Name : _____

Grade : VIII

Subject : Mathematics

Chapter : 9. Algebraic Expressions and Identities

Objective Type Questions (1 Marks)

I. Multiple choice questions

1. The product of a monomial and a binominal is a **(NCERT Exemplar)**

a. monomial b. binomial c. trinomial d. none of these

2. If we subtract $-3x^2y^2$ from x^2y^2, then we get **(NCERT Exemplar)**

a. $-4x^2y^2$ b. $-2x^2y^2$ c. $2x^2y^2$ d. $4x^2y^2$

3. Product of the following monomials 4p, - 7q3, -7 pq is **(NCERT Exemplar)**

a. $196\ p^2q^4$ b. $196\ pq^4$ c. $-196\ p^2q^4$ d, $196\ p^2q^3$

4. Area of a rectangle with length 4ab and breadth $6b^2$ is **(NCERT Exemplar)**

a. $24\ a^2b^2$ b. $24\ ab^3$ c. $24\ ab^2$ d. 24 ab

5. Volume of a rectangular box (cuboid) with length = 2ab, breadth = 3ac and height = 2ac is **(NCERT Exemplar)**

a. $12\ a^3bc^2$ b. $12\ a^3bc$ c. $12\ a^2bc$ d. 2ab + 3ac + 2ac

6. What is the volume of the cuboid of length 8xy, breadth 3xy and height xy? **(NCERT Exemplar)**

a. $5x^3y^2$ b. $6x^3y^3$ c. $24\ x^3y^3$ d. $8\ x^2y^3$

7. What is the value of $(x - y)^2$? **(NCERT Exemplar)**

a. $x^2 + 2xy + y^2$ b. $x^2 - 2xy + y^2$ c. $x^2 - 2xy - y^2$ d. $x^2 + y^2$

8. The value of $(-27x^2y) \div (-9xy)$ is **(NCERT Exemplar)**

a. 3xy b. -3xy c. -3x d. 3x

9. The value of $(3x^3 + 9x^2 + 27x) \div 3x$ is **(NCERT Exemplar)**

a. $x^2 + 9 + 27x$ b. $3x^3 + 3x^2 + 27x$ c. $3x^3 + 9x^2 + 9$ d. $x^3 + 3x + 9$

10. Which of the following is an identify? **(NCERT Exemplar)**

a. $(p + q)^2 = p^2 + q^2$ b. $p^2 - q^2 = (p - q)^2$

c. $p^2 - q^2 = p^2 + 2pq - q^2$ d. $(p + q)^2 = p^2 + 2pq + q^2$

11. The product of $-a, -a^2$ and a^3 equals to: **(NCERT Exemplar)**

a. $-a^6$ b. a^6 c. $a - a^2 + a^3$ d. $a + a^2 + a^3$

12. Dividing $x^3 + 2x^2 + x$ by $x(x + 1)$, we get: **(NCERT Exemplar)**

a. x b. $x + 1$ c. $x + 2$ d. $x(x + 1)$

13. $a^2 - b^2$ is equal to: **(NCERT Exemplar)**

a. $(a - b)^2$ b. $(a - b)(a - b)$ c. $(a + b)(a - b)$ d. $(a + b)(a + b)$

14. Which of the following are like terms? **(NCERT Exemplar)**

a. $5xyz^2, -3xy^2z$ b. $-5xyz^2, 7xyz^2$ c. $5xyz^2, 5x^2yz$ d. $5xyz^2, x^2y^2z^2$

15. The value of $(a + b)^2 + (a - b)^2$ is **(NCERT Exemplar)**

a. $2a + 2b$ b. $2a - 2b$ c. $2a^2 + 2b^2$ d. $2a^2 - 2b^2$

16. Product of $6a^2 - 7b + 5ab$ and $2ab$ is **(NCERT Exemplar)**

a. $12a^3b - 14ab^2 + 10\,ab$ b. $12a^3b - 14ab^2 + 10a^2b^2$

c. $6a^2 - 7b + 7ab$ d. $12a^2b - 7ab^2 + 10ab$

17. Square of $3x - 4y$ is **(NCERT Exemplar)**

a. $9x^2 - 16y^2$ b. $6x^2 - 8y^2$ c. $9x^2 + 16y^2 + 24xy$ d. $9x^2 + 16y^2 - 24xy$

18. Square of $9x - 7xy$ is **(NCERT Exemplar)**

a. $81x^2 + 49x^2y^2$ b. $81x^2 - 49x^2y^2$

c. $81x^2 + 49x^2y^2 - 126x^2y$ d. $81x^2 + 49x^2y^2 - 63x^2y$

19. $a(b + c) = ab + bc$ is

a. Commutative property b. Distributive property

c. Associative property d. Closure property

1. b	2. d	3. a	4. b	5. a	6. c	7. b	8. d	9. d	10. d
11. b	12. b	13. c	14. b	15. c	16. b	17. d	18. c	19. b	

