

Chapter: → Exponents and Powers

Laws of exponents

i. $a^m \times a^n = a^{m+n}$

ii. $a^m \div a^n = a^{m-n}$

(iii) $(a^m)^n = a^{mn}$

(iv) $a^m \times b^m = (ab)^m$

(v) $a^0 = 1$

(vi) $\frac{a^m}{b^m} = \left[\frac{a}{b} \right]^m$

Exercise 11.1

Q1

Q1. Evaluate: →

(i) 3^{-2}

Sol: $3^{-2} = \frac{1}{3^2} = \frac{1}{3 \times 3} = \frac{1}{9}$ Ans.

(ii) $(-4)^{-2}$

Sol: $(-4)^{-2} = \frac{1}{(-4)^2} = \frac{1}{-4 \times -4} = \frac{1}{16}$ Ans.

(iii) $\left(\frac{1}{2}\right)^{-5}$

Sol: $\left(\frac{1}{2}\right)^{-5} = \frac{1}{\left(\frac{1}{2}\right)^5} = \frac{1}{\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}} = \frac{1}{\frac{1}{32}} = 1 \times \frac{32}{1} = 32$ Ans.

Q2 Simplify and express the result in power notation with positive exponents. (P2)

(i) $(-4)^5 \div (-4)^8$

Sol: $(-4)^5 \div (-4)^8$ using $a^m \div a^n = a^{m-n}$

or $(-4)^{5-8} = (-4)^{-3} = \frac{1}{(-4)^3} = \frac{1}{-4 \times -4 \times -4} = \frac{1}{-64}$

in exponent form $\frac{1}{(-4)^3}$ Ans.

(ii) $\left(\frac{1}{2^3}\right)^2 = \frac{(1)^2}{(2^3)^2} = \frac{1}{2^6}$ using $(a^m)^n = a^{mn}$

$\frac{1}{2^6} = \frac{1}{2 \times 2 \times 2 \times 2 \times 2 \times 2} = \frac{1}{64} = \frac{1}{(2)^6}$ Ans.

(iii) $(-3)^4 \times \left(\frac{5}{3}\right)^4$

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

(iv) $(3^{-7} \div 3^{-10}) \times 3^{-5}$

using $a^m \div a^n = a^{m-n}$

$\frac{(3^{-7}) - (3^{-10})}{3} \times 3^{-5}$

$\frac{-7+10}{3} \times 3^{-5}$

$\frac{3^{-5}}{3 \times 3}$

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

$\frac{3^{-5}}{3}$

$\frac{3^{-2}}{3} = \frac{1}{3^2}$ Ans:-

(v) $2^3 \times (-7)^{-3}$ using $a^m \times b^m = (ab)^m$

$= (2 \times -7)^{-3} = (-14)^{-3} = \frac{1}{(-14)^3}$ Ans.

Q3 Find the value of :-

P3

$$(3^0 + 4^{-1}) \times 2^2$$

$$\text{Sol: } (3^0 + 4^{-1}) \times 2^2$$

Any number raised power zero is equal to 1

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

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

$$\frac{5}{4} \times 4 = 5 \text{ Ans.}$$

$$(ii) (2^{-1} \times 4^{-1}) \div 2^{-2}$$

$$(\frac{1}{2} \times \frac{1}{4}) \div 2^{-2}$$

$$(\frac{1}{8}) \div 2^{-2}$$

$$(\frac{1}{2 \times 2 \times 2}) \div 2^{-2}$$

$$\frac{1}{2^3} \div 2^{-2}$$

$$2^{-3} \div 2^{-2} = 2^{-3 - (-2)} = 2^{-3+2} = 2^{-1} = \frac{1}{2} \text{ Ans.}$$

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

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

$$2^2 + 3^2 + 4^2$$

$$= 4 + 9 + 16 = 29 \text{ Ans:}$$

$$(iv) \left(\frac{-1}{3} + \frac{-1}{4} + \frac{-1}{5} \right)^0$$

$$\left(\frac{1}{3} + \frac{1}{4} + \frac{1}{5} \right)^0 = 1$$

Any number raised power zero = 1

$$(v) \left\{ \left(\frac{-2}{3} \right)^2 \right\}^2$$

$$\left[\frac{1}{\left(\frac{-2}{3} \right)^2} \right]^2$$

$$= \left[\frac{1}{-\frac{2}{3} \times -\frac{2}{3}} \right]^2$$

$$= \left[\frac{1}{\frac{4}{9}} \right]^2 = \left[1 \times \frac{9}{4} \right]^2 = \frac{9^2}{4^2} = \frac{9 \times 9}{4 \times 4} = \frac{81}{16} \text{ Ans.}$$

Q4: Evaluate: →

$$\frac{8^{-1} \times 5^3}{2^{-4}}$$

$$\text{Sol:} = \frac{1}{(8)^1} \times 5^3 = \frac{5^3}{1/(8)^1} = \frac{5^3}{(8)^1} \times \frac{2^4}{1}$$

$$= \frac{5 \times 5 \times 5 \times 2 \times 2 \times 2 \times 2}{8 \times 1} = 250$$

Ans:-

(ii) $\left(\frac{1}{5 \times 2}\right) \times 6^{-1}$

8

Sol: $\left(\frac{1}{5} \times \frac{1}{2}\right) \times \frac{1}{6}$
 $= \frac{1}{10} \times \frac{1}{6} = \frac{1}{60}$ Ans.

05: Find the value of m for which
 $5^m \div 5^{-3} = 5^5$

Sol: $5^m \div 5^{-3} = 5^5$
 $= 5^{m - (-3)} = 5^5$
 $m + 3 = 5$ on Comparing the Powers on B/s
 we get

$m + 3 = 5$

$m = 5 - 3$

$m = 2$ Ans.

