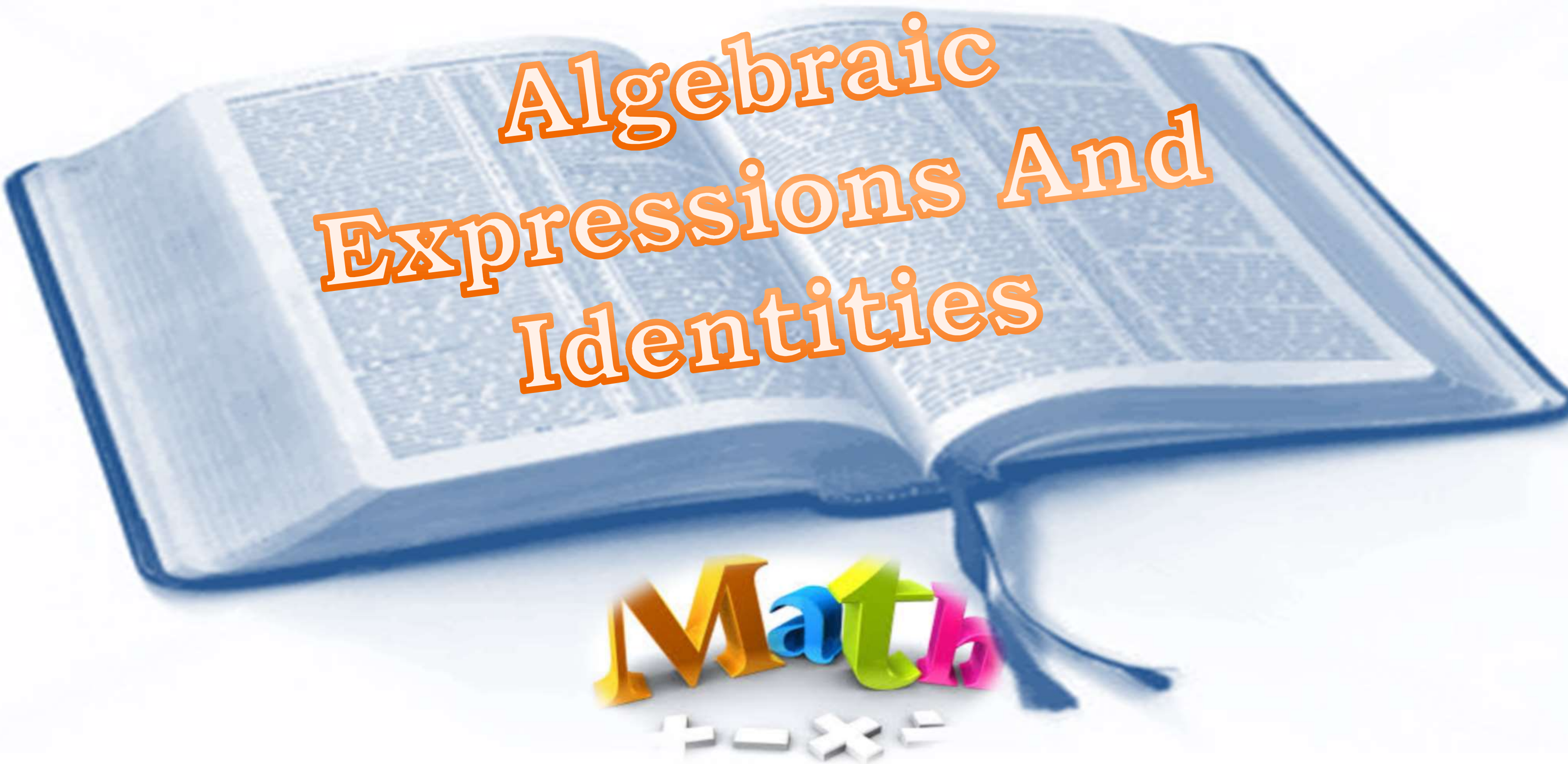
Algebraic Expressions And Identities



CHAPTER - 9
Algebraic Expressions And Identities

ALGEBRAIC EXPRESSIONS

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

$7x^2 - 5xy + y^2z - 8$

A combination of **constants** and **variables** connected by some or all of the four fundamental operations +, -, × and ÷ is called *an algebraic expression.*

LIKE AND UNLIKE TERMS

$7x$, $14x$, $-13x$, $5x^2$,

$7y$, $7xy$, $-9y^2$, $-9x^2$

The terms having dissimilar literal factors.

LIKE TERMS	UNLIKE TERMS
$7x$, $14x$, $-13x$, $5x^2$, $-9x^2$	$-9y^2$, $7y$ $7xy$

TERMS

A term is either a single number, a variable or Numbers and variables multiplied together.

This is an Algebraic Expression

Let us take an example

$$4x - y - 5$$

They are called variables because their values keep on changing.

All these are terms

COEFFICIENT

Coefficient is the number associated with a variable.

Let us take an example

4*x*

There is no number associated with a

Here *x* is the variable

Thus, 4 is the co-efficient of *x*

Term	Co-efficient	Variable
11mn	11	mn
a	1	a

Remember a = 1 × a

Q Identify the terms, their coefficients for each of the following expressions.

(i) $5xyz^3 - 3zy$

Sol.

Terms	$5xyz^3$	$-3zy$
Coefficients	5	– 3

A term is either a single number, a variable or numbers and variables multiplied together.

Q Identify the terms, their coefficients for each of the following expressions.

(ii) $1 + x + x^2$

Coefficient is the

A term is either a single number, a variable or numbers and variables multiplied together.

number associated with z.

Sol.

Terms	1	$1x$	$1x^2$
Coefficients	1	1	1

Q Identify the terms, their coefficients for each of the following expressions.

(iii) $4x^2y^2 - 4x^2y^2z^2 + z^2$

Sol.

Terms	$4x^2y^2$	$-4x^2y^2z^2$	$1z^2$
Coefficients	4	–4	1

A term is either a single number, a variable or numbers and variables multiplied together.

Q Identify the **terms**, their **coefficients** for each of the following expressions.

(iv) $3 - pq + qr - rp$

Sol.

Terms	3	$-1pq$	$1\,qr$	$-1rp$
Coefficients	3	–1	+1	–1

Remember –

Remember +q

Remember $-rp = -1 \times rp$

A term is either a single number, a variable or numbers and variables multiplied together.

There is the no number associated with $-rp$.

Q Identify the **terms**, their **coefficients** for each of the following expressions.

(v) $\frac{x}{2} + \frac{x}{2} - xy$

Sol.

Terms	$1\frac{x}{2}$	$1\frac{x}{2}$	$-1xy$
Coefficients	$\frac{1}{2}$	$\frac{1}{2}$	-1

Remember x = 1 ×

Remember x

Remember $-xy = -1 \times xy$

A te… nu… nu… multiplied together.

Coefficient is the number associated with a variable.

There is the no number associated with $-xy$.

Q

Identify the terms, their coefficients for each of the following expressions.

(vi) $0.3a - 0.6ab + 0.5b$

Sol.

Terms	$0.3a$	$-0.6ab$	$0.5b$
Coefficients	0.3	–0.6	0.5

A t e
n
nu
multiplied together.

Coefficient is the number associated with a variable.

TYPES OF ALGEBRAIC EXPRESSION

MONOMIAL

Expression having only one term.

Example:

$5x^2$, $3y^5$

BINOMIAL

Expressions having only two terms.

Example:

$8x + 9$, $13 - 7n^2$

TRINOMIAL

Expressions having only three term's.

Example:

$m^2 - 2m + 6a$

Q Classify the following polynomials as monomials, binomials and trinomials. Which polynomials do not fit in any of these three categories?

$x + y$, 1000, $x + x^2 + x^3 + x^4$, $7 + y + 5x$, $2y - 3y^2$, $2y - 3y^2 + 4y^3$, $5x - 4y + 3xy$, $4z - 15z^2$, $ab + bc + cd + da$, pqr, $p^2q + pq^2$, $2p + 2q$.

It has four term.

Sol.

Monomials	Binomials	Trinomials
1000	$x + y$	$7 + y + 5x$
pqr	$2y - 3y^2$	$2y - 3y^2 + 4y^3$
	$4z - 15z^2$	$5x - 4y + 3xy$
	$p^2q + pq^2$	
	$2p + 2q$	

The polynomial which do not fit in any of these three categories.

$x + x^2 + x^3 + x^2$ ...($\because$ It has 4 terms)

$ab + bc + cd + da$ ...($\because$ It has 4 terms)

Q Add the following.

(i) $ab - bc$, $bc - ca$, $ca - ab$

Sol.

$$
\begin{array}{cccccc}
 & \cancel{ab} & - \cancel{bc} & & \\
 & & + \cancel{bc} & - \cancel{ca} \\
 & - \cancel{ab} & & + \cancel{ca} \\
\hline
 & 0 & + \; 0 & + \; 0
\end{array}
$$

While writing the second expression below the first one, we write it below the respective like terms.

$\therefore$ $\boxed{\text{The sum of the expressions is } 0^{\circ}}$

Q Add the following.

(ii) $a - b + ab$, $b - c + bc$, $c - a + ac$

Sol.

$$\begin{array}{rrrrrrr} \cancel{a} & - \cancel{b} & + ab & & & & \\ & + \cancel{b} & & - \cancel{c} & + bc & & \\ - \cancel{a} & & & + \cancel{c} & & + ac \\ \hline 0 & + 0 & + ab & + 0 & + bc & + ac \end{array}$$

$$= \boxed{ab + bc + ac}$$

$\therefore$ **The sum of the expressions is $ab + bc + ac$.**

Q Add the following.

(iii) $2p^2q^2 - 3pq + 4$, $5 + 7pq - 3p^2q^2$

Sol.

$$\begin{array}{rrrr} & 2p^2q^2 & -\ 3pq & +\ 4 \\ - & 3p^2q^2 & +\ 7pq & +\ 5 \\ \hline & -p^2q^2 & +\ 4pq & +\ 9 \end{array}$$

$\therefore$ The sum of the expressions is $-p^2q^2 + 4pq + 9$.

Q **Add the following.**

(iv) $l^2 + m^2$, $m^2 + n^2$, $n^2 + l^2$, $2lm + 2mn + 2nl$

Sol.

$$
\begin{array}{lcccccccccccc}
 & l^2 & + & m^2 & & & & & & & & \\
+ & & & m^2 & + & n^2 & & & & & & \\
+ & l^2 & & & + & n^2 & & & & & & \\
+ & & & & & & & 2lm & + & 2mn & + & 2nl \\
\hline
 & \boxed{2}l^2 & + & \boxed{2}m^2 & + & \boxed{2}n^2 & + & \boxed{2}lm & + & \boxed{2}mn & + & \boxed{2}nl
\end{array}
$$

$\therefore$ **The sum of the expressions is $2(l^2 + m^2 + n^2 + lm + mn + nl)$**

Q Subtract :

(a) 4a – 7ab + 3b + 12 from 12a – 9ab + 5b – 3.

Sol.

$$
\begin{array}{rrrrrrr}
12a & - & 9ab & + & 5b & - & 3 \\
4a & - & 7ab & + & 3b & + & 12 \\
(-) & (+) & & (-) & & (-) & \\
\hline
\boxed{8a} & - & 2ab & + & 2b & - & 15
\end{array}
$$

All the signs of the second polynomial will become opposite.

ch

in

the same column.

Q Subtract :

(b) $3xy + 5yz - 7zx$ from $5xy - 2yz - 2zx + 10xyz$.

All the signs of the second polynomial will become opposite.

Sol.

$$
\begin{array}{rrrr}
5xy & -\ 2yz & -\ 2zx & +\ 10xyz \\
3xy & +\ 5yz & -\ 7zx & \\
(-) & (-) & (+) & \\
\hline
\boxed{2xy} & -\ 7yz & +\ 5zx & +\ 10xyz
\end{array}
$$

Q Subtract :

(c) $4p^2q - 3pq + 5pq^2 - 8p + 7q - 10$ from $18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q$.