II. Multiple choice questions

1. Which is the like term as $24a^2bc$ **(NCERT Exemplar)**

a. $13 \times 8a \times 2b \times c \times a$ b. $8 \times 3 \times a \times b \times c$

c. $3 \times 8 \times a \times b \times c \times c$ d. $3 \times 8 \times a \times a \times b \times c$

2. Which of the following is correct? **(NCERT Exemplar)**

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

c. $(a - b)^2 = a^2 - b^2$ d. $(a + b)^2 = a^2 + 2ab - b^2$

3. Which of the following is a binomial? **(NCERT Exemplar)**

a. $7 \times a + a$ b. $6a^2 + 7b + 2c$ c. $4a \times 3b \times 2c$ d. $6(a^2 + b)$

4. Coefficient of y in the term $\frac{-y}{3}$ is **(NCERT Exemplar)**

a. -1 b. -3 c. $\frac{-1}{3}$ d. $\frac{1}{3}$

5. The sum of -7 pq and 2pq is **(NCERT Exemplar)**

a. -9pq b. 9pq c. 5pq d. -5pq

6. The product of a monomial and a binomial is a **(NCERT Exemplar)**

a. monomial b. binomial c. trinomial d. None of these

7. Sum of $a - b + ab$, $b + c - bc$ and $c - a - ac$ is **(NCERT Exemplar)**

a. $2c + ab - ac - bc$ b. $2c - ab - ac - bc$ c. $2c + ab + ac + bc$ d. $2c - ab + ac + bc$

1. a	2. b	3. d	4. c	5. d	6. b	7. a

I. Fill in the blanks

1. $38x^3y^2z \div 19xy^2$ is equal is _____. **(NCERT Exemplar)**

2. Volume of a rectangular box with $l = b = h = 2x$ *is* _____. **(NCERT Exemplar)**

3. The coefficient in -37 abc is _____. **(NCERT Exemplar)**

4. The sum of areas of two squares with sides 4a and 4b is _____. **(NCERT Exemplar)**

5. The factorisation of $2x + 4y$ is _____. **(NCERT Exemplar)**

1. $2x^2z$	2. $8x^3$	3. -37	4. $16(a^2 + b^2)$	5. $2(x + 2y)$

I. True or False

1. $(a + b)(a - b) = a^2 - b^2$ **(NCERT Exemplar)**

2. The product of two negative term is a negative term. **(NCERT Exemplar)**

3. The coefficient of the term $-6x^2y^2$ is -6. **(NCERT Exemplar)**

4. The value of p for $51^2 - 49^2 = 100p$ is 2. **(NCERT Exemplar)**

5. The value of $(a + 1)(a - 1)(a^2 + 1)$ is $a^4 - 1$. **(NCERT Exemplar)**

1. True	2. False	3. True	4. True	5. True

I. Very Short Answer Questions

1. Add the following. **[NCERT Exemplar]**

a. $7a^2bc, -3abc^2, 3a^2bc, 2abc^2$

b. $5x^2 - 3xy + 4y^2 - 9, 7y^2 + 5xy - 2x^2 + 13$

Sol. a. $7a^2bc + (-3\ abc^2) + 3a^2bc + 2abc^2$

$\Rightarrow 7a^2bc - 3abc^2 + 3a^2bc + 2abc^2$

$\Rightarrow 10\ a^2bc - abc^2$

b. $[5x^2 - 3xy + 4y^2 - 9] + [7y^2 + 5xy - 2x^2 + 13]$

$\Rightarrow 5x^2 - 3xy + 4y^2 - 9 + 7y^2 + 5xy - 2x^2 + 13$

$\Rightarrow 3x^2 + 11y^2 + 2xy + 4$

2. Subtract $6x^2 - 4xy + 5y^2$ from $8y^2 + 6xy - 3x^2$ **[NCERT Exemplar]**

Sol.

$$\begin{array}{r} 8y^2 + 6xy - 3x^2 \\ 5y^2 - 4xy + 6x^2 \\ - \quad + \quad - \\ \hline 3y^2 + 10xy - 9x^2 \\ \hline \end{array}$$

3. Multiply the following.

a. $15xy^2, 17yz^2$

b. $-5a^2bc, 11ab, 13abc^2$ **[NCERT Exemplar]**

Sol. a. $15xy^2, 17yz^2 = (15 \times 17) \times x \times y^2 \times y \times z^2$