06: Evaluate: $\rightarrow$

$\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1}$
 Sol: $\left\{(3^{-1})^{-1} - (4^{-1})^{-1}\right\}^{-1}$

$\left\{3^{+1} - 4^{+1}\right\}^{-1}$

$(3 - 4) = (-1) = \frac{1}{(-1)} = \frac{1}{-1} = -1$ Ans: -

(ii) $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4}$

Date

Page

classmate

70

Sol:-

(P6.)

$$\left(\frac{5}{0}\right)^{-7} \times \left(\frac{0}{5}\right)^{-4}$$

$$= \frac{1}{\left(\frac{5}{0}\right)^7} \times \frac{1}{\left(\frac{0}{5}\right)^4}$$

$$= \frac{1}{\frac{5^7}{0^7}} \times \frac{1}{\frac{0^4}{5^4}}$$

$$= 1 \times \frac{0^7}{5^7} \times 1 \times \frac{5^4}{0^4}$$

$$= \frac{\cancel{0} \times \cancel{0} \times \cancel{0} \times \cancel{0} \times \cancel{0} \times \cancel{0} \times \cancel{0} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5}}{\cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{0} \times \cancel{0} \times \cancel{0} \times \cancel{0}}$$

$$= \frac{0 \times 0 \times 0}{5 \times 5 \times 5} = \frac{512}{125} \text{ Ans:-}$$

07: Simplify:-

$$(i) \frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}} \quad (t \neq 0)$$

$$\text{Sol:- } 25 \times \frac{1}{t^4}$$

$$= \frac{25}{t^4}$$

$$\frac{1}{5^3} \times 10 \times t^8$$

$$\frac{2 \times 10 \times t^8}{5 \times 5 \times 5}$$

$$\frac{25}{t^4}$$

$$2t^8$$

$$25$$

$$= \frac{25}{t^4} \times \frac{25}{2 \times t^8}$$

(ii)

$$\frac{3 \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$$

(P7)

$$\text{Sol. } \frac{1}{3^5} \times \frac{1}{10^5} \times 125$$

$$\frac{1}{5^7} \times \frac{1}{6^5}$$

$$= \frac{1}{3^5} \times \frac{1}{10^5} \times 125 \times \frac{5^7}{1} \times \frac{6^5}{1}$$

$$= \frac{125 \times 5^7 \times 6^5}{3^5 \times 10^5}$$

$$= \frac{125 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 6 \times 6 \times 6 \times 6 \times 6}{3 \times 3 \times 3 \times 3 \times 3 \times 10 \times 10 \times 10 \times 10 \times 10}$$

$$= \underline{125 \times 25 = 3125} \text{ Ans:-}$$

Exercise 11.2

Q1. Express the following numbers in Standard form.

(i) 0.000000000000085

$$\text{Sol:- } 0.000000000000085 = \frac{85}{100000000000000}$$

$$= \frac{85}{10^{13}} = 8.5 \times 10^{-13}$$

$$= 8.5 \times 10^1 \times 10^{-13} = 8.5 \times 10^{1-13}$$

$$= \underline{8.5 \times 10^{-12} \text{ Ans}}$$

(ii) 0.000000000000942

Sol. 0.000000000000942

$$\frac{942}{100000000000000} = \frac{942}{10^{14}}$$

$$\frac{9.42 \times 100}{10^{14}} = 9.42 \times 10^2 \times 10^{-14}$$

$$= 9.42 \times 10^{2-14}$$

$$= 9.42 \times 10^{-12} \quad \text{Ans}$$

(iii) 602000000000000
 $= 602 \times 10^{13}$

$$= 6.02 \times 100 \times 10^{13} = 6.02 \times 10^2 \times 10^{13}$$

$$= 6.02 \times 10^{2+13}$$

$$= 6.02 \times 10^{15} \quad \text{Ans}$$

(iv) 0.000000000000037

$$\frac{037}{100000000000000} = \frac{037}{10^{11}}$$

$$\frac{0.37 \times 100}{10^{11}} = 0.37 \times 10^2 \times 10^{-11}$$

$$= 0.37 \times 10^{2-11} = 0.37 \times 10^{-9} \quad \text{Ans}$$

(v)

$$310600000000$$

$$3106 \times 10^7 = 3.106 \times 1000 \times 10^7$$

$$= 3.106 \times 10^3 \times 10^7$$

$$= 3.106 \times 10^{3+7} = 3.106 \times 10^{10} \quad \text{Ans}$$

Q2 Express the following numbers in usual form.

19

(i) 3.02×10^{-6}

Sol: 3.02×10^{-6}

$$= \frac{3.02}{10^6} = \frac{302}{100} \times \frac{1}{10^6} = \frac{302}{10^8}$$

$$= \frac{302}{100000000} = 0.00000302 \text{ Ans.}$$

(ii)

$$4.5 \times 10^4 = 4.5 \times 10000 = \frac{45}{10} \times 10000$$

$$45 \times 10^{-1} \times 10^4 = 45 \times 10^{-1+4} = 45 \times 10^3$$

45000 Ans.

(iii)

$$3 \times 10^{-8} = \frac{3}{10^8} = \frac{3}{100000000}$$

$$= 0.00000003 \text{ Ans.}$$

(iv) 1.0001×10^9

$$\frac{10001}{10000} \times 10^9 = \frac{10001}{10^4} \times 10^9$$

$$10001 \times 10^{-4} \times 10^9 = 10001 \times 10^{-4+9} = 10001 \times 10^5$$

1000100000 Ans.

(v) $5.8 \times 10^{12} = \frac{58}{10} \times 1000000000000$

$$= 58 \times 10^{-1} \times 1000000000000$$

$$= 5800000000000 \text{ Ans}$$

(vi) 3.61492×10^6

$$\frac{361492}{100000} \times 10^6$$

$$\frac{361492}{10^5} \times 10^6 = 361492 \times 10^{-5} \times 10^6$$

$$\quad \quad \quad -5+6$$

$$361492 \times 10$$

$$361492 \times 10$$

$$= 361492 \times 10^1 = 3614920 \text{ Ans.}$$

Q3 - Express the number appearing in the following statements in Standard Form.

