

1

## PERCENTAGES :- TYPE-1

### SUCCESSIVE PERCENTAGES

$$1) +10\% \quad +20\%$$

$$10+20+\frac{10 \times 20}{100} = 32\%$$

$$2) +20\% \quad +30\%$$

$$20+30+\frac{20 \times 30}{100} = 56\%$$

$$5) +30\% \quad -20\%$$

$$+30-20+\frac{30 \times -20}{100} = 4\%$$

$$7) -20\% \quad -10\%$$

$$-20-10+\frac{20 \times 10}{100} = -28\%$$

$$-30+\cancel{10}^2$$

$$= -28\%$$

$$9) +10\% \quad -10\%$$

$$+10-10-\frac{10 \times 10}{100}$$

$$10-11$$

$$= -1\%$$

$$10) +15\% \quad -15\%$$

$$+15-15-\frac{15 \times 15}{100} = 2.25$$

$$15-17.25$$

$$\Rightarrow -2.25\%$$

## TYPE-2

### INCREASE / DECREASE

$$1) N \xrightarrow{\text{20\%}}.$$

$$100 \xrightarrow{-20} 120$$

$$\frac{20}{100} \times 100 \\ 120 \\ 120 \cancel{60}$$

$$= 16.66\%$$

$$2) N \xrightarrow{\text{25\%}}$$

$$100 \xrightarrow{25\%} 125$$

$$\frac{25}{100} \times 100 \\ 125 \\ 125 \cancel{50}$$

$$= 20\%$$

$$3) N \xrightarrow{\text{30\%}}$$

$$100 \xrightarrow{-30\%} 130$$

$$\frac{30}{100} \times 100 \\ 130$$

$$13$$

$$\frac{3}{13} \times 100 = 3 \times 7.69 \\ = 23.07\%$$

$$4) 100 \xrightarrow{-20\%} 80$$

$$\frac{20}{100} \times 100 \\ 80$$

$$= 20\%$$

$$5) 100 \xrightarrow{-30\%} 70$$

$$\frac{30}{70} \times 100$$

$$\frac{3}{7} \times 100 = 3 \times 14.28$$

$$= 42.84\%$$

### TYPE 3:- COMPARISON BASED PROBLEMS

$$1) A > B$$

$$110 \quad 100$$

$$2) A < B$$

$$90 < 100$$

$$\% \cdot \frac{10}{40} \times 100$$

$$\frac{10}{90} \times 100$$

$$\frac{1}{11} \times 100 = 9.09\%$$

$$11.11\%$$

$$3) A > B$$

$$135 \quad 100$$

$$\frac{35}{135} \times 100 = \frac{35 \times 100}{135} = .26$$

$$25.97\%$$

PROBLEMS:-

$$1) 20\% \text{ of } 600 \\ = 60 \times 2 \\ = 120$$

$$4) 18\% \text{ of } 1200 \\ = 120 + 12 \times 8 \\ = 120 + 96 \\ = 216$$

$$7) 25\% \text{ of } 9292 \\ = 2 \times 929.2 + \frac{929.2}{2} \\ = 1858.4 + 464.6 \\ = 2323$$

$$9) 82.5\% \text{ of } 9292 \\ = 8 \times 929.2 + \frac{83.34}{4} \\ = 7665.9$$

$$11) 28\% \text{ of } 12300 \\ = 2 \times 1230 + (1230 - 246) \\ = 2460 + 984 \\ = 3444$$

$$13) 72\% \text{ of } 14440 \\ = 7 \times 1444 + 2 \times 144.4 \\ = 10108 + 288.8 \\ = 10296.8$$

$$15) 55\% \text{ of } 72850 \\ = \frac{72850}{2} + 3642.5 \\ = 36425 + 3642.5 \\ = 40067.5$$

$$17) 45\% \text{ of } 11230 \\ = \frac{11230}{2} - 561.5 \\ = 5615 - 561.5 \\ = 5053.5$$

$$19) 88\% \text{ of } 43250 \\ = 8 \times 4325 + 8432.5 \times 8 \\ = 34600 + 34560 \\ = 38060$$

$$2) 30\% \text{ of } 800 \\ = 80 \times 3 \\ = 240$$

$$5) 11\% \text{ of } 700 \\ = 70 + 7 \\ = 77$$

$$8) 45\% \text{ of } 9240 \\ = 50\% - 5\% \\ = 4620 - 462 \\ = 4158$$

$$10) 6.25\% \text{ of } 8334 \\ = 83.34 \times 6 + \frac{83.34}{4} \\ = 500.04 + 83.35 \\ = 580.87$$

$$12) 46\% \text{ of } 183450 \\ = 4 \times 1845 + \frac{1845}{2} + 184.5 \\ = 7380 + 922.5 + 184.5 \\ = 8487$$

$$14) 55\% \text{ of } 18900 \\ = 9450 + \cancel{945} \\ = 10395$$

$$16) 45\% \text{ of } 63450 \\ = \frac{63450}{2} - 3172.5 \\ = \cancel{3172.5} - 3172.5 \\ = 28552.5$$

$$18) 78\% \text{ of } 12350 \\ = 7 \times 1235 + \frac{1235}{8} \times 8 \\ = 8645 + \cancel{884} \\ = 8753.80$$

$$20) 98\% \text{ of } 78900 \\ = 78900 - (9 \times 789) \\ = 78900 - 1518 \\ = 77382$$

$$21) 20\% \text{ of } 240$$

$$\Rightarrow \frac{20}{100} \times N = 40 \\ \Rightarrow N = \frac{40 \times 100}{20} \\ N = \underline{\underline{200}}$$

$$23) 40\% \text{ of } N = 7280$$

$$\Rightarrow \frac{40}{100} \times N = 7280 \\ \Rightarrow N = \frac{5 \times 3625}{40} \\ N = \underline{\underline{18125}}$$

$$25) 48\% \text{ of } N = 456$$

$$\Rightarrow \frac{48}{100} \times N = 456 \\ \Rightarrow N = \frac{9.6 \times 456}{48} \\ N = \underline{\underline{960}}$$

$$22) 24\% \text{ of } N =$$

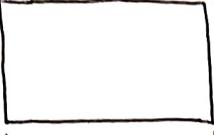
$$\frac{24}{100} \times N = 78 \\ N = \frac{78 \times 100}{24} \\ N = \underline{\underline{325}}$$

$$24) 12\% \text{ of } N = 3972$$

$$\Rightarrow \frac{12}{100} \times N = 3972 \\ \Rightarrow N = \frac{3 \times 3972}{12} \\ N = \underline{\underline{33100}}$$

$$26) 56\% \text{ of } N = 7896$$

$$\Rightarrow \frac{56}{100} \times N = 7896 \\ \Rightarrow N = \frac{141 \times 7896}{56} \\ N = \underline{\underline{14100}}$$

29) 

$$a_1 = l \times b = 100 \times 50 = 5000$$

$$a_2 = b \times l = 50 \times 100 = 5000$$

$$a_2 - a_1 = 5000 - 5000$$

$$\Rightarrow \frac{2800}{5000} \times 100\% = 56\%$$

3)  $C + 25\% \text{ of } C$

$$100 \rightarrow 125$$

$$\frac{25}{125} \times 100 = 20\%$$

14)  $\frac{x + 20\%x}{y + 25\%y} = \frac{3}{5}$   $\Rightarrow \frac{x + 20\%x}{y + 25\%y} = \frac{3}{5}$

$$\Rightarrow \frac{x + \frac{20}{100}x}{y + \frac{25}{100}y} = \frac{3}{5}$$

$$\Rightarrow x + \frac{1}{5}x$$

$$\Rightarrow \frac{y + \frac{1}{4}y}{y + \frac{1}{4}y} = \frac{3}{5}$$

$$= \frac{x + \frac{x}{5}}{y + \frac{y}{4}} = \frac{3}{5} \Rightarrow \frac{\frac{6x}{5}}{\frac{5y}{4}} = \frac{3}{5}$$

$$\frac{x}{y} = \frac{3}{5} \times \frac{4}{3} \times \frac{5}{6} = \frac{2}{3}$$

