Exercise 6.1

Q1: Identify the terms, their coefficients for each of the following expressions:

(i) $7x^2yz - 5xy$

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

(iii) $3x^2y^2 - 5x^2y^2z^2 + z^2$

(iv) 9 − ab + bc − ca

(v) $\frac{a}{2} + \frac{b}{2} - ab$

(vi) 0.2x − 0.3xy + 0.5y

Solution:

Definitions:

A term in an algebraic expression can be a constant, a variable or a product of constants and variables separated by the signs of addition (+) or subtraction (-) . Examples: 27, x, xyz, $\frac{1}{2}x^2yz$ etc.

The number factor of the term is called its coefficient.

(i) The expression $7x^2yz - 5xy$ consists of two terms, i.e., $7x^2yz\ and\ -5xy$.

The coefficient of $7x^2yz$ is 7 and the coefficient of -5xy. is -5.

(ii) The expression $x^2 + x + 1$ consists of three terms, i.e., x^2, x and 1.

The coefficient of each term is 1.

(iii) The expression $3x^2y^2 - 5x^2y^2z^2 + z^2$ consists of three terms, i.e., $3x^2y^2$, $-5x^2y^2z^2$ and z^2.

The coefficient of $3x^2y^2$ is 3.

The coefficient of $-5x^2y^2z^2$ is -5 and the coefficient of z^2 is 1.

(iv) The expression $9 - ab + bc - ca$ consists of four terms -9, -ab, bc and − ca.

The coefficient of the term 9 is 9.

The coefficient of -ab is -1.

The coefficient of bc is 1, and the coefficient of -ca is -1.

(v) The expression $\frac{a}{2} + \frac{b}{2} - ab$ consists of three terms , i.e., $\frac{a}{2}, \frac{b}{2}\ and\ -ab$.

The coefficient of $\frac{a}{2}\ is\ \frac{1}{2}$.

The coefficient of $\frac{b}{2}\ is\ \frac{1}{2}$ and the coefficient of -ab is -1.

(vi) The expression $0.2x - 0.3xy + 0.5y$ consists of three terms, i.e., 0.2x, -0.3xy and 0.5y.

The coefficient of 0.2x is 0.2.

The coefficient of -0.3xy is -0.3, and the coefficient of 0.5y is 0.5.

Q2) Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any category?

(i) x + y

(ii) 1000

(iii) $x + x^2 + x^3 + x^4$

(iv) 7 + a + 5b

(v) $2b - 3b^2$

(vi) $2y - 3y^2 + 4y^3$

(vii) 5x − 4y + 3x

(viii) $4a - 15a^2$

(ix) xy + yz + zt + tx

(x) pqr

(xi) $p^2q + pq^2$

(xii) 2p + 2q

Solution:

Definitions:

A polynomial is monomial if it has exactly one term. It is called binomial if it has exactly two non-zero terms. A polynomial is a trinomial if it has exactly three non-zero terms.

(i) The polynomial x + y has exactly two non zero terms, i.e., x and y. Therefore, it is a binomial.

(ii) The polynomial 1000 has exactly one term, i.e., 1000. Therefore, it is a monomial.

(iii) The polynomial $x + x^2 + x^3 + x^4$ has exactly four terms, i.e., x, x^2, x^3 and x^4. Therefore, it doesn't belong to any of the categories.

(iv) The polynomial 7 + a + 5b has exactly three terms, i.e., 7, a and 5b. Therefore, it is a trinomial.

(v) The polynomial 2b – $3b^2$ has exactly two terms, i.e., 2b and $-3b^2$. Therefore, it is a binomial.

(vi) The polynomial $2y – 3y^2 + 4y^3$ has exactly three terms, i.e., 2y, $3y^2$ and $4y^3$. Therefore, it is a trinomial.

(vii) The polynomial 5x – 4y + 3x has exactly three terms, i.e., 5x, -4y and 3x. Therefore, it is a trinomial.

(viii) The polynomial 4a – $15a^2$ has exactly two terms, i.e., 4a and $-15a^2$. Therefore, it is a binomial.

(ix) The polynomial xy + yz + zt + tx has exactly four terms xy, yz, zt and tx. Therefore, it doesn't belong to any of the categories.

(x) The polynomial pqr has exactly one term, i.e., pqr. Therefore, it is a monomial.

(xi) The polynomial $p^2q + pq^2$ has exactly two terms, i.e., p^2q and pq^2. Therefore, it is a binomial.

(xii) The polynomial 2p+ 2q has two terms, i.e., 2p and 2q. Therefore, it is a binomial.

Exercise 6.2

Q.1: Add the following algebraic expressions:

(i) $3a^2b,\ -4a^2b,\ 9a^2b$

(ii) $\frac{2}{3}a,\ \frac{3}{5}a,\ -\frac{6}{5}a$

(iii) $4xy^2 - 7x^2y,\ 12x^2y - 6xy^2,\ -3x^2y + 5xy^2$

(iv) $\frac{3}{2}a - \frac{5}{4}b + \frac{2}{5}c,\ \frac{2}{3}a - \frac{7}{2}b + \frac{7}{2}c,\ \frac{5}{3}a + \frac{5}{2}b - \frac{5}{4}c$

(v) $\frac{11}{2}xy + \frac{12}{5}y + \frac{13}{7}x,\ -\frac{11}{2}y - \frac{12}{5}x - \frac{13}{7}xy$

(vi) $\frac{7}{2}x^3 - \frac{1}{2}x^2 + \frac{5}{3},\ \frac{3}{2}x^3 + \frac{7}{4}x^2 - x + \frac{1}{3},\ \frac{3}{2}x^2 - \frac{5}{2}x - 2$

Solution:

(i) To add the like terms, we proceed as follows:

$3a^2b + (-4a^2b) + 9a^2b$

$= 3a^2b - 4a^2b + 9a^2b$ (Distributive Law)

$= 8a^2b$

(ii) To add like terms, we proceed as follows:

$\frac{2}{3}a + \frac{3}{5}a + (-\frac{6}{5}a)$

= $\frac{2}{3}a + \frac{3}{5}a - \frac{6}{5}a$

= $(\frac{2}{3} + \frac{3}{5} - \frac{6}{5})a$ (Distributive Law)

= $\frac{1}{15}a$

(iii) To add, we proceed as follows:

$(4xy^2 - 7x^2y) + (12x^2y) + (-6xy^2) + (-3x^2y + 5xy^2)$

= $4xy^2 - 7x^2y + 12x^2y - 6xy^2 - 3x^2y + 5xy^2$

= $4xy^2 - 6xy^2 + 5xy^2 - 7x^2y + 12x^2y - 3x^2y$ (Collecting like terms)

= $3xy^2 + 2x^2y$ (Combining like terms)

(iv) To add, we proceed as follows:

$(\frac{3}{2}a - \frac{5}{4}b + \frac{2}{5}c) + (\frac{2}{3}a - \frac{7}{2}b + \frac{7}{2}c) + (\frac{5}{3}a + \frac{5}{2}b - \frac{5}{4}c)$

= $\frac{3}{2}a - \frac{5}{4}b + \frac{2}{5}c + \frac{2}{3}a - \frac{7}{2}b + \frac{7}{2}c + \frac{5}{3}a + \frac{5}{2}b - \frac{5}{4}c$

= $\frac{3}{2}a + \frac{2}{3}a + \frac{5}{3}a - \frac{5}{4}b - \frac{7}{2}b + \frac{5}{2}b + \frac{2}{5}c + \frac{7}{2}c - \frac{5}{4}c$

(Collecting like terms)

= $\frac{23}{6}a - \frac{9}{4}b + \frac{53}{20}c$ (Combining like terms)

(v) To add, we proceed as follows:

$(\frac{11}{2}xy + \frac{12}{5}y + \frac{13}{7}x) + (-\frac{11}{2}y - \frac{12}{5}x - \frac{13}{7}xy)$

= $\frac{11}{2}xy + \frac{12}{5}y + \frac{13}{7}x - \frac{11}{2}y - \frac{12}{5}x - \frac{13}{7}xy$

= $\frac{11}{2}xy - \frac{13}{7}xy + \frac{12}{5}y - \frac{11}{2}y + \frac{13}{7}x - \frac{12}{5}x$ (Collecting like terms)

= $\frac{51}{14}xy - \frac{31}{10}y - \frac{19}{35}x$ (Combining like terms)

(vi) To add, we proceed as follows:

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

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

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

(Collecting like terms)

= $5x^3 + \frac{11}{4}x^2 - \frac{7}{2}x$ (Combining like terms)

Q2) Subtract:

(i) -5xy from 12xy

(ii) $2a^2$ from $-7a^2$

(iii) 2a – b from 3a – 5b

(iv) $2x^3 - 4x^2 + 3x + 5 \ from \ 4x^3 + x^2 + x + 6$

(v) $\frac{2}{3}y^3 - \frac{2}{7}y^2 - 5 \ from \ \frac{1}{3}y^3 + \frac{5}{7}y^2 + y - 2$

(vi) $\frac{3}{2}x - \frac{5}{4}y - \frac{7}{2}z \ from \ \frac{2}{3}x + \frac{3}{2}y - \frac{4}{3}z$

(vii) $x^2y - \frac{4}{5}xy^2 + \frac{4}{3}xy \ from \ \frac{2}{3}x^2y + \frac{3}{2}xy^2 - \frac{1}{3}xy$

(viii) $\frac{ab}{7} - \frac{35}{3}bc + \frac{6}{5}ac \ from \ \frac{3}{5}bc - \frac{4}{5}ac$

Solution:

(i) 12xy − (−5xy)

= 12xy + 5xy = 17xy

(ii) $-7a^2 - (2a^2)$

$= -7a^2 - 2a^2 = -9a^2$

(iii) (3a − 5b) − (2a − b)

= (3a − 5b) − 2a + b

= 3a − 5b − 2a + b

= 3a − 2a − 5b + b = a − 4b

(iv) $(4x^3 + x^2 + x + 6) - (2x^3 - 4x^2 + 3x + 5)$

$= 4x^3 + x^2 + x + 6 - 2x^3 + 4x^2 - 3x - 5$

$= 4x^3 - 2x^3 + x^2 + 4x^2 + x - 3x + 6 - 5$ (Collecting like terms)

$= 2x^3 + 5x^2 - 2x + 1$ (Combining like terms)

(v) $(\frac{1}{3}y^3 + \frac{5}{7}y^2 + y - 2) - (\frac{2}{3}y^3 - \frac{2}{7}y^2 - 5)$

$= \frac{1}{3}y^3 + \frac{5}{7}y^2 + y - 2 - \frac{2}{3}y^3 + \frac{2}{7}y^2 + 5$

$= \frac{1}{3}y^3 - \frac{2}{3}y^3 + \frac{5}{7}y^2 + \frac{2}{7}y^2 + y - 2 + 5$ (Collecting like terms)

$= -\frac{1}{3}y^3 + y^2 + y + 3$ (Combining like terms)

(vi) $(\frac{2}{3}x+\frac{3}{2}y-\frac{4}{3}z)-(\frac{3}{2}x-\frac{5}{4}y-\frac{7}{2}z)$

$=\frac{2}{3}x+\frac{3}{2}y-\frac{4}{3}z-\frac{3}{2}x+\frac{5}{4}y+\frac{7}{2}z$

$=\frac{2}{3}x-\frac{3}{2}x+\frac{3}{2}y+\frac{5}{4}y-\frac{4}{3}z+\frac{7}{2}z$ (Collecting like terms)

$=-\frac{5}{6}x+\frac{11}{4}y+\frac{13}{6}z$ (Combining like terms)

(vii) $(\frac{2}{3}x^2y+\frac{3}{2}xy^2-\frac{1}{3}xy)-(x^2y-\frac{4}{5}xy^2+\frac{4}{3}xy)$

$=\frac{2}{3}x^2y+\frac{3}{2}xy^2-\frac{1}{3}xy-x^2y+\frac{4}{5}xy^2-\frac{4}{3}xy$

$=\frac{2}{3}x^2y-x^2y+\frac{3}{2}xy^2+\frac{4}{5}xy^2-\frac{1}{3}xy-\frac{4}{3}xy$ (Collecting like terms)

$=-\frac{1}{3}x^2y+\frac{23}{10}xy^2-\frac{5}{3}xy$ (Combining like terms)

(viii) $(\frac{3}{5}bc-\frac{4}{5}ac)-(\frac{ab}{7}-\frac{35}{3}bc+\frac{6}{5}ac)$

$=\frac{3}{5}bc-\frac{4}{5}ac-\frac{ab}{7}+\frac{35}{3}bc-\frac{6}{5}ac$

$=\frac{3}{5}bc+\frac{35}{3}bc-\frac{4}{5}ac-\frac{6}{5}ac-\frac{ab}{7}$ (Collecting like terms)

$=\frac{184}{15}bc-2ac-\frac{ab}{7}$ (Combining like terms)

Q3) Take away:

(i) $\frac{6}{5}x^2-\frac{4}{5}x^3+\frac{5}{6}+\frac{3}{2}x\ from\ \frac{x^3}{3}-\frac{5}{2}x^2+\frac{3}{5}x+\frac{1}{4}$

(ii) $\frac{7}{4}x^3+\frac{3}{5}x^2+\frac{1}{2}x+\frac{9}{2}\ from\ \frac{7}{2}-\frac{x}{3}-\frac{x^2}{5}$

(iii) $\frac{y^3}{3}+\frac{7}{3}y^2+\frac{1}{2}y+\frac{1}{2}\ from\ \frac{1}{3}-\frac{5}{3}y^2$

(iv) $\frac{2}{3}ac-\frac{5}{7}ab+\frac{2}{3}bc\ from\ \frac{3}{2}ab-\frac{7}{4}ac-\frac{5}{6}bc$

Solution:

(i) The difference is given by:

$(\frac{x^3}{3}-\frac{5}{2}x^2+\frac{3}{5}x+\frac{1}{4})-(\frac{6}{5}x^2-\frac{4}{5}x^3+\frac{5}{6}+\frac{3}{2}x)$

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

$=\frac{x^3}{3}+\frac{4}{5}x^3-\frac{5}{2}x^2-\frac{6}{5}x^2+\frac{3}{5}x-\frac{3}{2}x+\frac{1}{4}-\frac{5}{6}$ (Collecting like terms)

$=(\frac{5+12}{15})x^3+(\frac{-25-12}{10})x^2+(\frac{6-15}{10}x)+(\frac{6-20}{24})$

$=\frac{17}{15}x^3-\frac{37}{10}x^2-\frac{9}{10}x-\frac{7}{12}$ (Combining like terms)

(ii) The difference is given by:

$(\frac{7}{2}-\frac{x}{3}-\frac{x^2}{5})-(\frac{7}{4}x^3+\frac{3}{5}x^2+\frac{x}{2}+\frac{9}{2})$

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

$=\frac{7}{2}-\frac{9}{2}-\frac{x}{3}-\frac{x}{2}-\frac{x^2}{5}-\frac{3x^2}{5}-\frac{7x^3}{4}$ (Collecting like terms)

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

$=-1-\frac{5x}{6}-\frac{4x^2}{5}-\frac{7x^3}{4}$ (Combining like terms)

(iii) The difference is given by:

$(\frac{1}{3} - \frac{5}{3}y^2) - (\frac{y^3}{3} + \frac{7}{3}y^2 + \frac{1}{2}y + \frac{1}{2})$