Sol.

$$
\begin{array}{cccccccccccc}
 & 5p^2q & - & 2pq^2 & + & 5pq & - & 11q & - & 3p & + & 18 \\
 & 4p^2q & + & 5pq^2 & - & 3pq & + & 7q & - & 8p & - & 10 \\
(-) & & (-) & & (+) & & (-) & & (+) & & (+) & \\
\hline
 & \boxed{p^2q} & - & 7pq^2 & + & 8pq & - & 18q & + & 5p & + & 28
\end{array}
$$

All the signs of the second polynomial will become opposite.

Q **Find the product of the following pairs of monomials.**

(i) $4, 7p$

Sol. $4 \times 7p = (4 \times 7) \times p$

$\boxed{4 \times 7p = 28p}$

Q **Find the product of the following pairs of monomials.**

(ii) $-4p, 7p$

Sol. $-4p \times 7p = (-4 \times 7) \times p \times p$

$$\boxed{-4p \times 7p = -28p^2}$$

Q Find the product of the following pairs of monomials.

(iii) $-4p,\ 7pq$

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

$= -28 \times p^2q$

$$\boxed{-4p \times 7pq = -28\,p^2q}$$

Q Find the product of the following pairs of monomials.

(iv) $4p^3, -3p$

Sol. $4p^3 \times -3p = (4 \times -3) \times p^3 \times p$

$= -12 \times p^4$

$\boxed{4p^3 \times -3p = -12p^4}$

Q Find the product of the following pairs of monomials.

(v) $4p, 0$

Sol. $4p \times 0 = \boxed{0}$

Q Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively.

(i) (p, q)

Sol.

Length $= p$

Breadth $= q$

Area of rectangle $=$ Length $\times$ Breadth

$= p \times q$

$= pq$

$\therefore$ Area of the rectangle is pq.

Q Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively.

(ii) (10m, 5n)

Sol.

Length $= 10m$

Breadth $= 5n$

Area of rectangle $=$ Length $\times$ Breadth

$= 10m \times 5n$

$= 10 \times 5 \times m \times n$

$= 50 \times mn$

$= 50mn$

$\therefore$ Area of the rectangle is $50mn$.

Multiply the coefficients together and variables together.

Q Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively.

(iii) $(20x^2, 5y^2)$

Sol. Length $= 20x^2$

Breadths $= 5y^2$

$\therefore$ Area of rectangle = Lengths × Breadths

$= 20x^2 \times 5y^2$

$= 20 \times 5 \times x^2 \times y^2$

$= 100 \times x^2y^2$

$= 100x^2y^2$

Area of the rectangle is $100x^2y^2$.

Multiply the coefficients together and variables together.

Q Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively.

(iv) $(4x, 3x^2)$

Sol. Length $= 4x$

Breadths $= 3x^2$

$\therefore$ Area of rectangle = Lengths × Breadths

$= 4x \times 3x^2$

$= 4 \times 3 \times x \times x^2$

$= 12 \times x^3$

$= 12x^3$

Area of the rectangle is $12x^3$.

Multiply the coefficients together and variables together.

Q Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively.

(v) $(3mn, 4np)$

Length $= 3mn$

Breadths $= 4np$

$\therefore$ Area of rectangle $=$ Lengths $\times$ Breadths

$= 3mn \times 4np$

$= 3 \times 4 \times mn \times np$

$= 12 \times mn^2p$

$= 12mn^2p$

Area of the rectangle is $12mn^2p$.

Multiply the coefficients together and variables together.

Q

Complete the table of products.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$						
$3x^2$						
$-4xy$						
$7x^2y$						
$-9x^2y^2$						

$$2x \times -5y = \boxed{(2 \times -5)} \times \boxed{x \times y} = -10xy$$

$$2x \times 3x^2 = \boxed{(2 \times 3)} \times \boxed{x \times x^2} = 6x^3$$

$$2x \times -4xy = \boxed{(2 \times -4)} \times \boxed{x \times xy} = -8x^2y$$

$$2x \times 7x^2y = \boxed{(2 \times 7)} \times \boxed{x \times x^2y} = 14x^3y$$

$$2x \times -9x^2y^2 = \boxed{(2 \times -9)} \times \boxed{x \times x^2y^2} = -18x^3y^2$$

Q Complete the table of products.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$-45x^2y^3$
$3x^2$						
$-4xy$						
$7x^2y$						
$-9x^2y^2$						

$$-5y \times 2x = \boxed{(-5 \times 2)} \times \boxed{y \times x} = -10xy$$

$$-5y \times -5y = \boxed{(-5 \times -5)} \times \boxed{y \times y} = 25y^2$$

$$-5y \times -4xy = \boxed{(-5 \times -4)} \times \boxed{y \times xy} = 20xy^2$$

$$-5y \times 7x^2y = \boxed{(-5 \times 7)} \times \boxed{y \times x^2y} = -35x^2y^2$$

$$-5y \times -9x^2y^2 = \boxed{(-5 \times -9)} \times \boxed{y \times x^2y^2} = -45x^2y^3$$

Q Complete the table of products.

First monomial → Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$-45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$
$-4xy$						
$7x^2y$						
$-9x^2y^2$						

$3x^2 \times 2x$
$= \boxed{(3 \times 2)} \times \boxed{x^2 \times x}$
$= 6x^3$

$3x^2 \times -5y$
$= \boxed{(3 \times -5)} \times \boxed{x^2 \times y}$
$= -15x^2y$

$3x^2 \times 3x^2$
$= \boxed{(3 \times 3)} \times \boxed{x^2 \times x^2}$
$= 9x^4$

$3x^2 \times -4xy$
$= \boxed{(3 \times -4)} \times \boxed{x^2 \times xy}$
$= 12x^3y$

$3x^2 \times 7x^2y$
$= \boxed{(3 \times 7)} \times \boxed{x^2 \times x^2y}$
$= 21x^4y^2$

$3x^2 \times -9x^2y^2$
$= \boxed{(3 \times -9)} \times \boxed{x^2 \times x^2y^2}$
$= -27x^4y^2$

Q Complete the table of products.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$-45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$
$-4xy$	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$-36x^3y^3$
$7x^2y$						
$-9x^2y^2$						

$-4xy \times 2x$

$= \boxed{(-4 \times 2)} \times \boxed{xy \times x}$

$= -8x^2y$

$-4xy \times -5y$

$= \boxed{(-4 \times -5)} \times \boxed{xy \times y}$

$= 20xy^2$

$-4xy \times 3x^2$

$= \boxed{(-4 \times 3)} \times \boxed{xy \times x^2}$

$= -12x^3y$

$-4xy \times -4xy$

$= \boxed{(-4 \times -4)} \times \boxed{xy \times xy}$

$= 16x^2y^2$

$-4xy \times 7x^2y$

$= \boxed{(-4 \times 7)} \times \boxed{xy \times x^2y}$

$= -28x^3y^2$

$-4xy \times -9x^2y^2$

$= \boxed{(-4 \times -9)} \times \boxed{xy \times x^2y^2}$

$= -36x^3y^3$

Q Complete the table of products.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$-45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$
$-4xy$	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$-36x^3y^3$
$7x^2y$	$14x^3y$	$-35x^2y^2$	$21x^4y$	$28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$						

$7x^2y \times 2x$

$= \boxed{(7 \times 2)} \times \boxed{x^2y \times x}$

$= 14x^3y$

$7x^2y \times -5y$

$= \boxed{(7 \times -5)} \times \boxed{x^2y \times y}$

$= -35x^2y^2$

$7x^2y \times 3x^2$

$= \boxed{(7 \times 3)} \times \boxed{x^2y \times x^2}$

$= 21x^4y$

$7x^2y \times -4xy$

$= \boxed{(7 \times -4)} \times \boxed{x^2y \times xy}$

$= 28x^3y^2$

$7x^2y \times 7x^2y$

$= \boxed{(7 \times 7)} \times \boxed{x^2y \times x^2y}$

$= 49x^4y^2$

$7x^2y \times -9x^2y^2$

$= \boxed{(7 \times -9)} \times \boxed{x^2y \times x^2y^2}$

$= -63x^4y^3$

Q Complete the table of products.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$-45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$
$-4xy$	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$-36x^3y^3$
$7x^2y$	$14x^3y$	$-35x^2y^2$	$21x^4y$	$28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$	$-18x^3y^2$	$45x^2y^3$	$-27x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^3$

$-9x^2y^2 \times 2x$

$= \boxed{(-9 \times 2)} \times \boxed{x^2y^2 \times x}$

$-9x^2y^2 \times -5y$

$= \boxed{(-9 \times -5)} \times \boxed{x^2y^2 \times y}$

$-9x^2y^2 \times 3x^2$

$= \boxed{(-9 \times 3)} \times \boxed{x^2y^2 \times x^2}$

$-9x^2y^2 \times -4xy$

$= \boxed{(-9 \times -4)} \times \boxed{x^2y^2 \times xy}$

$= 36x^3y^3$

$-9x^2y^2 \times 7x^2y$

$= \boxed{(-9 \times 7)} \times \boxed{x^2y^2 \times x^2y}$

$= -63x^4y^3$

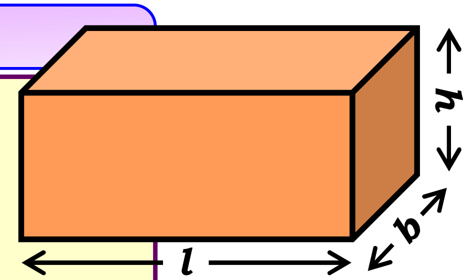
$-9x^2y^2 \times -9x^2y^2$

$= \boxed{(-9 \times -9)} \times \boxed{x^2y^2 \times x^2y^2}$

$= 81x^4y^3$

Q **Obtain the volume of rectangular boxes with the following length, breadth and height respectively.**

(i) $5a$, $3a^2$, $7a^4$



Sol. Length $= 5a$

Breadth $= 3a^2$

Height $= 7a^4$

By using the law
$a^m \times a^n = a^{m+n}$

Volume of a rectangular box $=$ Length(l) $\times$ Breadth(b) $\times$ Height(h)

$= 5a \times 3a^2 \times 7a^4$

$= (5 \times 3 \times 7) \times a \times a^2 \times a^4$

$= 105 \times a^7$

$= 105a^7$

$\therefore$ Volume of a rectangular box is $105a^7$.

Q **Obtain the volume of rectangular boxes with the following length, breadth and height respectively.**

(ii) $2p$, $4q$, $8r$

Sol. Length $= 2p$

Breadth $= 4q$

Height $= 8r$

By using the law
$a^m \times a^n = a^{m+n}$

Volume of a rectangular box $=$ Length(l) $\times$ Breadth(b) $\times$ Height(h)

$= 2p \times 4q \times 8r$

$= (2 \times 4 \times 8) \times p \times q \times r$

$= 64 \times pqr$

$= 64pqr$

$\therefore$ **Volume of a rectangle box is 64 pqr.**

Q Obtain the volume of rectangular boxes with the following length, breadth and height respectively.

(iii) xy, $2x^2y$, $2xy^2$

Sol. Length $= xy$

Breadth $= 2x^2y$

Height $= 2xy^2$

By using the law
$a^m \times a^n = a^{m+n}$

Volume of a rectangular box $=$ Length(l) $\times$ Breadth(b) $\times$ Height(h)

$= xy \times 2x^2y \times 2xy^2$

$= (1 \times 2 \times 2) \times xy \times x^2y \times xy^2$

$= 4 \times x^4y^4$

$= 4x^4y^4$

$\therefore$ Volume of a rectangle box is $4x^4y^4$.

Q **Obtain the volume of rectangular boxes with the following length, breadth and height respectively.**

(iv) $a, 2b, 3c$

Sol. Length $= a$

Breadth $= 2b$

Height $= 3c$

By using the law
$a^m \times a^n = a^{m+n}$

Volume of a rectangular box $=$ Length(l) × Breadth(b) × Height(h)

$= 1a \times 2b \times 3c$

$= (1 \times 2 \times 3) \times a \times b \times c$

$= 6 \times abc$

$= 6abc$

$\therefore$ **Volume of a rectangle box is $6abc$.**

Q Obtain the product of :

(i) xy, yz, zx

Sol. $1xy \times 1yz \times 1zx = (1 \times 1 \times 1) \times x \times y \times y \times z \times z \times x$

$= 1 \times (x^2 \times y^2 \times z^2)$

$\therefore \quad \boxed{xy \times yz \times zx = x^2y^2z^2}$

Multiply the coefficients together and variables together.