15)  $B = 1200 \quad g = 800 \quad = 2000 \text{ S}$

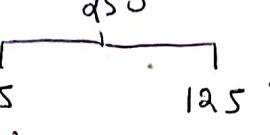
$$60\% B$$

$$55\% g$$

$$\text{pass} = 720 \quad \frac{480}{800} = 1160$$

$$\text{fail id} = 860$$

$$= \frac{42}{2000} \times 100 = 42\%$$

16) 

$$125 \quad 125$$

$$40\%, \quad 100 Q$$

$$= 50Q$$

$$\approx 60\% (250)$$

$$= 150 Q$$

$$\frac{100}{125} \times 100 = 80\%$$

$$\frac{4 \times 100}{5} = 80\%$$

17)  $20\%, (40\%) \times C = 3040$

$$\frac{20}{100} \times \frac{40}{100} \times C = 3040$$

$$C = \frac{76}{3040 \times 100 \times 100}$$

$$C = 380 \times 100$$

$$C = 38000$$

18) Student (65) Teacher (4)

$$20\% (65) \quad 40\% (65)$$

$$\text{Each Stu} = 13$$

$$26$$

$$\text{Total} = (13 \times 65) + (26 \times 4)$$

$$= 845 + 104$$

$$= 949$$

19)  $\frac{1}{3}B = \frac{1}{2}g \quad g = 40$

$$\frac{1}{3}B = \frac{40}{2} \Rightarrow \frac{1}{3}B = 20 \Rightarrow B = 20 \times 3$$

$$B = 60 \quad \frac{40}{60} \times 100 = 66 \frac{2}{3}\%$$

20)  $B \quad g$   
40% N    35% N

$$g = 35\% 1500$$

$$B = 483$$

$$\frac{117}{B = 600}$$

$$= \frac{35}{100} \times 1500$$

$$= 525$$

$$40\% N = 600$$

$$N = \frac{100 \times 600}{40}$$

$$N = 1500$$

## ② PERCENTAGE

### APPLICATION PROBLEMS

1) Total = 8344 Sold = 25%

$$\therefore = \frac{25}{100} \times 8344 = \frac{25}{100} \times 8344 \\ = 2086.0$$

2) 1.45H 9% of Day

$$\Rightarrow 1.45 = 60 + 1.45 = 105 \text{ min} \quad \text{Day} = 94 \times 60 \\ \Rightarrow \frac{105}{1440} \times 100 = 7.291$$

3) Population +10% +20% -30% =

Initial Population = 10000

$$10 + 20 + \frac{10 \times 20}{100} \Rightarrow +32 - 30 - \frac{30 \times 32}{100} \\ \Rightarrow 32\% \\ +32 - 39.6 \\ = -7.6\% \\ = -7.6\% / 10000 \\ = 760 \quad \text{Current Population} = 10000 - 760 \\ = 9240$$

4) Current Population = 18700

$$+25\% \quad +10\% \quad -15\% \quad 463.5 \\ \Rightarrow 25 + 10 + \frac{25 \times 10}{100} \Rightarrow +37.5 - 15 = \frac{37.5 \times 15}{100} \\ = 37.5 \quad \Rightarrow 37.5 - 19.635 \\ = 20.865\%$$

5) Discounts -10% -20%  

$$-10\% - 20\% + \frac{10 \times 20}{100} \\ = -28\%$$

6) Discounts = -10%, -15%, -20%  

$$= -10\% - 15\% + \frac{10 \times 15}{100} \\ = -25 + 1.5 \\ = -22.5\% \\ = -38\%$$

7)  $\frac{1}{42} \times \frac{1}{3} \times \frac{8}{5} \times N = 15$

$$\frac{1}{30} \times N = 15 \Rightarrow N = 15 \times 30 \\ = 450$$

$$40\% N \Rightarrow \frac{40}{100} \times 450 = 180$$

8) 37% N = 990.86

assume 37% N → 990.86

as 38% N → 1000

19% N ⇒ 500

9) 15% of 45% N = 105.3

$$= \frac{15}{100} \times \frac{45}{100} \times N = 105.3$$

$$N = \frac{105.3 \times 100 \times 100}{15 \times 45} = \frac{10530000}{675}$$

N = 1560

$$24\% N = \frac{24}{100} \times 1560 = 374.4$$

10) 22.005% of 449.999

⇒ 22% 450

$$= \frac{22}{100} \times 450 = 99 \frac{9}{100}$$

11) 75% N + 75 = N

$$\frac{375}{400} \times N + 75 = N \quad \left| \begin{array}{l} N = 75 \times 4 \\ = 300 \end{array} \right.$$

$$\frac{3}{4} N + 75 = N$$

$$75 = N - \frac{3}{4} N$$

$$75 = \frac{1}{4} N$$

$$P \quad M \quad R$$

$$108 \quad 90 \quad 100 = 298$$

$$\frac{8960}{298} \times 100$$

$$\text{Total} = 17880 \Rightarrow \frac{17880}{298} \times 100$$

$$1491$$

$$R = 6000 \text{ RS}$$

$$22) \quad \begin{array}{c} A \\ B \\ C \end{array} \quad \begin{array}{c} 180 \\ 100 \\ 180 \end{array} = 430$$

$$\text{Total} \Rightarrow 86000 \quad C's \text{ Income} = \frac{86000}{430} \times 180$$

$$C \text{ Income} = 36,000$$

$$23) \Rightarrow 15\% (x) = \text{Orphanage}$$

$$1896 \text{ RS}$$

$$80\% (15\%)x = 1896$$

$$\frac{80}{100} \times \frac{15}{100} \times x = 1896$$

$$\Rightarrow x = \frac{1896 \times 100 \times 100}{80 \times 15} \Rightarrow \frac{12640 \times 10}{8} \quad x = 15800$$

$$24) \quad 50\% x = \text{House Hold}$$

$$20\% x = \text{Cloth}$$

$$5\% x = \text{Medicine}$$

$$\frac{75\% x}{75\% x} \quad \text{Remaining} = 11250$$

$$75\% x = 11250$$

$$\frac{75}{100} \times x = 11250$$

$$\Rightarrow x = \frac{11250 \times 100}{75} \Rightarrow 15000$$

25)

27) Election

A      B

55\%(x)    45\%(x)

15\% Invalid

15\%

Total = 15200

$$\Rightarrow \frac{45}{100} \times 15200$$

$$\Rightarrow 6840 \text{ votes } B \text{ got}$$

$$= A \text{ got } 15200 - 6840$$

$$= 8360$$

$$15\% \text{ Invalid} = \frac{8360 - 1254}{100} \times 8360 \quad 418$$

$$\text{Valid vote } A \text{ got} = 8360 - 1254 \quad 2 = 1254$$

$$= 7106$$

$$28) x-68 = \text{Invalid votes}$$

$$(52\% - 48\%) (x-68) = 98$$

$$4\% (x-68) = 98$$

$$\frac{4}{100} (x-68) = 98$$

$$\Rightarrow x-68 = \frac{98 \times 100^2}{4} = x-68 = 98 \times 25$$

$$x = 98 \times 25 + 68 = 2518$$

$$29) 75\% \text{ of valid voters} = 9261$$

$$\therefore \Rightarrow \frac{9261}{75} \times 100 = 12348$$

$$\text{Percent of Valid Voter} = 75\% -$$

$$2\% (75\%)$$

$$= 75 - 1.5$$

$$= 73.5\%$$

$$= \frac{12348 \times 100}{73.5} = 16800$$

25) Total = x

32)