$= \frac{1}{3} - \frac{5}{3}y^2 - \frac{y^3}{3} - \frac{7}{3}y^2 - \frac{1}{2}y - \frac{1}{2}$

$= \frac{1}{3} - \frac{1}{2} - \frac{y}{2} - \frac{5}{3}y^2 - \frac{7}{3}y^2 - \frac{y^3}{3}$ (Collecting like terms)

$= (\frac{2-3}{6}) - \frac{y}{2} + (\frac{-5-7}{3})y^2 - \frac{7}{3}y^2 - \frac{y^3}{3}$

$= -\frac{1}{6} - \frac{y}{2} - 4y^2 - \frac{y^3}{3}$ (Combining like terms)

(iv) The difference is given by:

$(\frac{3}{2}ab - \frac{7}{4}ac - \frac{5}{6}bc) - (\frac{2}{3}ac - \frac{5}{7}ab + \frac{2}{3}bc)$

$= \frac{3}{2}ab - \frac{7}{4}ac - \frac{5}{6}bc - \frac{2}{3}ac + \frac{5}{7}ab - \frac{2}{3}bc$

$= \frac{3}{2}ab + \frac{5}{7}ab - \frac{7}{4}ac - \frac{2}{3}ac - \frac{5}{6}bc - \frac{2}{3}bc$ (Collecting like terms)

$= (\frac{21+10}{14})ab + (\frac{-21-8}{12})ac + (\frac{-5-4}{6})bc$

$= \frac{31}{14}ab - \frac{29}{12}ac - \frac{3}{2}bc$ (Combining like terms)

Q4: Subtract 3x − 4y − 7z from the sum of x − 3y + 2z and −4x + 9y − 11z

Solution:

First add the expressions x − 3y + 2z and −4x + 9y − 11z we get:

(x − 3y + 2z) + (−4x + 9y − 11z)

= x − 3y + 2z − 4x + 9y − 11z

= x − 4x − 3y + 9y + 2z − 11z (Collecting like terms)

= −3x + 6y − 9z (Combining like terms)

Now, Subtracting the expression $3x - 4y - 7z$ from the above sum, we get:

$(-3x + 6y - 9z) - (3x - 4y - 7z)$

$= -3x + 6y - 9z - 3x + 4y + 7z$

$= -3x - 3x + 6y + 4y - 9z + 7z$ (Collecting like terms)

$= -6x + 10y - 2z$ (Combining like terms)

Thus, the answer is $-6x + 10y - 2z$.

Q5) Subtract the sum of $3l - 4m - 7n^2$ and $2l + 3m - 4n^2$ from the sum of $9l + 2m - 3n^2$ and $-3l + m + 4n^2$.

Solution:

We have to subtract the sum of $(3l - 4m - 7n^2)$ and $(2l + 3m - 4n^2)$ from the sum of $(9l + 2m - 3n^2)$ and $(-3l + m + 4n^2)$

$\{(9l + 2m - 3n^2) + (-3l + m + 4n^2)\} - \{(3l - 4m - 7n^2) + (2l + 3m - 4n^2)\}$

$= (9l - 3l + 2m + m - 3n^2 + 4n^2) - (3l + 2l - 4m + 3m - 7n^2 - 4n^2)$

$= (6l + 3m + n^2) - (5l - m - 11n^2)$ (Combining like terms inside the parenthesis)

$= 6l + 3m + n^2 - 5l + m + 11n^2$

$= 6l - 5l + 3m + m + n^2 + 11n^2$ (Collecting like terms)

$= l + 4m + 12n^2$ (Combining like terms)

Thus, the required solution is $l + 4m + 12n^2$.

Q6) Subtract the sum $2x - x^2 + 5$ and $-4x - 3 + 7x^2$ from 5.

Solution:

We have to subtract the sum of $(2x - x^2 + 5)$ and $(-4x - 3 + 7x^2)$ from 5.

$5 - \{(2x - x^2 + 5) + (-4x - 3 + 7x^2)\}$

$= 5 - (2x - 4x - x^2 + 7x^2 + 5 - 3)$

$= 5 - 2x + 4x + x^2 - 7x^2 - 5 + 3$

$= 5 - 5 + 3 - 2x + 4x + x^2 - 7x^2$ (Collecting like terms)

$= 3 + 2x - 6x^2$ (Combining like terms)

Thus, the answer is $3 + 2x - 6x^2$.

Q7) Simplify each of the following:

(i) $x^2 - 3x + 5 - \frac{1}{2}(3x^2 - 5x + 7)$

(ii) $[5 - 3x + 2y - (2x - y)] - (3x - 7y + 9)$

(iii) $\frac{11}{2}x^2y - \frac{9}{4}xy^2 + \frac{1}{4}xy - \frac{1}{14}y^2x + \frac{1}{15}yx^2 + \frac{1}{2}xy$

(iv) $(\frac{1}{3}y^2 - \frac{4}{7}y + 11) - (\frac{1}{7}y - 3 + 2y^2) - (\frac{2}{7}y - \frac{2}{3}y^2 + 2)$

(v) $-\frac{1}{2}a^2b^2c + \frac{1}{3}ab^2c - \frac{1}{4}abc^2 - \frac{1}{5}cb^2a^2 + \frac{1}{6}cb^2a - \frac{1}{7}c^2ab + \frac{1}{8}ca^2b.$

Solution:

(i) $x^2 - 3x + 5 - \frac{1}{2}(3x^2 - 5x + 7)$

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

$= x^2 - \frac{3x^2}{2} - 3x + \frac{5x}{2} + 5 - \frac{7}{2}$ (Collecting like terms)

$= (\frac{1-3}{2})x^2 + (\frac{-3+5}{2})x + (\frac{10-7}{2})$

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

Thus, the answer is $\frac{-x^2}{2} - \frac{x}{2} + \frac{3}{2}$.

(ii) [5 – 3x + 2y – (2x – y)] – (3x – 7y + 9)

= [5 – 3x + 2y – 2x + y] – (3x – 7y + 9)

= [5 – 5x + 3y] – (3x – 7y + 9)

= 5 – 5x + 3y – 3x + 7y – 9

= 5 – 9 – 5x – 3x + 3y + 7y = -4 – 8x + l0y

(iii) $\frac{11}{2}x^2y - \frac{9}{4}xy^2 + \frac{1}{4}xy - \frac{1}{14}y^2x + \frac{1}{15}yx^2 + \frac{1}{2}xy$

$= \frac{11}{2}x^2y + \frac{1}{15}yx^2 - \frac{9}{4}xy^2 - \frac{1}{14}y^2x + \frac{1}{4}xy + \frac{1}{2}xy$ (Collecting like terms)

$= (\frac{165+2}{30})x^2y + (\frac{-63-2}{28})xy^2 + (\frac{1+2}{4})xy$

$= \frac{167}{30}x^2y - \frac{65}{28}xy^2 + \frac{3}{4}xy$ (Combining like terms)

(iv) $(\frac{1}{3}y^2 - \frac{4}{7}y + 11) - (\frac{1}{7}y - 3 + 2y^2) - (\frac{2}{7}y - \frac{2}{3}y^2 + 2)$

$= \frac{1}{3}y^2 - \frac{4}{7}y + 11 - \frac{1}{7}y + 3 - 2y^2 - \frac{2}{7}y + \frac{2}{3}y^2 - 2$

$= \frac{1}{3}y^2 + \frac{2}{3}y^2 - 2y^2 - \frac{4}{7}y - \frac{1}{7}y - \frac{2}{7}y + 11 + 3 - 2$ (Collecting like terms)

$= (\frac{1-6+2}{3})y^2 + (\frac{-4-1-2}{7})y + 12$

$= -y^2 - 7y + 12$ (Combining like terms)

(v) $-\frac{1}{2}a^2b^2c + \frac{1}{3}ab^2c - \frac{1}{4}abc^2 - \frac{1}{5}cb^2a^2 + \frac{1}{6}cb^2a - \frac{1}{7}c^2ab + \frac{1}{8}ca^2b$

$= -\frac{1}{2}a^2b^2c - \frac{1}{5}cb^2a^2 + \frac{1}{3}ab^2c + \frac{1}{6}cb^2a - \frac{1}{4}abc^2 - \frac{1}{7}c^2ab + \frac{1}{8}ca^2b$ (Collecting like terms)

$= (\frac{-5-2}{10})a^2b^2c + (\frac{2+1}{6})ab^2c + (\frac{-7-4}{28})c^2ab + \frac{1}{8}ca^2b$

$= -\frac{7}{10}a^2b^2c + \frac{1}{2}ab^2c - \frac{11}{28}abc^2 + \frac{1}{8}a^2bc$ (Combining like terms)

Exercise 6.3

Find each of the following products: (1-8)

Q1) $5x^2 \times 4x^3$

Solution:

To multiply algebraic expressions, we use commutative and associative laws along with the laws of indices. However, use of these laws is subject to their applicability in the given expressions.

In the present problem, to perform the multiplication, we can proceed as follows:

$5x^2 \times 4x^3$
= $(5 \times 4) \times (x^2 \times x^3)$
= $20x^5 \qquad (\because a^m \times a^n = a^{m+n})$

Thus, the answer is $20x^5$.

Q2) $-3a^2 \times 4b^4$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, $a^m \times a^n = a^{m+n}$, wherever applicable.

We have:

$-3a^2 \times 4b^4$
= $(-3 \times 4) \times (a^2 \times b^4)$
= $-12a^2b^4$

Thus, the answer is $-12a^2b^4$.

Q3) $(-5xy) \times (-3x^2yz)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, $a^m \times a^n = a^{m+n}$, wherever applicable.

We have:

$(-5xy) \times (-3x^2yz)$
$= [(-5) \times (-3)] \times (x \times x^2) \times (y \times y) \times z$

$= 15 \times (x^{1+2}) \times (y^{1+1}) \times z$

$= 15x^3y^2z$

Thus, the answer is $15x^3y^2z$.

Q4) $\frac{1}{2}xy \times \frac{2}{3}\ x^2yz^2$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$\frac{1}{2}xy \times \frac{2}{3}\ x^2yz^2$
$= (\frac{1}{4} \times \frac{2}{3}) \times (x \times x^2) \times (y \times y) \times z^2$

$= (\frac{1}{4} \times \frac{2}{3}) \times (x^{1+2}) \times (y^{1+1}) \times z^2$

$= \frac{1}{6}x^3y^2z^2$

Thus, the answer is $\frac{1}{6}x^3y^2z^2$.

Q5) $(-\frac{7}{5}xy^2z) \times (\frac{13}{3}\ x^2yz^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-\frac{7}{5}xy^2z) \times (\frac{13}{3}\ x^2yz^2)$
$= (-\frac{7}{5} \times \frac{13}{3}) \times (x \times x^2) \times (y \times y) \times (z \times z^2)$

$= (-\frac{7}{5} \times \frac{13}{3}) \times (x^{1+2}) \times (y^{2+1}) \times (z^{1+2})$

$= -\frac{91}{15}x^3y^3z^3$

Thus, the answer is $-\frac{91}{15}x^3y^3z^3$.

Q6) $(-\frac{24}{25}x^3z) \times (-\frac{15}{16}\ xz^2y)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-\frac{24}{25}x^3z) \times (-\frac{15}{16}\ xz^2y)$
$= [(-\frac{24}{25} \times (-\frac{15}{16})] \times (x^3 \times x) \times (z \times z^2) \times y$

$= [(-\frac{24}{25} \times (-\frac{15}{16})] \times (x^{3+1}) \times (z^{1+2}) \times y$

$= \frac{9}{10}x^4yz^3$

Thus, the answer is $\frac{9}{10}x^4yz^3$.

Q7) $(-\frac{1}{27}a^2b^2) \times (\frac{9}{2}a^3b^2c^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-\frac{1}{27}a^2b^2) \times (\frac{9}{2}a^3b^2c^2)$

= $[(-\frac{1}{27} \times (\frac{9}{2})] \times (a^2 \times a^3) \times (b^2 \times b^2) \times c^2$

= $[(-\frac{1}{27} \times (\frac{9}{2})] \times (a^{2+3}) \times (b^{2+2}) \times c^2$

= $-\frac{1}{6}a^5b^4c^2$

Thus, the answer is $-\frac{1}{6}a^5b^4c^2$.

Q8) $(-7xy) \times (\frac{1}{4}x^2yz)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

$(-7xy) \times (\frac{1}{4}x^2yz)$

= $(-7 \times \frac{1}{4}) \times (x \times x^2) \times (y \times y) \times z$

= $(-7 \times \frac{1}{4}) \times (x^{1+2}) \times (y^{1+1}) \times z$

= $-\frac{7}{4}x^3y^2z$

Thus, the answer is $-\frac{7}{4}x^3y^2z$.

Find each of the following products: (9-17)

Q9) $(7ab) \times (-5ab^2c) \times (6abc^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(7ab) \times (-5ab^2c) \times (6abc^2)$
= $[7 \times (-5) \times 6] \times (a \times a \times a) \times (b \times b^2 \times b) \times (c \times c^2)$

= $[7 \times (-5) \times 6] \times (a^{1+1+1}) \times (b^{1+2+1}) \times (c^{1+2})$

= $-210a^3b^4c^3$

Thus, the answer is $-210a^3b^4c^3$.

Q10) $(-5a) \times (-10a^2) \times (-2a^3)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-5a) \times (-10a^2) \times (-2a^3)$
= $[(-5) \times (-10) \times (-2)] \times (a \times a^2 \times a^3)$

= $[(-5) \times (-10) \times (-2)] \times (a^{1+2+3})$

= $-100a^6$

Thus, the answer is $-100a^6$.

Q11) $(-4x^2) \times (-6xy^2) \times (-3yz^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-4x^2) \times (-6xy^2) \times (-3yz^2)$
$= [(-4) \times (-6) \times (-3)] \times (x^2 \times x) \times (y^2 \times y) \times z^2$

$= [(-4) \times (-6) \times (-3)] \times (x^{2+1}) \times (y^{2+1}) \times z^2$

$= -72x^3y^3z^2$

Thus, the answer is $-72x^3y^3z^2$.

Q12) $(-\frac{2}{7}a^4) \times (-\frac{3}{4}a^2b) \times (-\frac{14}{5}b^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-\frac{2}{7}a^4) \times (-\frac{3}{4}a^2b) \times (-\frac{14}{5}b^2)$ $[(-\frac{2}{7}) \times (-\frac{3}{4}) \times (-\frac{14}{5})] \times (a^4 \times a^2) \times (b \times b^2)$
$= [-(\frac{2}{7} \times \frac{3}{4} \times \frac{14}{5})] \times (a^{4+2}) \times (b^{1+2})$

$= -\frac{3}{5}a^6b^3$

Thus, the answer is $-\frac{3}{5}a^6b^3$.

Q13) $(\frac{7}{9}ab^2) \times (\frac{15}{7}ac^2b) \times (-\frac{3}{5}a^2c)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(\frac{7}{9}ab^2) \times (\frac{15}{7}ac^2b) \times (-\frac{3}{5}a^2c)$
$= [(\frac{7}{9}) \times (\frac{15}{7}) \times (-\frac{3}{5})] \times (a \times a \times a^2) \times (b^2 \times b) \times (c^2 \times c)$

$= [\frac{7}{9} \times \frac{15}{7} \times (-\frac{3}{5})] \times (a^{1+1+2}) \times (b^{2+1}) \times (c^{2+1})$

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

Thus, the answer is $-a^4b^3c^3$.