Q Obtain the product of :

(ii) $a, -a^2, a^3$

Sol.

$$1a \times -1a^2 \times 1a^3 = [1 \times (-1) \times 1] \times a \times a^2 \times a^3$$

$$= (-1) \times a^6$$

$$\therefore \quad \boxed{a \times a^2 \times a^3 = -a^6}$$

By using the law
$a^m \times a^n = a^{m+n}$

Q **Obtain the product of :**

(iii) $2, 4y, 8y^2, 16y^3$

Sol. $2 \times 4y \times 8y^2 \times 16y^3 = (2 \times 4 \times 8 \times 16) \times y \times y^2 \times y^3$

$= 1024 \times y^6$

$\therefore \boxed{2 \times 4y \times 8y^2 \times 16y^3 = 1024y^6}$

By using the law
$a^m \times a^n = a^{m+n}$

Obtain the product of :

(iv) a, $2b$, $3c$, $6abc$

Sol. $1a \times 2b \times 3c \times 6abc = (1 \times 2 \times 3 \times 6) \times a \times b \times c \times abc$

$= 36 \times (a^2 \times b^2 \times c^2)$

$\therefore \quad \boxed{a \times 2b \times 3c \times 6abc = 36a^2b^2c^2}$

Multiply the coefficients together and variables together.

Q Obtain the product of :

(v) $m, -mn, mnp$

Sol. $1m \times -1mn \times 1mnp = [1 \times (-1) \times 1] \times m \times m \times n \times m \times n \times p$

$= -1 \times (m^3 \times n^2 \times p)$

$\therefore \quad \boxed{m \times mn \times mnp = -m^3n^2p}$

Multiply the **coefficients** together and variables together.

Q

Carry out the multiplication of the expressions in each of the following pairs.

(i) $4p,\ q + r$

Sol.

$$4p \times (q + r) = (4p \times 1q) + (4p \times 1r)$$

$$= (4 \times 1) \times p \times q + (4 \times 1) \times p \times r$$

$$= 4 \times pq + 4 \times pr$$

$$\therefore \quad \boxed{4p \times (q + r) = 4pq + 4pr}$$

Q **Carry out the multiplication of the expressions in each of the following pairs.**

(ii) $ab,\ a - b$

Sol. $ab \times (a - b)$ $= 1ab \times 1a) + [1ab \times (-1b)]$

$= (1 \times 1) \times ab \times a + (1 \times -1) \times ab \times b$

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

$\therefore$ $\boxed{ab \times (a - b) = a^2b - ab^2}$

Q **Carry out the multiplication of the expressions in each of the following pairs.**

(iii) $a + b,\ 7a^2b^2$

Multiply the coefficients together and variables together.

Sol. $(a + b) \times 7a^2b^2 = 1a \times 7a^2b^2 + 1b \times 7a^2b^2$

$= (1 \times 7) \times a \times a^2b^2 + (1 \times 7) \times b \times a^2b^2$

$= 7 \times a^3b^2 + 7 \times a^2b^3$

$\therefore \boxed{(a + b) \times 7a^2b^2 = 7a^3b^2 + 7a^2b^3}$

Q

Carry out the multiplication of the expressions in each of the following pairs.

(iv) $a^2 - 9$, $4a$

Sol.

$$(a^2 - 9) \times 4a = \boxed{a^2 \times 4a} - \boxed{4a \times 9}$$

$$\therefore \quad \boxed{(a^2 - 9) \times 4a = 4a^3 - 36a}$$

Q Carry out the multiplication of the expressions in each of the following pairs.

(v) $pq + qr + rp$, 0

Sol.

$$(pq + qr + rp) \times 0 = \boxed{pq \times 0} + \boxed{qr \times 0} + \boxed{rp \times 0}$$

$$= \boxed{0 + 0 + 0}$$

$$\therefore \quad \boxed{(pq + qr + rp)\, 0 = 0}$$

MULTIPLYING MONOMIAL

Q. $6(2a^2 - 3a - 5)$

Sol. $\boxed{6}(\boxed{2a^2}\boxed{-}\boxed{3a}\boxed{-}\boxed{5})$

$= \boxed{(6 \times 2a^2)} - \boxed{(6 \times 3a)} - \boxed{(6 \times 5)}$

$= \boxed{12a^2 - 18a - 30}$

- Monomial outside the bracket is multiplied by each term inside the bracket.
- Which is the monomial ? $\boxed{6}$
- Which is the first term inside the bracket $\boxed{2a^2}$
- Multiplying $\boxed{6 \text{ with } 2a^2}$
- Which is the second term inside the bracke $\boxed{3a}$
- Multiplying $\boxed{6 \text{ with } 3a}$
- Which is the third term inside the bracket $\boxed{5}$
- Multiplying $\boxed{6 \text{ with } 5}$

Q Complete the table.

	First monomial	Second monomial	Product
(i)	a	$b + c + d$	$ab + ac + ad$
(ii)	$x + y - 5$	$5xy$	
(iii)	p	$6p^2 - 7p + 5$	
(iv)	$4p^2q^2$	$p^2 - q^2$	
(v)	$a + b + c$	abc	

$$\boxed{a} \times (\boxed{b} + \boxed{c} + \boxed{d})$$

$$= \boxed{a \times b} + \boxed{a \times c} + \boxed{a \times d}$$

$$= ab + ac + ad$$

Q Complete the table.

	First monomial	Second monomial	Product
(i)	a	$b + c + d$	$ab + ac + ad$
(ii)	$x + y - 5$	$5xy$	$5x^2y + 5x^2y - 25xy$
(iii)	p	$6p^2 - 7p + 5$	
(iv)	$4p^2q^2$	$p^2 - q^2$	
(v)	$a + b + c$	abc	

$$(x + y - 5) \times 5xy$$

$$= x \times 5xy + y \times 5xy + (-5) \times 5xy$$

$$= 5x^2y + 5xy^2 - 25xy$$

Q Complete the table.

	First monomial	Second monomial	Product
(i)	a	$b + c + d$	$ab + ac + ad$
(ii)	$x + y - 5$	$5xy$	$5x^2y + 5x^2y - 25xy$
(iii)	p	$6p^2 - 7p + 5$	$6p^3 - 7p^2 + 5p$
(iv)	$4p^2q^2$	$p^2 - q^2$	
(v)	$a + b + c$	abc	

$$\boxed{p} \times (\boxed{6x^2} - \boxed{7p} + \boxed{5})$$

$$= \boxed{p \times 6p^2} + \boxed{p \times (-7p)} + \boxed{p \times 5}$$

$$= 6p^3 - 7p^2 + 5p$$

Q

Complete the table.

	First monomial	Second monomial	Product
(i)	a	$b + c + d$	$ab + ac + ad$
(ii)	$x + y - 5$	$5xy$	$5x^2y + 5x^2y - 25xy$
(iii)	p	$6p^2 - 7p + 5$	$6p^3 - 7p^2 + 5p$
(iv)	$4p^2q^2$	$p^2 - q^2$	$4p^4q^2 - 4p^2q^4$
(v)	$a + b + c$	abc	

$$4p^2q^2 \times (p^2 - q^2)$$

$$= 4p^2q^2 \times 1p^2 + 4p^2q^2 \times (-1q^2)$$

$$= (4 \times 1) \times p^2q^2 \times p^2 + (4 \times -1) \times p^2q^2 \times q^2$$

$$= 4 \times p^4q^2 + (-4) \times p^2q^4$$

$$= 4p^4q^2 - 4p^2q^4$$

Q Complete the table.

	First monomial	Second monomial	Product
(i)	a	$b + c + d$	$ab + ac + ad$
(ii)	$x + y - 5$	$5xy$	$5x^2y + 5x^2y - 25xy$
(iii)	p	$6p^2 - 7p + 5$	$6p^3 - 7p^2 + 5p$
(iv)	$4p^2q^2$	$p^2 - q^2$	$4p^4q^2 - 4p^2q^4$
(v)	$a + b + c$	abc	$abc(a + b + c)$

$$\boxed{a} + \boxed{b} + \boxed{c} \times \boxed{abc}$$

$$= \boxed{a \times abc} + \boxed{b \times abc} + \boxed{c \times abc}$$

$$= a^2bc + ab^2c + abc^2$$

$$= abc\,(a + b + c)$$

Q **Find the product.**

(i) $(a^2) \times (2a^{22}) \times (4a^{26})$

By using the law
$a^m \times a^n = a^{m+n}$

Sol. $(1a^2) \times (2a^{22}) \times (4a^{26}) = (1 \times 2 \times 4) \times a^2 \times a^{22} \times a^{26}$

$= 8 \times a^{50}$

$\therefore \quad \boxed{(a^2) \times (2a^{22}) \times (4a^{26}) = 8a^{50}}$

Multiply the coefficients together and variables together.

Q Find the product.

(ii) $\left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right)$

Multiply the $\boxed{\text{coefficients}}$ together and variables together.

Sol. $\left(\boxed{\frac{2}{3}}\boxed{xy}\right) \times \left(\boxed{\frac{-9}{3}}\boxed{x^2y^2}\right) = \frac{2}{3} \times \frac{-9}{3} \times \boxed{x}\boxed{y} \times \boxed{x^2}\boxed{y^2}$

$= \frac{\cancel{2}^{1}}{\cancel{3}_{1}} \times \frac{\cancel{-9}^{-3}}{\cancel{3}_{5}} \times x^3 \times y^3$

$\therefore$ $\boxed{\left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right) = \frac{-3}{5}x^3y^3}$

Q **Find the product.**

(iii) $\left(\frac{-10}{3}pq^3\right) \times \left(\frac{6}{5}p^3q\right)$

Multiply the coefficients together and variables together.

Sol.

$$\left(\boxed{\frac{-10}{3}}\boxed{pq^3}\right) \times \left(\boxed{\frac{6}{5}}\boxed{p^3q}\right) = \left(\frac{-10}{3} \times \frac{6}{5}\right)(\boxed{p} \times \boxed{p^3} \times \boxed{q^3} \times \boxed{q})$$

$$= \frac{\cancel{-10}^{-2}}{\cancel{3}_1} \times \frac{\cancel{6}^{2}}{\cancel{5}_1} \times p^4 \times q^4$$

$$\therefore \quad \boxed{\left(\frac{-10}{3}pq^3\right) \times \left(\frac{6}{5}p^3q\right) = -4\,p^4\,q^4}$$

Q Find the product.

(iv) $x \times x^2 \times x^3 \times x^4$

Sol. $1x \times 1x^2 \times 1x^3 \times 1x^4 = (1 \times 1 \times 1 \times 1) \times x^{\boxed{1}} \times x^{\boxed{2}} \times x^{\boxed{3}} \times x^{\boxed{4}}$

$= (1) \times x^{10}$

Multiply the **coefficients** together and variables together.

$\therefore$ $\boxed{x \times x^2 \times x^3 \times x^4 = x^{10}}$

Q Simplify $3x(4x - 5) + 3$ and find its values for.

(i) $x = 3$

Sol. $3x(4x - 5) + 3 = (3x \times 4x) + (3x \times (-5)) + 3$

$= (3 \times 4) \times x \times x + 3 \times (-5) \times x + 3$

$= 12 \times x^2 + (-15) \times x + 3$

$= \boxed{12x^2 - 15x + 3}$

(i) For $x = 3$, $12x^2 - 15x + 3 = 12(3)^2 - 15(3) + 3$

$= 12 \times 9 - 45 + 3$

$= 108 + 3 - 45$

$= 111 - 45$

$= \boxed{66}$

Q Simplify $3x(4x-5)+3$ and find its values for.