(i) 1 micron is equal to $\frac{1}{1000000}$ m

Sol: $1 \text{ micron} = \frac{1}{1000000} \text{ m} = \frac{1}{10^6} \text{ m}$

$$= 1 \times 10^{-6} \text{ m} \quad \text{Ans}$$

[illegible]

$$= \frac{16}{10^{20}} = 1.6 \times 10^{-20} \times 10^{1-20} = 1.6 \times 10^{-19} \text{ Coulomb}$$

$$= 1.6 \times 10^{-19} \text{ Coulomb. Ans.}$$

(iii) Size of bacteria is 0.0000005m .

Sol:- $\gamma 0.0000005$

$$= \frac{5}{100000000} = \frac{5}{10^7} \text{ m}$$

$$= 5 \times 10^{-7} \text{ m Ans}$$

(iv) Size of plant cell = 0.00001275m

(11)

Sol: - 0.00001275m

$$\frac{1275}{100000000} = \frac{1275}{10^8}$$

$$1.275 \times 1000 \times 10^{-8}$$

$$1.275 \times 10^3 \times 10^{-8} = 1.275 \times 10^{3-8} = 1.275 \times 10^{-5}$$

Ans.

(v) Thickness of a normal paper = 0.07mm

$$= \frac{7}{100} \text{ mm} = \frac{7}{10^2} \text{ mm}$$

7 × 10⁻² mm Ans.

Q4

Thickness of 1 book = 20mm

Thickness of 5 books = 20 × 5

$$= 100 \text{ mm} = 10 \text{ cm}$$

note: - 10mm = 1cm

$$1 \text{ mm} = \frac{1}{10} \text{ cm}$$

$$100 \text{ mm} = \frac{1}{10} \times 100 = 10 \text{ cm}$$

Thickness of 1 sheet = 0.016mm

Thickness of 5 sheets = 0.016 × 5

$$= 0.080 \text{ mm}$$

Again: - 10mm = 1cm

$$1 \text{ mm} = \frac{1}{10} \text{ cm}$$

$$0.080 \text{ mm} = \frac{1}{10} \times 0.080 = 0.008 \text{ cm}$$

Total thickness of the stack

Thickness of 5 books + Thickness of 5 sheets
= 10 cm + 0.008 cm = 10.008 cm Ans.

CHAPTER: $\rightarrow$ ALgebraic Expression

Introduction: $\rightarrow$ A Combination of constants and variables connected by four fundamental operations $+$, $-$, $\times$, $\div$ is called an algebraic expression

Single term is known as monomial
two terms as binomial
three terms as trinomial
and in general Polynomial

EXERCISE 9.1

Q1. Identify the terms, their coefficients for each of the following expression.

(i) $5xyz^2 - 3zy$ there are two terms i.e

$5xyz^2$ and $-3zy$

Coefficient of $5xyz^2 = 5$

Coefficient of $-3zy = -3$

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

There are three terms

Coefficient of $4x^2y^2 = 4$

Coefficient of $-4x^2y^2z^2 = -4$

Coefficient of $z^2 = 1$

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

There are three terms

Coefficient of $0.3a = 0.3$

Coefficient of $-0.6ab = -0.6$

Coefficient of $0.5b = 0.5$

Q2. Sol:-

Monomials $1000, Pq/k,$

Bi-nomials $x+y, 2y-3y^2, 4z-15z^2, Pq+Pq^2$

Tri-nomials $7+y+5x, 2y-3y^2+4y^3, 5x-4y+3xy$

Polynomials that do not fit in this categories
 $x+x^2+x^3+x^4$ and $ab+bc+cd+da$

Q3. Add the following

(i) $(ab - bc) + (bc - ca) + (ca - ab)$ Answer: $ab - bc + bc - ca + ca - ab = \text{Zero (0)}$

(ii) $(a - b + ab) + (b - c + bc) + (c - a + ca)$
 $a - b + ab + b - c + bc + c - a + ca$
 $ab + bc + ca$ Answer

(iii) $(2p^2q^2 - 3pq + 4) + (5 + 7pq - 3p^2q^2)$
 $2p^2q^2 - 3pq + 4 + 5 + 7pq - 3p^2q^2$
 Collect the like terms
 $2p^2q^2 - 3p^2q^2 - 3pq + 7pq + 4 + 5$
 $-p^2q^2 - 4pq + 9$ Answer

(iv) $(l^2 + m^2) + (m^2 + n^2) + (n^2 + l^2) +$
 $2lm + 2mn + 2nl$
 $l^2 + m^2 + m^2 + n^2 + n^2 + l^2 + 2lm + 2mn + 2nl$
 Collect like terms
 $l^2 + l^2 + m^2 + m^2 + n^2 + n^2 + 2lm + 2mn + 2nl$
 $2l^2 + 2m^2 + 2n^2 + 2lm + 2mn + 2nl$
 $2(l^2 + m^2 + n^2 + lm + mn + nl)$ Ans.

Q4: → Subtract

(a) $4a - 7ab + 3b + 12$ from $12a - 9ab + 5b - 3$
 Sol: $-(12a - 9ab + 5b - 3) - (4a - 7ab + 3b + 12)$
 $12a - 9ab + 5b - 3 - 4a + 7ab - 3b - 12$
 Collect like terms
 $12a - 4a - 9ab + 7ab + 5b - 3b - 3 - 12$
 $8a - 2ab + 2b - 15$ Answer.