Q14) $(\frac{4}{3}u^2vw) \times (-5uvw^2) \times (\frac{1}{3}v^2wu)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(\frac{4}{3}u^2vw) \times (-5uvw^2) \times (\frac{1}{3}v^2wu)$

= $[(\frac{4}{3}) \times (-5) \times (\frac{1}{3})] \times (u^2 \times u \times u) \times (v \times v \times v^2) \times (w \times w^2 \times w)$

= $[\frac{4}{3} \times (-5) \times \frac{1}{3}] \times (u^{2+1+1}) \times (v^{1+1+2}) \times (w^{1+2+1})$

= $-\frac{20}{9}u^4v^4w^4$

Thus, the answer is $-\frac{20}{9}u^4v^4w^4$.

Q15) $(0.5x) \times (\frac{1}{3}xy^2z^4) \times (24x^2yz)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(0.5x) \times (\frac{1}{3}xy^2z^4) \times (24x^2yz)$

= $[0.5x \times \frac{1}{3} \times 24] \times (x \times x \times x^2) \times (y^2 \times y) \times (z^4 \times z)$

= $[0.5x \times \frac{1}{3} \times 24] \times (x^{1+1+2}) \times (y^{2+1}) \times (z^{4+1})$

= $4x^4y^3z^5$

Thus, the answer is $4x^4y^3z^5$.

Q16) $(\frac{4}{3}pq^2) \times (-\frac{1}{4}p^2r) \times (16p^2q^2r^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(\frac{4}{3}pq^2) \times (-\frac{1}{4}p^2r) \times (16p^2q^2r^2)$
$= [\frac{4}{3} \times (-\frac{1}{4}) \times 16] \times (p \times p^2 \times p^2) \times (q^2 \times q^2) \times (r \times r^2)$

$= [\frac{4}{3} \times (-\frac{1}{4}) \times 16] \times (p^{1+2+2}) \times (q^{2+2}) \times (r^{1+2})$

$= -\frac{16}{3}p^5q^4r^3$

Thus, the answer is $-\frac{16}{3}p^5q^4r^3$.

Q17) $(2.3xy) \times (0.1x) \times (0.16)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(2.3xy) \times (0.1x) \times (0.16)$
$= (2.3 \times 0.1 \times 0.16) \times (x \times x) \times y$

$= (2.3 \times 0.1 \times 0.16) \times (x^{1+1}) \times y$

$= 0.0368x^2y$

Thus, the answer is $0.0368x^2y$.

Express each of the following products as a monomials and verify the result in each case for x = 1: (18-26)

Q18) $(3x) \times (4x) \times (-5x)$

Solution:

We have to find the product of the expression in order to express it as a monomial.

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

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

= $(3 \times 4 \times (-5)) \times (x^{1+1+1})$

= $-60x^3$

Substituting x = 1 in LHS, we get:

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

= $(3 \times 1) \times (4 \times 1) \times (-5 \times 1)$

= −60

Putting x = 1 in RHS, we get:

RHS = $-60x^3$

= $-60(1)^3$

= -60×1

= −60

Since, LHS = RHS for x =1; therefore, the result is correct.

Thus, the answer is $-60x^3$.

Q19) $(4x^2) \times (-3x) \times (\frac{4}{5}x^3)$

Solution:

We have to find the product of the expression in order to express it as a monomial.

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(4x^2) \times (-3x) \times (\frac{4}{5}x^3)$

= $(4 \times (-3) \times \frac{4}{5}) \times (x^2 \times x \times x^3)$

= $(4 \times (-3) \times \frac{4}{5}) \times (x^{2+1+3})$

= $-\frac{48}{5}x^6$

$\therefore (4x^2) \times (-3x) \times (\frac{4}{5}x^3)$

= $-\frac{48}{5}x^6$

Substituting x = 1 in LHS, we get:

LHS = $(4x^2) \times (-3x) \times (\frac{4}{5}x^3)$

= $(4 \times 1^2) \times (-3 \times 1) \times (\frac{4}{5} \times 1^3)$

= $4 \times (-3) \times \frac{4}{5}$

= $-\frac{48}{5}$

Putting x = 1 in RHS, we get:

RHS = $-\frac{48}{5}x^6$

= $-\frac{48}{5} \times 1^6$

= $-\frac{48}{5}$

Since, LHS = RHS for x = 1; therefore, the result is correct

Thus, the answer is $-\frac{48}{5}x^6$.

Q20) $(5x^4) \times (x^2)^3 \times (2x)^2$

Solution:

We have to find the product of the expression in order to express it as a monomial.

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(5x^4) \times (x^2)^3 \times (2x)^2$

= $(5x^4) \times (x^6) \times (2^2 \times x^2)$

= $(5 \times 2^2) \times (x^4 \times x^6 \times x^2)$

= $(5 \times 2^2) \times (x^{4+6+2})$

= $20x^{12}$

$\therefore (5x^4) \times (x^2)^3 \times (2x)^2 = 20x^{12}$

Substituting x = 1 in LHS, we get:

LHS = $(5x^4) \times (x^2)^3 \times (2x)^2$

= $(5 \times 1) \times (1^6) \times (2)^2$

= $5 \times 1 \times 4$

= 20

Put x = 1 in RHS, we get:

RHS = $20x^{12}$

= 20×1^{12}

= 20×1

= 20

Since, LHS = RHS for x = 1; therefore, the result is correct

Thus, the answer is $20x^{12}$

Q21) $(x^2)^3 \times (2x) \times (-4x) \times (5)$

Solution:

We have to find the product of the expression in order to express it as a monomial.

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(x^2)^3 \times (2x) \times (-4x) \times 5$
= $(x^6) \times (2x) \times (-4x) \times 5$

= $(2 \times (-4) \times 5) \times (x^6 \times x \times x)$

= $(2 \times (-4) \times 5) \times (x^{6+1+1})$

= $-40x^8$

$\therefore (x^2)^3 \times (2x) \times (-4x) \times 5 = -40x^8$
Substituting x = 1 in LHS, we get:

LHS = $(x^2)^3 \times (2x) \times (-4x) \times 5$

= $(1^2)^3 \times (2 \times 1) \times (-4 \times 1) \times 5$

= $1^6 \times 2 \times (-4) \times 5$

= -40

Put x = 1 in RHS, we get:

RHS = $-40x^8$

= -40×1^8

= -40×1

= -40

Since, LHS = RHS for x = 1; therefore, the result is correct

Thus, the answer is $-40x^8$

Q22) Write down the product of $-8x^2y^6$ and $-20xy$. Verify the product for x = 2.5, y = 1.

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-8x^2y^6) \times (-20xy)$
= $[(-8) \times (-20)] \times (x^2 \times x) \times (y^6 \times y)$

= $[(-8) \times (-20)] \times (x^{2+1}) \times (y^{6+1})$

= $-160x^3y^7$

$\therefore (-8x^2y^6) \times (-20xy) = -160x^3y^7$
Substituting x = 2.5 and y = 1 in LHS, we get:

LHS = $(-8x^2y^6) \times (-20xy)$

= $(-8(2.5)^2(1)^6) \times (-20(2.5)(1))$

= $(-8(6.25)(1)) \times (-20(2.5)(1))$

= $(-50) \times (-50)$

= 2500

Substituting x = 2.5 and y = 1 in RHS, we get:

RHS = $-160x^3y^7$

= $-160(2.5)^3(1)^7$

= $-160(15.625)(1)$

= 2500

Because LHS is equal to RHS, the result is correct.

Thus, the answer is $-160x^3y^7$

Q23) Evaluate $(3.2x^6y^3) \times (2.1x^2y^2)$ when x = 1 and y = 0.5.

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(3.2x^6y^3) \times (2.1x^2y^2)$
= $(3.2 \times 2.1) \times (x^6 \times x^2) \times (y^3 \times y^2)$

= $(3.2 \times 2.1) \times (x^{6+2}) \times (y^{3+2})$

= $6.72x^8y^5$

$\therefore (3.2x^6y^3) \times (2.1x^2y^2) = 6.72x^8y^5$
Substituting x = 1 and y = 0.5 in the result, we get:

$6.72x^8y^5$
= $6.72(1)^8(0.5)^5$

= $6.72 \times 1 \times 0.03125$

= 0.21

Thus, the answer is 0.21.

Q24) Find the value of $(5x^6) \times (-1.5x^2y^3) \times (-12xy^2)$ when x = 1, y = 0.5.

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(5x^6) \times (-1.5x^2y^3) \times (-12xy^2)$
= $[5 \times (-1.5) \times (-12)] \times (x^6 \times x^2 \times x) \times (y^3 \times y^2)$

= $[5 \times (-1.5) \times (-12)] \times (x^{6+2+1}) \times (y^{3+2})$

= $90x^9y^5$

$\therefore (5x^6) \times (-1.5x^2y^3) \times (-12xy^2) = 90x^9y^5$
Substituting x = 1 and y = 0.5 in the result, we get:

$90x^9y^5$
= $90(1)^9(0.5)^5$

= $90 \times 1 \times 0.03125$

= 2.8125

Thus, the answer is 2.8125.

Q25) Evaluate when $(2.3a^5b^2) \times (1.2a^2b^2)$ when a = 1 and b = 0.5.

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(2.3a^5b^2) \times (1.2a^2b^2)$
$= (2.3 \times 1.2) \times (a^5 \times a^2) \times (b^2 \times b^2)$

$= (2.3 \times 1.2) \times (a^{5+2}) \times (b^{2+2})$

$= 2.76a^7b^4$

$\therefore (2.3a^5b^2) \times (1.2a^2b^2) = 2.76a^7b^4$
Substituting a = 1 and b = 0.5 in the result, we get:

$2.76a^7b^4$
$= 2.76(1)^7(0.5)^4$

$= 2.76 \times 1 \times 0.0625$

= 0.1725

Thus, the answer is 0.1725.

Q26) Evaluate for $(-8x^2y^6) \times (-20xy)$ x = 2.5 and y = 1.

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-8x^2y^6) \times (-20xy)$
$= [(-8) \times (-20)] \times (x^2 \times x) \times (y^6 \times y)$

$= [(-8) \times (-20)] \times (x^{2+1}) \times (y^{6+1})$

$= 160x^3y^7$

$\therefore (-8x^2y^6) \times (-20xy) = 160x^3y^7$
Substituting x = 2.5 and y =1 in the result, we get:

$160x^3y^7$
$= 160(2.5)^3(1)^7$

$= 160 \times 15.625$

= 2500

Thus, the answer is 2500.

Express each of the following products as a monomials and verify the result for x = 1, y =2 : (27-31)

Q27) $(-xy^3) \times (yx^3) \times (xy)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-xy^3) \times (yx^3) \times (xy)$
= $(-1) \times (x \times x^3 \times x) \times (y^3 \times y \times y)$

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

= $-x^5y^5$

To verify the result, we substitute x = 1 and y = 2 in LHS; we get:

LHS = $(-xy^3) \times (yx^3) \times (xy)$

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

= $[(-1) \times 1 \times 8] \times (2 \times 1) \times 2$

= $(-8) \times 2 \times 2$

= −32

Substitute x = 1 and y = 2 in RHS, we get:

RHS = $-x^5y^5$

= $(-1)(1)^5(2)^5$

= $(-1) \times 1 \times 32$

= −32

Because LHS is equal to RHS, the result is correct.

Thus, the answer is $-x^5y^5$

Q28) $(\frac{1}{8}x^2y^4) \times (\frac{1}{4}x^4y^2) \times (xy) \times 5$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(\frac{1}{8}x^2y^4) \times (\frac{1}{4}x^4y^2) \times (xy) \times 5$
= $(\frac{1}{8} \times \frac{1}{4} \times 5) \times (x^2 \times x^4 \times x) \times (y^4 \times y^2 \times y)$

= $(\frac{1}{8} \times \frac{1}{4} \times 5) \times (x^{2+4+1}) \times (y^{4+2+1})$

= $\frac{5}{32}x^7y^7$

To verify the result, we substitute x = 1 and y = 2 in LHS; we get:

LHS = $(\frac{1}{8}x^2y^4) \times (\frac{1}{4}x^4y^2) \times (xy) \times 5$

= $(\frac{1}{8} \times (1)^2 \times (2)^4) \times (\frac{1}{4} \times (1)^4 \times (2)^2) \times (1 \times 2) \times 5$

= $(\frac{1}{8} \times 1 \times 16) \times (\frac{1}{4} \times 1 \times 4) \times (1 \times 2) \times 5$

= $2 \times 1 \times 2 \times 5$

= 20

Substituting x = 1 and y = 2 in RHS, we get:

RHS = $\frac{5}{32}x^7y^7$

= $\frac{5}{32}(1)^7(2)^7$

= $\frac{5}{32} \times 1 \times 128$

= 20

Because LHS is equal to RHS, the result is correct.

Thus, the answer is $\frac{5}{32}x^7y^7$.

Q29) $(\frac{2}{5}a^2b) \times (-15b^2ac) \times (-\frac{1}{2}c^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(\frac{2}{5}a^2b) \times (-15b^2ac) \times (-\frac{1}{2}c^2)$
= $[\frac{2}{5} \times (-15) \times (-\frac{1}{2})] \times (a^2 \times a) \times (b \times b^2) \times (c \times c^2)$

= $[(\frac{2}{5} \times (-15) \times (-\frac{1}{2})] \times (a^{2+1}) \times (b^{1+2}) \times (c^{1+2})$

= $3a^3b^3c^3$

Since the expression doesn't consist of the variables x and y.

Therefore, the result cannot be verified for x = 1 and y = 2

Thus, the answer is $3a^3b^3c^3$.

Q30) $(-\frac{4}{7}a^2b) \times (-\frac{2}{3}b^2c) \times (-\frac{7}{6}c^2a)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(-\frac{4}{7}a^2b) \times (-\frac{2}{3}b^2c) \times (-\frac{7}{6}c^2a)$
= $[(-\frac{4}{7}) \times (-\frac{2}{3}) \times (-\frac{7}{6})] \times (a^2 \times a) \times (b \times b^2) \times (c \times c^2)$

= $[(-\frac{4}{7}) \times (-\frac{2}{3}) \times (-\frac{7}{6})] \times (a^{2+1}) \times (b^{1+2}) \times (c^{1+2})$

= $-\frac{4}{9}a^3b^3c^3$

Since the expression doesn't consist of the variables x and y.

Therefore, the result cannot be verified for x = 1 and y = 2

Thus, the answer is $-\frac{4}{9}a^3b^3c^3$.

Q31) $(\frac{4}{9}abc^3) \times (-\frac{27}{5}a^3b^2) \times (-8b^3c)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(\frac{4}{9}abc^3) \times (-\frac{27}{5}a^3b^2) \times (-8b^3c)$
= $[(\frac{4}{9}) \times (-\frac{27}{5}) \times (-8)] \times (a \times a^3) \times (b \times b^2 \times b^3) \times (c^3 \times c)$

= $[(\frac{4}{9}) \times (-\frac{27}{5}) \times (-8)] \times (a^{1+3}) \times (b^{1+2+3}) \times (c^{3+1})$

= $\frac{96}{5}a^4b^6c^4$

Since the expression doesn't consist of the variables x and y.