(ii) $x = \frac{1}{2}$

Sol. (ii) For $\boxed{x = \frac{1}{2}}$, $12\boxed{x^2} - 15\boxed{x} + 3 = 12\left(\frac{1}{2}\right)^2 - 15\left(\frac{1}{2}\right) + 3$

Substitute $\frac{1}{2}$ in the place of x.

$$= 12^{3}\left(\frac{\cancel{1}}{\cancel{4}_{1}}\right) - \frac{15}{2} + 3$$

$$= 3 - \frac{15}{2} + 3$$

$$= 6 - \frac{15}{2}$$

$$= \frac{12 - 15}{2}$$

$$= \boxed{\frac{-3}{2}}$$

Q Simplify $a(a^2 + a + 1) + 5$ and find its values for.

(i) $a = 0$, (ii) $a = 1$, (ii) $a = -1$

Sol. $a(a^2 + a + 1) + 5 = a \times a^2 + a \times a + a \times 1 + 5$

$= \boxed{a^3 + a^2 + a + 5}$

(i) For $a = 0$, $= a^3 + a^2 + a + 5 = (0)^3 + (0)^2 + (0) + 5$

$= 0 + 0 + 0 + 5 = \boxed{5}$

(ii) For $a = 1$, $= a^3 + a^2 + a + 5 = (1)^3 + (1)^2 + (1) + 5$

$= 1 + 1 + 1 + 5 = \boxed{8}$

(iii) For $a = -1$, $= a^3 + a^2 + a + 5 = (-1)^3 + (-1)^2 + (-1) + 5$

$= -1 + 1 + -1 + 5$

$= -2 + 6 = \boxed{4}$

Q (a) Add :

(i) $p(p - q)$, $q(q - r)$ and $r(r - p)$

Sol.

$p\,(p - q) = p \times p - p \times q = \boxed{p^2 - pq}$

$q\,(q - r) = q \times q - q \times r = \boxed{q^2 - qr}$

and $r\,(r - p) = r \times r - r \times p = \boxed{r^2 - rp}$

$\therefore$ Adding the above products, we have

$$(p^2 - pq) + (q^2 - qr) + (r^2 - rp) = p^2 - pq + q^2 - qr + r^2 - rp$$

$$= p^2 + q^2 + r^2 - pq - qr - rp$$

$$= \boxed{p^2 + q^2 + r^2 - (pq + qr + rp)}$$

Q While subtracting the signs of the product terms becomes opposite.

Q (b) Add :

(ii) $2x(z - x - y)$ and $2y(z - y - zx)$

Sol. $2x(z - x - y) + 2y(z - x - y) = 2xz - 2x^2 - 2xy + 2yz - 2y^2 - 2xy$

$= 2xz - 2xy - 2xy + 2yz - 2x^2 - 2y^2$

$= -2x^2 - 2y^2 - 4xy + 2yz + 2zx$

$\therefore \quad \boxed{2x(z - x - y) + 2y(z - y - zx) = -2x^2 - 2y^2 - 4xy + 2yz + 2zx}$

(b) Subtract :

(i) $3l\,(l - 4m + 5n)$ **From** $4l\,(10n - 3m + 2l)$

Sol. $3l\,(l - 4m + 5n) - 4l\,(10n - 3m + 2l)$

$$4l\,(10n - 3m + 2l)\ 3l(l - 4m + 5n) = 40ln - 12lm + 8l^2 - 3l^2 + 12lm - 15ln$$

$$= 8l^2 - 3l^2 - \cancel{12lm} + \cancel{12lm} + 40ln - 15ln$$

$$= 5l^2 + 25ln$$

$$\therefore \boxed{4l\,(10n - 3m + 2l)\ 3l(l - 4m + 5n) = 5l^2 + 25ln}$$

Q **(b) Subtract :**

(ii) $3a(a + b + c) - 2b(a - b + c)$ **From** $4c(-a + b + c)$

Sol.

$$4c(-a + b + c) - [3a(a + b + c) - 2b(a - b + c)]$$

$$= -4ac + 4bc + 4c^2 - [3a^2 + 3ab + 3ac - 2ab + 2b^2 - 2bc]$$

$$= -4ac + 4bc + 4c^2 - [3a^2 + 2b^2 + 3ab - 2bc + 3ac - 2ab]$$

$$= -4ac + 4bc + 4c^2 - [3a^2 + 2b^2 + ab + 3ac - 2bc]$$

$$= -4ac + 4bc + 4c^2 - 3a^2 - 2b^2 - ab - 3ac + 2bc$$

$$= -3a^2 - 2b^2 + 4c^2 - ab + 4bc + 2bc - 4ac - 3ac$$

$$= -3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac$$

Multiplying a binomial by a binomial

Example : $(x + 2) \times (x + 3)$

Sol. $(x + 2) \times (x + 3)$

$= x \times (x + 3) + 2 \times (x + 3)$

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

$= \boxed{x^2 + 5x + 6}$

Let us take an example

The second binomial is multiplied separately by each term of the first binomial.

Multiplying second binomial with the first term of first binomial.

Which are the like terms? $3x$ & $2x$

Adding the like terms together.

Multiplying a binomial by a binomial

$$\boxed{x + 2} \times (x + 3)$$

$$= x \times (x + 3) + 2 \times (x + 3)$$

$$= x^2 + \boxed{3x + 2x} + 6$$

$$= x^2 + 5x + 6$$

Th ... ely
by each term ...

Which is ...

... d term
... l ? 2

Adding the like terms together.

Which is the like terms ? 3x + 2x

... the second term of first binomial.

Multiplying second binomial with the first term of first binomial.

Q Multiply the binomials.

(i) $(2x + 5)$ and $(4x - 3)$

The second binomial is multiplied separately by each term of the first binomial.

Sol. $(2x + 5) \times (4x - 3) = \boxed{2x}(\boxed{4x} - \boxed{3}) + \boxed{5}(\boxed{4x} - \boxed{3})$

$= \boxed{(2x \times 4x)} - \boxed{(2x \times 3)} + \boxed{(5 \times 4x)} - \boxed{(5 \times 3)}$

$= (8x^2) - (6x) + (20x) - (15)$

$= 8x^2 \boxed{- 6x + 20x} - 15$

$= 8x^2 + 14x - 15$

$\therefore \quad \boxed{(2x + 5) \times (4x - 3) = 8x^2 + 14x - 15}$

Multiply the binomials.

(ii) $(y - 8)$ and $(3y - 4)$

The second binomial is multiplied separately by each term of the first binomial.

Sol. $(y - 8) \times (3y - 4) = y(3y - 4) - 8(3y - 4)$

$= (3y \times y) - (4 \times y) - (8 \times 3y) - 8 \times (-4)$

$= (3y^2) - (4y) - (24y) + (32)$

$= 3y^2 - 4y - 24y + 32$

$= 3y^2 - 28y + 32$

$\therefore \quad \boxed{(y - 8) \times (3y - 4) = 3y^2 - 28y + 32}$

Multiply the binomials.

(iii) $(2.5l - 0.5m)$ and $(2.5l + 0.5m)$

Sol. $(2.5l - 0.5m) \times (2.5l + 0.5m)$

$= 2.5l \times (2.5l + 0.5m) - 0.5m \times (2.5l + 0.5m)$

$= 2.5l \times 2.5l + 2.5l \times 0.5m - 0.5m \times 2.5l - 0.5m \times 0.5m$

$= 6.25l^2 + \cancel{1.25lm} - \cancel{1.25lm} - 0.25m^2$

$= 6.25l^2 - 0.25m^2$

$\therefore \quad \boxed{(2.5l - 0.5m) \times (2.5l + 0.5m) = 6.25l^2 - 0.25m^2}$

Q Multiply the binomials.

(iv) $(a + 3b)$ and $(x + 5)$

Sol. $(a + 3b) \times (x + 5) = \boxed{a}(\boxed{x} + \boxed{5}) + \boxed{3b}(\boxed{x} + \boxed{5})$

$= \boxed{a \times x} + \boxed{a \times 5} + \boxed{3b \times x} + \boxed{3b \times 5}$

$= ax + 5a + 3bx + 15b$

$\therefore \quad \boxed{(a + 3b) \times (x + 5) = ax + 5a + 3bx + 15b}$

Multiply the binomials.

(v) $(2pq + 3q^2)$ and $(3pq - 2q^2)$

Sol. $(2pq + 3q^2)(3pq - 2q^2) = 2qp \times (3pq - 2q^2) + 3q^2 \times (3pq - 2q^2)$

$= 2qp \times 3pq - 2q \times 2q^2 + 3q^2 \times 3pq - 3q^2 \times 2q^2$

$= 6p^2q^2 - 4pq^3 + 9pq^3 - 6q^4$

$= 6p^2q^2 + 5pq^3 - 6q^4$

$\therefore \quad \boxed{(2pq + 3q^2)(3pq - 2q^2) = 6p^2q^2 + 5pq^3 - 6q^4}$

Q Multiply the binomials.

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

Sol. $\left(\frac{3}{4}a^2 + 3b^2\right) \times 4\left(a^2 - \frac{2}{3}b^2\right) = \left(\boxed{\frac{3}{4}a^2} + \boxed{3b^2}\right) \times \boxed{\left(4a^2 - \frac{8}{3}b^2\right)}$

$$= \boxed{\frac{3}{4}a^2} \times \left(\boxed{4a^2} - \boxed{\frac{8}{3}b^2}\right) + \boxed{3b^2} \times \left(\boxed{4a^2} - \boxed{\frac{8}{3}b^2}\right)$$

$$= \frac{3}{\cancel{4}_{1}}a^2 \times \cancel{4}^{1}a^2 - \frac{\cancel{3}^{1}}{\cancel{4}_{1}}a^2 \times \frac{\cancel{8}^{2}}{\cancel{3}_{1}}b^2 + \boxed{3b^2 \times 4a^2} - \cancel{3}^{1}b^2 \times \frac{8}{\cancel{3}_{1}}b^2$$

$$= 3a^4 \boxed{- 2a^2b^2 + 12a^2b^2} - 8b^4$$

$$= 3a^4 + 10a^2b^2 - 8b^4$$

$\therefore$ $\boxed{\left(\frac{3}{4}a^2 + 3b^2\right) \times 4\left(a^2 - \frac{2}{3}b^2\right) = 3a^4 + 10a^2b^2 - 8b^4}$

Q **Find the product :**

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

The second binomial is multiplied separately by each term of the first binomial.

Sol.

$$(5 - 2x) \times (x + 3) = \boxed{5}\,(\boxed{x} + \boxed{3}) - \boxed{2x}\,(\boxed{x} + \boxed{3})$$

$$= \boxed{(5 \times x)} + \boxed{(5 \times 3)} - \boxed{(2x \times x)} - \boxed{(2x \times 3)}$$

$$= \boxed{5x} + 15 - 2x^2 \boxed{- 6x}$$

$$= -2x^2 - x + 15$$

$$\therefore \quad \boxed{(5 - 2x) \times (x + 3) = 15 - x - 2x^2}$$

Q Find the product :

(ii) $(x + 7y)\,(7x - y)$

The second binomial is multiplied separately by each term of the first binomial.

Sol. $(x - 7y) \times (7x + y) = x(7x + y) - 7y(7x + y)$

$= (x \times 7x) + (x \times y) - (7y \times 7x) - (7x \times y)$

$= 7x^2 - xy + 49xy - 7y^2$

$= 7x^2 + 48xy - 7y^2$

$\therefore$ $\boxed{(x - 7y) \times (7x + y) = 7x^2 + 48xy - 7y^2}$

Q Find the product :

(iii) $(a^2 + b)(a + b^2)$

The second binomial is multiplied separately by each term of the first binomial.

Sol.

$$(a^2 + b) \times (a + b^2) = \boxed{a^2}(\boxed{a} + \boxed{b^2}) + \boxed{b}(\boxed{a} + \boxed{b^2})$$

$$= \boxed{(a^2 \times a)} + \boxed{(a^2 \times b^2)} + \boxed{(b \times a)} + \boxed{(b \times b^2)}$$

$$= a^3 + a^2b^2 + ab + b^3$$

$$\therefore \quad \boxed{(a^2 + b) \times (a + b^2) = a^3 + a^2b^2 + ab + b^3}$$

Q Find the product :

(iv) $(p^2 - q^2)(2p + q)$

The second binomial is multiplied separately by each term of the first binomial.