Subtract

b) Solve yourself.

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

Sol: $-(4p^2q - 3pq + 5p^2q^2 - 8p + 7q - 10)$
 $18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q - 4p^2q + 3pq - 8p + 7q + 10$
 Collect like terms

$-3p + 8p - 11q - 7q + 5pq + 3pq - 2pq^2 - 5p^2q +$
 $5p^2q - 4pq + 18 + 10$
 $= 5p - 18q + 8pq - 7pq + pq + 28$ Answer.

Exercise: 9.2

Q1. Find the product of the following monomials

(i) $4, 7P$

Sol: $4 \times 7P = \underline{28P}$

(ii)

$-4P, 7P$

Sol: $\rightarrow -4P \times 7P$
 $= -28P^2$

(iii) $-4P, 7PQ$

Sol: $-4P \times 7PQ$
 $= -28P^2Q$

(iv)

$4P, 0$

Sol: $4P \times 0 = 0$

Q2: Area of rectangle = length $\times$ breadth

(i) (P, q)

$l = P, b = q$

Area of rectangle = $l \times b$
 $= P \times q = Pq$ sq unit

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

Sol $l = 20x^2$

$b = 5y^2$

Area of $\square = l \times b$
 $= 20x^2 \times 5y^2$
 $= 100x^2y^2$ sq unit

(iii)

$4x, 3x^2$

$l = 4x, b = 3x^2$

Area of $\square = l \times b$
 $= 4x \times 3x^2$
 $= 12x^3$ sq unit

(v) $l = 3mn, b = 4np$

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

Area of $\square = 12mnp$ sq unit

Q4: Obtain the volume of rectangle boxes with the following l, b, h , respectively

Sol (i) $l = 5a, b = 3a^2, h = 7a^4$

Volume of rect. box

$= l \times b \times h$

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

$= 105a^7$ cubic unit

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

Vol. of rectangle = $l \times b \times h$

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

$= 6abc$ cubic unit

(v) $l = xy, b = 2x^2y, h = 2xy^2$

Vol: $l \times b \times h$

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

$= 4x^3y^4$

cubic unit

Answer

Q5

Obtain the Product of

(i) xy, yz, zx

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

Sol: $\rightarrow xy \times yz \times zx$

$= x^2 y^2 z^2$ Ans

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

Sol: $-a \times -a^2 \times a^3$

$= -a^6$ Ans

(iv)

$a, 2b, 3c, 6abc$

Sol: $-a \times 2b \times 3c \times 6abc$

$= 36 a^2 b^2 c^2$

Answer.

Sol: $-2 \times 4y \times 8y^2 \times 16y^3$

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

$= 1024 y^6$ Ans

(iii)

$m, -mn, mn^2$

Sol: $m \times -mn \times mn^2$

$= -m^2 n^3$ Ans

Exercise 9.3

Q1. Carry out the multiplication of the expression in each of the pairs.

(i) $4p, q+r$

Sol.

$4p \times (q+r)$

$4pq + 4pr$ Ans

(ii) $ab, a-b$

Sol.

$ab \times (a-b)$

$a^2 b - ab^2$

Answer

(iii)

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

Sol: $(a+b) \times 7a^2 b$

$7a^3 + 7a^2 b$ Ans

(iv)

$(pq+qr+rs), 0$

$(pq+qr+rs) \times 0$

0 zero Ans.

Q3 Find the product of

(i) $(a^2) \times (2a^{22}) \times (4a^{26}) = 8a^{50}$ Ans

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

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

$= -\frac{3}{5} x^3 y^3$

Answer.

Q 3 (iii)

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

$$\text{Sol: } -\frac{10}{3} \times \frac{6}{5} \times p^1 q^3 \times p^1 q^3$$

$$-4p^2 q^6$$

(iv)

$$x^2 x^2 x^3 x^4$$

$$x^{10}$$

Answer.

Q 4. a) Simplify $3x(4x-5)+3$ and find the value of (i) $x=3$ (ii) $x=1/2$

$$\text{Sol: } 3x(4x-5)+3$$

$$12x^2 - 15x + 3$$

$$\text{When } x=3$$

$$\text{The value of } 12x^2 - 15x + 3$$

$$= 12(3) - 15(3) + 3$$

$$= 12 \times 9 - 45 + 3$$

$$= 108 - 45 + 3$$

$$= 66$$

The value of

$$12x^2 - 15x + 3$$

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

$$6 - \frac{15}{2} + 3$$

$$9 - \frac{15}{2}$$

$$\frac{18-15}{2} = \frac{3}{2}$$

Q 5. Add $P(P-Q)$, $Q(Q-R)$ and $R(R-P)$

$$\text{Sol: } P(P-Q) + Q(Q-R) + R(R-P)$$

$$P^2 - PQ + Q^2 - QR + R^2 - RP$$

$$P^2 + Q^2 + R^2 - PQ - QR - RP \quad \text{Ans:}$$

$$b) 2x(z-x-y) + 2y(z-y-x)$$

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

$$-2x^2 - 2y^2 - 4xy + 2xz + 2yz$$

c) Subtract

$$\text{Sol: } 4l(10n-3m+2l) - 3l(l-4m+5n)$$

$$40ln - 12lm + 8l^2 - 3l^2 + 12lm - 15ln$$

collect like terms

$$(40ln - 15ln) + (-12lm + 12lm) + (8l^2 - 3l^2)$$

$$25ln + 0 + 5l^2$$

$$25ln + 5l^2 \quad \text{Ans:}$$

Solve yourself.

Q1.