20% - food

$$\underline{15\% - \text{education}}$$

35

$$100 - 35 = 65\%, \rightarrow \text{Remaining}$$

30% → medical }  
40% → transport } in 65%

$$30\% (65\%) x = 8775$$

$$\frac{30}{100} \times \frac{65}{100} xx = 8775$$

$$\begin{array}{r} 8775 \times 100 \times 100 \\ \hline 30 \times 65 \\ 18 \cancel{1} \cancel{5} 13 \\ \hline 3 \end{array} \quad 45000 \\ x = \frac{8775 \times 100 \times 100}{1950} =$$

$$x = 45000$$

26) 12% → sports

$$\frac{3}{4} (100) = 75\%, = \text{dancing}$$

10% = singing

$$97\%, \quad \text{Remaining} = 15$$

$$3\% x = 15$$

$$\frac{3}{100} \times x = 15$$

$$x = \frac{1500}{3} = 500$$

$$x = 500$$

$$\begin{array}{r} 100 \\ 100 \\ \hline 0.1 : 0.5 = 0.2 \end{array}$$

RATIOS :-

1)  $a:b = 2:3 \quad b:c = 3:4 \quad a:b:c = ?$

$$\begin{aligned} a:b &= 2:3 \\ b:c &= 3:4 \end{aligned}$$

$$a:b:c = 2:3:4$$

2)  $a:b = 3:5 \quad b:c = 5:7 \quad a:b:c = ?$

$$\begin{aligned} a:b &= 3:5 \\ b:c &= 5:7 \end{aligned}$$

$$a:b:c = 3:5:7$$

3)  $a:b = 2:3 \quad b:c = 4:5 \quad a:b:c = ?$

$$\begin{aligned} a:b &= 2:3 \\ b:c &= 4:5 \end{aligned}$$

$$a:b:c = 8:12:15$$

4)  $a:b = 3:5 \quad b:c = 6:7 \quad a:b:c = ?$

$$\begin{aligned} a:b &= 3:5 \\ b:c &= 6:7 \end{aligned}$$

$$a:b:c = 18:30:35$$

5)  $a:b = 2:3, b:c = 4:5, c:d = 6:7$

$$a:b:c:d$$

$$a:b = 2:3 \quad 48:72:90:105$$

$$b:c = 4:5$$

$$c:d = 6:7$$

6)  $a:b = \frac{3}{4} : \frac{2}{5}, b:c = \frac{2}{3} : \frac{4}{7}, a:b:c = ?$

$$a:b = \frac{9}{b} \frac{3/4}{2/5} \quad b:c = \frac{2}{c} \frac{2/3}{4/7}$$

$$\frac{q}{b} \frac{15}{8}$$

$$a:b = 15:8$$

$$\frac{14}{12} \frac{7}{6} \quad b:c$$

$$b:c = 7:6$$

$$a:b = 15:8$$

$$b:c = 7:6$$

$$105:56:48$$

$$a:b:c = 105:56:48$$

7)  $\frac{a}{2} = \frac{b}{3} = \frac{c}{4}$  Find  $a:b:c$

$$\frac{a}{2} = \frac{b}{3}$$

$$\frac{b}{3} = \frac{c}{4}$$

$$\frac{a}{b} = \frac{2}{3}$$

$$\frac{b}{c} = \frac{3}{4}$$

$$a:b:c$$

$$a:b = 2:3 \quad b:c = 3:4$$

$$2:3:4$$

8)  $3a = 5b = 7c \quad a:b:c ?$

Assume :-  $3a = 5b = 7c = x$

$$a = \frac{x}{3}, b = \frac{x}{5}, c = \frac{x}{7}$$

$$\text{LCM of } (3, 5, 7) = 3^1 \times 5^1 \times 7^1 = 105$$

$$a:b:c = \frac{x}{3} : \frac{x}{5} : \frac{x}{7}$$

$$= \frac{35}{105} : \frac{21}{105} : \frac{15}{105}$$

$$a:b:c = \underline{\underline{35:21:15}}$$

9) 700. A, B, C  $4:7:9$

$$\Rightarrow A:B:C = 4:7:9 = 700$$

$$(4:7:9)_x = 4x + 7x + 9x = 20x = 700$$

$$4x + 7x + 9x = 20x = 700$$

$$\boxed{x = 35}$$

$$4x:7x:9x = 35x:7x:9x = 35:7:9$$

$$= 140:245:315$$

10) 2040, A, B, C  $8:11:15$

$$\Rightarrow \frac{A}{8} : \frac{B}{11} : \frac{C}{15} = 2040$$

$$(8:11:15)_x \Rightarrow 8x:11x:15x = 8x$$

$$8x + 11x + 15x = 2040$$

$$34x = \frac{2040}{34} = \boxed{60 = x}$$

$$60 \times 8: 60 \times 11: 60 \times 15 = 2040$$

$$480:660:900$$

11) 4810, A, B, C  $6:9:11$

$$(6:9:11)_x \Rightarrow 6x + 9x + 11x = 4810$$

$$26x = 4810$$

$$\boxed{x = 185}$$

$$6 \times 185: 9 \times 185: 11 \times 185 = 4810$$

$$110:165:2035$$

12)  $x:y = 5:4$  Find  $x+y : x-y$

$$\frac{x}{y} = \frac{5}{4} \Rightarrow \frac{x+y}{x-y} = \frac{5+4}{5-4} = \frac{9}{1}$$

$$= 9:1$$

$$16) \text{ total students} = 2500$$

$$\text{no. of girls} = 1400$$

$$\text{no. of girls} + x = 2500$$

$$1400 + x = 2500$$

$$x = 1100$$

$$\text{Boys : girls} = \frac{11}{14}$$

$$17) \text{ total students} = 31700$$

$$B : G = 743 : 842$$

$$\frac{842}{1885} \times 31700 = 16840$$

$$18) x : y : z$$

$$80 : 100 : 96$$

$$20 : 25 : 24 \quad 20 : 25 : 24$$

$$19) 70\%, x = \frac{3}{5}y \quad x : y ?$$

$$\frac{70}{100}xx = \frac{3}{5}y$$

$$\frac{7}{10}x = \frac{3}{5}y \Rightarrow \frac{x}{y} = \frac{30}{35} = \frac{6}{7}$$

$$\frac{x}{y} = \frac{6}{7} \quad x : y = 6 : 7$$

$$20) \text{ sum} = 98 \quad A : B = 2 : 3$$

$$B : C = 5 : 8$$

$$A : B : C = 10 : 15 : 24 = 98$$

$$B = \frac{15}{(10+15+24)} \times 98 = \frac{15}{49} \times 98$$

$$\boxed{B = 30}$$

$$21) 25P : 10P : 5P = 30$$

$$(L : 2 : 3)x$$

$$25x + 20x + 15x = 30 \times 100$$

$$60x = 30 \times 100$$

$$x = \frac{50}{60} \quad x = 50$$

$$5P \text{ wages} = 3x = 3 \times 50 \\ = 150$$

$$22) IRS : SOP : 2SP = 75$$

$$100P : SOP : 2SP = 78 \times 100$$

$$(12 : 10 : 7)x$$

$$1200x : 500x : 175x = 78 \times 100$$

$$1875x = 75 \times 100$$

$$x = \frac{7500}{1875} = 4$$

$$\boxed{x = 4}$$

$$2SP = 7 = 7 \times 4$$

$$= 28 \text{ nos}$$

$$23) 10P : 20P : IRS = 57$$

$$10P : 20P : 100P = 57 \times 100$$

$$(10 : 17 : 7)x$$

$$100x : 340x : 700x = 57 \times 100$$

$$1140x = 57 \times 100$$

$$x = \frac{57 \times 100}{1140} = 5$$

$$20P = 17 \times 5 =$$

$$= \frac{85}{17}$$

$$24) A : B = 5 : 7 \quad 5(A) = 12 + 3(B)$$

$$5(5x) = 12 + 3(7x) \quad 5 : 7$$

$$25x = 12 + 21x \quad 5x = 21$$

$$4x = 12 \quad \boxed{x = 3}$$

$$25) 75 \rightarrow 900x$$

$$\text{Student} \rightarrow 1 \text{ meal/day}$$

$$75 \rightarrow 90 \times 75$$

$$10 \text{ days} \left\{ \begin{array}{l} 25 \\ 50 \end{array} \right. \rightarrow \left\{ \begin{array}{l} 6750 \\ 750 \end{array} \right. \rightarrow$$

$$+ 1 \text{ ad.} \left\{ \begin{array}{l} 5 \\ 15 \end{array} \right. \rightarrow \left\{ \begin{array}{l} 6000 \\ - 500 \end{array} \right.$$

$$55 \rightarrow 5500$$

$$\frac{100}{55} = 100 \text{ days}$$

$$26) A \ B \ C$$

$$(x+8) : (x+3) x = 53$$

$$(15+x) + (8+x) + x = 53$$

$$23 + 3x = 53$$

$$3x = 53 - 23$$

$$x = \frac{30}{3} = 10$$

$$(10+8)+7 : (10+8) : 10$$

$$25 : 18 : 10 = 53$$

=

IOS:-

27) Actual Ratio =  $2:3:5 = 2x+3x+5x$   
 Add 20  
 Student =  $120 + 120 + 120$

changed Ratio =  $4:5:7 = 4x:5x:7x$

$$\begin{array}{l|l} 2x+20=4x & 2x+3x+5x \\ 20=4x-2x & 2x+10+3x+10+5x+10 \\ \boxed{x=10} & =100 \text{ Students} \end{array}$$