$= 255\ xy^3z^2$

b. $-5a^2bc \times 11ab \times 13abc^2 = (-5 \times 11 \times 13)\ a^2bc \times ab \times abc^2$

$= -715\ a^4\ b^3\ c^3$

4. Find the product of $-4p$ and $7pq$.

Sol. We have,

$-4p \times 7pq = (-4 \times 7) \times p \times pq$

$= -28p^2q$

5. Simply: $\left(\frac{3}{4}x - \frac{4}{3}y\right)^2 + 2xy$ **[NCERT Exemplar]**

Sol. $\left(\frac{3}{4}x - \frac{4}{3}y\right)^2 + 2xy$

$\Rightarrow \left(\frac{3}{4}x\right)^2 - 2\left(\frac{3}{4}x\right)\left(\frac{4}{3}y\right) + \left(\frac{4}{3}y\right)^2 + 2xy$

$\Rightarrow \frac{9}{16}x^2 - 2xy + \frac{16}{9}y^2 + 2xy$

$\Rightarrow \frac{9}{16}x^2 + \frac{16}{9}y^2$

6. Using suitable identify evaluate: $(35.4)^2 - (14.6)^2$. **[NCERT Exemplar]**

Sol. $(35.4)^2 - (14.6)^2 = (35.4 + 14.6)(35.4 - 14.6)$

$= 50 \times 20.8$

$= 1040$

7. Expand the following using suitable identities.

a. $\left(\frac{2}{3}x - \frac{3}{2}y\right)^2$

b. $(7x + 5)^2$

Sol. $\left(\frac{2}{3}x - \frac{3}{2}y\right)^2$

$\Rightarrow \left(\frac{2}{3}x\right)^2 - 2\left(\frac{2}{3}x\right)\left(\frac{3}{2}x\right) + \left(\frac{3}{2}y\right)^2$

$\Rightarrow \frac{4}{9}x^2 - 2xy + \frac{9}{4}y^2$

b. $(7x + 5)^2$

$\Rightarrow (7x)^2 + 2(7x)(5) + (5)^2$

$\Rightarrow 49x^2 + 70x + 25$

8. Simplify : $(ab - c)^2 + 2abc$ **[NCERT Exemplar]**

Sol. $(ab - c)^2 + 2abc$

$\Rightarrow (ab)^2 - 2(ab)(c) + (c)^2 + 2abc$

$\Rightarrow a^2b^2 - 2abc + c^2 + 2abc$

$\Rightarrow a^2b^2 + c^2$

9. Find the product of $(-3x^2y) \times (4x^2y - 3xy^2 + 4x - 5y)$

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

$= -12x^4y^2 + 9x^3y^3 - 12x^3y + 15x^2y^2$

10. If the sides of a triangle are $3x + 1$, $-x + 2$ and $4x + 6$, then find its perimeter.

Sol. Let $AB = 3x + 1$

$BC = -x + 2$

$AC = 4x + 6$

Since, perimeter of $\triangle ABC = AB + BC + AC$

$= Bx + 1 + (-x + 2) + 4x + 6$

$= 3x + 1 - x + 2\ 4x + 6$

$= 6x + 9$

II. Very Short Answer Questions

1. Using suitable identity, evaluate $(69.3)^2 - (30.7)^2$ **(NCERT Exemplar)**

Sol. $(69.3)^2 - (30.7)^2$

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

$(69.3)^2 - (30.7)^2 = (69.3 + 30.7)(69.3 - 30.7)$

$= 100 \times 38.6$

$= 3860$

2. State whether the statements are True (T) or False (F). **(NCERT Exemplar)**

i. The product of two negative term is a negative term.

ii. $p^2q + q^2r + r^2q$ is a binomial.

Sol. i. False

ii. False

3. Find the volume of a rectangular box with $l = b = h = 2x$

Sol. Volume of rectangular box = $l \times b \times h$

$= 2x \times 2x \times 2x = 2 \times 2 \times 2 \times x \times x \times x = 8x^3$

4. Add : $9ax, 3by - cz$ and $-5by + ax + 3cz$ **(NCERT Exemplar)**

Sol. $9ax$

$$\begin{array}{r} 3by - cz \\ +\ ax - 5by + 3cz \\ \hline 10ax - 2by + 2cz \end{array}$$

6. Fill in the blanks.

i. Area of rectangular plot with sides $4x^2$ and $3y^2$ is _____.

ii. $a^2 - b^2 = (a + b)$ _____.