Exercise 9.4

multiply the binomials:→

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

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

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

$$8x^2 - 6x + 20x - 15$$

$$8x^2 + 14x - 15 \text{ Ans.}$$

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

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

$$6.25l^2 + 1.25lm - 1.25lm - 0.25m^2$$

$$6.25l^2 - 0.25m^2 \text{ Ans.}$$

(v) $(2pq + 3q^2) \times (3pq - 2q^2)$

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

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

$$6p^2q^2 + 5pq^3 - 6q^4 \text{ Ans}$$

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

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

$$\frac{3}{4}a^2(4a^2 - \frac{8}{3}b^2) + 3b^2(4a^2 - \frac{8}{3}b^2)$$

$$\frac{3}{4} \times 4a^4 - \frac{3}{4} \times \frac{8}{3}a^2b^2 + 12a^2b^2 - 3b^2 \times \frac{8}{3}b^2$$

$$3a^4 - 2a^2b^2 + 12a^2b^2 - 8b^4$$

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

$$3a^4 - 8b^4 + 10a^2b^2 \text{ Ans.}$$

$$+ 10a^2b^2$$

Q2:- Find the Product:-

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

$$\begin{aligned} & 5(3-x) - 2x(3-x) \\ &= 15 - 5x + 6x + 2x^2 \\ &= 15 + x + 2x^2 \quad \text{Ans} \end{aligned}$$

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

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

$$a^3 + a^2b^2 + ab + b^3 \quad \text{Ans}$$

Q3:- Simplify:-

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

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

$$x^3 + 5x^2 - 5x - 25 + 25$$

$$x^3 + 5x^2 + 5x \quad \text{Ans}$$

(ii) $(t^2-5)(t^2-5)$

$$t(t^2-5) + 5(t^2-5)$$

$$t^3 - 5t + 5t^2 - 25$$

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

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

$$ac - ad + bc - bd + ac + ad - bc - bd + 2ac + 2bd$$

$$2ac + 2ac$$

$$= 4ac \quad \text{Ans}$$

(vii)

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

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

$$2.25x^2 + 6.0xy + 4.5x - 6.0xy - 16y^2 - 12y$$

$$- 4.5x + 12y$$

$$2.25x^2 - 16y^2 \quad \text{Ans}$$

End Ex = 9.4

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

$$a(a+b-c) + b(a+b-c) + c(a+b-c)$$

$$a^2 + ab - ac + ab + b^2 - bc + ca + cb - c^2$$

$$a^2 + b^2 - c^2 + 2ab \quad \text{Ans.}$$

P14

Standard Identities

$$1. (a+b)^2 = a^2 + 2ab + b^2$$

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

$$3. (a-b)(a+b) = a^2 - b^2$$

$$4. (x+a)(x+b) = x^2 + (a+b)x + ab$$

Exercise 9.5

use the suitable identity to get each of the following product.

Q1 (i) $(x+3)(x+3)$ Here $(a+b)^2 = a^2 + 2ab + b^2$
 $(x+3)^2 = x^2 + 2 \times x \times 3 + 3^2$ $a=x, b=3$

$$= x^2 + 6x + 9 \quad \text{Ans.}$$

(ii) $(2y+5)(2y+5)$ (iii) $(2a-7)(2a-7)$

$$(2y+5)^2 \text{ using}$$

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

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

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

Ans

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

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

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

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

Ans.

(iv)

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

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

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

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

$$9a^2 - 3a + \frac{1}{4} \quad \text{Ans}$$

(v)

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

$$\text{using Idy } (a+b)(a-b) = a^2 - b^2$$

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

$$= 1.21m^2 - 1.6 \quad \text{Ans}$$

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

$$(b^2 + a^2) (b^2 - a^2) = (b^2)^2 - (a^2)^2 = b^4 - a^4 \quad \text{Ans}$$

(vii)

$$(-a + c) (-a + c) \text{ or}$$

$$(c-a)(c-a) = (c-a)^2 = c^2 - 2ca + a^2 \quad \text{Ans}$$

(ix)

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

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

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

$$= \frac{x^2}{4} + \frac{9y^2}{16} + \frac{3xy}{4} \quad \text{Ans}$$

P. 15

Q8. using the identity $(x+a)(x+b) = x^2 + (a+b)x + ab$ to solve the following products.

Q8
P16

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

using

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

$a=3$

$b=7$

$$x^2 + (3+7)x + 3 \times 7$$

$$x^2 + 10x + 21 \text{ Ans.}$$

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

Here $x=4x, a=-5, b=-1$

$$(x+a)(x+b) = x^2 + (a+b)x + (a \times b)$$

$$(4x) + [-5 + (-1)]x + (-5)(-1)$$

$$16x^2 + (-5-1)4x + 5$$

$$16x^2 + (-6)4x + 5 = 16x^2 - 24x + 5 \text{ Ans.}$$

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

Here $x=2x, a=5y, b=3y$

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

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

$$= 4x^2 + 8y \times 2x + 15y^2$$

$$4x^2 + 16xy + 15y^2 \text{ Ans.}$$

NO

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

Here $x=xyz$

$a=-4$

$b=-2$

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

$$(xyz) + (-4-2)xyz + (-4)(-2)$$

$$x^2 y z^2 + (-6)xyz + 8$$

$$x^2 y z^2 - 6xyz + 8 \text{ Ans.}$$

Q3: Find the following squares by using the identities

(i) $(b-7)^2$ using $(a-b)^2 = a^2 - 2ab + b^2$

$$(b)^2 + 2 \times b \times (-7) + (-7)^2$$

$$b^2 - 14b + 49$$

Ans.

(ii) $(2xy + 3z)^2$ $a = 2xy, b = 3z$

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

$$4x^2y^2 + 12xyz + 9z^2$$

Ans.

(iv) $(\frac{2}{3}m + \frac{3}{2}n)^2$ $a = \frac{2}{3}m, b = \frac{3}{2}n$

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

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

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

Ans.