Therefore, the result cannot be verified for x = 1 and y = 2

Thus, the answer is $\frac{96}{5}a^4b^6c^4$

Evaluate each of the following when x = 2, y = -1.

Q32) $(2xy) \times (\frac{x^2y}{4}) \times (x^2) \times (y^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(2xy) \times (\frac{x^2y}{4}) \times (x^2) \times (y^2)$
= $(2 \times \frac{1}{4}) \times (x \times x^2 \times x^2) \times (y \times y \times y^2)$

= $(2 \times \frac{1}{4}) \times (x^{1+2+2}) \times (y^{1+1+2})$

= $\frac{1}{2}x^5y^4$

Substituting x = 2 and y = -1 in the result, we get:

$\frac{1}{2}x^5y^4$
= $\frac{1}{2}(2)^5(-1)^4$

= $\frac{1}{2} \times 32 \times 1$

= 16

Thus, the answer is 16.

Q33) $(\frac{3}{5}x^2y) \times (\frac{-15}{4}xy^2) \times (\frac{7}{9}x^2y^2)$

Solution:

To multiply algebraic expressions, we can use commutative and associative laws along with the law of indices, that is, $a^m \times a^n = a^{m+n}$

We have:

$(\frac{3}{5}x^2y) \times (-\frac{15}{4}xy^2) \times (\frac{7}{9}x^2y^2)$
= $(\frac{3}{5} \times (-\frac{15}{4}) \times \frac{7}{9}) \times (x^2 \times x \times x^2) \times (y \times y^2 \times y^2)$

= $(\frac{3}{5} \times (-\frac{15}{4}) \times \frac{7}{9}) \times (x^{2+1+2}) \times (y^{1+2+2})$

= $-\frac{7}{4}x^5y^5$

Substituting x = 2 and y = -1 in the result, we get:

$-\frac{7}{4}x^5y^5$
= $-\frac{7}{4}(2)^5(-1)^5$

= $(-\frac{7}{4}) \times 32 \times (-1)$

= 56

Thus, the answer is 56.

Exercise 6.4

Find the following products: (1-15)

Q 1. $2a^3$(3a + 5b)

SOLUTION:

To find the product, we will use distributive law as follows:

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

= $2a^3 \times 3a + 2a^3 \times 5b$

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

= $(2 \times 3)\, a^{3+1} + (2 \times 5)\, a^3b$

= $6a^4 + 10a^3b$

Thus, the answer is $6a^4 + 10a^3b$.

Q 2. -11a(3a + 2b)

SOLUTION:

To find the product, we will use distributive law as follows:

-11a(3a + 2b)

= $(-11a) \times 3a + (-11a) \times 2b$

= $(-11 \times 3) \times (a \times a) + (-11 \times 2) \times (a \times b)$

= $(-33) \times (a^{1+1}) + (-22) \times (a \times b)$

= $-33a^2 - 22ab$

Thus, the answer is $-33a^2 - 22ab$.

Q 3. $-5a(7a - 2b)$

SOLUTION:

To find the product, we will use distributive law as follows:

$-5a(7a - 2b)$

$= (-5a) \times 7a + (-5a) \times (-2b)$

$= (-5 \times 7) \times (a \times a) + (-5 \times (-2)) \times (a \times b)$

$= (-35) \times (a^{1+1}) + (10) \times (a \times b)$

$= -35a^2 + 10ab$

Thus, the answer is $-35a^2 + 10ab$.

Q 4. $-11y^2(3y + 7)$

SOLUTION:

To find the product, we will use distributive law as follows:

$-11y^2(3y + 7)$

$= (-11y^2) \times 3y + (-11y^2) \times 7$

$= (-11 \times 3)(y^2 \times y) + (-11 \times 7) \times (y^2)$

$= (-33)(y^{2+1}) + (-77) \times (y^2)$

$= -33y^3 - 77y^2$

Thus, the answer is $-33y^3 - 77y^2$.

Q 5. $\frac{6x}{5}\left(x^3 + y^3\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$\frac{6x}{5}\left(x^3+y^3\right)$

$=\frac{6x}{5}\times x^3+\frac{6x}{5}\times y^3$

$=\frac{6}{5}\times\left(x\times x^3\right)+\frac{6}{5}\times\left(x\times y^3\right)$

$=\frac{6}{5}\times\left(x\times x^{1+3}\right)+\frac{6}{5}\times\left(x\times y^3\right)$

$=\frac{6x^4}{5}+\frac{6xy^3}{5}$

Thus, the answer is $\frac{6x^4}{5}+\frac{6xy^3}{5}$.

Q 6. xy($x^3 - y^3$)

SOLUTION:

To find the product, we will use the distributive law in the following way:

xy($x^3 - y^3$)

= xy $\times x^3$ - xy $\times y^3$

= (x $\times x^3$) $\times$ y – x $\times$ (y $\times y^3$)

= x^{1+3}y – xy^{1+3}

= x^4y – xy^4

Thus, the answer is x^4y – xy^4.

Q 7. 0.1y(0.1x^5 + 0.1y)

SOLUTION:

To find the product, we will use distributive law as follows:

0.1y$(0.1x^5$ + 0.1y)

= (0.ly) $(0.1x^5)$ + (0.ly)(0.ly)

= (0.1×0.1)(y $\times x^5$) + (0.1×0.1)(y $\times$ y)

= (0.1×0.1) $(x^5 \times$ y) + (0.1×0.1)(y^{1+1})

= $0.01x^5$y + $0.01y^2$

Thus, the answer is $0.01x^5$y + $0.01y^2$

Q 8. $\left(\frac{-7}{4}ab^2c-\frac{6}{25}a^2c^2\right)\left(-50a^2b^2c^2\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$\left(\frac{-7}{4}ab^2c-\frac{6}{25}a^2c^2\right)\left(-50a^2b^2c^2\right)$

$=\left\{\left(\frac{-7}{4}ab^2c\right)\left(-50a^2b^2c^2\right)\right\}-\left\{\left(\frac{6}{25}a^2c^2\right)\left(-50a^2b^2c^2\right)\right\}$

$=\left\{\left\{\frac{-7}{4}\times(-50)\right\}\left(a\times a^2\right)\left(b^2\times b^2\right)\times\left(c\times c^2\right)\right\}$

$-\left\{\left(\frac{6}{25}\right)(-50)\left(a^2\times a^2\right)\times b^2\times\left(c^2\times c^2\right)\right\}$

= $\frac{175}{2}a^3b^4c^3-\left(-12a^4b^2c^4\right)$

= $\frac{175}{2}a^3b^4c^3+12a^4b^2c^4$

Thus, the answer is $\frac{175}{2}a^3b^4c^3+12a^4b^2c^4$.

Q 9. $-\frac{8}{27}xyz\left(\frac{3}{2}xyz^2-\frac{9}{4}xy^2z^3\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$-\frac{8}{27}xyz\left(\frac{3}{2}xyz^2-\frac{9}{4}xy^2z^3\right)$

$=\left\{\left(-\frac{8}{27}xyz\right)\left(\frac{3}{2}xyz^2\right)\right\}-\left\{\left(-\frac{8}{27}xyz\right)\left(\frac{9}{4}xy^2z^3\right)\right\}$

=

$\left\{\left(\frac{-8}{27}\times\frac{3}{2}\right)(x\times x)\times(y\times y)\times(z\times z^2)\right\}$

$-\left\{\left(\frac{-8}{27}\times\frac{9}{4}\right)(x\times x)\times(y\times y^2)\times(z\times z^3)\right\}$

$=\left\{\left(-\frac{8}{27}\times\frac{3}{2}\right)\left(x^{1+1}y^{1+1}z^{1+2}\right)\right\}-\left\{\left(-\frac{8}{27}\times\frac{9}{4}\right)\left(x^{1+1}y^{1+2}z^{1+3}\right)\right\}$

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

Thus, the answer is $-\frac{4}{9}x^2y^2z^3+\frac{2}{3}x^2y^3z^4$

Q 10. $-\frac{4}{27}xyz\left(\frac{9}{2}x^2yz-\frac{3}{4}xyz^2\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$-\frac{4}{27}xyz\left(\frac{9}{2}x^2yz-\frac{3}{4}xyz^2\right)$

$=\left\{\left(-\frac{4}{27}xyz\right)\left(\frac{9}{2}x^2yz\right)\right\}-\left\{\left(-\frac{4}{27}xyz\right)\left(\frac{3}{4}xyz^2\right)\right\}$

$=\left\{\left(-\frac{4}{27}\times\frac{9}{2}\right)\left(x^{1+2}y^{1+1}z^{1+1}\right)\right\}-\left\{\left(-\frac{4}{27}\times\frac{3}{4}\right)\left(x^{1+1}y^{1+1}z^{1+2}\right)\right\}$

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

Thus, the answer is $-\frac{2}{3}x^3y^2z^2+\frac{1}{9}x^2y^2z^3$

Q 11. $1.5x(10x^2y-100xy^2)$

SOLUTION:

To find the product, we will use distributive law as follows:

$1.5x(10x^2y - 100xy^2)$
$= (1.5x \times 10x^2y) - (1.5x \times 100xy^2)$
$= (15x^{1+2}y) - (150x^{1+1}y^2)$
$= 15x^3y - 150x^2y^2$
Thus, the answer is $15x^3y - 150x^2y^2$.

Q 12. $4.1xy\,(1.1x - y)$

SOLUTION:

To find the product, we will use distributive law as follows:

$4.1xy\,(1.1x - y)$
$= (4.1xy \times 1.1x) - (4.1xy \times y)$
$= \{(4.1 \times 1.1) \times xy \times x\} - (4.1xy \times y)$
$= (4.51x^{1+1}y) - (4.1xy^{1+1})$
$= 4.51x^2y - 4.1xy^2$
Thus, the answer is $4.51x^2y - 4.1xy^2$

Q 13. $250.5xy\left(xz + \frac{y}{10}\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$250.5xy\left(xz + \frac{y}{10}\right)$
$= 250.5xy \times xz + 250.5xy \times \frac{y}{10}$
$= 250.5x^{1+1}yz + 25.05xy^{1+1}$
$= 250.5x^2yz + 25.05xy^2$
Thus, the answer is $250.5x^2yz + 25.05xy^2$.

Q 14. $\frac{7}{5}x^2y\left(\frac{3}{5}xy^2+\frac{2}{5}x\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$\frac{7}{5}x^2y\left(\frac{3}{5}xy^2+\frac{2}{5}x\right)$
$=\frac{7}{5}x^2y\times\frac{3}{5}xy^2+\frac{7}{5}x^2y\times\frac{2}{5}x$
$=\frac{21}{25}x^{2+1}y^{1+2}+\frac{14}{25}x^{2+1}y$
$=\frac{21}{25}x^3y^3+\frac{14}{25}x^3y$
Thus, the answer is $\frac{21}{25}x^3y^3+\frac{14}{25}x^3y$

Q 15. $\frac{4}{3}a\left(a^2+b^2-3c^2\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$\frac{4}{3}a\left(a^2+b^2-3c^2\right)$
$=\frac{4}{3}a\times a^2+\frac{4}{3}a\times b^2-\frac{4}{3}a\times 3c^2$
$=\frac{4}{3}a^{1+2}+\frac{4}{3}ab^2-4ac^2$
$=\frac{4}{3}a^3+\frac{4}{3}ab^2-4ac^2$
Thus, the answer is $\frac{4}{3}a^3+\frac{4}{3}ab^2-4ac^2$.

Q 16. Find the product $24x^2\left(1-2x\right)$ and evaluate its value for x = 3.

SOLUTION:

To find the product, we will use distributive law as follows:

$$24x^2\,(1-2x)$$
$$= 24x^2 \times 1 - 24x^2 \times 2x$$
$$= 24x^2 - 48x^{1+2}$$
$$= 24x^2 - 48x^3$$

Substituting x = 3 in the result, we get

$$24x^2 - 48x^3$$

=

$$24(3)^2 - 48(3)^3$$
$$= 24 \times 9 - 48 \times 27$$
$$= 216 - 1296$$
$$= -1080$$

Thus, the product is $24x^2 - 48x^3$ and its value for x = 3 is -1080.

Q 17. Find the product $-3y\left(xy + y^2\right)$ and find its value for x = 4 and y = 5.

SOLUTION:

To find the product, we will use distributive law as follows:

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

Substituting x = 4 and y = 5 in the result, we get

$$-3xy^2 - 3y^3$$
$$= -3\,(4)\,(5)^2 - 3(5)^3$$
$$= -3\,(4)\,(25) - 3\,(125)$$
$$= -300 - 375$$
$$= -675$$

Thus, the product is $-3xy^2 - 3y^3$, and its value for x = 4 and y = 5 is -675.

Q 18. Multiply $-\frac{3}{2}x^2y^3$ by (2x − y) and verify the answer for x = 1 and y = 2.

SOLUTION:

To find the product, we will use distributive law as follows:

$-\frac{3}{2}x^2y^3 \times (2x-y)$

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

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

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

Substituting x = 1 and y = 2 in the result, we get

$-3x^3y^3 + \frac{3}{2}x^2y^4$

$= -3(1)^3(2)^3 + \frac{3}{2}(1)^2(2)^4$

$= -3 \times 1 \times 8 + \frac{3}{2} \times 1 \times 16$

$= -24 + 24$

$= 0$

Thus, the product is $-3x^3y^3 + \frac{3}{2}x^2y^4$, its value for x = 1 and y = 2 is 0.