Sol. i. $4x^2 \times 3y^2 = 12x^2y^2$

ii. $(a - b)$

7. Is 1 a polynomial? If yes, what is its degree?

Sol. Yes, 1 is a polynomial. Its degree is zero. (As it contains no variable)

I. Short Answer Questions

1. If $x - \frac{1}{x} = 7$, then find the value $x^2 + \frac{1}{x^2}$. **[NCERT Exemplar]**

Sol. We know that (a - b)2 = a2 - 2ab + b2

$\therefore \quad \left(x - \frac{1}{x}\right)^2 = 7^2$

$x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x} = 49$

$x^2 + \frac{1}{x^2} - 2 = 49$

$x^2 + \frac{1}{x^2} = 49 + 2$

$x^2 + \frac{1}{x^2} = 51$

2. Simplify

a. $-pqr\ (p^2 + q^2 + r^2)$

b. $(px + qy)\ (ax - by)$ [NCERT Exemplar]

Sol. a. $-pqr\ (p^2 + q^2 + r^2)$

$= -(pqr) \times p^2 - (pqr) \times q^2 - (pqr) \times r^2$

$= -p^3 qr - pq^3 r - pqr^3$

b. $(px + qy)\ (ax - by)$

$= px\ (ax - by) + qy\ (ax - by)$

$= apx^2 - pbxy + aqxy - qby^2$

3. Simplify:

a. $(3x + 2y)^2 - (3x - 2y)^2$

$\Rightarrow [(3x)^2 + 2(3x)\ (2y) + (2y)^2] - [(3x)^2 - 2(3x)\ (2y) + (2y)^2]$

$\Rightarrow (9x^2 + 12xy + 4y^2) - (9x^2 - 12xy + 4y^2)$

$\Rightarrow 9x^2 + 12xy + 4y^2 - 9x^2 + 12xy - 4y^2$

$\Rightarrow 24xy$

b. $\left(\frac{7}{9}a + \frac{9}{7}b\right)^2 - ab$

$\Rightarrow \left(\frac{7}{9}a\right)^2 + 2\left(\frac{7}{9}a\right)\left(\frac{9}{7}b\right) + \left(\frac{9}{7}b\right)^2 - ab$

$\Rightarrow \frac{49}{81}a^2 + 2ab + \frac{81}{49}b^2 - ab$

$\Rightarrow \frac{49}{81}a^2 + ab + \frac{81}{49}b^2$

4. Simplify: $(2x + 5)^2 - (2x - 5)^2$

Sol. $(2x + 5)^2 - (2x - 5)^2 = [(2x)^2 + (5)^2 + 2 \times 2x \times 5]$

$- [(2x)^2 + (5)^2 - 2 \times 2x \times 5]$

$= [4x^2 + 25 + 20x] - [4x^2 + 25 - 20x]$

$= 4x^2 + 25 + 20x - 4x^2 + 25 - 20x$

$= 20x + 20x$

$= 40x$

5. Find the value of $\frac{38^2 - 22^2}{16}$, using a suitable identify. [NCERT Exemplar]

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

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

$= 16 \times 60$

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

$= 60$

6. Find the value of x, if $10000x = (9982)^2 - (18)^2$ [NCERT Exemplar]

Sol. R.H.S $= (9982)^2 - (18)^2$

$= (9982 + 18)(9982 - 18)$

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

$= (10000) \times (9964)$

L.H.S $= (10000) \times x$

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

$10000x = 10000 \times 9964$

or $x = \frac{10000 \times 9964}{10000} = 9964$

7. Verify that:

$(3x + 5y)^2 - 30xy = 9x^2 + 25y^2$ [NCERT Exemplar]

Sol. L.H.S. $= (3x + 5y)^2 - 30xy$

$= (3x)^2 + 2 \times 3x \times 5y + (5y)^2 - 30xy$

[Since, $(a + b)^2 = a^2 + 2ab + b^2$]

$= 9x^2 + 30xy + 25y^2 - 30xy$

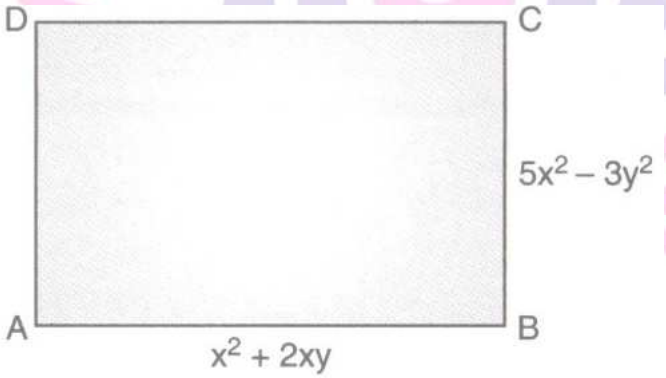
$= 9x^2 + 25y^2$

$=$ R.H.S (Hence Verified)

