times (3x^2 + 7x - 3)$

    $= 6x^2(3x^2 + 7x - 3) - 5x(3x^2 + 7x - 3) + 3(3x^2 + 7x - 3)$

    $= 18x^4 + 42x^3 - 18x^2 - 15x^3 - 35x^2 + 15x + 9x^2 + 21x - 9$

    $= 18x^4 + 42x^3 - 15x^3 - 18x^2 - 35x^2 + 9x^2 + 15x + 21x - 9$

    $= 18x^4 + 27x^3 - 44x^2 + 36x - 9$

6. $2x^2(x + 2) - 3x(x^2 - 3) - 5x(x + 5)$

    $= 2x^3 + 4x^2 - 3x^3 + 9x - 5x^2 - 25x$

    $= 2x^3 - 3x^3 - 5x^2 + 4x^2 + 9x - 25x$

    $= -x^3 - x^2 - 16x$

7. $(x^2 + 2y) \times (x^3 - 2xy + y3)$

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

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

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

    Put x = 1 and y = -1

    $= (1)^5 + (1)^2 (-1)^3 - 4(1)(-1)^2 + 2(-1)^4$

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

    $= 1 - 1 - 4 + 2$

    $= -2$

8.

$$y^3 - y^2 + 3y - 2$$
$$y^2 + 5y - 6$$
$$(-) \quad (-) \quad (+)$$
_____
$$y^3 - 2y^2 - 2y + 4$$
_____

9.

$$x^3 - 3x^2 + 5x - 1$$
$$2x^3 + x^2 - 4x + 2$$
$$(-) \quad (-) \quad (+) \quad (-)$$
_____
$$-x^3 - 4x^2 + 9x - 3$$
_____

Long Answer :

1.

(i) $(50 - 2)^2 = (50)^2 - 2 \times 50 \times 2 + (2)^2$
$= 2500 - 200 + 4$
$= 2504 - 200$
$= 2304$

(ii) $96^2 = (100 - 4)^2$
$= (100)^2 - 2(100)(4) + (4)^2$
$\qquad [\because (a - b)^2 = a^2 - 2ab + b^2]$
$= 10000 - 800 + 16$
$= 10016 - 800$
$= 9216$

(iii) $231^2 - 131^2$

$= (231 - 131)(231 + 131)$
$= (100)(362)$
$\qquad [\because a^2 - b^2 = (a + b)(a - b)]$
$= 36200$

(iv) 97×103
$= (100 - 3) \times (100 + 3)$
$= (100)^2 - (3)^2$
$\qquad [(a + b)(a - b) = a^2 - b^2]$
$= 10000 - 9$
$= 9991$

(v) $181^2 - 19^2 = (181 - 19)(181 + 19)$
$\qquad [\text{Using } a^2 - b^2 = (a - b)(a + b)]$
$= 162 \times 200 = 32400$

2.

(i) $\left(x - \dfrac{1}{x}\right)^2 = x^2 + \dfrac{1}{x^2} - 2 \times x \times \dfrac{1}{x}$

$[\because (a-b)^2 = a^2 + b^2 - 2ab]$

$= x^2 + \dfrac{1}{x^2} - 2$

$= 38 - 2 = 36$

$\therefore \quad x - \dfrac{1}{x} = \sqrt{36} = 6$

(ii) $\left(x^2 + \dfrac{1}{x^2}\right)^2$

$= x^4 + \dfrac{1}{x^4} + 2 \times x^2 \times \dfrac{1}{x^2}$

$\Rightarrow \quad (38)^2 = x^4 + \dfrac{1}{x^4} + 2$

$\left[\text{Given } \left(x^2 + \dfrac{1}{x^2}\right) = 38\right]$

$\Rightarrow \quad 1444 - 2 = x^4 + \dfrac{1}{x^4}$

$\Rightarrow \quad 1442 = x^4 + \dfrac{1}{x^4}$

$\therefore \quad x^4 + \dfrac{1}{x^4} = 1442$

3. LHS = $(11pq + 4q)^2 - (11pq - 4q)^2$ = $(11pq + 4q + 11pq - 4q) \times (11pq + 4q - 11pq + 4q)$

[using $a^2 - b^2 = (a - b)(a + b)$, here a = 11pq + 4q and b = 11 pq − 4q]

= (22pq) (8q)

= 176 pq^2

= RHS.

Hence Verified.

4.

Since $a^2 - b^2 = (a + b)(a - b)$, therefore

$38^2 - 22^2 = (38 - 22)(38 + 22)$

$= 16 \times 60$

So, $\quad \dfrac{38^2 - 22^2}{16} = \dfrac{16 \times 60}{16}$

$= 60$

RHS = (9982)2 − (18)2 = (9982 + 18)(9982 − 18)

[Since a2 -b2 = (a + b) (a − b)]

= (10000) × (9964)

LHS = (10000) × x

Comparing L.H.S. and RHS, we get

10000x = 10000 × 9964

x = 9964