Q 19. Multiply the monomial by the binomial and find the value of each for x = -1, y = 0.25 and z = 0.05:

(i) $15y^2\,(2-3x)$

SOLUTION:

To find the product, we will use distributive law as follows:

$15y^2\,(2-3x)$

= $15y^2 \times 2 - 15y^2 \times 3x$

= $30y^2 - 45xy^2$

Substituting x = -1 and y = 0.25 in the result, we get:

$30y^2 - 45xy^2$

$= 30(0.25)^2 - 45\,(-1)\,(0.25)^2$

$= 30 \times 0.0625 - \{45 \times (-1) \times 0.0625\}$

$= 1.875 - (-2.8125)$

$= 1.875 + 2.8125$

$= 4.6875$

(ii) $-3x\left(y^2 + z^2\right)$

SOLUTION:

To find the product, we will use distributive law as follows:

$-3x\left(y^2 + z^2\right)$

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

$= -3xy^2 - 3xz^2$

Substituting x = -1, y = 0.25 and z = 0.05 in the result, we get:

$-3xy^2 - 3xz^2$

$= -3\,(-1)\,(0.25)^2 - 3\,(-1)\,(0.05)^2$

$= -3\,(-1)\,(0.0625) - 3\,(-1)\,(0.0025)$

$= 0.1875 + 0.0075$

$= 0.195$

(iii) $z^2\,(x - y)$

SOLUTION:

To find the product, we will use distributive law as follows:

$z^2\,(x - y)$

$= z^2 \times x - z^2 \times y$

$= xz^2 - yz^2$

Substituting x = -1, y = 0.25 and z = 0.05 in the result, we get:

$xz^2 - yz^2$
$= (-1)(0.05)^2 - (0.25)(0.05)^2$
$= (-1)(0.0025) - (0.25)(0.0025)$
$= -0.0025 - 0.000625$
$= -0.003125$

(iv) $xz(x^2 + y^2)$

SOLUTION:

To find the product, we will use distributive law as follows:

$xz(x^2 + y^2)$
$= xz \times x^2 + xz \times y^2$
$= x^3z + xy^2z$
Substituting x = -1, y = 0.25 and z = 0.05 in the result, we get:

$x^3z + xy^2z$
$= (-1)^3(0.05) + (-1)(0.25)^2(0.05)$
$= (-1)(0.05) + (-1)(0.0625)(0.05)$
$= -0.05 - 0.003125$
$= -0.053125$

Q 20. Simplify:

(i) $2x^2(x^3 - x) - 3x(x^4 + 2x) - 2(x^4 - 3x^2)$

SOLUTION:

To simplify, we will use distributive law as follows:

$2x^2(x^3 - x) - 3x(x^4 + 2x) - 2(x^4 - 3x^2)$
$= 2x^5 - 2x^3 - 3x^5 - 6x^2 - 2x^4 + 6x^2$
$= 2x^5 - 3x^5 - 2x^4 - 2x^3 - 6x^2 + 6x^2$
$= -x^5 - 2x^4 - 2x^3$

(ii) $x^3y\left(x^2-2x\right)+2xy\left(x^3-x^4\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$x^3y\left(x^2-2x\right)+2xy\left(x^3-x^4\right)$$
$$=x^5y-2x^4y+2x^4y-2x^5y$$
$$=x^5y-2x^5y-2x^4y+2x^4y$$
$$=-x^5y$$

(iii) $3a^2+2(a+2)-3a(2a+1)$

SOLUTION:

To simplify, we will use distributive law as follows:

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

(iv) $x(x+4)+3x\left(2x^2-1\right)+4x^2+4$

SOLUTION:

To simplify, we will use distributive law as follows:

$$x(x+4)+3x\left(2x^2-1\right)+4x^2+4$$
$$=x^2+4x+6x^3-3x+4x^2+4$$
$$=x^2+4x^2+4x-3x+6x^3+4$$
$$=5x^2+x+6x^3+4$$

(v) a(b − c) − b(c − a) − c(a − b)

SOLUTION:

To simplify, we will use distributive law as follows:

a(b − c) − b(c − a) − c(a − b)

= ab − ac − bc + ba − ca + cb

= ab + ba − ac − ca − bc − cb

= 0

(vi) a(b − c) + b(c − a) + c(a − b)

SOLUTION:

To simplify, we will use distributive law as follows:

a(b − c) + b(c − a) + c(a − b)

= ab − ac + bc − ba + ca − cb

= ab − ba − ac + ca + bc − cb

= 0

(vii) $4ab\,(a-b)-6a^2\left(b-b^2\right)-3b^2\left(2a^2-a\right)+2ab\,(b-a)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$4ab\,(a-b)-6a^2\left(b-b^2\right)-3b^2\left(2a^2-a\right)+2ab\,(b-a)$$
$$=4a^2b-4ab^2-6a^2b+6a^2b^2-6b^2a^2+3b^2a+2ab^2-2a^2b$$
$$=4a^2b-6a^2b-2a^2b-4ab^2+3b^2a+2ab^2+6a^2b^2-6b^2a^2$$
$$=-4a^2b+ab^2$$

(viii) $x^2\left(x^2+1\right)-x^3(x+1)-x\left(x^3-x\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$x^2\left(x^2+1\right)-x^3(x+1)-x\left(x^3-x\right)$$
$$=x^4+x^2-x^4-x^3-x^4+x^2$$
$$=x^4-x^4-x^4-x^3+x^2+x^2$$
$$=-x^4-x^3+2x^2$$

(ix) $2a^2+3a\left(1-2a^3\right)+a(a+1)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$2a^2+3a\left(1-2a^3\right)+a(a+1)$$
$$=2a^2+3a-6a^4+a^2+a$$
$$=2a^2+a^2+3a+a-6a^4$$

(x) $a^2(2a-1)+3a+a^3-8$

SOLUTION:

To simplify, we will use distributive law as follows:

$$a^2(2a-1)+3a+a^3-8$$
$$=2a^3-a^2+3a+a^3-8$$
$$=2a^3+a^3-a^2+3a-8$$
$$=3a^3-a^2+3a-8$$

(xi) $\frac{3}{2}x^2\left(x^2-1\right)+\frac{1}{4}x^2\left(x^2+x\right)-\frac{3}{4}x\left(x^3-1\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$\begin{aligned}
&\frac{3}{2}x^2\left(x^2-1\right)+\frac{1}{4}x^2\left(x^2+x\right)-\frac{3}{4}x\left(x^3-1\right)\\
&=\frac{3}{2}x^4-\frac{3}{2}x^2+\frac{1}{4}x^4+\frac{1}{4}x^3-\frac{3}{4}x^4+\frac{3}{4}x\\
&=\frac{3}{2}x^4+\frac{1}{4}x^4-\frac{3}{4}x^4+\frac{1}{4}x^3-\frac{3}{2}x^2+\frac{3}{4}x\\
&=x^4+\frac{1}{4}x^3-\frac{3}{2}x^2+\frac{3}{4}x
\end{aligned}$$

(xii) $a^2b\left(a-b^2\right)+ab^2\left(4ab-2a^2\right)-a^3b\left(1-2b\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$\begin{aligned}
&a^2b\left(a-b^2\right)+ab^2\left(4ab-2a^2\right)-a^3b\left(1-2b\right)\\
&=a^3b-a^2b^3+4a^2b^3-2a^3b^2-a^3b+2a^3b^2\\
&=a^3b-a^3b-a^2b^3+4a^2b^3-2a^3b^2+2a^3b^2\\
&=3a^2b^3
\end{aligned}$$

(xiii) $a^2b\left(a^3-a+1\right)-ab\left(a^4-2a^2+2a\right)-b\left(a^3-a^2-1\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$\begin{aligned}
&a^2b\left(a^3-a+1\right)-ab\left(a^4-2a^2+2a\right)-b\left(a^3-a^2-1\right)\\
&=a^5b-a^3b+a^2b-a^5b+2a^3b-2a^2b-a^3b+a^2b+b\\
&=a^5b-a^5b-a^3b+2a^3b-2a^2b+a^2b+b\\
&=b
\end{aligned}$$

Exercise 6.5

Multiply

Q1. (5x + 3) by (7x + 2)

SOLUTION:

To multiply, we will use distributive law as follows:

$$(5x+3)(7x+2)$$
$$=5x(7x+2)+3(7x+2)$$
$$=(5x\times 7x+5x\times 2)+(3\times 7x+3\times 2)$$
$$=\left(35x^2+10x\right)+(21x+6)$$
$$=35x^2+10x+21x+6$$
$$=35x^2+31x+6$$

Thus, the answer is $35x^2+31x+6$

Q2. (2x + 8) by (x − 3)

SOLUTION:

To multiply, we will use distributive law as follows:

$$(2x+8)(x-3)$$
$$=2x(x-3)+8(x-3)$$
$$=(2x\times x-2x\times 3)+(8x-8\times 3)$$
$$=\left(2x^2-6x\right)+(8x-24)$$
$$=2x^2-6x+8x-24$$
$$=2x^2+2x-24$$

Thus, the answer is $2x^2+2x-24$.

Q3. (7x + y) by (x + 5y)

SOLUTION:

To multiply, we will use distributive law as follows:

$$(7x+y)(x+5y)$$
$$=7x(x+5y)+y(x+5y)$$
$$=7x^2+35xy+xy+5y^2$$
$$=7x^2+36xy+5y^2$$

Thus, the answer is $7x^2+36xy+5y^2$.

Q4. (a − 1) by ($0.1a^2$ + 3)

SOLUTION:

To multiply, we will use distributive law as follows:

$$(a-1)\left(0.1a^2+3\right)$$
$$=0.1a^2(a-1)+3(a-1)$$
$$=0.1a^3-0.1a^2+3a-3$$

Thus, the answer is $0.1a^3-0.1a^2+3a-3$.

Q5. $\left(3x^2+y^2\right)\left(2x^2+3y^2\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(3x^2+y^2\right)\left(2x^2+3y^2\right)$$
$$=3x^2\left(2x^2+3y^2\right)+y^2\left(2x^2+3y^2\right)$$
$$=6x^4+9x^2y^2+2x^2y^2+3y^4$$
$$=6x^4+11x^2y^2+3y^4$$

Thus, the answer is $6x^4+11x^2y^2+3y^4$.

Q6. $\left(\frac{3}{5}x+\frac{1}{2}y\right)$ *by* $\left(\frac{5}{6}x+4y\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(\frac{3}{5}x+\frac{1}{2}y\right)\left(\frac{5}{6}x+4y\right)$$
$$=\frac{3}{5}x\left(\frac{5}{6}x+4y\right)+\frac{1}{2}y\left(\frac{5}{6}x+4y\right)$$
$$=\frac{1}{2}x^2+\frac{12}{5}xy+\frac{5}{12}xy+2y^2$$
$$=\frac{1}{2}x^2+\left(\frac{144+25}{60}\right)xy+2y^2$$
$$=\frac{1}{2}x^2+\left(\frac{169}{60}\right)xy+2y^2$$

Thus, the answer is $\frac{1}{2}x^2+\left(\frac{169}{60}\right)xy+2y^2$.

Q7. $(x^6 - y^6)(x^2 + y^2)$

SOLUTION:

To multiply, we will use distributive law as follows:

$(x^6 - y^6)(x^2 + y^2)$

$= x^6(x^2 + y^2) - y^6(x^2 + y^2)$

$= (x^8 + x^6y^2) - (y^6x^2 + y^8)$

$= x^8 + x^6y^2 - y^6x^2 - y^8$

Thus, the answer is $x^8 + x^6y^2 - y^6x^2 - y^8$.

Q8. $(x^2 + y^2)(3a + 2b)$

SOLUTION:

To multiply, we will use distributive law as follows:

$(x^2 + y^2)(3a + 2b)$

$= x^2(3a + 2b) + y^2(3a + 2b)$

$= 3ax^2 + 2bx^2 + 3ay^2 + 2by^2$

Thus, the answer is $3ax^2 + 2bx^2 + 3ay^2 + 2by^2$.

Q9. $[-3d + (-7f)](5d + f)$

SOLUTION:

To multiply, we will use distributive law as follows:

$[-3d+(-7f)]\,(5d+f)$
$=(-3d)\,(5d+f)+(-7f)\,(5d+f)$
$=\left(-15d^2-3df\right)+\left(-35df-7f^2\right)$
$=-15d^2-3df-35df-7f^2$
$=-15d^2-38df-7f^2$
Thus, the answer is $-15d^2-38df-7f^2$.

Q10. $(0.8a-0.5b)\,(1.5a-3b)$

SOLUTION:

To multiply, we will use distributive law as follows:

$(0.8a-0.5b)\,(1.5a-3b)$
$=0.8a\,(1.5a-3b)-0.5b\,(1.5a-3b)$
$=1.2a^2-2.4ab-0.75ab+1.5b^2$
$=1.2a^2-3.15ab+1.5b^2$
Thus, the answer is $1.2a^2-3.15ab+1.5b^2$.

Q11. $\left(2x^2y^2-5xy^2\right)\left(x^2-y^2\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(2x^2y^2-5xy^2\right)\left(x^2-y^2\right)$$
$$=2x^2y^2\left(x^2-y^2\right)-5xy^2\left(x^2-y^2\right)$$
$$=2x^4y^2-2x^2y^4-5x^3y^2+5xy^4$$

Thus, the answer is $2x^4y^2-2x^2y^4-5x^3y^2+5xy^4$.

Q12. $\left(\frac{x}{7}+\frac{x^2}{2}\right)\left(\frac{2}{5}+\frac{9x}{4}\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(\frac{x}{7}+\frac{x^2}{2}\right)\left(\frac{2}{5}+\frac{9x}{4}\right)$$
$$=\frac{x}{7}\left(\frac{2}{5}+\frac{9x}{4}\right)+\frac{x^2}{2}\left(\frac{2}{5}+\frac{9x}{4}\right)$$
$$=\frac{2x}{35}+\frac{9x^2}{28}+\frac{x^2}{5}+\frac{9x^3}{8}$$
$$=\frac{2x}{35}+\left(\frac{45+28}{140}\right)x^2+\frac{9x^3}{8}$$
$$=\frac{2x}{35}+\frac{73}{140}x^2+\frac{9x^3}{8}$$

Thus, the answer is $\frac{2x}{35}+\frac{73}{140}x^2+\frac{9x^3}{8}$

Q13. $\left(-\frac{a}{7}+\frac{a^2}{9}\right)\left(\frac{b}{2}-\frac{b^2}{3}\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(-\frac{a}{7}+\frac{a^2}{9}\right)\left(\frac{b}{2}-\frac{b^2}{3}\right)$$
$$=\left(-\frac{a}{7}\right)\left(\frac{b}{2}-\frac{b^2}{3}\right)+\left(\frac{a^2}{9}\right)\left(\frac{b}{2}-\frac{b^2}{3}\right)$$
$$=\left(-\frac{ab}{14}+\frac{ab^2}{21}\right)+\left(\frac{a^2b}{18}-\frac{a^2b^2}{27}\right)$$
$$=-\frac{ab}{14}+\frac{ab^2}{21}+\frac{a^2b}{18}-\frac{a^2b^2}{27}$$

Thus, the answer is $-\frac{ab}{14}+\frac{ab^2}{21}+\frac{a^2b}{18}-\frac{a^2b^2}{27}$.

Q14. $\left(3x^2y-5xy^2\right)\left(\frac{1}{5}x^2+\frac{1}{3}y^2\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(3x^2y-5xy^2\right)\left(\frac{1}{5}x^2+\frac{1}{3}y^2\right)$$
$$=\frac{1}{5}x^2\left(3x^2y-5xy^2\right)+\frac{1}{3}y^2\left(3x^2y-5xy^2\right)$$
$$=\frac{3}{5}x^4y-x^3y^2+x^2y^3-\frac{5}{3}xy^4$$

Thus, the answer is $\frac{3}{5}x^4y-x^3y^2+x^2y^3-\frac{5}{3}xy^4$.

Q15. $\left(2x^2-1\right)\left(4x^3+5x^2\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$(2x^2-1)\left(4x^3+5x^2\right)$$
$$=2x^2\left(4x^3+5x^2\right)-1\left(4x^3+5x^2\right)$$
$$=8x^5+10x^4-4x^3-5x^2$$
Thus, the answer is $8x^5+10x^4-4x^3-5x^2$.

Q16. $\left(2xy+3y^2\right)\left(3y^2-2\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(2xy+3y^2\right)\left(3y^2-2\right)$$
$$=2xy\left(3y^2-2\right)+3y^2\left(3y^2-2\right)$$
$$=6xy^3-4xy+9y^4-6y^2$$
$$=9y^4+6xy^3-6y^2-4xy$$
Thus, the answer is $9y^4+6xy^3-6y^2-4xy$.