8. Two adjacent sides of a rectangle are $5x^2 - 3y^2$ and $x^2 + 2xy$. Find the perimeter.

Sol. Let, Length, $l = x^2 + 2xy$

and Breadth, $b = 5x^2 - 3y^2$



Since, perimeter of rectangle $= 2(l + b)$

Then, perimeter $= 2[x^2 + 2xy + 5x^2 - 3y^2]$

$= 2[6x^2 + 2xy - 3y^2]$

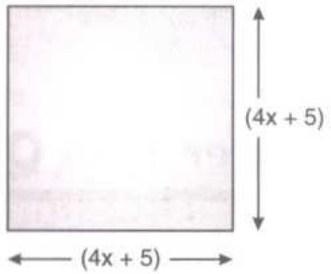
$= 12x^2 + 4xy - 6y^2$

9. Multiply: $\left(x^4 + \frac{1}{x^4}\right)$ by $\left(x + \frac{1}{4}\right)$.

Sol. $\left(x^4 + \frac{1}{x^4}\right)$ by $\left(x + \frac{1}{4}\right) = x^2 \times x + x^4 + \frac{1}{x} + \frac{1}{x^4} \times x + \frac{1}{x^4} \times \frac{1}{x}$

$= x^5 + x^3 + \frac{1}{x^3} + \frac{1}{x^5}$

10. Find the length of the side of the given square, if area of the square is 625 square units and then find the value of x.



[NCERT Exemplar]

Sol. We know that,

Area of square = $(\text{side})^2$

$\Rightarrow$ $625 = (4x + 5)^2$

$\Rightarrow$ $25 = 4x + 5$

$\Rightarrow$ $4x = 25 - 5$

$\Rightarrow$ $4x = 20$

$\Rightarrow$ $x = \frac{20}{4} = 5$

II. Short Answer Questions

1. Subtract $(x^3 - 5y^3 + 2z^3 + 3xyz)$ from the sum of $(-3x^3 - 7y^3 + z^3 + xyz)$;

$(3x^3 - y^3 + 7z^3 + 5xyz)$ and $(-x^3 - y^3 - 2x^3 - 3xyz)$.

Sol. Let $A = (-3x^3 - 7y^3 + z^2 + xyz) + (3x^3 - y^3 + 7z^3 + 5xyz) + (-x^3 - y^3 - 2z^3 - 3xyz)$

$= (-3x^3 + 3x^3 - x^3) + (-7y^3 - y^3 - y^3) + (z^3 + 7z^3 - 2z^3) + (xyz + 5xyz - 3xzy)$

$= -x^3 - 9y^3 + 6z^3 + 3xyz$

Let $B = x^3 - 5y^3 + 2z^3 + 3xyz$

For A - B, $\quad -x^3 - 9y^3 + 6z^3 + 3xyz$ [By column method]

$\quad +x^3 - 5y^3 + 2z^3 + 3xyz$

$\quad - \quad + \quad - \quad -$

$-2x^3 - 4y^3 + 4z^3 + 0$

$\therefore$ A - B = $-2x^3 - 4y^3 + 4z^3$

2. Simplify the following expression.

$x + [2x^2 - \{x^2 - 2xy - (-5x^2 - x)\}]$

Sol. We have,

$x + [2x^2 - \{x^2 - 2xy - (-5x^2 - x)\}]$

$= x + [2x^2 - \{x^2 - 2xy + 5x^2 + x\}]$

$= x + [2x^2 - \{6x^2 + 2xy + x\}]$

$= x + [2x^2 - 6x^2 + 2xy - x]$

$= x + [-4x^2 + 2xy - x]$

$= x - 4x^2 + 2xy - x = -4x^2 + 2xy$

Note: For simplification of algebraic expression, we follow same rules as in arithmetic and we also follow BDMAS / BODMAS and other brackets rules.

3. Subtract : $\frac{8}{5}x^3 - \frac{2}{3}x^2 + \frac{3}{2}xy - 2y^3$ *from* $\frac{1}{5}x^3 + \frac{3}{5}xy - \frac{1}{3}x^2 - 5y^3$

Sol. We have,

$= \left(\frac{1}{5}x^3 + \frac{3}{5}xy - \frac{1}{3}x^2 - 5y^3\right) - \left(\frac{8}{5}x^3 - \frac{2}{3}x^2 + \frac{3}{2}xy - 2y^3\right)$

$= \left(\frac{1}{5}x^3 + \frac{3}{5}xy - \frac{1}{3}x^2 - 5y^3\right) + \left(-\frac{8}{5}x^3 + \frac{2}{3}x^2 - \frac{3}{2}xy + 2y^3\right)$