28) Income of A:B =  $3:2 \quad x \times = \frac{3x}{2x}$   
 Expenditure A:B =  $5:3 \quad xy = \frac{5y}{3y}$

$$\begin{array}{l|l} 2x+3x-5y=2000 \rightarrow ① & \text{Expenditure} = \\ 3x+2x-3y=2000 & 5y:3y \\ \hline \Rightarrow 6x-10y=4000 & 5x2000:3x2000 \\ \text{Get } +ay = 6000 & 10000:6000 \\ \hline y=2000 & \end{array}$$

29) Salaries A:B:C  
 $2:3:5$  Let's assume salary  
 Salary  $\rightarrow (2 \times 100):(3 \times 100):(5 \times 100)$   
 $= 200:300:500$   
 Increment  $\rightarrow +15\% : 10\% : 20\%$   
 New salary =  $230:330:600$   
 New Ratio =  $230:330:600$   
 $\underline{\underline{23:33:60}}$

30)  $3lh = 5dm$

If  $1lh = 3dm = 3lh$

$$\therefore 3lh \times (3lh) = 5dm$$

$$\Rightarrow 9lh = 5dm$$

$$\therefore 9:5$$

13) If  $x:y = 3:7 \quad x+4:y-3$

$$\begin{aligned} x=3 &\Rightarrow 3+4=7 \\ y=7 &\Rightarrow 7-3=4 \end{aligned}$$

$$x:y \approx 7:4$$

14) If  $x:y = 4:5$  then  $(x^2-y^2):(x^2+y^2)$

$$\begin{aligned} \Rightarrow x:y &= 4:5 \\ \Rightarrow \frac{x}{y} &= \frac{4}{5} \Rightarrow \frac{3x+4y}{5x-3y} = \cancel{\frac{3x+4y}{5x-3y}} \end{aligned}$$

$$\begin{aligned} \Rightarrow \frac{\frac{3x}{y}+4}{\frac{5x}{y}-3} &= \frac{3x(\frac{4}{5})+4}{5x(\frac{4}{5})-3} = \cancel{\frac{\frac{12+20}{5}}{\frac{20-12}{5}}} \end{aligned}$$

$$\begin{aligned} \frac{x}{y} &= \frac{4}{5} = \frac{3x+4y}{5x-3y} = \frac{12+20}{20-12} \\ &= \frac{32}{8} \end{aligned}$$

12) If  $x:y = 4:5$  then  $(3x+4y):(5x-3y)$

$$\Rightarrow \frac{x}{y} = \frac{4}{5} \Rightarrow \frac{3x+4y}{5x-3y} = \frac{1}{\frac{y}{x}}$$

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

$$\Rightarrow \frac{\frac{12+20}{5}}{\frac{20-12}{5}} = \frac{32}{8} = 32:5$$

12)  $x:y = 5:4$  find  $xy:x-y$

$$\frac{x}{y} = \frac{5}{4} \Rightarrow \frac{x+y}{x-y} \Rightarrow \frac{5+4}{5-4} = \frac{9}{1} = 9:1$$

15)  $x:y$  is  $5:4$  find  $(x^2-y^2):(x^2+y^2)$

$$\Rightarrow \frac{x}{y} = \frac{5}{4} \Rightarrow \frac{x^2-y^2}{x^2+y^2} = \frac{5^2-4^2}{5^2+4^2}$$

$$= \frac{9}{41}$$

$$x:y = 9:41$$

## LOGARITHM :-

1)  $s^3 = 125$  in log form

$\Rightarrow \log_{\text{base}} \text{ans} = \text{Power}$

$$\Rightarrow \log_s 125 = 3$$

2)  $\log_{10} 1 = 0$  Exponential form

$$\Rightarrow 10^0 = 1$$

3)  $\log$  of 32 to the base of 4

$$\Rightarrow \log_4 32 = x$$

$$\Rightarrow 4^x = 32 \Rightarrow (2^2)^x = 2^5$$

$$\Rightarrow 2^{2x} = 2^5$$

$$\Rightarrow 2x = 5 \Rightarrow x = \frac{5}{2}$$

4)  $\log_a m = n \Rightarrow a^{n-1} =$

$$\Rightarrow a^n = m \Rightarrow a^{(n-1)} \cdot a^1 = m$$

$$\Rightarrow a^{(n-1)} = \frac{m}{a}$$

5) Find  $x$  if  $\log_5 (x-7) = 1$

$$\Rightarrow 5^1 = (x-7)$$

$$5 = x-7 \Rightarrow 5+7 = x$$

$$\underline{x=12}$$

6)  $\log(x-1) + \log(x+1) = \log_2 1$

$$\log_2 1 = 0 \Rightarrow 2^0 = 1$$

$$\log(x-1) + \log(x+1) = 0$$

$$\log[(x-1)(x+1)] = 0$$

$$\log_{10}(x^2 - 1) = 0$$

$$\cancel{\Rightarrow} 10^0 = (x^2 - 1)$$

$$\underline{1 = x^2 - 1}$$

$$x^2 = 1+1 \Rightarrow x^2 = 2 \Rightarrow x = \sqrt{2}$$

$$x = \pm \sqrt{2}$$

$$7) \text{ EXPAND } \log\left(\frac{75}{16}\right) = \log\left(\frac{5}{4}\right) + \log\left(\frac{32}{243}\right)$$

$$\Rightarrow \log\left(\frac{75}{16}\right) = 2\log\left(\frac{5}{4}\right) + \log\left(\frac{32}{243}\right)$$

$$\Rightarrow \log\frac{75}{16} = \log\left(\frac{5}{4}\right)^2 + \log\left(\frac{32}{243}\right)$$

$$\Rightarrow \log\frac{75}{16} = \log\left(\frac{25}{81}\right) + \log\left(\frac{32}{243}\right)$$

$$\Rightarrow \log\frac{75}{16} = \log\left(\frac{81}{243}\right) + \log\left(\frac{32}{243}\right)$$

$$\Rightarrow \log\frac{3 \times 28}{16} = \log\left(\frac{81}{243}\right) + \log\left(\frac{32}{243}\right)$$

$$\Rightarrow \log\left(\frac{243}{16}\right) + \log\left(\frac{32}{243}\right)$$

$$\Rightarrow \log\left(\frac{243}{16} \times \frac{32}{243}\right) = \log\left(\frac{32}{16}\right)$$

$$= \log 2$$

$$8) 2\log\left(\frac{15}{18}\right) - \log\left(\frac{25}{162}\right) + \log\left(\frac{4}{9}\right) = \log x$$

$$\Rightarrow \log\left(\frac{15}{18}\right)^2 - \log\left(\frac{25}{162}\right) + \log\left(\frac{4}{9}\right) = \log x$$

$$\Rightarrow \log\left(\frac{225}{324}\right) - \log\left(\frac{25}{162}\right) + \log\left(\frac{4}{9}\right) = \log x$$

$$\Rightarrow \log\left(\frac{225}{324} \times \frac{162}{25}\right) + \log\left(\frac{4}{9}\right) = \log x$$

$$\Rightarrow \log\left(\frac{9}{2}\right) + \log\left(\frac{4}{9}\right) = \log x$$

$$\Rightarrow \log\left(\frac{9}{2} \times \frac{4}{9}\right) = \log 2 = \underline{\log x}$$