Sol. $(p^2 - q^2) \times (2p + q) = p^2(2p + q) - q^2(2p + q)$

$= (p^2 \times 2p) + (p^2 \times q) - (q^2 \times 2p) - (q^2 \times q)$

$= 2q^3 + p^2q + 2pq^2 + q^3$

$\therefore$ $\boxed{(a^2 + b) \times (a + b^2) = 2q^3 + p^2q + 2pq^2 + q^3}$

Q **Simplify :**

(i) $(x^2 - 5)(x + 5) + 25$

The second binomial is multiplied separately by each term of the first binomial.

Sol. $(x^2 - 5) \times (x + 5) + 25 = \boxed{x^2}(\boxed{x} + \boxed{5}) - \boxed{5}(\boxed{x} + \boxed{5}) + 25$

$= \boxed{(x^2 \times x)} + \boxed{(x^2 \times 5)} - \boxed{(5 \times x)} - \boxed{(5 \times 5)} + 25$

$= x^3 + 5x^2 - 5x - \cancel{25} + \cancel{25}$

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

$\therefore \quad \boxed{(x^2 - 5) \times (x + 5) + 25 = x^3 + 5x^2 - 5x}$

Q **Simplify :**

(ii) $(a^2 + 5)(b^3 + 3) + 5$

The second binomial is multiplied separately by each term of the first binomial.

Sol. $(a^2 + 5) \times (b^3 + 3) + 5 = \boxed{a^2}\,(\boxed{b^3} + \boxed{3}) + \boxed{5}\,(\boxed{b^3} + \boxed{3}) + 5$

$= \boxed{(a^2 \times b^3)} + \boxed{(a^2 \times 3)} + \boxed{(5 \times b^3)} + \boxed{(5 \times 3)} + 5$

$= a^3b^3 + 3a^2 + 5b^3 + \boxed{15 + 5}$

$= a^3b^3 + 3a^2 + 5b^3 + 20$

$\therefore$ $\boxed{(x^2 - 5) \times (x + 5) + 25 = a^3b^3 + 3a^2 + 5b^3 + 20}$

Q **Simplify :**

(iii) $(t + s^2)\ (t^2 - s)$

The second binomial is multiplied separately by each term of the first binomial.

Sol.

$$(t + s^2) \times (t^2 - s) = t\,(t^2 - s) + s^2\,(t^2 - s)$$

$$= (t \times t^2) - (t \times s) + (s^2 \times t^2) - (s^2 \times s)$$

$$= t^3 - ts + s^2t^2 - s^3$$

$$\therefore \quad \boxed{(a^2 + b) \times (a + b^2) = t^3 - ts + s^2t^2 - s^3}$$

Q **Simplify :**

(iv) $(a + b)(c - d) + (a - b)(c + d) + 2(ac + bd)$

Sol.

$$[(a + b) \times (c - d)] + [(a - b) \times (c + d)] + 2(ac + bd)$$

$$= \boxed{a}(\boxed{c} - \boxed{d}) + \boxed{b}(\boxed{c} - \boxed{d}) + \boxed{a}(\boxed{c} + \boxed{d}) \times \boxed{-b}(\boxed{c} + \boxed{d}) + \boxed{2}(\boxed{ac} + \boxed{bd})$$

$$= (ac - ad) + (bc - bd) + (ac + ad) - (bc + bd) + (2ac + 2bd)$$

$$= ac - \cancel{ad} + \cancel{bc} - \cancel{bd} + ac + \cancel{ad} - \cancel{bc} - \cancel{bd} + 2ac + 2\cancel{bd}$$

$$= ac + ac + 2ac$$

$$= 4ac$$

$\therefore$ $$\boxed{[(a + b) \times (c - d)] + [(a - b) \times (c + d)] + 2(ac + bd) = 4ac}$$

Q **Simplify :**

(v) $(x + y)(2x + y) + (x + 2y)(x - y)$

Sol. $(x + y)(2x + y) + (x + 2y)(x - y)$

$= \boxed{x}(\boxed{2x} + \boxed{y}) + \boxed{y}(\boxed{2x} + \boxed{y}) + \boxed{x}(\boxed{x} - \boxed{y}) + \boxed{2y}(\boxed{x} - \boxed{y})$

$= 2x^2 + \boxed{xy} + \boxed{2xy} + \boxed{y^2} + \boxed{x^2} \boxed{- xy} + \boxed{2xy} - 2y^2$

$= \boxed{2x^2 + x^2} + \cancel{xy} + \boxed{2xy} - \cancel{xy} + \boxed{2xy} + \boxed{y^2 - 2y^2}$

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

$\therefore \quad \boxed{(x + y)(2x + y) + (x + 2y)(x - y) = 3x^2 + 4xy - y^2}$

Q **Simplify :**

(vi) $(x + y)(x^2 - xy + y^2)$

Sol.

$$(x + y)(x^2 - xy + y^2) = \boxed{x}\,(\boxed{x^2}\boxed{-xy} + \boxed{y^2}) + \boxed{y}\,(\boxed{x^2}\boxed{-xy} + \boxed{y^2})$$

$$= x^3 - \boxed{x^2y} + \boxed{xy^2} + \boxed{x^2y} - \boxed{xy^2} + \boxed{y^3}$$

$$= x^3 - \cancel{x^2y} + \cancel{x^2y} + \cancel{xy^2} - \cancel{xy^2} + y^3$$

$$= x^3 + y^3$$

$\therefore$ $\boxed{(x + y)(x^2 - xy + y^2) = x^3 + y^3}$

Q **Simplify :**

(vii) $(1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y$

Sol. $(1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y$

$= \boxed{1.5x}(\boxed{1.5x} + \boxed{4y} + \boxed{3}) \boxed{-4y}(\boxed{1.5x} + \boxed{4y} + \boxed{3}) - 4.5x + 12y$

$= 2.25x^2 + 6.0xy + \boxed{4.5x} \boxed{-6.0xy} \boxed{-16y^2} \boxed{-12y} \boxed{-4.5x} + \boxed{12y}$

$= 2.25x^2 + \cancel{6.0xy} - \cancel{6.0xy} + \cancel{4.5x} - \cancel{4.5x} - 16y^2 - \cancel{12y} + \cancel{12y}$

$= 2.25x^2 - 16y^2$

$\therefore$ $\boxed{(1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y = 2.25x^2 - 16y^2}$

Q **Simplify :**

(viii) $(a + b + c)\,(a + b - c)$

Sol. $(a + b + c)\,(a + b - c) = \boxed{a}\,(\boxed{a} + \boxed{b}\,\boxed{-c}) + \boxed{b}\,(\boxed{a} + \boxed{b}\,\boxed{-c}) + \boxed{c}\,(\boxed{a} + \boxed{b}\,\boxed{-c})$

$$= a^2 + ab \boxed{-\ ac} + \boxed{ab} + \boxed{b^2} - \boxed{bc} + \boxed{ac} + \boxed{bc} - \boxed{c^2}$$

$$= a^2 + \boxed{ab + ab} - \cancel{ac} + \cancel{ca} - \cancel{bc} + \cancel{bc} + b^2 - c^2$$

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

$\therefore$ $\boxed{(a + b + c)\,(a + b - c) = a^2 + b^2 - c^2 + 2ab}$

Some Special Products (Special Identities)

An identity is an equality. Which is true for all values of the variables.
The following three identities are very important.

IDENTITY 1

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

PROOF: We have,

$$\begin{aligned}(a + b)^2 &= (a + b)(a + b)\\ &= a(a + b) + b(a + b)\\ &= a^2 + ab + ba + b^2\\ &= a^2 + 2ab + b^2 \quad \text{(since } ab = ba\text{)}\end{aligned}$$

$$\therefore \quad (a + b)^2 = a^2 + 2ab + b^2$$

Some Special Products (Special Identities)

IDENTITY 2

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

PROOF: We have,

$$\begin{aligned}(a - b)^2 &= (a - b)(a - b)\\ &= a(a - b) - b(a - b)\\ &= a^2 - ab - ba + b^2\\ &= a^2 - ab - ab + b^2 \quad \text{(since } ba = ab\text{)}\\ &= a^2 - 2ab + b^2\end{aligned}$$

$$\therefore \quad (a - b)^2 = a^2 - 2ab + b^2$$

Some Special Products (Special Identities)

IDENTITY 3

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

PROOF: We have,

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

$$= a^2 - ab + ba - b^2$$

$$= a^2 - ab + ab - b^2 \quad \text{(since } ba = ab\text{)}$$

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

$$\therefore \quad (a + b)(a - b) = a^2 - b^2$$

Some Special Products (Special Identities)

IDENTITY 4

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

PROOF: We have,

$$\begin{aligned}(x + a)(x + b) &= x(x + b) + a(x + b)\\ &= x^2 + \underline{xb + ax} + ab\\ &= x^2 + x(a + b) + ab\end{aligned}$$

Some Special Products (Special Identities)

IMPORTANT

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

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

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

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

Q Use a suitable identity to get each of the following products.

(i) $(x + 3)(x + 3)$

Sol.

Both the bracket are same

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

We have,

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

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

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

$= x^2 + 6x + 9$

$\therefore \quad \boxed{(x + 3)(x + 3) = x^2 + 6x + 9}$

Q Use a suitable identity to get each of the following products.

(ii) $(2y + 5)(2y + 5)$

Both the bracket are same

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

Sol. $(2y + 5)(2y + 5) = (2y + 5)^2$

$$(2y + 5)^2 = 2y^2 + 2 \times 2y \times 5 + 5^2$$

$$= 4y^2 + 2 \times 10y + 5 \times 5$$

$$= 4y^2 + 20y + 25$$

$$\therefore \quad (x + 3)(x + 3) = 4y^2 + 20y + 25$$

Q **Use a suitable identity to get each of the following products.**

(iii) $(2a - 7)(2a - 7)$

Both the bracket are same

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

Sol. $(2a - 7)(2a - 7) = (2a - 7)^2$

$$(2a - 7)^2 = 2a^2 + 2 \times 2a \times 7 + 7^2$$

$$= 4a^2 + 2 \times 14a + 7 \times 7$$

$$= 4a^2 + 28a + 49$$

$\therefore$ $\boxed{(2a - 7)(2a - 7) = 4a^2 + 28y + 49}$

Q **Use a suitable identity to get each of the following products.**

(iv) $\left(3a - \frac{1}{2}\right)\left(3a - \frac{1}{2}\right)$

Both the bracket are same

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

Sol. $\left(3a - \frac{1}{2}\right)\left(3a - \frac{1}{2}\right) = \left(3a - \frac{1}{2}\right)^2$

$$\left(3a - \frac{1}{2}\right)^2 = 3a^2 - \cancel{2} \times 3a \times \left(\frac{1}{\cancel{2}}\right) + \left(\frac{1}{2}\right)^2$$

$$= 9a^2 - 3a + \frac{1}{4}$$

$\therefore$ $\boxed{\left(3a - \frac{1}{2}\right)^2 = 9a^2 - 3a + \frac{1}{4}}$

Q Use a suitable identity to get each of the following products.

(v) $(1.1m - 0.4)(1.1m + 0.4)$

Lets replace a with 1.1m and b with 0.4

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

Sol. $(1.1m - 0.4)(1.1m + 0.4) = (1.1m)^2 - (0.4)^2$

$= 1.21 - 0.16$

$\therefore$ $\boxed{(1.1m - 0.4)(1.1m + 0.4) = 1.21 - 0.16}$

Q Use a suitable identity to get each of the following products.

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

Lets replace a with 1.1m and b with 0.4

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

Sol.

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

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

$$= b^4 - a^4$$

$\therefore$ $\boxed{(a^2 + b^2)(-a^2 + b^2) = b^4 - a^4}$

Q Use a suitable identity to get each of the following products.

(vii) $(6x - 7)(6x + 7)$

Lets replace a with $6x$ and b with 7

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

Sol. $(6x - 7)(6x + 7) = (6x + 7)(6x - 7)$

$= (6x)^2 - (7)^2$

$= 36x^2 - 49$

$\therefore \boxed{(6x - 7)(6x + 7) = 36x^2 - 49}$

Q

Use a suitable identity to get each of the following products.