(v) $(0.4p - 0.5q)^2$ $a = 0.4p, b = 0.5q$

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

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

$$0.16p^2 - 2(0.20)pq + 0.25q^2$$

$$0.16p^2 - 0.40pq + 0.25q^2$$

Ans.

Q4: Simplify

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

$$a = a^2, b = b^2$$

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

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

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

Ans.

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

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

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

$$4x^2 + 20x + 25 - 4x^2 + 20x - 25 = 40x$$

Ans.

Page

Date

classmate

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

$$a=4m, b=5n \text{ using Idty, } (a+b)^2 = a^2 + 2ab + b^2$$

$$(4m)^2 + 2(4m)(5n) + (5n)^2 + [(5m)^2 + 2(5m)(4n) + (4n)^2]$$

$$16m^2 + 40mn + 25n^2 + [25m^2 + 40mn + 16n^2]$$

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

$$= 41m^2 + 80mn + 41n^2 \text{ Ans.}$$

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

$$\text{Here } a=2.5p, b=1.5q$$

$$\text{using idty } (a-b)^2 = a^2 - 2ab + b^2$$

$$[(2.5p)^2 - 2(2.5p)(1.5q) + (1.5q)^2] - [(1.5p)^2 - 2(1.5p)(2.5q) + (2.5q)^2]$$

$$[6.25p^2 - 0.75pq + 2.25q^2] - [2.25p^2 - 0.75pq + 6.25q^2]$$

$$6.25p^2 - 0.75pq + 2.25q^2 - 2.25p^2 + 0.75pq - 6.25q^2$$

$$(6.25p^2 - 2.25p^2) + (2.25q^2 - 6.25q^2)$$

$$4.00p^2 + (-4.00q^2) = 4p^2 - 4q^2 \text{ Ans.}$$

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

$$\text{Here } a=m^2, b=n^2m$$

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

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

$$= m^4 + n^4m^2 \text{ Ans.}$$

05

Q5: - Show that

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

L.H.S: $\left(\frac{3x}{a} + \frac{7}{b}\right)^2 - 84x$

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

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

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

$$(9x^2 - 42x + 49) = (3x-7)^2 \quad \text{R.H.S}$$

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

$$(ii) \left[\frac{4}{3}m - \frac{3}{4}n\right]^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$$

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

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

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

$$\frac{16}{9}m^2 + \frac{9}{16}n^2 = \text{R.H.S}$$

L.H.S = R.H.S

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

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

$$= a^2 - b^2 + b^2 - c^2 + c^2 - a^2 = 0 = \text{R.H.S}$$

L.H.S = R.H.S

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

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

$$16p^2q^2 + 2 \times 4pq \times 3q + 9q^2 - (16p^2q^2 - 2 \times 4pq \times 3q + 9q^2)$$

$$16p^2q^2 + 24pq^2 + 9q^2 - 16p^2q^2 + 24pq^2 - 9q^2$$

$$= 48pq^2 = \text{R.H.S}$$

L.H.S = R.H.S

Q6! - using identities evaluate: $\rightarrow$ (P₂₀)

$$(i) 71^2 = (70+1)^2 \text{ using } (a+b)^2 = a^2 + 2ab + b^2 \\ = (70)^2 + 2(70)(1) + 1^2 \\ = 4900 + 140 + 1 = 5041 \text{ Ans.}$$

$$(iii) 102^2 = (100+2)^2 \\ (100)^2 + 2(100)(2) + 2^2 = 10000 + 400 + 4 \\ = 10404 \text{ Ans.}$$

$$(v) (5.2)^2 = (5+0.2)^2 \text{ using } (a+b)^2 = a^2 + 2ab + b^2 \\ = (5)^2 + 2(5)(0.2) + (0.2)^2 \\ = 25 + 2.0 + 0.04 = 27.04 \text{ Ans.}$$

$$(vi) 297 \times 303 \text{ using } (a-b)(a+b) = a^2 - b^2 \\ (300-3)(300+3) \\ (300)^2 - (3)^2 = 90000 - 9 = 89991 \text{ Ans.}$$

$$(vii) 78 \times 82 = (80-2)(80+2) = (80)^2 - (2)^2 \\ = 6400 - 4 = 6396 \text{ Ans.}$$

$$(viii) (8.9)^2 = (9-0.1)^2 \text{ using } (a-b)^2 = a^2 - 2ab + b^2 \\ = (9)^2 - 2(9)(0.1) + (0.1)^2 \\ = 81 - 1.8 + 0.01 = 79.21 \text{ Ans.}$$

$$(ix) 1.05 \times 9.5 \\ (10+0.5)(10-0.5) \text{ using } (a+b)(a-b) = a^2 - b^2 \\ (10)^2 - (0.5)^2 = 100 - 0.25 = 99.75 \text{ Ans.}$$

$$Q7 - \text{using } a^2 - b^2 = (a+b)(a-b) \text{ find} \\ 51^2 - 49^2 = (51+49)(51-49) \\ = 100 \times 2 = 200 \text{ Ans.}$$