$= \left(\frac{1}{5}x^2 - \frac{8}{5}x^3\right) + \left(-\frac{1}{3}x^2 + \frac{2}{3}x^2\right) + \left(\frac{3}{5}xy - \frac{3}{2}xy\right) + (-5y^3 + 2y^3)$

$= \left(\frac{1}{5} - \frac{8}{5}\right)x^3 + \left(\frac{-1}{3} + \frac{2}{3}\right)x^2 + \left(\frac{3}{5} - \frac{3}{2}\right)xy + (-5 + 2)y^3$

$= \left(\frac{1-8}{5}\right)x^3 + \left(\frac{-1+2}{3}\right)x^2 + \left(\frac{6-15}{10}\right)xy - 3y^3$

$= \frac{-7}{5}x^3 + \left(\frac{1}{3}\right)x^2 + \left(\frac{-9}{10}\right)xy - 3y^3$

$= -\frac{7}{5}x^3 + \frac{1}{3}x^2 - \frac{9}{10}xy - 3y^3$

4. Expand the following, using suitable identities. **[NCERT Exemplar]**

i. $\left(\frac{4x}{5} + \frac{y}{4}\right)\left(\frac{4x}{5} + \frac{3y}{4}\right)$ ii. $(x^2 + y^2)(x^2 - y^2)$ iii. $(0.9p - 0.5q)^2$

Sol. i. $\left(\frac{4x}{5} + \frac{y}{4}\right)\left(\frac{4x}{5} + \frac{3y}{4}\right)$

Using identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

$\left(\frac{4x}{5} + \frac{y}{4}\right)\left(\frac{4x}{5} + \frac{3y}{4}\right) = \left(\frac{4x}{5}\right)^2 + \left(\frac{y}{4} + \frac{3y}{4}\right)\frac{4x}{5} + \left(\frac{y}{4}\right) \times \left(\frac{3y}{4}\right)$

$$= \frac{16}{25}x^2 + \frac{4}{5}xy + \frac{3}{16}y^2$$

ii. $(x^2 + y^2)(x^2 - y^2)$

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

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

iii. $(0.9p - 0.5q)^2$

Using identity $(a-b)^2 = a^2 - 2ab + b^2$

$$(0.9p - 0.5q)^2 = (0.9p)^2 - 2(0.9)(0.5q) + (0.5q)^2$$

$$= 0.81p^2 - 0.9pq + 0.25q^2$$

5. Evaluate $(-7x + y) \times (3x^2 + xyz + y^2)$, when $x = 1$, $= 2$, $z = 3$.

Sol. We have $(-7x + y) \times (3x^2 + xyz + y^2)$

$$= -7x \times (3x^2 + xyz + y^2) + y \times (3x^2 + xyz + y^2)$$

$$= -7x \times 3x^2 - 7x \times xyz - 7x \times y^2 + y \times 3x^2 + y \times xyz + y \times y^2$$

$$= -21x^3 - 7x^2yz - 7xy^2 + 3x^2y + xy^2z + y^3$$

Putting the value of $x = 1, y = 2, z = 3$ in the product so obtained, we get

Required value

$$= -21 \times 1^3 - 7 \times 1^2 \times 2 \times 3 - 7 \times 1 \times 2^2 + 3 \times 1^2 \times 2 + 1 \times 2^2 \times 3 + 2^3$$