(viii) $(-a + c)\,(-a + c)$

Lets replace a with $6x$ and b with 7

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

Sol. $(-a + c)\,(-a + c) = (c - a)\,(c - a)$

$= (c - a)^2$

$= c^2 - 2 \times c \times a + a^2$

$= 36x^2 - 49$

$\therefore \quad \boxed{(6x - 7)\,(6x + 7) = 36x^2 - 49}$

Q **Use a suitable identity to get each of the following products.**

(x) $(7a - 9b)(7a - 9b)$

Both the bracket are different

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

Sol. $(7a - 9b)(7a - 9b) = (7a - 9b)^2$

$$(7a + 9b)^2 = 7a^2 - 2 \times 7a \times 9b + 9b^2$$

$$= 49a^2 - 2 \times 63ab + 81b^2$$

$$= 4y^2 - 162y + 81b^2$$

$$\therefore \quad (x + 3)(x + 3) = 4y^2 - 162y + 81b^2$$

Q Use the identity $(x + a)(x + b) = \boxed{x^2} + (\boxed{a} + \boxed{b})\boxed{x} + \boxed{ab}$ to find the following products.

(i) $(x + 3)(x + 7)$

Sol. $(\boxed{x} + \boxed{3})(x + \boxed{7}) = x^2 + \boxed{(3 + 7)x} + \boxed{(3 \times 7)}$

$= x^2 + 10x + 21$

$\therefore \quad \boxed{(x + 3)(x + 7) = x^2 + 10x + 21}$

Q Use the identity $(x + a)(x + b) = \boxed{x^2} + (\boxed{a} + \boxed{b})\boxed{x} + \boxed{ab}$ to find the following products.

(ii) $(4x + 5)(4x + 1)$

Sol.

$$(\boxed{4x} + \boxed{5})(4x + \boxed{1}) = (4x)^2 + \boxed{(5 + 1)}\,4x + \boxed{(5 \times 1)}$$

$$= 16x^2 + \boxed{6 \times 4x} + 5$$

$$= 16x^2 + 24x + 5$$

$$\therefore \quad \boxed{(4x + 5)(4x + 1) = 16x^2 + 24x + 5}$$

Q Use the identity $(x + a)(x + b) = \boxed{x^2} + (\boxed{a} + \boxed{b})\boxed{x} + \boxed{ab}$ to find the following products.

(iii) $(4x - 5)(4x - 1)$

Sol.

$$\begin{aligned}(\boxed{4x} - \boxed{5})(4x \boxed{- 1}) &= (4x)^2 + \boxed{(-5 - 1)}\ 4x + \boxed{(-5 \times -1)} \\ &= 16x^2 + \boxed{(-6) \times 4x} + 5 \\ &= 16x^2 - 24x + 5\end{aligned}$$

$\therefore$ $\boxed{(4x - 5)(4x - 1) = 16x^2 - 24x + 5}$

Q Use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$ to find the following products.

(iv) $(4x + 5)(4x - 1)$

Sol.

$$(4x + 5)(4x - 1) = (4x)^2 + (5 + (-1))\,4x + (5 \times -1)$$

$$= 16x^2 + (-4) \times 4x + 5$$

$$= 16x^2 + 16x + 5$$

$$\therefore \quad \boxed{(4x - 5)(4x - 1) = 16x^2 + 16x + 5}$$

Q Use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$ to find the following products.

(v) $(2x + 5y)(2x + 3y)$

Sol.

$$
\begin{aligned}
(2x + 5y)(2x + 3y) &= (2x)^2 + (5y + 3y)2x + (5y) \times (3y) \\
&= 4x^2 + (8y) \times 2x + 15y^2 \\
&= 16x^2 + 16xy - 15y^2
\end{aligned}
$$

$\therefore$ $\boxed{(2x + 5y)(2x + 5y) = 16x^2 + 16xy - 15y^2}$

Q Use the identity $(x + a)(x + b) = \boxed{x^2} + (\boxed{a} + \boxed{b})\boxed{x} + \boxed{ab}$ to find the following products.

(vi) $(2a^2 + 9)(2a^2 + 5)$

Sol.

$$(\boxed{2a}^2 + \boxed{9})(2a^2 + \boxed{5}) = (2a^2)^2 + \boxed{(9 + 5)}2a^2 + \boxed{9 \times 5}$$

$$= 4a^2 + \boxed{14 \times 2a^2} + 45$$

$$= 4a^2 + 28a^2 + 45$$

$$\therefore \quad \boxed{(2a^2 + 9)(2a^2 + 5) = 4a^2 + 28a^2 + 45}$$

Q Use the identity $(x + a)(x + b) = \boxed{x^2} + (\boxed{a} + \boxed{b})\boxed{x} + \boxed{ab}$ to find the following products.

(vii) $(xyz - 4)(xyz - 2)$

Sol. $(xyz - 4)(xyz - 2) = (xyz)^2 + (-4 - 2)\,xyz + (-4 \times -2)$

$= x^2y^2z^2 + 6xyz + 8$

$\therefore$ $\boxed{(2a^2 + 9)(2a^2 + 5) = x^2y^2z^2 + 6xyz + 8}$

Q Find the following square by using the identity.

(i) $(b - 7)^2$

$(a + b)^2 = \boxed{a^2} + \boxed{2ab} + \boxed{b^2}$

Sol. $(\boxed{b} - \boxed{7})^2 = (b)^2 + \boxed{2(b) \times (7)} + (7)^2$

$= (b)^2 - 14b + 49$

$\therefore \quad \boxed{(b - 7)^2 = (b)^2 - 14b + 49}$

Q Find the following square by using the identity.

(ii) $(xy + 3z)^2$

$(a + b)^2 = \boxed{a^2} + \boxed{2ab} + \boxed{b^2}$

Sol. $(\boxed{xy} + \boxed{3z})^2 = (xy)^2 + \boxed{2(xy) \times (3z)} + (3z)^2$

$= (xy)^2 + 6xyz + 9z^2$

$\therefore \boxed{(xy + 3z)^2 = x^2y^2 + 6xyz + 9z^2}$

Q Find the following square by using the identity.

(iii) $(6x^2 - 5y)^2$

$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$

Sol. $(\boxed{6x^2} - \boxed{5y})^2 = (6x^2)^2 - \boxed{2(6x^2) \times (5y)} + (5y)^2$

$= 36x^4 - 60x^2y + 25y^2$

$\therefore \quad \boxed{(xy + 3z)^2 = 36x^4 - 60x^2y + 25y^2}$

Q **Find the following square by using the identity.**

(iv) $\left(\frac{2}{3}m + \frac{3}{2}n\right)^2$

$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$

Sol.

$$\left(\boxed{\frac{2}{3}m} + \boxed{\frac{3}{2}n}\right)^2 = \left(\frac{2}{3}m\right)^2 + \cancel{2}\left(\frac{2}{\cancel{3}}m\right)\left(\frac{\cancel{3}}{\cancel{2}}n\right) + \left(\frac{3}{2}n\right)^2$$

$$= \frac{4}{9}m + 2mn + \frac{9}{4}n$$

$$\therefore \quad \boxed{\left(\frac{2}{3}m + \frac{3}{2}n\right)^2 = \frac{4}{9}m + 2mn + \frac{9}{4}n}$$

Q **Find the following square by using the identity.**

(v) $(0.4p - 0.5q)^2$

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

Sol. $(0.4p - 0.5q)^2 = (0.4p)^2 - 2(0.4p) \times (0.5q) + (0.5q)^2$

$= 0.16p^2 - 0.04pq + 0.25q^2$

$\therefore \quad (xy + 3z)^2 = 0.16p^2 - 0.04pq + 0.25q^2$

Q Find the following square by using the identity.

(vi) $(2xy + 5y)^2$

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

Sol. $(2xy + 5y)^2 = (2xy)^2 + 2(2xy) \times (5y) + (5y)^2$

$= 4x^2y^2 + 20xy^2 + 25y^2$

$\therefore \quad \boxed{(xy + 3z)^2 = 4x^2y^2 + 20xy^2 + 25y^2}$

Q Simplify :

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

$$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$$

Sol. $(\boxed{a^2} - \boxed{b^2})^2 = (a^2)^2 - \boxed{2(a^2) \times (b^2)} + (b^2)^2$

$= a^4 - 2a^2b^2 + b^2$

$\therefore \quad \boxed{(b - 7)^2 = a^4 - 2a^2b^2 + b^2}$

Q **Simplify :**

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

$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$

Sol. $(\boxed{2x} + \boxed{5})^2 - (\boxed{2x} - \boxed{5})^2$

$= (2x)^2 + \boxed{2\,(2x) \times (5)} + (5)^2 \;-\; (2)^2 - \boxed{2\,(2x) \times (5)} + (5)^2$

$= \cancel{4x^2} + \boxed{20x} + \cancel{25} - \cancel{4x^2} + \boxed{20x} - \cancel{25}$

$= 40x$

$\therefore \quad \boxed{(2x + 5)^2 - (2x - 5)^2 = 40x}$

Simplify :

(iii) $(7m - 8n)^2 + (7m + 8n)^2$

$$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$$

Sol. $(\boxed{7m} - \boxed{8n})^2 + (\boxed{7m} + \boxed{8n})^2$

$$= \boxed{(7m)^2} + \boxed{2\,(7m) \times (8n)} + \boxed{(8n)^2} + \boxed{(7m)^2} - \boxed{2\,(7m) \times (8n)} + \boxed{(8n)^2}$$

$$= \boxed{49m^2} + \cancel{112mn} + \boxed{64n^2} + \boxed{49m^2} - \cancel{112mn} + \boxed{64n^2}$$

$$= 98m^2 + 128n^2$$

$$\therefore \quad \boxed{(7m - 8n)^2 + (7m + 8n)^2 = 40m^2 + 128n^2}$$

Simplify :

(iv) $(4m + 5n)^2 + (5m + 4n)^2$

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

Sol. $(4m + 5n)^2 + (5m + 4n)^2$

$$= (4m)^2 - 2(4m) \times (5n) + (5n)^2 + (5m)^2 - 2(5m) \times (4n) + (4n)^2$$

$$= 16m^2 + 40mn + 25n^2 + 25m^2 + 40mn + 16n^2$$

$$= 41m^2 + 80mn + 41n^2$$

$$\therefore \quad (7m - 8n)^2 + (7m + 8n)^2 = 41m^2 + 80mn + 41n^2$$

Q **Simplify :**

(v) $(2.5p - 1.5q)^2 - (1.5p - 2.5p)^2$

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

Sol. $(2.5p - 1.5q)^2 - (1.5p - 2.5p)^2$

$= (2.5p)^2 - 2(2.5p) \times (1.5q) + (1.5q)^2 - 1.5q)^2 - 2(1.5q) \times (2.5q) + (2.5q)^2$

$= 6.25p^2 - \cancel{7.50pq} + 2.25q^2 - 2.25q^2 + \cancel{7.50pq} + 6.25q^2$

$= 4p^2 - 4q^2$

$\therefore \quad \boxed{(7m - 8n)^2 + (7m + 8n)^2 = 40m^2 + 128n^2}$

Q **Simplify :**

(vi) $(ab + bc)^2 - 2ab^2c$

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

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

$= (ab)^2 + 2(ab) \times (bc) + (bc)^2 - 2ab^2c$

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

$= a^2b^2 + (0)ab^2c + b^2c^2$

$= a^2b^2 + 0 + b^2c^2$

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

$\therefore$ $\boxed{(ab + bc)^2 - 2ab^2c = a^2b^2 + b^2c^2}$

Q **Simplify :**

(vii) $(m^2 - n^2m)^2 + 2m^3n^2$

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

Sol. $(m^2 - n^2m)^2 + 2m^3n^2$

$$= (m^2)^2 - 2(m^2) \times (n^2m) + (n^2m)^2 + 2m^3n^2$$

$$= m^4 - 2m^3n^2 + n^4m^2 + 2m^3n^2$$

$$\therefore \quad \boxed{(ab + bc)^2 - 2ab^2c = m^4 - 2m^3n^2 + n^4m^2 + 2m^3n^2}$$

Q **Show that :**

(i) $(3x + 7)^2 - 84x = (3x - 7)^2$

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

Sol.