Find the following products and verify the result for x = -1 and y = -2:

Q17. $(3x-5y)(x+y)$

SOLUTION:

To multiply, we will use distributive law as follows:

$(3x-5y)(x+y)$
$= 3x(x+y)-5y(x+y)$
$= 3x^2+3xy-5xy-5y^2$
$= 3x^2-2xy-5y^2$
$= \therefore (3x-5y)(x+y) = 3x^2-2xy-5y^2$
Now, we put x = -1 and y = -2 on both sides to verify the result.

LHS =
$(3x-5y)(x+y)$
$= \{3(-1)-5(-2)\}\{-1+(-2)\}$
$= (-3+10)(-3)$
$= -21$

RHS =
$3x^2-2xy-5y^2$
$= 3(-1)^2-2(-1)(-2)-5(-2)^2$
$= 3\times 1-4-5\times 4$
$= 3-4-20$
$= -21$

Because LHS is equal to RHS, the result is verified.

Q18. $(x^2y-1)(3-2x^2y)$

SOLUTION:

To multiply, we will use distributive law as follows:

$(x^2y-1)(3-2x^2y)$
$= x^2y(3-2x^2y)-1(3-2x^2y)$
$= 3x^2y-2x^4y^2-3+2^2y$
$= 5x^2y-2x^4y^2-3$
$\therefore (x^2y-1)(3-2x^2y) = 5x^2y-2x^4y^2-3$
Now, we put x = -1 and y = -2 on both sides to verify the result.

LHS =

$$(x^2y-1)\,(3-2x^2y)$$
$$=\left[(-1)^2(-2)-1\right]\left[3-2(-1)^2(-2)\right]$$
$$=[1\times(-2)-1]\,[3-2\times1\times(-2)]$$
$$=(-2-1)\,(3+4)$$
$$=-3\times7$$
$$=-21$$

RHS =

$$5x^2y-2x^4y^2-3$$
$$=5(-1)^2(-2)-2(-1)^4(-2)^2-3$$
$$=[5\times1\times(-2)]-[2\times1\times4]-3$$
$$=-10-8-3$$
$$=-21$$

Because LHS is equal to RHS, the result is verified.

Q19. $\left(\frac{1}{3}x-\frac{y^2}{5}\right)\left(\frac{1}{3}x+\frac{y^2}{5}\right)$

SOLUTION:

To multiply, we will use distributive law as follows:

$$\left(\frac{1}{3}x-\frac{y^2}{5}\right)\left(\frac{1}{3}x+\frac{y^2}{5}\right)$$
$$=\left[\frac{1}{3}x\left(\frac{1}{3}x+\frac{y^2}{5}\right)\right]-\left[\frac{y^2}{5}\left(\frac{1}{3}x+\frac{y^2}{5}\right)\right]$$
$$=\left[\frac{1}{9}x^2+\frac{xy^2}{15}\right]-\left[\frac{xy^2}{15}+\frac{y^4}{25}\right]$$
$$=\frac{1}{9}x^2+\frac{xy^2}{15}-\frac{xy^2}{15}-\frac{y^4}{25}$$
$$=\frac{1}{9}x^2-\frac{y^4}{25}$$
$$\therefore\left(\frac{1}{3}x-\frac{y^2}{5}\right)\left(\frac{1}{3}x+\frac{y^2}{5}\right)=\frac{1}{9}x^2-\frac{y^4}{25}$$

Now, we put x = -1 and y = -2 on both sides to verify the result.

LHS =

$$\left(\frac{1}{3}x-\frac{y^2}{5}\right)\left(\frac{1}{3}x+\frac{y^2}{5}\right)$$
$$=\left[\frac{1}{3}(-1)+\frac{(-2)^2}{5}\right]$$
$$=\left(-\frac{1}{3}-\frac{4}{5}\right)\left(-\frac{1}{3}+\frac{4}{5}\right)$$
$$=\left(-\frac{17}{15}\right)\left(\frac{7}{15}\right)$$
$$=-\frac{119}{225}$$

RHS =

$$\frac{1}{9}x^2-\frac{y^4}{25}$$
$$=\frac{1}{9}(-1)^2-\frac{(-2)^4}{25}$$
$$=\frac{1}{9}\times 1-\frac{16}{25}$$
$$=\frac{1}{9}-\frac{16}{25}$$
$$=-\frac{119}{225}$$

Because LHS is equal to RHS, the result is verified.

Simplify:

Q20. $x^2(x+2y)(x-3y)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$x^2(x+2y)(x-3y)$$
$$=\left[x^2(x+2y)\right](x-3y)$$
$$=\left(x^3+2x^2y\right)(x-3y)$$
$$=x^3(x-3y)+2x^2y(x-3y)$$
$$=x^4-3x^3+2x^3-6x^2y^2$$
$$=x^4-x^3-6x^2y^2$$

Thus, the answer is $x^4-x^3-6x^2y^2$.

Q21. $\left(x^2-2y^2\right)(x+4y)x^2y^2$

SOLUTION:

To simplify, we will use distributive law as follows:

$$\left(x^2-2y^2\right)(x+4y)x^2y^2$$
$$=\left[x^2(x+4y)-2y^2(x+4y)\right]x^2y^2$$
$$=\left(x^3+4x^2y-2xy^2-8y^3\right)x^2y^2$$
$$=x^5y^2+4x^4y^3-2x^3y^4-8x^2y^5$$

Thus, the answer is $x^5y^2+4x^4y^3-2x^3y^4-8x^2y^5$.

Q22. $a^2b^2\left(a+2b\right)\left(3a+b\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$\begin{aligned}&a^2b^2\left(a+2b\right)\left(3a+b\right)\\&=\left[a^2b^2\left(a+2b\right)\right]\left(3a+b\right)\\&=\left(a^3b^2+2a^2b^3\right)\left(3a+b\right)\\&=3a\left(a^3b^2+2a^2b^3\right)+b\left(a^3b^2+2a^2b^3\right)\\&=3a^4b^2+6a^3b^3+a^3b^3+2a^2b^4\\&=3a^4b^2+7a^3b^3+2a^2b^4\end{aligned}$$

Thus, the answer is $3a^4b^2+7a^3b^3+2a^2b^4$.

Q23. $x^2\left(x-y\right)y^2\left(x+2y\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$\begin{aligned}&x^2\left(x-y\right)y^2\left(x+2y\right)\\&=\left[x^2\left(x-y\right)\right]\left[y^2\left(x+2y\right)\right]\\&=\left(x^3-x^2y\right)\left(xy^2+2y^3\right)\\&=x^3\left(xy^2+2y^3\right)-x^2y\left(xy^2+2y^3\right)\\&=x^4y^2+2x^3y^3-\left[x^3y^3+2x^2y^4\right]\\&=x^4y^2+2x^3y^3-x^3y^3-2x^2y^4\\&=x^4y^2+x^3y^3-2x^2y^4\end{aligned}$$

Thus, the answer is

$$\begin{aligned}&x^4y^2+2x^3y^3-x^3y^3-2x^2y^4\\&=x^4y^2+x^3y^3-2x^2y^4\end{aligned}$$

Q24. $\left(x^3 - 2x^2 + 5x - 7\right)(2x - 3)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$\left(x^3 - 2x^2 + 5x - 7\right)(2x - 3)$$
$$= 2x\left(x^3 - 2x^2 + 5x - 7\right) - 3\left(x^3 - 2x^2 + 5x - 7\right)$$
$$= 2x^4 - 4x^3 + 10x^2 - 14x - 3x^3 + 6x^2 - 15x + 21$$
$$= 2x^4 - 4x^3 - 3x^3 + 10x^2 + 6x^2 - 14x - 15x + 21$$
$$= 2x^4 - 7x^3 + 16x^2 - 29x + 21$$

Thus, the answer is $2x^4 - 7x^3 + 16x^2 - 29x + 21$.

Q25. $2x^4 - 7x^3 + 16x^2 - 29x + 21$

SOLUTION:

To simplify, we will use distributive law as follows:

$$(5x + 3)(x - 1)(3x - 2)$$
$$= [(5x + 3)(x - 1)](3x - 2)$$
$$= [5x(x - 1) + 3(x - 1)](3x - 2)$$
$$= \left[5x^2 - 5x + 3x - 3\right](3x - 2)$$
$$= 3x\left(5x^2 + 2x - 3\right) - 2\left(5x^2 + 2x - 3\right)$$
$$= 15x^3 - 6x^2 - 9x - \left[10x^2 - 4x - 6\right]$$

$= 15x^3 - 6x^2 - 9x - 10x^2 + 4x + 6$
$= 15x^3 - 16x^2 - 5x + 6$
Thus, the answer is
$15x^3 - 6x^2 - 9x - 10x^2 + 4x + 6$
$= 15x^3 - 16x^2 - 5x + 6$
.

Q26. $(5 - x)(6 - 5x)(2 - x)$

SOLUTION:

To simplify, we will use distributive law as follows:

$(5 - x)(6 - 5x)(2 - x)$
$= [(5 - x)(6 - 5x)](2 - x)$
$= [5(6 - 5x) - x(6 - 5x)](2 - x)$
$= \left(30 - 25x - 6x + 5x^2\right)(2 - x)$
$= \left(30 - 31x + 5x^2\right)(2 - x)$
$= 2\left(30 - 31x + 5x^2\right) - x\left(30 - 31x + 5x^2\right)$
$= 60 - 62x + 10x^2 - 30x + 31x^2 - 5x^3$
$= 60 - 92x + 41x^2 - 5x^3$
Thus, the answer is $60 - 92x + 41x^2 - 5x^3$.

Q27. $(2x^2+3x-5)(3x^2-5x+4)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$(2x^2+3x-5)(3x^2-5x+4)$$
$$=2x^2(3x^2-5x+4)+3x(3x^2-5x+4)-5(3x^2-5x+4)$$
$$=6x^4-10x^3+8x^2+9x^3-15x^2+12x-15x^2+25x-20$$
$$=6x^4-10x^3+9x^3+8x^2-15x^2-15x^2+25x+12x-20$$
$$=6x^4-x^3-22x^2+36x-20$$

Thus, the answer is $6x^4-x^3-22x^2+36x-20$.

Q28. $(3x-2)(2x-3)+(5x-3)(x+1)$

SOLUTION:

To simplify, we will use distributive law as follows:

$$(3x-2)(2x-3)+(5x-3)(x+1)$$
$$=[(3x-2)(2x-3)]+[(5x-3)(x+1)]$$
$$=[3x(2x-3)-2(2x-3)]+[5x(x+1)-3(x+1)]$$
$$=6x^2-9x-4x+6+5x^2+5x-3x-3$$
$$=6x^2+5x^2-9x-4x+5x-3x-3+6$$
$$=11x^2-11x+3$$

Thus, the answer is $11x^2-11x+3$.

Q29. $(5x-3)(x+2)-(2x+5)(4x-3)$

SOLUTION:

To simplify, we will use distributive law as follows:

$(5x-3)(x+2)-(2x+5)(4x-3)$
$=[(5x-3)(x+2)]-[(2x+5)(4x-3)]$
$=[5x(x+2)-3(x+2)]-[2x(4x-3)+5(4x-3)]$
$=5x^2+10x-3x-6+8x^2+6x-20x+15$
$=5x^2-8x^2+10x-3x+6x-20x-6+15$
$=-3x^2-7x+9$
Thus, the answer is $-3x^2-7x+9$.

Q30. $(3x+2y)(4x+3y)-(2x-y)(7x-3y)$

SOLUTION:

To simplify, we will use distributive law as follows:

$(3x+2y)(4x+3y)-(2x-y)(7x-3y)$
$=[(3x+2y)(4x+3y)]-[(2x-y)(7x-3y)]$
$=[3x(4x+3y)+2y(4x+3y)]-[2x(7x-3y)-y(7x-3y)]$
$=12x^2+9xy+8xy+6y^2-14x^2+6xy+7xy-3y^2$
$=12x^2-14x^2+9xy+8xy+6xy+7xy+6y^2-3y^2$
$=-2x^2+30xy+3y^2$
Thus, the answer is $-2x^2+30xy+3y^2$.

Q31. $\left(x^2-3x+2\right)(5x-2)-\left(3x^2+4x-5\right)(2x-1)$

SOLUTION:

To simplify, we will use distributive law as follows:

$\left(x^2-3x+2\right)(5x-2)-\left(3x^2+4x-5\right)(2x-1)$
$=\left[\left(x^2-3x+2\right)(5x-2)\right]-\left[\left(3x^2+4x-5\right)(2x-1)\right]$
$=\left[5x\left(x^2-3x+2\right)-2\left(x^2-3x+2\right)\right]-\left[2x\left(3x^2+4x-5\right)-1\left(3x^2+4x-5\right)\right]$
$=\left[5x^3-15x^2+10x-2x^2+6x-4\right]-\left[6x^3+8x^2-10x-3x^2-4x+5\right]$
$=5x^3-15x^2+10x-2x^2+6x-4-6x^3-8x^2+10x+3x^2+4x-5$
$=-x^3-22x^2+30x-9$
Thus, the answer is $-x^3-22x^2+30x-9$.

Q32. $\left(x^3-2x^2+3x-4\right)(x-1)-(2x-3)\left(x^2-x+1\right)$

SOLUTION:

To simplify, we will use distributive law as follows:

$\left(x^3-2x^2+3x-4\right)(x-1)-(2x-3)\left(x^2-x+1\right)$
$=\left[\left(x^3-2x^2+3x-4\right)(x-1)\right]-\left[(2x-3)\left(x^2-x+1\right)\right]$
$=\left[x\left(x^3-2x^2+3x-4\right)-1\left(x^3-2x^2+3x-4\right)\right]-\left[2x\left(x^2-x+1\right)-3\left(x^2-x+1\right)\right]$
$=x^4-2x^3+3x^2-4x-x^3+2x^2-3x+4-2x^3+2x^2-2x+3x^2-3x+3$
$=x^4-2x^3-2x^3-x^3+3x^2+2x^2+2x^2+3x^2-4x-3x-2x-3x+4+3$
$=x^4-5x^3+10x^2-12x+7$
Thus, the answer is $x^4-5x^3+10x^2-12x+7$.

