Algebraic Expressions

a. Solving equations using Vilokanam Sutra.

Vilokanam Sutra.

Meaning : Observation

An expression is an equation equalling to quantity.

Equal symbol : "="

Eg: $3 \times 4 = 12$

$3 \times \_ = 12$.

OR

$\_ \times 4 = 12$.

* Solve problem by just observation.

Eg: a. $4x \_ = 32$.

$\downarrow$

8

b. $4x \_ = 12$

$\downarrow$

3

c. $x * 5 = 17$

$\downarrow$

12

d. $x + \frac{1}{x} = \frac{5}{2}$

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

$x = 2$.

e. $\frac{x}{3} = 12$.

$\frac{x}{3} = \frac{36}{3}$

$x = 36$.

f. $18 - x = 15$

$\downarrow$

3

Solving Equations by 'Transpose & Adjust'

(i) Transpose : to change.

Addition $\xrightarrow{\text{Transpose}}$ Subtraction.

Subtraction $\xrightarrow{\text{Transpose}}$ Addition.

Multiplication $\xrightarrow{\text{Transpose}}$ Division.

Division $\xrightarrow{\text{Transpose}}$ Multiplication.

1. Eg: $2+3x = 20$.

$3x = 20-2$

$3x = 18$

$x = 6$

2. Eg: $5x-11 = 29$

$5x = 29+11$.

$5x = 40$.

$x = 8$

b. Ratios & Proportions.

Ratio : A ratio is a relationship b/n two numbers indicating how many times the first number 'contains' the second.

Anuhupyena → 'Proportional'

i. Ratio of 2 Numbers

1. Eg: A school of 150 students & 25 teachers. What is the ratio of students to teachers.

S1: Students : teachers.

150 : 25

S2: Find the HCF (to find ratio).

5	150, 25
5	30, 5
	6, 1

HCF → 25

LCM = 150

S3: $150/25 : 25/25$

$\Rightarrow 6 : 1$

∴ Ratio of students to teachers is 6:1

2. Eg: A class room has 24 girls & 42 boys. What is the ratio of girls to boys in the class room.

S1: Girls : boys.

24 : 42

S2: Find HCF.

2	24, 42
3	12, 21
	4, 7

HCF = 6

S3: $24/6 : 42/6$

4 : 7

∴ Ratio of girls to boys is 4:7

ii. Ratio of 3 Numbers.

1. Eg: In a basket, there are 75 apples, 450 oranges & 125 Gauva. Find the ratio of each fruit in the basket.

S1: Apples : Oranges : Gauva

75 : 450 : 125

S2: Find HCF.

5	75, 450, 125
5	15, 90, 25
	3, 18, 5

HCF = 25

S3: $75/25 : \frac{450}{25} : \frac{125}{25}$

3 : 18 : 5

Ratio of Apples & fruits in basket → 3:18:5

2. Eg: Bring ratio to the simplest form.

12 : 54 : 96.

S1: 12 : 54 : 96.

S2: Find HCF.

$$\begin{array}{r|l} 2 & 12, 54, 96 \\ 3 & 6, 27, 48 \\ \hline & 2, 9, 16 \end{array}$$

HCF = 6.

S3: $12/6 : 54/6 : 96/6$

2 : 9 : 16

Proportions:

proportions means equating two ratios (comparitive) relation b/n things or magnitudes as to size, quantity, number etc.)

Use Madhyamadhyena Adyamantyena sutra to perform calculations.

1. eg: Consider ratio 72:18

Simplest form → 4:1 (ratio).

HCF → 18

$$\begin{array}{r|l} 2 & 72, 18 \\ 9 & 36, 9 \\ \hline & 4, 1 \end{array}$$

72:18 :: 4:1

↓

proportions b/n two ratios.

2. Eg: 15 : 3 & 100 : y are in proportion

determine 'y'

S1: Madyamadhyen Adyamantyena.

means → product of means } = { Product of extremes.

i.e. 15 : 3 = 100 : y

$15y = 300$

S2: Transpose.

$y = \frac{300}{15} = 20.$

3. Eg: z : 8 :: 14 : 16

$16z = 14 \times 8$

$z = \frac{14 \times 8}{16} = 7$

$z = 7$.

Percentage:

Percentage means 'per hundred' or 'for every hundred'

* fraction of 100.

Symbol → %

1. Eg: 20%, 12%, 7% etc.

Conversion of percentage to fraction:

% age can be expressed as fraction of 100.

1. Eg: 25%

$\Rightarrow 25/100 = 1/4.$

fraction of 25% = $1/4$.

2. Eg: 64%.

$\Rightarrow \frac{64}{100} = \frac{16}{25}$

fraction of 64% = $16/25$

3. Eg: 33.5%.

$\Rightarrow \frac{33.5}{100} = \frac{335}{1000} = \frac{67}{200}$.

$33\frac{1}{2} = \frac{67}{2}/100 = \frac{67}{200}$.

Conversion of fraction to Percentage

* Given fraction is multiplied by 100 & simplify to get %age.

1. Eg: 4/5.

$\Rightarrow 4/5 \times 100^{20} = 80\%$.

2. Eg: 3/8

$\Rightarrow 3/8_2 \times 100^{25} = \frac{75}{2} = 37.5\%$.

Find the Percentage of quantity:

1. Eg: 23% of 45

Sl: $\frac{23}{100} \times 45$

Apply Gunitasamuccayah samuccayagunitah sutra.

→ Count No. of zeros & place decimal point

(divisor) Two zeros, hence put decimal of 2 digits from the right.

⇒ 10.35.

S2: 23 × 45 using UT.

	③	②	①
	2	3	
	4	5	
	8	22	15
	8	23	5
	10	35	

2. Eg: 22% of 7

S1: $\frac{22}{100} \times 7$.

S2:
$$\begin{array}{r} 2\ 2 \\ 0\ 7 \\ \hline 0\ 14\ 14 \end{array}$$
154.

S3: 1.54.

3. Eg: 12% of 46.

S1: $\frac{12}{100} \times 46$.

S2:
$$\begin{array}{r} 1\ 2 \\ 4\ 6 \\ \hline 4\ 14\ 12 \end{array}$$
4 15 2
552

S3: 5.52

4. Eg: 36% of 850.

S1: $\frac{36}{100} \times 850$.

S2:
$$\begin{array}{r} 0\ 3\ 6 \\ 8\ 5\ 0 \\ \hline 0\ 24\ 63\ 30\ 0 \end{array}$$
24 66 00
30 6 00
= 30600

S3: 306