# LOGARITHM

$$\log(x+s) + \log(x-s) = 4\log 2 + 2\log 3$$

$$\log(x+s)(x-s) = \log 2^4 + \log 3^2$$

$$\log(x^2 - 2s^2) = \log(2^4 \times 3^2)$$

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

$$x^2 - 2s^2 = 144$$

$$\Rightarrow x^2 = 144 + 2s^2 \Rightarrow x^2 = 169$$

$$x = \sqrt{169} = 13$$

10)  $\frac{\log 225}{\log 15} = \log x \quad ?$

$$\Rightarrow \frac{\log 15^2}{\log 15} = \log x$$

$$\Rightarrow \frac{2 \log 15}{\log 15} = \log x \Rightarrow \log_{10} x = 2$$

$$\Rightarrow 10^2 = x$$

$$x = 100$$

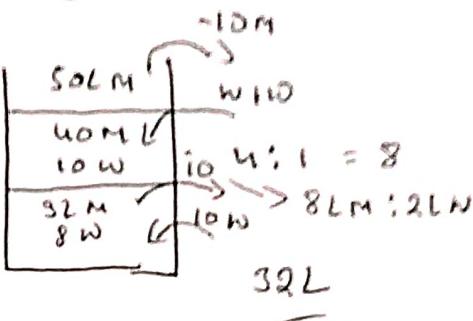
## MIXTURES AND ALLEGATIONS

$$\therefore A_1 = 50 \text{ kg} \quad A_2 = 70 \text{ kg} \quad A' = 65 \text{ kg}$$

$$n_1 : n_2 \quad \frac{n_1}{n_2} = \frac{A_2 - A'}{A' - A_1} = \frac{70 - 65}{65 - 50} = \frac{1}{3}$$

$$\frac{n_1}{n_2} = \frac{1}{3} \quad n_1 : n_2 = 1 : 3$$

2)



$$32L$$

3)  $A_1 = 1.15 \quad A_2 = 1.24 \quad A'$

$$A_1 = 1.15 \quad A_2 = 1.24 \quad SP = 1.50$$

$$SP = 125\% CP$$

$$1.50 = \frac{125}{100} \times CP$$

$$\frac{1.50 \times 4}{5} = CP$$

$$CP = 1.2$$

$$n_1 = 0.04 \quad n_2 = 0.05$$

$$\frac{n_1}{n_2} = \frac{0.04}{0.05} = \frac{n_1}{n_2} = 4 : 5$$

4)  $A_W = 0 \quad A_m = SR \quad n_2 = 36L$

$$A_{m+n} = 3.60$$

$$n_1 = 1.40 \quad n_2 = 3.60$$

$$\frac{n_1}{n_2} = \frac{1.40}{3.60} = 7 : 8$$

$$\frac{n_1}{n_2} = \frac{7}{18}$$

$$\frac{n_1}{36} = \frac{7}{18}$$

$$n_1 = \frac{36 \times 7}{18} = 14L$$

5)  $A_1 = 34P \quad A_2 = 50P$

$$A' = 40P$$

$$n_1 = 10P \quad n_2 = 6P$$

$$\frac{n_1}{n_2} = \frac{10P}{6P} = \frac{5}{3}$$

$$SP = 44P \quad 10\% +$$

$$SP = \frac{1+10}{100} \times CP$$

$$44 = \frac{11}{10} \times CP$$

$$\frac{44 \times 10}{11} = CP$$

$$CP = 40P$$

$$n_1 : n_2 = 5 : 3$$

6)  $A_1 = 9.5 \text{ m}^2$        $A_2 = 7.0 \text{ m}^2$        $A_3 = 17 \text{ kg}$

$A' = 13 \text{ m}^2$

$n_1 = 7 \text{ m}^2$        $n_2 = 9.5 \text{ m}^2$

$\frac{n_1}{n_2} = \frac{1}{1}$        $n_1 : n_2 = 2 : 1$

$\frac{n_1}{m} = \frac{2}{17}$        $n_1 = \frac{17 \times 2}{17} = 2 \text{ kg}$

$n_1 = 34 \text{ kg}$

12)  $A_{\text{mix}} = 100$        $A_m = 160$

$A_{\text{water}} = 100$

$n_1 = 40$        $n_2 = 100$

$\frac{n_1}{m} = \frac{40}{160} = \frac{1}{4}$

$n_1 : n_2 = 2 : 5$

$SP_{\text{Milk}} = 140$

$SP_{\text{Water}} = 100$

$SP_{\text{Milk}} = 140$

$SP_{\text{Water}} = 100$

8) Total mixture =  $x \text{ ltrs}$

Spirit =  $20\% = 0.2x$

Removed mixture = 5 ltrs

Removed spirit =  $0.2 \times 5 = 1 \text{ l}$

Remaining spirit =  ~~$0.2x - 1$~~   
 $= 0.2x - 1.0 \text{ ltrs}$

i. Remaining spirit % =  $12\% = 0.12x$

$$0.2x - 1 = 0.12x$$

$$0.2x(1 - 0.12) = 1$$

$$0.08x = 1$$

$$x = \frac{1}{0.08} = 12.5$$

$$x = 12.5 \text{ ltrs}$$

10)  $A_1 = 70\%$        $A_2 = 88\%$

$$A' = 84\%$$

$$n_1 = 4\%, \quad n_2 = 14\%$$

$$\frac{n_1}{m} = \frac{4}{14} = \frac{2}{7} \quad n_1 : m = 2 : 7$$

11)  $A_w = 0$ ,       $A_J = 12 \text{ m}^2$

$$A_{w/J} = 8 \text{ m}^2$$

$$n_1 = 4 \text{ m}^2, \quad n_2 = 8 \text{ m}^2$$

$$\frac{n_1}{m} = \frac{4}{8} = \frac{1}{2} \quad \frac{n_1}{n_2} = 1 : 2$$

13) Spirit      Solution

$30\%$        $100\%$

$80\%$

$n_1 = 20\%$        $n_2 = 50\%$

$\frac{n_1}{m} = \frac{20}{50} = \frac{2}{5} \Rightarrow n_1 : n_2 = 2 : 5$

14) Alloy 1      Silver : Copper  
 $5 : 1 = 6$

Alloy 2       $7 : 2 = 9$

Alloy 3 has 80% Silver hence

$$80 : 20 = 4 : 1 = 5$$

$$A_1 = \frac{5}{6}, \quad A_2 = \frac{7}{9}$$

$$A' = \frac{4}{5}$$

$$n_1 = \frac{7}{9} - \frac{4}{5} = \frac{35 - 36}{45} = \frac{1}{45}$$

$$n_1 = \frac{36 - 35}{45} = \frac{1}{45} \quad n_2 = \frac{25 - 24}{45} = \frac{1}{45}$$

$$= \frac{1}{45} : \frac{1}{45}$$

$$= \frac{1}{3} : \frac{1}{2}$$

$$= \frac{2}{3} \quad n_1 : n_2 = 2 : 3$$

## STRUCTURE AND ALLEGATIONS

COPPER : NICKLE

$$\text{Alloy 1} = 65:35 \Rightarrow 13:7 = 20$$

$$\text{Alloy 2} = 17:3 = 20$$

3rd Alloy contains 4 times more copper than

Nickel so  $80:20$  is the Ratio

$$C:N \\ 4:1 = 5$$

$$A_1 = \frac{13}{20} \quad A_2 = \frac{17}{20}$$

$$A' = \frac{4}{5}$$

$$n = \frac{17}{20} = \frac{4}{5} : \frac{13}{20} \quad \frac{4}{5} : \frac{13}{20}$$

$$= \frac{85 - 80}{100} : \frac{80 + 65}{100} = \frac{5}{100} : \frac{145}{100} = \frac{1}{20} : \frac{3}{20}$$

$$\frac{1}{20} : \frac{3}{20} = 1:3$$

$$n_1:n_2 = 1:3$$

$$15) \text{ Box A} = \text{wheat} = 30/\text{kg}, \\ \text{B} = 40/\text{kg}$$

$$n_1:n_2 = 4:7$$

$$A_1 = 30 \quad A_2 = 40$$

$$A' = x$$

$$n_1 = 40-x \quad n_2 = x-30$$

$$\frac{n_1}{n_2} = \frac{40-x}{x-30} \Rightarrow \frac{4}{7} = \frac{40-x}{x-30}$$

$$4x - 120 = 280 - 7x$$

$$4x + 7x = 120 + 280$$

$$11x = 400$$

$$x = \frac{400}{11} = 36.36 \text{ RS/kg}$$

	$S : W$	
Mix 1	5% : 95% $7.62/\text{L}$	
Mix 2	25% : 75% $7.82/\text{L}$	
Mix 3	18% : 82% ?	

$$\text{Required Ratio} = 25 - 18 : 18 - 5 \\ = 7 : 13$$

$$\text{Mix 1} = 7.62/\text{L}$$

$$\text{Mix 2} = 7.82/\text{L}$$

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

$$n_1 = 7.82 - x$$

$$n_2 = \cancel{7.62} - x - 7.62$$

$$\frac{n_1}{n_2} = \frac{7.82 - x}{x - 7.62} = \frac{1}{13}$$

$$= 101.66 - 13x = 7x - \cancel{5.62} \quad 53.34$$

$$\Rightarrow 101.66 + 53.34 = 13x + 7x$$

$$155 = 20x$$

$$x = \frac{155}{20} = 7.75/\text{L}$$

$$\text{For 5 Ltrs of mix} = 7.75 \times 5$$

$$= 38.75 \text{ RS}$$

# NUMBER SYSTEM

	% 3	% 9
4320	4 ✓	✗
2343	12 ✓	✗
3474	18 ✓	✓
4131	9 ✓	✓
5286	21 ✓	✗
5340	18 ✓	✗
6336	18 ✓	✓
7347	21 ✓	✗
8115	15 ✓	✗
9276	24 ✓	✗