L.H.S. $= (3x + 7)^2 - 84x$

$= (3x)^2 + 2(3x)(7) + (7)^2 - 84x$

$= 9x^2 + 42x + 49 - 84x$

$= 9x^2 - 42x + 49$

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

R.H.S. $= (3x + 7)^2$

$= (3x)^2 + 2(3x)(7) + (7)^2$

$= 9x^2 + 42x + 49$

L.H.S. = R.H.S.

$\therefore \quad (3x + 7)^2 - 84x = (3x - 7)^2$

Q **Show that :**

(ii) $(9p - 5q)^2 + 180pq = (9p + 5q)^2$

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

Sol.

L.H.S. $= (9p - 5q)^2 - 180pq$

$= (3p)^2 + 2(9p)(5q) + (5q)^2 - 180pq$

$= 9p^2 + 90pq + 25q^2 - 180pq$

$= 9p^2 - 90x + 25q^2$

$= (9p - 5q)^2$

R.H.S. $= (9p + 5q)^2$

L.H.S. = R.H.S.

$\therefore$ $(3x + 7)^2 - 84x = (3x - 7)^2$

Q Show that :

(iii) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{3}m - \frac{16}{3}n$

$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$

Sol.

$$\text{L.H.S.} = \left(\boxed{\frac{4}{3}m} - \boxed{\frac{3}{4}n}\right)^2 + 2mn = \boxed{\left(\frac{4}{3}m\right)^2} - 2\left(\frac{\cancel{4}}{\cancel{3}}m\right)\left(\frac{\cancel{3}}{\cancel{4}}n\right) + \boxed{\left(\frac{3}{4}n\right)^2} + 2mn$$

$$= \frac{16}{9}m - \cancel{2mn} + \frac{9}{16}n + \cancel{2mn}$$

$$= \boxed{\frac{16}{9}m - \frac{16}{4}n}$$

$$\text{R.H.S.} = \left(\frac{4}{3}m - \frac{3}{4}n\right)^2 = \boxed{\frac{16}{9}m - \frac{16}{4}n}$$

$$\text{L.H.S.} = \text{R.H.S.}$$

$$\therefore \quad \boxed{\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{3}m - \frac{16}{3}n}$$

Q Show that :

(iv) $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

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

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

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

$= \cancel{16p^2q^2} + 24pq^2 + \cancel{9q^2} - \cancel{16p^2q^2} + 24pq^2 - \cancel{9q^2}$

$= 48pq^2$

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

$\therefore \quad \boxed{(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2}$

Q **Show that :**

(v) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Sol. L.H.S. $= (a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a)$

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

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

$= \cancel{a^2} - \cancel{b^2} + \cancel{b^2} - \cancel{c^2} + \cancel{c^2} - \cancel{a^2}$

$= 0$

R.H.S. $= 0$

L.H.S. $=$ R.H.S.

$\therefore \quad \boxed{(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0}$

Q **Solve :**

(i) 71^2

Sol.

$$(a + b)^2 = \boxed{a^2} + \boxed{2ab} + \boxed{b^2}$$

$(71) = (70 + 1)$

$\therefore \quad (71)^2 = (\boxed{70} + \boxed{1})^2$

$= \boxed{(70)^2} + \boxed{2(70) \times (1)} + (1)^2$

$= \boxed{4900 + 140 + 1}$

$= 5041$

$\therefore \quad \boxed{(71)^2 = 5041}$

Q Solve :

(ii) 99^2

Sol.

$(99) = (100 - 1)$

$\therefore \quad (71)^2 = (\boxed{100} - \boxed{1})^2$

$= \boxed{(100)^2} - \boxed{2(100) \times (1)} + (1)^2$

$= \boxed{10000 - 200 + 1}$

$= 9801$

$\therefore \quad \boxed{(99)^2 = 9801}$

$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$

Solve :

(iii) 102^2

Sol.

$$(a+b)^2 = \boxed{a^2} + \boxed{2ab} + \boxed{b^2}$$

$$(102) = (100 + 2)$$

$$\therefore \quad (102)^2 = (\boxed{100} + \boxed{2})^2$$

$$= \boxed{(100)^2} + \boxed{2(100) \times (1)} + (2)^2$$

$$= \boxed{10000 + 200 + 2}$$

$$= 10404$$

$$\therefore \quad \boxed{(102)^2 = 10404}$$

Solve :

(iv) 998^2

Sol.

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

$$(998) = (1000 - 2)$$

$$\therefore \quad (998)^2 = (1000 - 2)^2$$

$$= (1000)^2 - 2(1000) \times (2) + (2)^2$$

$$= 1000000 - 4000 + 4$$

$$= 996004$$

$$\therefore \quad \boxed{(998)^2 = 996004}$$

Solve :

(v) 5.2^2

Sol.

$$(a + b)^2 = \boxed{a^2} + \boxed{2ab} + \boxed{b^2}$$

$$(5.2) = (5 + 0.2)$$

$$\therefore \quad (5.2)^2 = (\boxed{5} + \boxed{0.2})^2$$

$$= \boxed{(5)^2} + \boxed{2(5) \times (0.2)} + (0.2)^2$$

$$= \boxed{25 + 2.0 + 0.04}$$

$$= 27.04$$

$$\therefore \quad \boxed{(5.2)^2 = 27.04}$$

Q Solve :

(vi) 297×303

$(a + b)(a - b) = \boxed{a^2} - \boxed{b^2}$

This is similar to the formula

Sol.

$(207) = (300 - 3)$ and $303 = (300 + 3)$

∴

207 can be written a

303 can be written as (300 + 3)

$= (300)^2 - (3)^2$

$= \boxed{90000 - 9}$

$= 89991$

∴ $\boxed{297 \times 303 = 89991}$

Solve :

(vii) 78 × 82

$(a + b)(a - b) = \boxed{a^2} - \boxed{b^2}$

This is similar to the formula

Sol.

$(78) = (80 - 2)$ and $82 = (80 + 2)$

78 can be written a

82 can be written as (80 + 2)

∴

$= (80)^2 - (2)^2$

$= \boxed{6400 - 4}$

$= 6396$

∴ $\boxed{78 \times 82 = 6396}$

Q **Solve :**

(viii) 8.9^2

Sol.

$$(a + b)^2 = \boxed{a^2} - \boxed{2ab} + \boxed{b^2}$$

$$(8.9) = (9 - 0.1)$$

$$\therefore \quad (8.9)^2 = (\boxed{9} - \boxed{0.1})^2$$

$$= \boxed{(9)^2} - \boxed{2(9) \times (0.1)} + (0.1)^2$$

$$= 81 - 1.8 + 0.01$$

$$= \boxed{81.01 - 1.8}$$

$$= 79.21$$

$$\therefore \quad \boxed{(8.9)^2 = 79.21}$$

Solve :

(ix) 1.05×9.5

$(a + b)(a - b) = \boxed{a^2} - \boxed{b^2}$

Sol. $(207) = (300 - 3)$ and $303 = (300 + 3)$

207 can be written a

303 can be written as (300 + 3)

This is similar to the formula

$\therefore$

$= (300)^2 - (3)^2$

$= \boxed{90000 - 9}$

$= 89991$

$\therefore$ $\boxed{297 \times 303 = 89991}$

Q Using $a^2 - b^2 = (a + b)(a - b)$. Find

(i) $51^2 - 49^2$

Sol. $51^2 - 49^2 = (51 + 49)\ (51 - 49)$

$= (100) \times (2)$

$= 200$

$\therefore \quad \boxed{51^2 - 49^2 = 200}$

Q Using $a^2 - b^2 = (a + b)(a - b)$. Find

(ii) $(1.02)^2 - (0.98)^2$

Sol.

$$(1.02)^2 - (0.98)^2 = (1.02)^2 + (0.98)^2 \quad (1.02)^2 - (0.98)^2$$

$$= (2.00) \times (0.04)$$

$$= 0.08$$

$$\therefore \quad \boxed{(1.02)^2 - (0.98)^2 = 0.08}$$

Q Using $a^2 - b^2 = (a + b)(a - b)$. Find

(iii) $153^2 - 147^2$

Sol.

$$(153)^2 - (147)^2 = (153)^2 + (147)^2 \quad (153)^2 - (147)^2$$

$$= (300) \times (6)$$

$$= 1800$$

$\therefore \quad \boxed{(153)^2 - (147)^2 = 1800}$

Q Using $a^2 - b^2 = (a + b)(a - b)$. Find

(iv) $12.1^2 - 7.9^2$

Sol.

$$(12.1)^2 - (7.9)^2 = (12.1)^2 + (7.9)^2 \quad (12.1)^2 - (7.9)^2$$

$$= (20.0) \times (4.2)$$

$$= 0.84$$

$\therefore$ $\boxed{(12.1)^2 - (7.9)^2 = 0.84}$

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

(i) 103×104

Sol. $(103) = (100 + 3)$ and $104 = (100 + 4)$

103 can be written a

104 can b $(3 + 4)$ ten as (1 (3×4)

$= 10000 + 7 \times 100 + 12$

$= 10000 + 700 + 12$

$= 10712$

$\therefore \quad \boxed{103 \times 104 = 10712}$

Q **Using $(x + a)(x + b) = x^2 + (a + b)x + ab$ Find**

(ii) 5.1 × 5.2

Sol. $(5.1) = (5 + 0.1)$ and $5.2 = (5 + 0.2)$

5.1 can be written as

5.2 can be written as (5 + 0.2)

.2)

$= 25 + 0.3 \times 5 + 0.02$

$= 25 + 1.5 + 0.02$

$= 26.52$

$\therefore$ $\boxed{5.1 \times 5.2 = 26.52}$

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

(iii) 103 × 98

Sol. (103) = (100 + 3) and 98 = (100 – 2)

103 can be written as (100 + 3)

written as (100 – 2)

$= 10000 + 1 \times 100 - 6$

$= 10000 + 100 - 6$

$= 10094$

$\therefore \quad \boxed{103 \times 98 = 10094}$

Q Using $(x + a)(x + b) = \boxed{x^2} + (\boxed{a} + \boxed{b})\boxed{x} + \boxed{ab}$ Find

(iv) 9.7×9.8

Sol. $(9.7) = (10 - 0.3)$ and $9.8 = 10 - 0.2$

$$(\boxed{10} - \boxed{0.3})(10 - \boxed{0.2}) = (10)^2 + \boxed{(-0.3) \times (-0.2)} \times 10 + \boxed{(-0.3 \times -0.2)}$$

$$= 100 - \boxed{0.5 \times 10} + 0.06$$

$$= \boxed{100 - 5.0 + 0.06}$$

$$= 95.06$$

$$\therefore \quad \boxed{9.7 \times 9.8 = 95.06}$$

ADDITIONAL SUMS

Q Take away $\dfrac{9}{2} + \dfrac{x}{2} + \dfrac{3}{5}x^3 + \dfrac{7}{4}x^3$ from $\dfrac{7}{2} - \dfrac{x}{3} - \dfrac{x^3}{5}$

Sol. We have $\left(\dfrac{7}{2} - \dfrac{x}{3} - \dfrac{x^3}{5}\right) - \left(\dfrac{9}{2} + \dfrac{x}{2} + \dfrac{3}{5}x^3 + \dfrac{7}{4}x^3\right)$

$$= \frac{7}{2} - \frac{x}{3} - \frac{x^2}{5} - \frac{9}{2} - \frac{x}{2} - \frac{3}{5}x^3 - \frac{7}{4}x^3$$

$$= \boxed{\frac{7}{2} - \frac{9}{2}}\ \boxed{-\frac{x}{3} - \frac{x}{2}}\ \boxed{-\frac{x^2}{5} - \frac{3}{5}x^2}\ \boxed{-\frac{7}{4}x^3}$$

$$= \boxed{\left(\frac{7-9}{2}\right)} + \boxed{\left(-\frac{1}{3} - \frac{1}{2}\right)}x + \boxed{\left(-\frac{1}{5} - \frac{3}{5}\right)}x^2\ \boxed{-\frac{7}{4}x^3}$$

$$= -1 - \frac{5}{6}x - \frac{4}{5}x^2 - \frac{7}{4}x^3$$

$$-\frac{1}{3} - \frac{1}{2} = \frac{-3 - 2}{6} = -\frac{5}{6}$$

$$-\frac{1}{5} - \frac{3}{5} = \frac{-3 - 1}{5} = -\frac{4}{5}$$

$$\therefore \boxed{\left(\frac{7}{2} - \frac{x}{3} - \frac{x^3}{5}\right) - \left(\frac{9}{2} + \frac{x}{2} + \frac{3}{5}x^3 + \frac{7}{4}x^3\right) = -1 - \frac{5}{6}x - \frac{4}{5}x^2 - \frac{7}{4}x^3}$$