$$= -21 - 42 - 28 + 6 + 12 + 8 = -65$$

I. Long Answer Questions

1. If $a + b = 25$ and $a^2 + b^2 = 225$, then find ab. **[NCERT Exemplar]**

Sol. We know that,

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

Here, $a + b = 25$, $a^2 + b^2 = 225$

$\Rightarrow$ $(25)^2 = 225 + 2ab$

$\Rightarrow$ $625 = 225 + 2ab$

$625 - 225 = 2ab$

$\Rightarrow \quad 400 = 2ab$

$\Rightarrow \quad ab = \frac{400}{2}$

$\Rightarrow \quad ab = 200$

2. Find the value of

a. $\frac{6.25 \times 6.25 - 1.75 \times 1.75}{4.5}$

b. $\frac{198 \times 198 - 102 \times 102}{96}$ **[NCERT Exemplar]**

Sol. a. $\frac{6.25 \times 6.25 - 1.75 \times 1.75}{4.5}$

$= \frac{(6.25)^2 - (1.72)^2}{4.5}$

$= \frac{(6.25+1.75) + (6.25-1.75)}{4.5}$

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

$= \frac{8 \times 4.5}{4.5}$

$= 8$

b. $\frac{198 \times 198 - 102 \times 102}{96}$

$= \frac{(198)^2 - (102)^2}{96}$

$= \frac{(198+102)(198-102)}{96}$

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

$= \frac{300 \times 96}{96}$

$= 300$

3. Show that : $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$ **[NCERT Exemplar]**

Sol. L.H.S $= (4pq + 3q)^2 - (4pq - 3q)^2$

$= (4pq)^2 + 2(4pq)(3q) + (3q)^2 - [(4pq)^2 - 2(4oq)(3q) + (3q)^2]$

$= 16p^2q^2 + 24pq^2 + 9p^2 - [16p^2q^2 - 24pq^2 + 9q^2]$

$= 48pq^2 = R.H.S$

4. Subtract : $4p^2q + 5pq^2 - 3pq + 7q - 8p - 10$ from $5p^2q - 2pq^2 + 5pq - 11q - 3p + 28$.

Sol. We have,

$$5p^2q - 2pq^2 + 5pq - 11q - 3p + 28$$

$$4p^2q + 5pq^2 - 3pq + 7q - 8q - 10$$

$$\frac{(-) \quad (-) \quad (+) \quad (-) \quad (+) \quad (+)}{p^2 - 7pq^2 + 8pq - 18q + 5p + 38}$$

5. The length and breadth of a rectangle are $3x^2 - 2$ and $2x + 5$ respectively, then find its area.

Sol. Here, Length $= 3x^2 - 2$

Breadth $= 2x + 5$

Area = Length x Breadth

$= (3x^2 - 2) \times (2x + 5)$

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

$= (3x^2 \times 2x) + (5 \times 3x^2) + (-2) \times 2x + (-2) \times 5$

$= 6x^3 + 15x^2 + (-4x) + (-10)$

$= 6x^3 + 15x^2 - 4x - 10$

6. Find the volume of cuboid whose dimensions are $(x^2 - 2)$, $(2x + 2)$ and $(x - 1)$

Sol. Volume of a cuboid = Length x Breadth x Height

$= (x^2 - 2)[(2x + 2)(x - 1)]$

$= (x^2 - 2)[2x^2 - 2x + 2x - 2]$

$= (x^2 - 2)[2x^2 - 2]$

$= 2(x^2 - 2)(x^2 - 1)$

$= 2[x^4 - x^2 - 2x^2 + 2]$

$= 2[x^4 - 3x^2 + 2]$

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

II. Long Answer Questions

1. Subtract

i. $2ab^2c^3 + 4a^2b^2c - 5a^2bc^2$ from $-10a^2b^2c + 4ab^2c^2 + 2a^2bc^2$

ii. $-3p^2 + 3pq + 3px$ from $3p(-p - a - r)$

Sol. (i)

$-10a^2b^2c$	$+4ab^2c^2$	$+2a^2bc^2$
$+4a^2b^2c$	$=2ab^2c^2$	$-5a^2bc^2$
(-1)	$(-)$	$(+)$
$-14a^2b^2c$	$+2ab^2c^2$	$+7a^2bc^2$

ii. $3p(-p-a-r) = [3p \times (-p)] + [3p \times (-1)] + [3p \times (-r)]$

$= -3p^2 - 3pa - 3pr$

Subtracting

$-3p^2 - 3pa - 3pr$		
$-3p^2$	$+3pq + 3p$	
$(+)$	(-1)	(2)
$-3pa - 3pr - 3pq - 3px$		

So, $3p(-p - q - r) - (-3p^2 + 3pq + 3px) = -3pa - 3pr - 3pq - 3px$

2. If $x + y = 12$ and $xy = 14$, find the value of $x^2 + y^2$.

Sol. We know that $(a+b)^2 = a^2 + 2ab + b^2$

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

Putting the values of $x + y = 12$ and $xy = 14$, 23 have

$(12)^2 = x^2 + y^2 + 2 \times 14$

or, $144 = x^2 + y^2 + 28$

or, $144 - 28 = x^2 + y^2$

or, $x^2 + y^2 = 116$

Which is the required answer.

3. If $\left(x+\frac{1}{x}\right)=7$, find the values of $\left(x^2+\frac{1}{x^2}\right)$ and $\left(x^4+\frac{1}{x^4}\right)$.