6 no. are divisible by 3

$$2) \quad 5^2 - 3^2 = 25 - 9 \\ = 16 / 8 \leftarrow \\ 9^2 - 7^2 = 81 - 49 = 32 / 8 = 4 \\ \text{Ans} = \underline{\underline{8}}$$

$$3) \quad 653Pq \% 80 \quad P+q$$

$$\begin{array}{r} 653PQ \\ \times 8 \\ \hline 80 \\ 8 \quad 10 \\ \hline 320 \quad 40 \\ \hline 8 \quad \underline{\underline{0}} \end{array}$$

$$65320 \quad P=2 \quad q=0$$

$$4) \quad \begin{array}{r} 4P3 \\ + 984 \\ \hline 1397 \end{array} \quad P+q = \underline{\underline{9}}$$

$$1397 \% 11$$

$$q = 9 \quad (7+3) - (1+9) = 0 / 11 \\ P+8 = 9 \quad 10 - 1 \cancel{+8} - 9 = 0 \\ P \neq 8 \neq 9 \quad 10 - 1 = 9 \\ P = 9 - 8 = 1 \quad = 9$$

$$P+q = 9+1 = \underline{\underline{10}}$$

$$5) \quad 1+4+6+5+11+6+\dots$$

Sum of 200th term

1+6+11+...	4+5+6
$a=1 \quad d=5 \quad n=200$	$a=6 \quad d=2 \quad n=200$
$\text{Sum}_{100} = \frac{n}{2}(2a+(n-1)d)$	$\text{Sum}_{100} = \frac{n}{2}(2a+(n-1)d)$
$= \frac{100}{2}(2 \times 1 + (100-1) \times 5)$	$= \frac{100}{2}(2 \times 6 + (100-1) \times 2)$
$= 50(2 + 99 \times 5)$	$= 50(6 + 99 \times 2)$
$= 50(2 + 495)$	$= 50(6 + 198)$
$= 50 \times 497$	$= 50 \times 204$
$= 24850$	$= \underline{\underline{5350}}$
$\text{Sum} = \underline{\underline{30200}}$	

$$7) \quad -1 \leq a \leq 2 \quad \& \quad 1 \leq b \leq 3 \\ \Rightarrow (2a - 3b)$$

$$\star \quad a = -1 \quad b = 1 \quad (2 \times -1 - 3 \times 1) = 5 \\ \vee \quad a = -1 \quad b = 3 \quad (2 \times -1 - 3 \times 3) = 7 \\ \Rightarrow (2a + 3(-b)) \\ \star \quad a = -1 \quad b = +3 \quad (2 \times -1 + 3 \times (-3)) \\ = -11 \quad = \underline{\underline{-11}}$$

$$8) \quad 987$$

$$\begin{array}{r} 987 \\ \times \quad N \\ \hline 55 \underline{9981} \end{array}$$

$$N = 555681$$

$$\begin{array}{r} 987 \\ \diagdown \quad \diagup \\ 3' \quad 329 \\ \diagdown \quad \diagup \\ 7' \quad 47' \end{array}$$

$$a) \quad 555181 = (16)7 \% 3 \times \\ b) \quad 555684 = (81)3 \% 3 \leftarrow \\ \Leftrightarrow 555213 \times \\ d) \quad 555621 \times$$

## Number System:-

$$\frac{1}{4} \times \frac{1}{7} \times L = 30000$$

$$\frac{8}{35} \times L = ?$$

$$\frac{L}{28} = \frac{30000}{84} \Rightarrow L = 28 \times 30000 = 840000$$

$$\frac{8}{35} \times 840000 = \frac{192000}{7}$$

10)  $653ab \ \% 90$  (a+b)

$$\begin{array}{r} 653ab \\ 653a0 \curvearrowleft \\ \underline{65340} \\ a+b = 4+0 \\ = 4 \end{array}$$

11)  $(729)^{59}$   
 $19^{59}$       59 odd N  
Hence unit digit is 9

13) Prime numbers in

$$67 \times 35^3 \times 11^{10}$$

$$\Rightarrow (2 \times 3)^7 \times (7 \times 5)^3 \times 11^{10}$$

$$= 2^7 \times 3^7 \times 7^3 \times 5^3 \times 11^{10}$$

Sum of power = No. of primes

$$= 30$$

14)  $x - y = 2395$   $\frac{x}{y} = 6$   $R = 15$

$$y = ?$$

$$x = y \times 6 + 15$$

$$x = 6y + 15$$

$$x - 6y = 15 \rightarrow \textcircled{1}$$

$$\begin{aligned} x - y &= 2395 \\ x - 6y &= 15 \\ \hline 5y &= 2380 \\ y &= 476 \end{aligned}$$

15)  $x \rightarrow$  whole no

$x^2(x^2-1)$  is % by (always)

$\Rightarrow 12 \cancel{\times}$

$$\text{consider } x = 10 \Rightarrow 10^2(10^2-1)$$

$$\Rightarrow 100(99) = 9900$$

$$12 - x = 12 - 10 = 2$$

$$\Rightarrow x = 12 = 12^2(12^2-1) = 144(143)$$

$$= 20592$$

15)  $x \rightarrow$  is whole no  $x^2(x^2-1)$  is %

$$x = 1 \quad 1^2(1^2-1) = 0$$

$$x = 2 \quad 2^2(2^2-1) = 12$$

$$x = 3 \quad 3^2(3^2-1) = 72$$

$\therefore x^2(x^2-1)$  always % by 12

16) 2, 4, 8, 16, ..., 1024.

No. of terms

$$CM = 2$$

$$\text{Sum} = \frac{a(2^n - 1)}{2 - 1}$$

$$a = 2$$

$$n = 10$$

$$= \frac{2(2^{10} - 1)}{2 - 1}$$

$$a_n = a(2^{n-1}) \Rightarrow 2 \times 2^{(n-1)}$$

$$1024 = 2^n$$

$$2^{10} = 2^n$$

$$n = \underline{10}$$

17) The digit in unit's place of product  $71 \times 72 \times 73 \times \dots \times 79$  is

$$\Rightarrow 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \\ = 362880$$

digit at unit's place = 0

18)  $11158 + P \% 77$

$$\begin{array}{r} 11158 \\ + 1 + 2 \\ \hline 11159 \end{array}$$

11159 NOT divisible by 11

$$\begin{array}{r} 11160 \\ \times \% 11 \\ \hline 11161 \end{array}$$

11161 NOT divisible by 11

$$\begin{array}{r} 11162 \\ \times \% 11 \\ \hline 11163 \end{array}$$

11163 NOT divisible by 11

$$\begin{array}{r} 11164 \\ \times \% 11 \\ \hline 11165 \end{array}$$

11165  $\leftarrow$  Divisible by 11  $\therefore$  P  
 $\underline{+ 7}$

19) No. of factors of 9321

$$\begin{array}{r} 9321 \\ \swarrow \quad \searrow \\ 3 \quad 3107 \\ \swarrow \quad \searrow \\ 3 \quad 1037 \\ \swarrow \quad \searrow \\ 3 \quad 349 \\ \swarrow \quad \searrow \\ 3 \quad 117 \\ \swarrow \quad \searrow \\ 3 \quad 39 \\ \swarrow \quad \searrow \\ 3 \quad 13 \\ \swarrow \quad \searrow \\ 3 \quad 1 \end{array}$$

$$= 3^1 \times 13^1 \times 23^1$$

$$= (1+1) \times (1+1) \times (1+1)$$

$$= 8$$

No. of factors = 8

20) Rightmost integer

$$\begin{array}{r} 65776 \quad 759 \\ + 54697 \quad 467 \\ \hline 2 \quad 6 \quad 759 \quad + 7 \quad 467 \\ = 6 + 3 \\ = \underline{\underline{9}} \end{array}$$