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

$$= (1.02 + 0.98)(1.02 - 0.98)$$

$$= 2.00 \times 0.04 = 0.08 \text{ Ans}$$

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

$$= 200 \times 6 = 1200 \text{ Ans}$$

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

$$= (12.1 + 7.9)(12.1 - 7.9)$$

$$= 20.0 \times 4.2 = 84.0 = 84 \text{ Ans}$$

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

find, $103 \times 104 = (100+3)(100+4)$

$$(i) = (100)^2 + (3+4) \times 100 + 3 \times 4$$

$$10000 + 700 + 12 = 10712 \text{ Ans}$$

$$(ii) 5.1 \times 5.2$$

$$(5+0.1)(5+0.2) = 5 + (0.1+0.2) \times 5 + (0.1 \times 0.2)$$

$$= 25 + 0.02 \times 5 + 0.02$$

$$25 + 0.10 + 0.02 = 25.12 \text{ Ans}$$

Q.10
Rept

$$103 \times 104$$

$$(100+3)(100+4) = (x+a)(x+b) = x^2 + (a+b)x + ab$$

$$= (100)^2 + (3+4)100 + 3 \times 4$$

$$= 10000 + 7 \times 100 + 12 = 10712 \text{ Ans}$$

$$(iii) 103 \times 98 = (100+3)(100-2)$$

$$= (100)^2 + [3+(-2)] \times 100 + 3 \times (-2)$$

$$= 10000 + [3-2] \times 100 - 6 =$$

$$10000 + 1 \times 100 - 6$$

$$= 10094 \text{ Ans}$$

Direct and Inverse Proportion

Two quantities x and y are said to be in direct proportion, if they increase or decrease together in such a manner that the ratio of their corresponding values remain constant.

Thus if $x/y = k$ constant. Then x and y are said to vary directly. In such a case if y_1, y_2 are the values of y corresponding to the values x_1, x_2 of x respectively then $x_1/y_1 = x_2/y_2$.

Exercise 12.1

Q1 Questions on book.

Sol: Let the parking time of car is x hours and its charges in Rs is y .

<u>x</u>	4	8	12	24
<u>y</u>	60	100	140	180
x/y	$\frac{4}{60} = \frac{1}{15}$	$\frac{8}{100} = \frac{2}{25}$	$\frac{12}{140} = \frac{3}{35}$	$\frac{24}{180} = \frac{2}{15}$

Since ratio x is not same for all value of x and y . Therefore parking charges are not in direct proportion to parking time.

Q3: 1 part pigment of red pigment = 75 ml of base.
75 ml of base = 1 part of red pigment
1 ml of base = $\frac{1}{75}$ parts of red pigment

1000 ml of base = $\frac{1}{75} \times 1000 = 13\frac{1}{3}$ parts of red pigment.

Q2. we have to maintain ratio as: = (123)

1 part of red pigment = 8 parts of base pigment

4 parts of red pigment = $8 \times 4 = 32$ parts of base pigment

7 parts of red pigment = $8 \times 7 = 56$ parts of base pigment

12 parts of red pigment = $8 \times 12 = 96$ parts of base pigment

20 parts of red pigment = $8 \times 20 = 160$ parts of base pigment

Parts of red pigment	1	4	7	12	20
Parts of base	8	32	56	96	160

Q4. Let the number of bottles be x
 number of times and numbers of bottles vary directly.

	x_1	x_2
no of times	6	5
no of bottles	840	x

By direct variation $x_1/y_1 = x_2/y_2$

$$\frac{6}{840} = \frac{5}{x} \text{ or } x \times 6 = 5 \times 840$$

$$x = \frac{5 \times 840}{6} = 700 \quad \text{no of bottles} = 700$$

Q5. Let the length of bacteria = x
 length of bacteria and enlarged times of bacteria vary directly.

Enlarged times of Bacteria	50000	20000	1
Enlarged length of Bacteria	5	x	x_1

Now

now $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

$$\frac{50000}{5} = \frac{20,000}{x_2}$$

$$x = \frac{5 \times 20000}{50000} = 2$$

Enlarged length = 2 cm

$$\text{Actual length } x_1 = \frac{2}{20000} = \frac{1}{10000} = 0.0001 \text{ cm}$$

The actual length of the bacteria is 0.0001 cm and the enlarged length = 2 cm

Q6

Actual height of mast = 12 m = 1200 cm
Height of mast in model = 9 cm
Scale used by model = $\frac{1200}{9} = 133.33 \text{ cm}$

The scale of model is 1 cm for 133.33 cm

Actual length of ship = 20 m = 2000 cm
Length of ship in model = $\frac{2000}{133.33} = 15 \text{ cm}$

The length of ship in model = 15 cm

Q10

Q10:- 60 mins = 1 h

1 min = $\frac{1}{60}$ hour

25 min = $\frac{1}{60} \times 25 = \frac{5}{12}$ hour

Let distance of travelling by truck = x
Distance of travelling truck and time vary directly. By direct variation $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

Distance (in km)	14	x
Time (in hour)	$\frac{5}{12}$	5

$$\frac{14}{\frac{5}{12}} = \frac{x}{5} \quad \text{or} \quad \frac{14 \times 12}{5} = \frac{x}{5}$$

$$x = \frac{14 \times 12}{5} \times \frac{5}{1} = 168 \text{ km distance}$$

Q7: Let 5 kg of Sugar Contain = x crystals
 (i) 1.2 k.g of Sugar Contain = y crystals

(1/25)

Weight of sugar (in kg)	5	1.2
No. of Crystals	x	y

Since it is in direct variation

$$\frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{5}{x} = \frac{1.2}{y}$$

$$5y = 1.2x \quad \text{or} \quad x = \frac{5y}{1.2}$$

$$x = 2.25 \times 10^6 = 2.25 \times 10^7$$

in 5 k.g of Sugar Contain 2.25×10^7 crystals

(ii) $\frac{x_1}{y_1} = \frac{x_2}{y_2} \Rightarrow \frac{5}{x} = \frac{1.2}{y}$

$$5y = 1.2x \Rightarrow y = \frac{1.2x}{5}$$

$$y = 5.4 \times 10^6$$

1.2 k.g of Sugar Contain 5.4×10^6 crystals

Q8

Q8:- let the distance covered in the map = x
 Map with a Scale and distance covered in the map vary directly

Scale (in cm)	1	x
Distance (in km)	18	72

$$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$

$$\frac{1}{18} = \frac{x}{72} \quad \text{or} \quad x \times 18 = 1 \times 72$$

$$x = \frac{72}{18} = 4$$

$$x = 4 \text{ cm}$$

The required distance covered = 4 cm.