Q **Express the following product as a monomial :**

$(x)^3 \times (7x)^3 \times \left(\frac{1}{5}x^2\right) \times (-6x)^4$ **Verify the product for $x = 1$**

Sol. **We have** $1(x)^3 \times (7x)^3 \times \left(\frac{1}{5}x^2\right) \times (-6x)^4$

$$= \left[1 \times 7 \times \frac{1}{5} \times -6\right] \times (x^3 \times x^5 \times x^2 \times x^4)$$

$$= -\frac{42}{5}x^{3+5+2+4}$$

$$= -\frac{42}{5}x^{14}$$

Q **Express the following product as a monomial :**

$(x)^3 \times (7x)^3 \times \left(\frac{1}{5}x^2\right) \times (-6x)^4$ **Verify the product for $x = 1$**

Sol. **Verification :**

For $x = \boxed{1}$, we have

$$\text{L. H. S} = (\boxed{x})^3 \times (7\boxed{x})^3 \times \left(\frac{1}{5}\boxed{x}^2\right) \times (-6\boxed{x})^4$$

$$= \boxed{(1)^3} \times \boxed{(7 \times (1))} \times \boxed{\left[\frac{1}{5}(1)^2\right]} \times \boxed{(-6 \times (1)^4)}$$

$$= 1 \times 7 \times \frac{1}{5} \times -6$$

$$\boxed{\text{L. H. S} = -\frac{42}{5}}$$

and,

$$\text{R. H. S} = -\frac{42}{5} \times (1)^{14}$$

$$\boxed{\text{R. H. S} = -\frac{42}{5}}$$

$$\text{L. H. S} = \text{R. H. S}$$

Q Simplify the expression and evaluate them as directed :

(i) $x(x - 3) + 2$ for $x = 1$

Sol. (i) We have,

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

For $x = \boxed{1}$, we have,

$$\boxed{x}^2 - 3\boxed{x} + 2 = \boxed{(1)^2} - \boxed{3 \times 1} + \boxed{2}$$

$$= \boxed{1} - 3 + \boxed{2}$$

$$= \boxed{3 - 3}$$

$$= 0$$

Q **Simplify the expression and evaluate them as directed :**

(ii) $3y(2y - 7) - 3(y - 4) - 63$ for $y = -2$

Sol. **(ii)** We have,

$$3y(2y - 7) - 3(y - 4) - 63$$

$$= (6y^2 - 21y) - (3y - 12) - 63$$

$$= 6y^2 - \boxed{21y - 3y} + \boxed{12 - 63}$$

$$= 6y^2 - 24y - 51$$

For $y = \boxed{-2}$, we have

$$6\boxed{y^2} - 24\boxed{y} - 51 = 6 \times \boxed{(-2)^2} - 24(-2) - 51$$

$$= \boxed{6 \times 4} + \boxed{24 \times 2} - 51$$

$$= \boxed{24 + 48} - 51$$

$$= \boxed{72 - 51}$$

$$= 21$$

Q Simplify the following :

(i) $\frac{1}{3}(6x^2 + 15y^2)(6x^2 - 15y^2)$

Sol. (i) We have $\boxed{\frac{1}{3}}\ \boxed{(6x^2 + 15y^2)}\ (6x^2 - 15y^2)$

$= \left[\boxed{\frac{1}{3}} \times (\boxed{6x^2} + \boxed{15y^2})\right] \times (6x^2 - 15y^2)$ [By using associativity of multiplication]

$= \left[\frac{1}{\cancel{3}_{1}} \times \overset{2}{\cancel{6}}x^2 + \frac{1}{3} \times 15y^2\right] \times (6x^2 - 15y^2)$ [By using distributive of multiplication over addition]

$= (2x^2 + 5y^2) \times (6x^2 - 15y^2)$

$= 2x^2 \times (6x^2 - 15y^2) + 5y^2 \times (6x^2 - 15y^2)$

$= 2x^2 \times 6x^2 - 2x^2 \times 15x^2 + 5y^2 \times 6x^2 - 5y^2 \times 15y^2$

$= 12x^4 - 30x^2y^2 + 30x^2y^2 - 75y^2$

$= 12x^4 - 75y^4$

Q Simplify the expression and evaluate them as directed :

(ii) $9x^4(2x^3 - 5x^4) \times 5x^6(x^4 - 3x^2)$

Sol. (ii) We have $9x^4(2x^3 - 5x^4) \times 5x^6(x^4 - 3x^2)$

$= 9x^4(2x^3 - 5x^4) \times 5x^6(x^4 - 3x^2)$

$= \{9x^4(2x^3 - 5x^4)\} \times \{5x^6(x^4 - 3x^2)\}$ [By using associativity of multiplication]

$= (18x^7 - 45x^8) \times (5x^{10} - 15x^8)$

$= 18x^7 \times (5x^{10} - 15x^8) - 45x^8 \times (5x^{10} - 15x^8)$

$= 18x^7 \times 5x^{10} - 18x^7 \times 15x^{18} - 45x^8 \times 5x^{10} - 45x^8 \times 5x^8$

$= 90x^{17} \times 270x^{15} - 225x^{18} + 675x^{16}$

Q $x + \frac{1}{x} = 4$, find the values of

(i) $x^2 + \frac{1}{x^2}$

Sol. (i) We have, $x + \frac{1}{x} = 4$

On squaring both sides, we get

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

$$x^2 + 2 \times x \times \frac{1}{x} \times \left(\frac{1}{x}\right)^2 = 16$$

$$x^2 + 2 + \frac{1}{x} = 16$$

$$x^2 + \frac{1}{x} = 16 - 2 \quad \text{[On transposing 2 on RHS]}$$

$$x^2 + \frac{1}{x} = 14$$

Q $x + \frac{1}{x} = 4$, find the values of

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

Sol. (ii) We have, $x^2 + \frac{1}{x^2} = 14$

On squaring both sides, we get

$$\left(x^2 + \frac{1}{x^2}\right)^2 = 14^2$$

$$(x^2)^2 + \left(\frac{1}{x^2}\right)^2 + 2 \times x^2 \times \left(\frac{1}{x^2}\right)^2 = 16$$

$$x^2 + \frac{1}{x^2} + 2 = 196 - 2 \quad \text{[On transposing 2 on RHS]}$$

$$x^4 + \frac{1}{x^4} = 194$$

Q Complete the table of products.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$

Sol.

$2x \times -5y = \boxed{(2 \times -5)} \times \boxed{x \times y} = -10xy$

$2x \times 3x^2 = \boxed{(2 \times 3)} \times \boxed{x \times x^2} = 6x^3$

$2x \times -4xy = \boxed{(2 \times -4)} \times \boxed{x \times xy} = -8x^2y$

$2x \times 7x^2y = \boxed{(2 \times 7)} \times \boxed{x \times x^2y} = 14x^3y$

$2x \times -9x^2y^2 = \boxed{(2 \times -9)} \times \boxed{x \times x^2y^2} = -18x^3y^2$

Q Complete the table of product:

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$-45x^2y^3$

Sol.

$$-5y \times 2x = \boxed{(-5 \times 2)} \times \boxed{y \times x} = -10xy$$

$$-5y \times -5y = \boxed{(-5 \times -5)} \times \boxed{y \times y} = 25y^2$$

$$-5y \times -4xy = \boxed{(-5 \times -4)} \times \boxed{y \times xy} = 20xy^2$$

$$-5y \times 7x^2y = \boxed{(-5 \times 7)} \times \boxed{y \times x^2y} = -35x^2y^2$$

$$-5y \times -9x^2y^2 = \boxed{(-5 \times -9)} \times \boxed{y \times x^2y^2} = -45x^2y^3$$

Q Complete the table of product:

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$

Sol.

$3x^2 \times 2x = \boxed{(3 \times 2)} \times \boxed{x^2 \times x} = 6x^3$

$3x^2 \times -5y = \boxed{(3 \times -5)} \times \boxed{x^2 \times y} = -15x^2y$

$3x^2 \times 3x^2 = \boxed{(3 \times 3)} \times \boxed{x^2 \times x^2} = 9x^4$

$3x^2 \times -4xy = \boxed{(3 \times -4)} \times \boxed{x^2 \times xy} = 12x^3y$

$3x^2 \times 7x^2y = \boxed{(3 \times 7)} \times \boxed{x^2 \times x^2y} = 21x^4y^2$

$3x^2 \times -9x^2y^2 = \boxed{(3 \times -9)} \times \boxed{x^2 \times x^2y^2} = -27x^4y^2$

Q Complete the table of product:

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$-4xy$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$

Sol.

$-4xy \times 2x = \boxed{(-4 \times 2)} \times \boxed{xy \times x} = -8x^2y$

$-4xy \times -5y = \boxed{(-4 \times -5)} \times \boxed{xy \times y} = 20xy^2$

$-4xy \times 3x^2 = \boxed{(-4 \times 3)} \times \boxed{xy \times x^2} = -12x^3y$

$-4xy \times -4xy = \boxed{(-4 \times -4)} \times \boxed{xy \times xy} = 16x^2y^2$

$-4xy \times 7x^2y = \boxed{(-4 \times 7)} \times \boxed{xy \times x^2y} = -28x^3y^2$

$-4xy \times -9x^2y^2 = \boxed{(-4 \times -9)} \times \boxed{xy \times x^2y^2} = -36x^3y^3$

Q Complete the table of product:

First monomial → Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$7x^2y$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$

Sol.

$$7x^2y \times 2x = \boxed{(7 \times 2)} \times \boxed{x^2y \times x} = 14x^3y$$

$$7x^2y \times -5y = \boxed{(7 \times -5)} \times \boxed{x^2y \times y} = -35x^2y^2$$

$$7x^2y \times 3x^2 = \boxed{(7 \times 3)} \times \boxed{x^2y \times x^2} = 21x^4y$$

$$7x^2y \times -4xy = \boxed{(7 \times -4)} \times \boxed{x^2y \times xy} = 28x^3y^2$$

$$7x^2y \times 7x^2y = \boxed{(7 \times 7)} \times \boxed{x^2y \times x^2y} = 49x^4y^2$$

$$7x^2y \times -9x^2y^2 = \boxed{(7 \times -9)} \times \boxed{x^2y \times x^2y^2} = -63x^4y^3$$

Q Complete the table of product:

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$-9x^2y^2$	$6x^3$	$-15x^2y$	$9x^4$	$12x^3y$	$21x^4y^2$	$-27x^4y^2$

Sol.

$$-9x^2y^2 \times 2x = \boxed{(-9 \times 2)} \times \boxed{x^2y^2 \times x} = -18x^3y^2$$

$$-9x^2y^2 \times -5y = \boxed{(-9 \times -5)} \times \boxed{x^2y^2 \times y} = 45x^2y^3$$

$$-9x^2y^2 \times 3x^2 = \boxed{(-9 \times 3)} \times \boxed{x^2y^2 \times x^2} = -27x^4y^2$$

$$-9x^2y^2 \times -4xy = \boxed{(-9 \times -4)} \times \boxed{x^2y^2 \times xy} = 36x^3y^3$$

$$-9x^2y^2 \times 7x^2y = \boxed{(-9 \times 7)} \times \boxed{x^2y^2 \times x^2y} = -63x^4y^3$$

$$-9x^2y^2 \times -9x^2y^2 = \boxed{(-9 \times -9)} \times \boxed{x^2y^2 \times x^2y^2} = 81x^4y^3$$