$$\begin{array}{r} 5PQ \rightarrow 500 + 10P + Q \\ - 7QR \rightarrow -700 + 10Q + R \\ + 9R6 \rightarrow 900 + 10R + 6 \\ \hline 823 \\ 700 + 10(P+Q) \\ 700 + 10(P+Q+R) + 13 \end{array}$$

$$700 + 10(P+Q+R) + 13 = 823$$

$$10(P+Q+R) = 823 - 713$$

$$10(P+Q+R) = 110$$

$$(P+Q+R) = \frac{110}{10} = 11$$

$$P+Q+R = 11$$

$$P+R = 11 - Q$$

$$Q = P+R-11$$

$$0 \leq P, Q, R \leq 9$$

$$\therefore P=R=9$$

$$Q = 9+9-11 = 7$$

$$P=R=8$$

$$Q = 8+8-11 = 5$$

$$P=9 \quad Q=8$$

$$Q = 9+8-11 = 6$$

$$12) (y^n - b^n) \% (y-b)$$

$$\Rightarrow n=0 \quad (y^0 - b^0) = 0 \times$$

$$n=1 \quad (y^1 - b^1) / (y-b) = 1$$

$$n=2 \quad (y^2 - b^2) = (y+b)(y-b) = 2$$

When  $\therefore n$  is any natural no;

$$CP = 1400 \quad SP = -15\% \\ SP = 85\% \cdot CP \Rightarrow \frac{85}{100} \times 1400 \\ SP = 1190$$

2)  $CP = 3000$



$CP = x \quad (3000-x)$   
 $P = 20\%, \quad L = 10\%$

$$SP_H = 120\% \cdot CP \quad SP_C = 90\% \cdot (3000-x)$$

$$2\% \text{ gain} = 3000 + 2\%, \\ = 3060$$

$$SP_H + SP_C = 3060$$

$$120\%x + 90\% \cdot (3000-x) = 3060$$

$$120\%x + 90\% \cdot (3000) - 90\%x = 3060$$

$$30\%x + 2700 = 3060$$

$$30\%x = 3060 - 2700$$

$$\frac{30}{100}x = 360$$

$$x = \frac{360 \times 100}{30} = x = 1200$$

3)  $SP = 18700 \quad L = -15\%$

$$SP = 85\% \cdot CP \\ 18700 = \frac{85}{100} \times CP \\ \underline{\frac{18700 \times 100}{85}} = CP = 22200$$

4)  $SP_1 = 840$

$$P_1 = 20\%$$

$$CP_1 = ?$$

$$SP_1 = 120\% \cdot CP$$

$$840 = \frac{120}{100} \times CP$$

$$\underline{\frac{840 \times 100}{120}} = CP$$

$$CP = \underline{\underline{700}}$$

$$1700 = CP_1 + CP_2$$

$$SP_1 + SP_2 = 840 + 960 = 1800$$

$$\frac{100}{1700} \times 100$$

$$= 5.88\% \text{ gain}$$

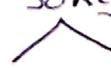
5)  $D = 32 \quad P = 15\%, \quad CP = 320$

$$SP = CP + 15\%$$

$$SP = 320 + 48 = 368$$

$$MP = 368 + 32 = MP = 400$$

$$P = \frac{32}{32+4} \times 100 = 25\% \quad \underline{\underline{=}}$$

6) 

$$P = 14\%, \quad L = 6\% \text{ loss} \quad \text{Total} = -4\%$$

$$CP_1 = x \quad CP_2 = (50-x)$$

$$SP_1 = 114\% \cdot x \quad SP_2 = 94\% \cdot (50-x)$$

$$114\%x + 94\% \cdot (50-x) = 48$$

$$114\%x + 94\% \cdot (50) - 94\%x = 48$$

$$20\%x + 47 = 48$$

$$\frac{20}{100}xx = 1$$

$$x = \underline{\underline{5}}$$

7)  $CP = x/1+r \quad CP_m = 6x$

$$SP = 2x/1+r \quad CP_w = 0x$$

$$2w:6m:r$$

$$\text{Sold to r.l.} = 8/100(8 \times 22)/1+r$$

$$SP = 16x$$

$$P = 16 - 6x = 10x$$

$$P\% = \frac{10x}{6x} \times 100 \Rightarrow 10 \left( \frac{6x}{6} \right) x$$

$$= 10 \times 1660$$

$$= 166.66\%$$

8)  $CP = 25\% \cdot SP$

let  $SP = 100R$

$$CP = 25\% \cdot SP$$

$$P\% = 25 \Rightarrow \frac{25}{25} \times 100$$

$$P = 300\% \quad \underline{\underline{=}}$$

$$9) \text{ Amanur} = 150 \text{ RS}$$

$$150 \text{ Pencils} \quad \text{QD} \cdot 50 \text{ Pen}$$

$$1 \text{ RS} = 1 \text{ Pencil}$$

$$3 \text{ RS} = 1 \text{ Pen}$$

$$10\% \Rightarrow 150 - 15 = 135$$

$$50 \text{ Pencil} = 135 - 54 = 81$$

$$P = \frac{81}{3} = 27$$

$$10) CP_{12} = SP_8$$

$$\text{Let } CP_i = 1 \text{ / Pen}$$

$$CP_{12} = 12 \quad SP_8 = 8$$

$$SP_i = \frac{12}{8} = 1.5 \text{ Pen Pen}$$

$$P\% = \frac{0.5}{1} \times 100$$

$$P = 50\%$$

$$\begin{aligned} \text{Profit} &= \\ 1.5 - 1 &= 0.5 \text{ / Pen} \end{aligned}$$

$$11) CP_{20} = SP_x$$

$$\Rightarrow 20 \text{ CP} \times SP \Rightarrow \text{①}$$

$$Profit = 25\% \Rightarrow S.P - CP$$

$$Profit \% = \frac{SP - CP}{CP} \times 100 = 22\%$$

$$\Rightarrow \frac{SP}{CP} = 1$$

$$\text{Let's take } CP_i = 1 \text{ RS}$$

$$CP_{20} = 20 \text{ RS} = SP_x \cancel{OR}$$

$$CP_x = Q \times RS$$

$$P\% = \frac{P}{CP} \times 100$$

$$2S = \frac{20 - x}{2} \times 100^4$$

$$2 = 20 - x \times 4 \Rightarrow 80 - 4x$$

$$5x = 80$$

$$x = \frac{80}{5} = 16$$

$$12) \text{ TO.kil } 65\%$$

$$\begin{array}{c|c} 20\% & 25\% \\ \hline 20+25+\frac{25 \times 25}{100} & x\% = 65\% \end{array}$$

$$45 + 5$$

$$50\% + x\% = 65\%$$

$$20 50\% + x\% + \frac{50 \times x\%}{100}$$

$$x + \frac{x}{2} = 15\%$$

$$\frac{3x}{2} = 15\% = \frac{15 \times 2}{3} = 10\%$$

$$13) CP = 250 \times 150$$

$$= 37500 + 2500 \quad \left| \begin{array}{l} MP = 320 \\ D = 5\% \end{array} \right.$$

$$CP = 40000 \quad \left| \begin{array}{l} SP = 320 - 10 \\ = 310 \end{array} \right.$$

$$P = 45600 - 4000 \quad SP = 310 \times 150$$

$$= 5600 \quad = 45600$$

$$\frac{5600}{45600} = \frac{5600}{45600} \times 100 \quad 14\%$$

$$P = 14\%$$

$$14) \quad \text{ID} \quad \text{ID}$$

$$CP = RS/D \quad R4/D = 9R/2D$$

$$S.S0/D = 11R/2D$$

$$= \frac{2RS}{D}$$

$$\frac{Profit}{2RS/DP} \quad \frac{D}{S0RS/50D} =$$

$$15)$$

$$\text{SP} = \frac{1000 + 1000}{3} = 2000$$

$$= \frac{(1000 \times 100)}{3} = \frac{2000}{3}$$

$$CP_D = \frac{1000 \times 100}{90} = \frac{10000}{9}$$

$$\text{Total CP}_D = \frac{9500 \times 3 + 10000}{9} = \frac{17500}{9}$$

$$\text{Profit} = 2000 - \frac{17500}{9} =$$

$$= \frac{18000 - 17500}{9} = \frac{500}{9}$$

$$P\% = \frac{500/9 \times 100}{17500} = \frac{500}{17500} = 2.86\%$$

16) Let MRP = x

$$D = 20\%, SP_1 = x - 20\%, x$$

$$D = 25\%, SP_2 = x - 25\%, x$$

$$\left( x - \frac{20}{100}x \right) - \left( x - \frac{25}{100}x \right) = 2500$$