Exercice: 6.6

Q1 Write the following squares of binomials as trinomials

We know that, $(a+b)^2 = a^2 + 2ab + b^2$ and

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

(i) $(x+2)^2$

Sol:

$(x+2)^2$ is in the form of $(a+b)^2 = a^2 + 2ab + b^2$

here, a = x , b = 2

=> $x^2 + 2 \times x \times 2 + b^2$

=> $x^2 + 4x + b^2$

(ii) $(8a+3b)^2$

Sol:

$(8a+3b)^2$ is in the form of $(a+b)^2 = a^2 + 2ab + b^2$

here, a = 8a, b = 3b

=> $(8a)^2 + 2 \times (8a) \times (3b) + (3b)^2$

=> $64^2 + 48ab + 36b^2$

(iii) $(2m+1)^2$

Sol:

$(2m+1)^2$ is in the form of $(a+b)^2 = a^2+2ab+b^2$

here, a =2m, b = 1

=> $(2m)^2 + 2 \times (2m) \times (1) + (1)^2$

=> $4m^2 + 4m + 1$

(iv) $(9a + \frac{1}{6})^2$

Sol:

$(9a + \frac{1}{6})^2$ is in the form of $(a+b)^2 = a^2+2ab+b^2$

here, a = 9a, b = $\frac{1}{6}$

=> $(9a)^2 + 2 \times (9a) \times (\frac{1}{6}) + (\frac{1}{6})^2$

=> $81a^2 + 3a + \frac{1}{36}$

(v) $(x + \frac{x^2}{2})^2$

Sol:

$(x + \frac{x^2}{2})^2$ is in the form of $(a+b)^2 = a^2+2ab+b^2$

here, a = x, b = $\frac{x^2}{2}$

=> $x^2+2\times x\times(\frac{x^2}{2})+(\frac{x^2}{2})^2$

=> $x^2+x^3+\frac{x^4}{4}$

(vi) $(\frac{x}{4}-\frac{y}{3})^2$

Sol:

$(\frac{x}{4}-\frac{y}{3})^2$ is in the form of $(a-b)^2=a^2-2ab+b^2$

here, a = $\frac{x}{4}$, b = $\frac{y}{3}$

=> $(\frac{x}{4})^2-2\times(\frac{x}{4})\times(\frac{y}{3})+(\frac{y}{3})^2$

=> $\frac{x^2}{16}-\frac{1}{6}xy+\frac{y^2}{9}$

(vii) $(3x-\frac{1}{3x})^2$

Sol:

$(3x-\frac{1}{3x})^2$ is in the form of $(a-b)^2=a^2-2ab+b^2$

here, a = 3x, b = $\frac{1}{3x}$

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

=> $9x^2-2+\frac{1}{9x^2}$

(viii) $(\frac{x}{y}-\frac{y}{x})^2$

Sol:

$(\frac{x}{y} - \frac{y}{x})^2$ is in the form of $(a - b)^2 = a^2 - 2ab + b^2$

here, a = $\frac{x}{y}$, b = $\frac{y}{x}$

=> $(\frac{x}{y})^2 - 2 \times (\frac{x}{y}) \times (\frac{y}{x}) + (\frac{y}{x})^2$

=> $\frac{x^2}{y^2} - 2 + \frac{y^2}{x^2}$

(ix) $(\frac{3a}{2} - \frac{5b}{4})^2$

Sol:

$(\frac{3a}{2} - \frac{5b}{4})^2$ is in the form of $(a - b)^2 = a^2 - 2ab + b^2$

here, a = $\frac{3a}{2}$, b = $\frac{5b}{4}$

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

=> $\frac{9a^2}{4} - \frac{15ab}{4} + \frac{25b^2}{16}$

(x) $(a^2b - bc^2)^2$

Sol:

$(a^2b - bc^2)^2$ is in the form of $(a - b)^2 = a^2 - 2ab + b^2$

here, a = a^2b, b = bc^2

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

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

Q2 Find the product of the following binomials

(i) (2x + y) (2x + y)

sol:

(2x + y) (2x + y) can be written as $(2x+y)^2$

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

we know that, $(a+b)^2 = a^2+2ab+b^2$

=> $(2x)^2 + 2 \times (2x) \times (y) + y^2$

=> $4x^2 + 4xy + y^2$

(ii) (a + 2b) (a − 2b)

sol:

we know that (a + b) (a − b) = $a^2 - b^2$

here, a = a, b = 2b

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

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

(iii) $(a^2+bc) - (a^2 - bc)$

sol:

we know that (a + b) (a − b) = $a^2 - b^2$

here, a = a^2, b = bc

=> $(a^2)^2 - (bc)^2$

=> $a^4 - b^2c^2$

(iv) $(\frac{4x}{5}-\frac{3y}{4})(\frac{4x}{5}+\frac{3y}{4})$

sol:

we know that (a + b) (a − b) = a^2-b^2

here, a = $\frac{4x}{5}$, b = $\frac{3y}{4}$

=> $(\frac{4x}{5})^2-(\frac{3y}{4})^2$

=> $\frac{16x^2}{25}-\frac{9y^2}{16}$

(v) $(2x+\frac{3}{y})(2x-\frac{3}{y})$

sol:

we know that (a + b) (a − b) = a^2-b^2

here, a = 2x, b = $\frac{3}{y}$

=> $(2x)^2-(\frac{3}{y})^2$

=> $4x^2-\frac{9}{y^2}$

(vi) $(2a^3+b^3)(2a^3-b^3)$

sol:

we know that (a + b) (a − b) = a^2-b^2

here, a = $2a^3$, b = b^3

=> $(2a^3)^2-(b^3)^2$

=> $4a^6-b^6$

(vii) $(x^4+\frac{2}{x^2})(x^4-\frac{2}{x^2})$

sol:

sol:

we know that (a + b) (a − b) = $a^2 - b^2$

here, a= x^4, b = $\frac{2}{x^2}$

=> $(x^4)^2 - (\frac{2}{x^2})^2$

=> $x^8 - \frac{4}{x^4}$

(viii) $(x^3 + \frac{1}{x^3})(x^3 - \frac{1}{x^3})$

sol:

we know that (a + b) (a − b) = $a^2 - b^2$

here, a = x^3, b = $\frac{1}{x^3}$

=> $(x^3)^2 - (\frac{1}{x^3})^2$

=> $x^6 - \frac{1}{x^6}$

Q3 Using the formula for squaring a binomial, evaluate the following

(i) $(102)^2$

sol:

$(102)^2$ can be written as $(100 + 2)^2$

we know that, $(a + b)^2 = a^2 + 2ab + b^2$

here, a = 100, b = 2

=> $(100 + 2)^2$

=> $(100)^2 + 2 \times (100) \times 2 + 2^2$

=> 10000 + 400 + 4

=> 10404

(ii) $(99)^2$

sol:

$(99)^2$ can be written as $(100-1)^2$

we know that, $(a-b)^2 = a^2-2ab+b^2$

here, a = 100, b = 1

=> $(100-1)^2$

=> $(100)^2-2\times(100)\times1+1^2$

=> 10000 − 200 + 1

=> 9801

(iii) $(1001)^2$

sol:

$(1001)^2$ can be written as $(1000+1)^2$

we know that, $(a+b)^2 = a^2+2ab+b^2$

here, a = 1000, b = 1

=> $(1000+1)^2$

=> $(1000)^2+2\times(1000)\times1+1^2$

=> 1000000 + 2000 + 1

=> 1002001

(iv) $(999)^2$

sol:

$(999)^2$ can be written as $(1000 – 1)^2$

we know that, $(a – b)^2 = a^2 – 2ab + b^2$

here, a = 1000, b = 1

=> $(1000 – 1)^2$

=> $(1000)^2 – 2 \times (1000) \times 1 + 1^2$

=> 1000000 – 2000 + 1

=> 998001

(v) $(703)^2$

sol:

$(703)^2$ can be written as $(700 + 3)^2$

we know that, $(a + b)^2 = a^2 + 2ab + b^2$

here, a = 700, b = 3

=> $(700 + 3)^2$

=> $(700)^2 + 2 \times (700) \times 3 + 3^2$

=> 490000 + 4200 + 9

=> 494209

Q4 Simplify the following using the formula: (a + b) (a − b) = $a^2 - b^2$

(i) $(82)^2 - (18)^2$

sol:

$(82)^2 - (18)^2$
here, a = 82, b = 18

=> (82 + 18) (82 − 18)

=> 100×64

=> 6400

(ii) $(467)^2 - (33)^2$

sol:

$(467)^2 - (33)^2$
here, a = 467, b = 33

=> (467 + 33) (467 − 33)

=> 500×434

=> 217000

(iii) $(79)^2 - (69)^2$

sol:

$(79)^2 - (69)^2$
here, a = 79, b = 69

=> (79 + 69) (79 − 69)

=> 148×10

=> 1480

(iv) 197×203

sol:

Since, $\frac{197+203}{2}$ = $\frac{400}{2}$ = 200

197×203 can be written as (200 + 3) (200 – 3)

=> (200 + 3) (200 – 3)

=> $(200)^2 - (3)^2$

=> 40000 – 9

=> 39991

(v) 113×87

sol:

Since, $\frac{113+87}{2}$ = $\frac{200}{2}$ = 100

113×87 can be written as (100 + 13) (100 – 13)

=> (100 + 13) (100 – 13)

=> $(100)^2 - (13)^2$

=> 10000 – 169

=> 9831

(vi) 95×105

sol:

Since, $\frac{95+105}{2}$ = $\frac{200}{2}$ = 100

95×105 can be written as (100 + 5) (100 – 5)

=> (100 + 5) (100 – 5)

=> $(100)^2 - (5)^2$

=> 10000 – 25

=> 9975

(vii) 1.8×2.2

sol:

Since, $\frac{1.8+2.2}{2}$ = $\frac{4}{2}$ = 2

1.8×2.2 can be written as (2 + 0.2) (2 − 0.2)

=> (2 + 0.2) (2 − 0.2)

=> $(2)^2 - (0.2)^2$

=> 4 − 0.04

=> 3.96

(viii) 9.8×10.2

sol:

Since, $\frac{9.8+10.2}{2}$ = $\frac{20}{2}$ = 10

9.8×10.2 can be written as (10 + 0.2) (10 − 0.2)

=> (10 + 0.2) (10 − 0.2)

=> $(10)^2 - (0.2)^2$

=> 100 − 0.04

=> 99.96

Q5 Simplify the following using identities

(i) $\frac{(58)^2-(42)^2}{16}$

sol:

The numerator is in the form of (a + b) (a − b) = a^2-b^2

$\frac{(58)^2-(42)^2}{16} = \frac{(58+42)(58-42)}{16}$

=> $\frac{(58)^2-(42)^2}{16} = \frac{100\times16}{16}$

=> $\frac{(58)^2-(42)^2}{16}$ = 100

(ii) $(178 \times 178) - (22 \times 22)$

sol:

we know that, (a + b) (a − b) = a^2-b^2

=> $(178 \times 178) - (22 \times 22) = (178)^2 - (22)^2$

=> $(178 \times 178) - (22 \times 22)$ = (178 + 22) (178 − 22)

=> $(178 \times 178) - (22 \times 22)$ = 200 $\times$ 156

=> $(178 \times 178) - (22 \times 22)$ = 31200

(iii) $\frac{(198\times198)-(102\times102)}{96}$

sol:

we know that, (a + b) (a − b) = a^2-b^2

=> $\frac{(198\times198)-(102\times102)}{96} = \frac{(198)^2-(102)^2}{96}$

=> $\frac{(198\times198)-(102\times102)}{96} = \frac{(198+102)(198-102)}{96}$

=> $\frac{(198\times198)-(102\times102)}{96} = \frac{300\times96}{96}$

=> $\frac{(198\times198)-(102\times102)}{96}$ = 300

(iv) $(1.73 \times 1.73) - (0.27 \times 0.27)$

sol:

we know that, (a + b) (a − b) = $a^2 - b^2$

=> $(1.73 \times 1.73) - (0.27 \times 0.27)$ = $(1.73)^2 - (0.27)^2$

=> $(1.73 \times 1.73) - (0.27 \times 0.27)$ = (1.73 + 0.27) (1.73 − 0.27)

=> $(1.73 \times 1.73) - (0.27 \times 0.27)$ = 2×1.46

=> $(1.73 \times 1.73) - (0.27 \times 0.27)$ = 2.92

(v) $\frac{(8.63 \times 8.63) - (1.37 \times 1.37)}{0.726}$

sol:

we know that, (a + b) (a − b) = $a^2 - b^2$

=> $\frac{(8.63 \times 8.63) - (1.37 \times 1.37)}{0.726}$ = $\frac{(8.63)^2 - (1.37)^2}{0.726}$

=> $\frac{(8.63 \times 8.63) - (1.37 \times 1.37)}{0.726}$ = $\frac{(8.63 + 1.37)(8.63 - 1.37)}{0.726}$

=> $\frac{(8.63 \times 8.63) - (1.37 \times 1.37)}{0.726}$ = $\frac{10 \times 7.26}{0.726}$

=> $\frac{(8.63 \times 8.63) - (1.37 \times 1.37)}{0.726}$ = 10×10

=> $\frac{(8.63 \times 8.63) - (1.37 \times 1.37)}{0.726}$ = 100

Q6 Find the value of x, if:

(i) $4x = (52)^2 – (48)^2$

sol:

we know that, (a + b) (a − b) = $a^2 – b^2$

=> $4x = (52)^2 – (48)^2$

=> 4x = (52 + 48) (52 − 48)

=> 4x = 100×4

=> 4x = 400

=> x = $\frac{400}{4}$

=> x = 100

(ii) $14x = (47)^2 – (33)^2$

sol:

we know that, (a + b) (a − b) = $a^2 – b^2$

=> $14x = (47)^2 – (33)^2$

=> 14x = (47 + 33) (47 − 33)

=> 14x = 80×14

=> 14x = 1120

=> x = $\frac{1120}{14}$

=> x = 80

(iii) $5x = (50)^2 – (40)^2$

sol:

we know that, (a + b) (a − b) = $a^2 – b^2$

=> $5x = (50)^2 – (40)^2$

=> 5x = (50 + 40) (50 − 40)

=> 5x = 90×10

=> 5x = 900

=> x = $\frac{900}{5}$

=> x = 180

Q7 If $x+\frac{1}{x}=20$, find the value of $x^2+\frac{1}{x^2}$

sol:

Given that,

$x+\frac{1}{x}=20$
squaring on both sides

=> $(x+\frac{1}{x})^2=(20)^2$

=> $(x+\frac{1}{x})^2=400$

we know that, $(a+b)^2=a^2+2ab+b^2$

=> $x^2+2\times x\times\frac{1}{x}+(\frac{1}{x})^2=400$

=> $x^2+2+(\frac{1}{x})^2=400$

=> $x^2+\frac{1}{x^2}=400-2$

=> $x^2+\frac{1}{x^2}=398$

hence, $x^2+\frac{1}{x^2}=398$

Q8 If $x - \frac{1}{x} = 3$, find the values of $x^2 + \frac{1}{x^2}$, $x^4 + \frac{1}{x^4}$

sol:

Given that,

$x - \frac{1}{x} = 3$
squaring on both sides

=> $(x - \frac{1}{x})^2 = (3)^2$

=> $(x - \frac{1}{x})^2 = 9$

we know that, $(a - b)^2 = a^2 - 2ab + b^2$

=> $x^2 - 2 \times x \times \frac{1}{x} + (\frac{1}{x})^2 = 9$

=> $x^2 - 2 + (\frac{1}{x})^2 = 9$

=> $x^2 + \frac{1}{x^2} = 9 + 2$

=> $x^2 + \frac{1}{x^2} = 11$

Again, squaring on both sides

=> $(x^2 + \frac{1}{x^2})^2 = (11)^2$

=> $(x^2 + \frac{1}{x^2})^2 = 121$

=> $x^2 + 2 \times (x^2) \times (\frac{1}{x^2}) + (\frac{1}{x^2})^2 = 121$

=> $x^4 + 2 + \frac{1}{x^4} = 121$

=> $x^4 + \frac{1}{x^4} = 121 - 2$

=> $x^4 + \frac{1}{x^4} = 119$

hence, $x^4 + \frac{1}{x^4} = 119$

Q9 If $x^2+\frac{1}{x^2}=18$, find the values of $x+\frac{1}{x}$, $x-\frac{1}{x}$

sol:

Given that,

$x^2+\frac{1}{x^2}=18$, find the values of $x+\frac{1}{x}$, $x-\frac{1}{x}$

consider, $x+\frac{1}{x}$

squaring the above equation

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

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

=> $(x+\frac{1}{x})^2$ = $x^2+2+\frac{1}{x^2}$

=> $(x+\frac{1}{x})^2$ = 18 + 2

=> $(x+\frac{1}{x})^2$ = 20

=> $x+\frac{1}{x}=\pm\sqrt{20}$

consider, $x-\frac{1}{x}$

squaring the above equation

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

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

=> $(x-\frac{1}{x})^2$ = $x^2-2+\frac{1}{x^2}$

=> $(x-\frac{1}{x})^2$ = 18 − 2

=> $(x-\frac{1}{x})^2$ = 16

=> $x-\frac{1}{x}=\pm\sqrt{20}$

=> $x-\frac{1}{x}=\pm4$

Q10 If x + y = 4 and xy = 2,find the value of $x^2 + y^2$

sol:

Given that,

x + y = 4 and xy = 2

we know that, $(a + b)^2 = a^2 + 2ab + b^2$

=> $x^2 + y^2 = (x + y)^2 – 2xy$

=> $x^2 + y^2 = 4^2 – (2 \times 2)$

=> $x^2 + y^2 = 16 – 4$

=> $x^2 + y^2 = 12$

Q11 If x − y = 7 and xy = 9,find the value of $x^2 + y^2$

sol:

Given that,

x − y = 7 and xy = 9

we know that, $(a – b)^2 = a^2 – 2ab + b^2$

=> $x^2 – y^2 = (x – y)^2 + 2xy$

=> $x^2 – y^2 = 7^2 + (2 \times 9)$

=> $x^2 – y^2 = 49 + 18$

=> $x^2 – y^2 = 67$

Q12 If 3x + 5y = 11 and xy = 2,find the value of $9x^2 + 25y^2$

sol:

Given that,

3x + 5y = 11 and xy = 2

we know that, $(a+b)^2 = a^2 + 2ab + b^2$

$(3x+5y)^2 = (3x)^2 + 2 \times (3x) \times (5y) + (5y)^2$
=> $(3x+5y)^2 = 9x^2 + 30xy + 25y^2$

=> $9x^2 + 25y^2 = (3x+5y)^2 – 10xy$

=> $9x^2 + 25y^2 = (11)^2 – (30 \times 2)$

=>$9x^2 + 25y^2 = 121 – 60$

=> $9x^2 + 25y^2 = 61$

Q13 Find the values of the following expressions

(i) $16x^2 + 24x + 9$ when x = $\frac{7}{4}$

Sol:

Given, $16x^2 + 24x + 9$ and x = $\frac{7}{4}$

we know that, $(a+b)^2 = a^2 + 2ab + b^2$

$16x^2 + 24x + 9$ = $(4x+3)^2$

=> $16x^2 + 24x + 9$ = $(4(\frac{7}{4})+3)^2$

=> $16x^2 + 24x + 9$ = $(7+3)^2$

=> $16x^2 + 24x + 9$ = $(10)^2$

=> $16x^2 + 24x + 9$ = 100

(ii) $64x^2 + 81y^2 + 144xy$ when x = 11 and y = $\frac{4}{3}$

sol:

Given, $64x^2 + 81y^2 + 144xy$ and x = 11, y = $\frac{4}{3}$

we know that, $(a + b)^2 = a^2 + 2ab + b^2$

$64x^2 + 81y^2 + 144xy$ = $(8x + 9y)^2$

=> $64x^2 + 81y^2 + 144xy$ = $(8(11) + 9(\frac{4}{3}))^2$

=> $64x^2 + 81y^2 + 144xy$ = $(88 + 12)^2$

=> $64x^2 + 81y^2 + 144xy$ = $(100)^2$

=> $64x^2 + 81y^2 + 144xy$ = 10000

(iii) $81x^2 + 16y^2 - 72xy$ when x = $\frac{2}{3}$

and y = $\frac{3}{4}$

sol:

Given that, $81x^2 + 16y^2 - 72xy$ and x = $\frac{2}{3}$,

y = $\frac{3}{4}$

we know that, $(a - b)^2 = a^2 - 2ab + b^2$

$81x^2 + 16y^2 - 72xy$ = $(9x - 4y)^2$

=> $81x^2 + 16y^2 - 72xy$ = $(9(\frac{2}{3}) - 4(\frac{3}{4}))^2$

=> $81x^2 + 16y^2 - 72xy$ = $(6 - 3)^2$

=> $81x^2 + 16y^2 - 72xy$ = 3^2

=> $81x^2 + 16y^2 - 72xy$ = 9

Q14 If $x + \frac{1}{x}$ = 9, find the value of $x^4 + \frac{1}{x^4}$

sol:

Given,

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

squaring on both sides

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

=> $(x + \frac{1}{x})^2 = 81$

=> $x^2 + 2 \times x \times \frac{1}{x} + (\frac{1}{x})^2 = 81$

=> $x^2 + 2 + \frac{1}{x^2} = 81$

=> $x^2 + \frac{1}{x^2} = 81 - 2$

=> $x^2 + \frac{1}{x^2} = 79$

Again, squaring on both sides

$(x^2 + \frac{1}{x^2})^2 = (79)^2$

=> $(x^2 + \frac{1}{x^2})^2 = 6241$

=> $(x^2)^2 + 2 \times (x^2) \times (\frac{1}{x^2}) + (\frac{1}{x^2})^2$ = 6241

=> $x^4 + 2 + \frac{1}{x^4} = 6241$

=> $x^4 + \frac{1}{x^4} = 6241 - 2$

=> $x^4 + \frac{1}{x^4} = 6239$

Q15 If $x+\frac{1}{x}$ = 12, find the value of $x-\frac{1}{x}$

sol:

Given that,

$x+\frac{1}{x}$ = 12

squaring on both sides

$(x+\frac{1}{x})^2=(12)^2$
=> $(x+\frac{1}{x})^2=144$

=> $x^2+2\times x\times\frac{1}{x}+(\frac{1}{x})^2=144$

=> $x^2+2+\frac{1}{x^2}=144$

=> $x^2+\frac{1}{x^2}=144-2$

=> $x^2+\frac{1}{x^2}=142$

Here,

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

=> $(x-\frac{1}{x})^2=x^2-2+\frac{1}{x^2}$

=> $(x-\frac{1}{x})^2=142-2$

=> $(x-\frac{1}{x})^2=140$

=> $x-\frac{1}{x}=\pm\sqrt{40}$

Q16 If 2x + 3y = 14 and 2x − 3y = 2, find the value of xy

Sol:

we know that, $(a+b)(a-b) = a^2 - b^2$

Given, 2x + 3y = 14 and 2x − 3y = 2

squaring (2x + 3y) and (2x − 3y) and then subtracting them, we get

$(2x+3y)^2 - (2x-3y)^2 = [(2x+3y)+(2x-3y)][(2x+3y)-(2x-3y)]$
=> $(2x+3y)^2 - (2x-3y)^2 = 4x \times 6y$

=> $(2x+3y)^2 - (2x-3y)^2 = 24xy$

=> $(14)^2 - (2)^2 = 24xy$

=> (14 + 2) (14 − 2) = 24xy

=> $16 \times 12 = 24xy$

=> 24xy = 192

=> xy = $\frac{192}{8}$

=> xy = 8

hence, xy = 8

Q17 If $x^2 + y^2 = 29$ and xy = 2, Find the value of

(i) x + y

sol

Given,

$x^2 + y^2 = 29$ and xy = 2

squaring the (x + y)

$(x+y)^2 = x^2 + 2 \times x \times y + y^2$
=> $(x+y)^2 = 29 + (2 \times 2)$

=> $(x+y)^2 = 29 + 4$

=> $(x+y)^2 = 33$

=> $x + y = \pm\sqrt{33}$

(ii) x − y

sol:

Given,

$x^2 + y^2 = 29$ and xy = 2

squaring the (x − y)

$(x - y)^2 = x^2 - 2 \times x \times y + y^2$
=> $(x - y)^2 = 29 - (2 \times 2)$

=> $(x - y)^2 = 29 - 4$

=> $(x - y)^2 = 25$

=> $x - y = \pm\sqrt{25}$

=> $x + y = \pm 5$

(iii) $x^4 + y^4$

Sol:

Given,

$x^2 + y^2 = 29$ and xy = 2

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

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

=> $x^4 + y^4 = (29)^2 - 2(2)^2$

=> $x^4 + y^4 = 841 - 8$

=> $x^4 + y^4 = 833$

Exercise: 6.7

Q1) Find the following products:

(i) $(x + 4)(x + 7)$

(ii) $(x - 11)(x + 4)$

(iii) $(x + 7)(x - 5)$

(iv) $(x - 3)(x - 2)$

(v) $(y^2 - 4)(y^2 - 3)$

(vi) $\left(x + \frac{4}{3}\right)\left(x + \frac{3}{4}\right)$

(vii) $(3x + 5)(3x + 11)$

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

(ix) $(z^2 + 2)(z^2 - 3)$

(x) $(3x - 4y)(2x - 4y)$

(xi) $(3x^2 - 4xy)(3x^2 - 3xy)$

(xii) $(x + \frac{1}{5})(x + 5)$

(xiii) $(z + \frac{3}{4})(z + \frac{4}{3})$

(xiv) $(x^2 + 4)(x^2 + 9)$

(xv) $(y^2 + 12)(y^2 + 6)$

(xvi) $(y^2 + \frac{5}{7})(y^2 - \frac{14}{5})$

(xvii) $(p^2 + 16)(p^2 - \frac{1}{4})$

Solution:

(i) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$.

$(x + 4)(x + 7)$

$= x^2 + (4 + 7)x + 4 \times 7$

$= x^2 + 11x + 28$

(ii) Here, we will use the identity $(x - a)(x + b) = x^2 + (b - a)x - ab$.

$(x - 11)(x + 4)$

$= x^2 + (4 - 11)x - 11 \times 4$

$= x^2 - 7x - 44$

(iii) Here, we will use the identity (x + a) (x − b) = x^2 + (a − b)x − ab.

(x + 7) (x − 5)

= $x^2+(7-5)x-7\times5$

= $x^2+2x-35$

(iv) Here, we will use the identity (x − a) (x − b) = x^2 − (a + b)x + ab.

(x − 3) (x − 2)

= $x^2-(3+2)x+3\times2$

= x^2-5x+6

(v) Here, we will use the identity (x − a) (x − b) = x^2 − (a + b)x − ab.

(y^2 − 4) (y^2 − 3)

= $(y^2)^2-(4+3)(y^2)+4\times3$

= y^4-7y^2+12

(vi) Here, we will use the identity (x + a) (x + b) = x^2 + (a + b)x + ab.

$(x+\frac{4}{3})\ (x+\frac{3}{4})$

= $x^2+(\frac{4}{3}+\frac{3}{4})x+\frac{4}{3}\times\frac{3}{4})$

= $x^2+\frac{25}{12}x+1$

(vii) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$.

$(3x + 5)(3x + 11)$

$= (3x)^2 + (5 + 11)(3x) + 5 \times 11$

$= 9x^2 + 48x + 55$

(viii) Here, we will use the identity $(x - a)(x + b) = x^2 + (b - a)x - ab$.

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

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

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

(ix) Here, we will use the identity $(x + a)(x - b) = x^2 + (a - b)x - ab$.

$(z^2 + 2)(z^2 - 3)$

$= (z^2)^2 + (2 - 3)(z^2) - 2 \times 3$

$= z^4 - z^2 - 6$

(x) Here, we will use the identity $(x - a)(x - b) = x^2 - (a + b)x - ab$.

$(3x - 4y)(2x - 4y)$

$= (4y - 3x)(4y - 2x)$ (Taking common -1 from both parentheses)

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

$= 16y^2 - (12xy + 8xy) + 6x^2$

$= 16y^2 - 20xy + 6x^2$

(xi) Here, we will use the identity $(x - a)(x - b) = x^2 - (a + b)x - ab$.

$(3x^2 - 4xy)(3x^2 - 3xy)$

$= (3x^2)^2 - (4xy + 3xy)(3x^2) + 4xy \times 3xy$

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

$= 9x^4 - 21x^3y + 12x^2y^2$

(xii) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$.

$(x + \frac{1}{5})(x + 5)$

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

$= x^2 + \frac{26}{5}x + 1$

(xiii) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$.

$(z + \frac{3}{4})(z + \frac{4}{3})$

$= z^2 + (\frac{3}{4} + \frac{4}{3})x + \frac{3}{4} \times \frac{4}{3}$

$= z^2 + \frac{25}{12}x + 1$

(xiv) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$.

$(x^2 + 4)(x^2 + 9)$

$= (x^2)^2 + (4 + 9)(x^2) + 4 \times 9$

$= x^4 + 13x^2 + 36$

(xv) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$.

$(y^2 + 12)(y^2 + 6)$

$= (y^2)^2 + (12 + 6)(y^2) + 12 \times 6$

$= y^4 + 18xy^2 + 72$

(xvi) Here, we will use the identity (x + a) (x − b) = x^2 + (a − b)x −ab.

$(y^2 + \frac{5}{7})\ (y^2 - \frac{14}{5})$

= $(y^2)^2 + (\frac{5}{7} - \frac{14}{5})(y^2) - \frac{5}{7} \times \frac{14}{5}$

= $y^4 - \frac{73}{35}y^2 - 2$

(xvii) Here, we will use the identity (x + a) (x − b) = x^2 + (a − b)x −ab.

$(p^2 + 16)\ (p^2 - \frac{1}{4})$

= $(p^2)^2 + (16 - \frac{1}{4})(p^2) - 16 \times \frac{1}{4}$

= $p^4 + \frac{63}{4}p^2 - 4$

Q2. Evaluate the following:

(i) 102 x 106

(ii) 109 x 107

(iii) 35 x 37

(iv) 53 x 55

(v) 103 x 96

(vi) 34 x 36

(vii) 994 x 1006

Solution:

(i) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

102 x 106

$= (100 + 2)(100 + 6)$

$= 100^2 + (2 + 6)100 + 2 \times 6$

$= 10000 + 800 + 12 = 10812$

(ii) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

109 x 107

$= (100 + 9)(100 + 7)$

$= 100^2 + (9 + 7)100 + 9 \times 7$

$= 10000 + 1600 + 63 = 11663$

(iii) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

35 x 37

$= (30 + 5)(30 + 7)$

$= 30^2 + (5 + 7)30 + 5 \times 7$

$= 900 + 360 + 35 = 1295$

(iv) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

53×55

$= (50 + 3)(50 + 5)$

$= 50^2 + (3 + 5)50 + 3 \times 5$

$= 2500 + 400 + 15 = 2915$

(v) Here, we will use the identity $(x + a)(x - b) = x^2 + (a - b)x - ab$

103×96

$= (100 + 3)(100 - 4)$

$= 100^2 + (3 - 4)100 - 3 \times 4$

$= 10000 - 100 - 12 = 9888$

(vi) Here, we will use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

34×36

$= (30 + 4)(30 + 6)$

$= 30^2 + (4 + 6)30 + 4 \times 6$

$= 900 + 300 + 24 = 1224$

(vii) Here, we will use the identity $(x - a)(x + b) = x^2 + (b - a)x - ab$

994×1006

$= (1000 - 6) \times (1000 + 6)$

$= 1000^2 + (6 - 6) \times 1000 - 6 \times 6$

$= 1000000 - 36 = 999964$