Q₁: Let the length of shadow be x and height of pole $= y$

(P26)

Here length of the shadow and height of pole vary directly i.e. $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

Height of pole	5m 60cm	10m 50cm	y
length of shadow	3m 20cm	x	5m

$$(i) \frac{x_1}{y_1} = \frac{x_2}{y_2}$$

$$\frac{5.60}{3.20} = \frac{10.50}{x}$$

$$x = \frac{3.20 \times 10.50}{5.60}$$

$$= 6m$$

length of shadow = 6m

$$(ii) \frac{x_1}{y_1} = \frac{x_2}{y_2}$$

$$\frac{5.60}{3.20} = \frac{y}{5}$$

$$y = \frac{5.60 \times 5}{3.20} = 8.75m$$

$$= 8m 75cm$$

= Height of pole 8.75

Inverse Proportion

Two quantities x and y are said to vary inversely as such that x varies inversely as y and y varies inversely as x

if $xy = k$ (constant)

y_1, y_2 are the values of y corresponding to the values of x_1, x_2 of x respectively

then $x_1 y_1 = x_2 y_2 = k$ (constant)

So that

$$\frac{x_1}{x_2} = \frac{y_2}{y_1}$$

Q₂

if $xy = k$ then x and y are in inverse proportion where k is constant

$$\frac{x_1}{x_2} = \frac{y_2}{y_1} = k$$

no of winners	1	2	4	5	8	10
Price of each Winner	10000	5000	2500	2000	1250	1000

(P27)

As Prize money is constant, the Prize for each winner will reduce proportionally.

Q3: The no. of Spokes (S) and angle between pair of consecutive Spokes (A) are in inversely proportional to each other
 So $S \times A = \text{Constant}$

$$S \times A = 4 \times 90^\circ = 360^\circ$$

for $S = 8$ then $8 \times A = 360$ or $A = \frac{360}{8} = 45^\circ$

for $S = 10$ then $10 \times A = 360$ or $A = \frac{360}{10} = 36^\circ$

for $S = 12$ then $12 \times A = 360$

$$A = \frac{360}{12} = 30^\circ$$

No. of Spokes S	4	6	8	10	12
Angle between pair of Spokes A	90°	60°	45°	36°	30°
$S \times A$	360°	360°	360°	360°	360°

(i) They are in inverse proportion

(ii) Angle between pair of consecutive spokes on wheel with 15 spokes $= \frac{360}{15} = 24^\circ$

no of spokes $= \frac{360}{24} = 15$

no of sweets	5 x_1	x_2	$\frac{x_1}{x_2} = \frac{y_1}{y_2}$
no of children	24 y_1	20 y_2	$\frac{24}{20} = \frac{6}{5}$

$$\frac{5}{x} = \frac{20}{24} \text{ or } x = \frac{5 \times 24}{20} = 6$$

no. of sweets for 1 child = 6

Q5: let no. of days = x

no. of animals	20	30
no. of days	6	x

By inverse Proportion

$$\frac{x_1}{x_2} = \frac{y_2}{y_1} = \frac{20}{30} = \frac{x}{6}$$

$$\text{or } x = \frac{20 \times 6}{30} = 4$$

The no. of days = 4 days

Q6: let the days = x

no. of persons	3	4
no. of days	4	x

By inverse Proportion $\frac{x_1}{x_2} = \frac{y_2}{y_1}$

$$\frac{3}{4} = \frac{x}{4}$$

$$x = \frac{3 \times 4}{4} = 3$$

no. of days = 3

Q7:-

let no. of boxes = x

no. of boxes	25	x
no. of bottles	12	20

$$\frac{x_1}{x_2} = \frac{y_2}{y_1}$$

$$\frac{25}{x} = \frac{20}{12} \quad \text{or } x = \frac{25 \times 12}{20} = 15$$

no. of boxes = 15.

Q8:- let no. of machines = x

no. of machines	42	x
no. of days	63	54

$$\frac{x_1}{x_2} = \frac{y_2}{y_1} \quad \text{or } \frac{42}{x} = \frac{54}{63}$$

$$x = \frac{42 \times 63}{54} = 49$$

The number of machines = 49

Q9:- let the time = x

Time taken (in hours)	2	x
Speed (km/h)	60	80

By inverse proportion $\frac{x_1}{x_2} = \frac{y_2}{y_1}$

$$2/x = 80/60 \text{ OR } x \times 80 = 2 \times 60$$

$$x = \frac{2 \times 60}{80} = 1.5 \text{ hours}$$

The car will take 1.5 hours

Q10:- let no. of days = x

(i)	no of Person	2	1	$\frac{x_1}{x_2} = \frac{y_2}{y_1}$
	no of days	3	x	

$$\text{Now } \frac{2}{1} = \frac{x}{3} \text{ OR } 2 \times 1 = 2 \times 3$$

$$x = 6 \text{ The no. of days to}$$

Complete work = 6 days

(ii) let the no. of person = A

no of Person	2	A	$\frac{x_1}{x_2} = \frac{y_2}{y_1}$
no of days	3	1	

$$2/A = 1/3 \text{ OR } A \times 1 = 2 \times 3$$

$A = 6$ The no. of person = 6

Q11. let the number of duration = x

no of duration	45	x	$\frac{x_1}{x_2} = \frac{y_2}{y_1}$
no of periods	8	9	

$$\frac{45}{x} = \frac{9}{8} \text{ OR } x = \frac{45 \times 8}{9} = 40$$

The time duration = 40 mins