Sol. We have, $\left(x+\frac{1}{x}\right)=7$

$$\left(x+\frac{1}{x}\right)^2=(7)^2$$

$\Rightarrow \quad x^2+\frac{1}{x^2}+2\times x\times\frac{1}{x}=49$ (Using $(a+b)^2=a^2+b^2+2ab$ to the LHS)

$\Rightarrow \quad x^2+\frac{1}{x^2}+2=49 \Rightarrow x^2+\frac{1}{x^2}=49-2$

$\Rightarrow \quad x^2+\frac{1}{x^2}=47 \qquad \ldots.(1)$

For finding the second quantity, squaring both sides in (1),

$$\left(x^2+\frac{1}{x^2}\right)^2=(47)^2$$

$\Rightarrow \quad (x^2)^2+(\frac{1}{x^2})^2+2.x^2.\left(\frac{1}{x^2}\right)=2209$ [Using again $(a+b)^2=a^2+2ab+b^2$]

$\Rightarrow \quad x^4+\frac{1}{x^4}+2=2209 \Rightarrow x^4+\frac{1}{x^4}=2209-2$

$$x^4+\frac{1}{x^4}=2207$$

4. If $x+\frac{1}{x}=6$, find the value of $x^3+\frac{1}{x^3}$

Sol. We have, $x+\frac{1}{x}=6$

On cubing both the sides, we get $\left(x+\frac{1}{x}\right)^3=6^3$

$\Rightarrow \quad x^3+\frac{1}{x^3}+3\times x\times\frac{1}{x}\left(x+\frac{1}{x}\right)=216$

$\Rightarrow \quad x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=216 \qquad \ldots$ (ii)

Substituting $x+\frac{1}{x}=6\ [from\ (i)]\ in\ (ii)$

$\Rightarrow \quad x^3+\frac{1}{x^3}+3\times 6=216 \Rightarrow x^3+\frac{1}{x^3}+18=216$

$\Rightarrow \quad x^3+\frac{1}{x^3}=216-18=198$

5. Obtain the product of following.

$(xy^2-3),\ \left(\frac{1}{3}x^2\ y^2+3xy+x\right)$

Sol. We have $(xy^2-3),\ \left(\frac{1}{3}x^2\ y^2+3xy+x\right)$

Since one coefficient is in fraction, therefore row method only preferred.

Required product $=(xy^2-3)\times\left(\frac{1}{3}x^2\ y^2+3xy+x\right)$

$= xy^2 \left(\frac{1}{3}x^2\ y^2 + 3xy + x\right) + (-3)\ \left(\frac{1}{3}x^2\ y^2 + 3xy + x\right)$

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

$= \frac{1}{3} \times x^{1+2} \times y^{2+2} + 3 \times x^{1+1} \times y^{2+1} + x^{1+1} \times y^2 - x^2 y^2 - 9xy - 3x$

$= \frac{1}{3}x^3 y^4 + 3x^2 y^3 + x^2 y^2 - x^2 y^2 - 9xy - 3x$

$= \frac{1}{3}x^3 y^4 + 3x^2 y^3 - 9xy - 3x$

I. Higher Order Thinking Skill

1. If $x + \frac{1}{x} = 5$, find the value of $x^2 + \frac{1}{x^2}$. **[NCERT Exemplar]**

Sol. Since, $x + \frac{1}{x} = 5$

Squaring on both sides,

$$\left(x + \frac{1}{x}\right)^2 = 5^2$$

or $x^2 + \frac{1}{x^2} + 2 \times x \times \frac{1}{x} = (5)^2$

or $x^2 + \frac{1}{x^2} + 2 = 25$

or $x^2 + \frac{1}{x^2} = 25 + 2$

or $x^2 + \frac{1}{x^2} = 23$

2. Using division show that (x + 1) is a factor of $(2x^2 + 3x + 1)$. **[NCERT Exemplar]**

Sol.

$$x + 1 \overline{)2x^2 + 3x + 1\ (2x + 1}$$

$2x^2 + 2x$

$- \quad -$

$x + 1$

$x + 1$

$- \quad -$

0

Since, remainder = 0

Then, $(x + 1)$ is a factor of $(2x^2 + 3x + 1)$.

I. Value Based Questions

1. a. Find the value of the expression ($81x^2 + 16y^2 - 72xy$), when $x = \frac{2}{3} and\ y = \frac{3}{4}$.

b. If a = 2 and b = 5, then verify $(a + b)^2 = a^2 + b^2 + 2ab$. [NCERT Exemplar]

Sol. a. $81x^2 + 16y^2 - 72xy = (9x)^2 + (4y)^2 - 2 \times 9x \times 4y$

$= (9x - 4y)^2$

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

Now, putting $x = \frac{2}{3} and\ y = \frac{3}{4}, then$

$= \left(9 \times \frac{2}{3} - 4 \times \frac{3}{4}\right)^2$

$= (6 - 3)^2 = 3^2 = 9$

b. Putting a = 2 and b = 5, then

L.H.S $= (a + b)^2$

$= (2 + 5)^2 = 7^2 = 49$

and R.H.S $= a^2 + b^2 + 2ab$

$= 2^2 + 5^2 + 2 \times 2 \times 5$

$= 4 + 25 + 20 = 49$

Hence, L.H.S = R.H.S = 49