$$= \left( x - \frac{4}{20}x \right) - \left( x - \frac{5}{20}x \right)$$

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

16) Let MRP = x

$$D = 20\%, SP = 80\% x$$

$$25\%, SP = 75\% x$$

$$80\% x - 75\% x = 500$$

$$5\% x = 500$$

$$\frac{5}{100} x = 500 = \frac{500 \times 100}{5}$$

$$x = 10000$$

$$CP = 80\% of x = \frac{80}{100} \times 10000 = 8000 \text{ Rs}$$

17) Assume Shopkeeper has 300 items  
= 300 Rs

$$\frac{1}{3} \text{ Rs} = 10\% \text{ of } 300 = 100$$

$$\Rightarrow 100 = 110 \Rightarrow 100 = 120$$

$$100 = 94 \text{ Rs}$$

Total sold amount = 324 Rs

$$P\% = \frac{24\%}{324} \times 100 = 8\%$$

18)

$$CP_{200} = 375 \times 20 = 7500$$

$$SP \text{ of 200 items} = 33 \times 12 + 20 = 792$$

$$\text{Profit} = 7920 - 7500 = 420 \text{ Rs}$$

$$\% = \frac{420}{7500} \times 100 = 5.6\%$$

$$19) \therefore CP = x \quad P = 32\% x$$

$$SP = CP + P$$

$$SP = x + 32\% x$$

$$SP = x + \frac{32}{100} x = 4.2x$$

after increasing cost price by 25%

$$CP = 125\% x = 1.25x$$

$$D = 4.2x - 1.25x = 2.95x$$

$$\% = \frac{2.95}{4.25} \times 100 = 69.4\% \approx 70\%$$

$$20) CP = 100 \text{ Rs}$$

$$SP = 152\% CP = 152$$

$$MRP = x$$

$$D = 5\% = 95\% x = 152$$

$$\frac{95}{100} x = 152 \Rightarrow \frac{152 \times 100}{95}$$

$$x = 160$$

$$MRP = 60\% \text{ above CP}$$

## Averages

$$1) \text{ Avg}_s = 213 \quad A B C D \bar{D}$$

$$\frac{A+B+C+D+\bar{D}}{5} = 213 \Rightarrow 213 \times 5 \\ = 1065$$

$$\frac{A+B}{2} = 233.5 \quad \frac{D+E}{2} = 271$$

$$A+B = 233.5 \times 2 \\ = 467 \quad D+E = 271 \times 2 \\ = 542$$

$$467 + 542 + C = 1065$$

$$C = 1065 - (467 + 542) = \underline{\underline{56}}$$

$$2) \frac{568 + 467 + 342 + 987 + 105 + 178 + 426}{7}$$

$$= \frac{3073}{7} = \underline{\underline{439}}$$

$$3) 36a + 36b = 576 \quad \text{avg}(\underline{\underline{a+b}})$$

$$4) n = 65 \quad \text{Avg} = 150 \quad \text{Sum} = \text{Avg} \times \frac{n}{2}$$

$$= 65 \times 155 \\ = 9775$$

$$\text{Sum} = 9775 - 142 + 152$$

$$= 9780 + 10 = 9790$$

$$\frac{\text{Sum}}{N} = \frac{9790}{65} = \underline{\underline{150.15}}$$

$$5) 32B \Rightarrow \text{avg age} = 14$$

$$28g \Rightarrow \text{avg age} = 13$$

$$14 \times 32 = \underline{\underline{448}} \quad 13 \times 28 = \underline{\underline{364}}$$

$$\frac{812}{65} = \underline{\underline{12.53}}$$

$$6) \frac{A+B+C+D+\bar{D}}{5} = 74$$

$$AP = A B C D \bar{D} = 74 \\ = 70 72 74 76 78 \quad = 74 \times 78 \\ = \underline{\underline{5712}}$$

$$7) \begin{array}{ccccc} & A & B & \downarrow & C & D \\ 103 & 105 & 106 & 107 & 109 \end{array} \\ \underline{\underline{\text{III}}} \text{rd No} = \underline{\underline{107}}$$

$$8) \begin{array}{ccccccccc} A & B & C & D & E & F & G & H & I & J & K \\ 7 & 9 & 11 & 13 & 15 & 17 & 19 & 21 & 23 & 25 & 27 \end{array} = 17$$

$$27 - 7 = \underline{\underline{20}}$$

$$9) \begin{array}{ccc} A & B & C \\ \underbrace{A+B}_{\frac{A+B}{2}} & > & \frac{B+C}{2} \\ 15 & & \end{array}$$

$$\frac{40+20}{2} = 30 > \frac{80+10}{2} = 15 \\ 30 > 15 \\ 40 - 10 = \underline{\underline{30}}$$

10) Rose : Lillies

$$3 : 2 \quad \frac{R+L}{2} = 180.$$

$$3+2 = 5 \quad \frac{2}{5} \times 360 = \underline{\underline{144}}$$

$$11) \text{ avg of } 4 = 15130$$

$$-1 = 14660$$

$$\begin{array}{cccc|c} 1 & 2 & 3 & 4 & \\ 15130 & 15130 & 15130 & 15130 & \\ 14660 & 14660 & 14660 & 14660 & \\ \hline 470 & 470 & 470 & 470 & = 16540 \end{array}$$

$$12) \text{ Avg Temp on Monday to Thursday}$$

$$= 36.5 \times 4 = 146.0$$

$$\text{on Monday} = 38^{\circ}\text{C}$$

$$= 108^{\circ}\text{C}$$

$$\text{From Tuesday to Friday} = 34.5 \times 4$$

$$\Rightarrow 138.0^{\circ}\text{C}$$

$$\text{Temp on Friday} = 138 - 108^{\circ}\text{C}$$

$$= 30^{\circ}\text{C}$$

$$\begin{aligned} \text{Avg score} &= 4a \text{ in } 24 \text{ innings} \\ \text{in } 25 &= 25 + 4a \\ &= 74 \text{ Runs} \end{aligned}$$

16) Avg age of 10 boys = 13  
after adding  
Teacher's age &  $\approx 14$

$$\begin{aligned} \text{Teacher age} &= 15 \times 14 - 13 \times 14 \\ &= 210 - 182 \\ &= 28 \text{ years} \end{aligned}$$

$$17) \frac{2a + a + (a+1) + 108}{4} = 73.5$$

$$\frac{2a + 152}{4} = 73.5 \Rightarrow$$

$$\Rightarrow 4 \times 73.5 = 2a + 152 = 294 - 152 = 2a$$

$$a = \frac{142}{2} = 71$$

$$a+15 = 71+15 = 82$$

$$18) \begin{array}{ccccccc} 1 & 2 & 3 & 4 & 14 & \text{Employees} \\ 2500 & 2500 & 2500 & 2500 & 2500 & \end{array}$$

$$\begin{array}{r} \text{Manager} = \cancel{5000} \quad 5550 \\ - \cancel{2500} \quad \quad \quad \quad \\ \hline = 3050 \end{array}$$

$$\frac{3050}{20} = 152.5 = 2500 + 152.5 = 2652.5$$

$$19) \frac{22 + 24 + 26}{3} = 24$$

$$22 + 24 + 26 = 72$$

$$20) \Rightarrow \frac{532}{7} = 76$$

A	B	C	D	E	F	G
72	72	74	76			
				73		

$$21) \begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & \\ 1kg & 2kg & 2kg & 1kg & 1kg & \end{array}$$

- 40

$$\begin{array}{cccccc} & & 1kg & & & \\ & & -10kg & -10kg & & \\ & & & & & 100kg \times 5 \\ & & & & & = 500kg \\ & & & & & = 5kg \end{array}$$

$$5kg = 40 - 5$$

$$= 35kg$$

$$22) \text{ Books from Shop 1} = 65$$

$$= 1050 \text{ Rs}$$

$$\text{Shop 2} = 50$$

$$= 1020 \text{ books}$$

$$\text{Avg price} = \frac{1050 + 1020}{115} = \frac{2070}{115}$$

$$= 18 \text{ Rs}$$

$$23) \begin{array}{cccccc} 1 & 2 & 3 & 4 & 12 & + A \\ 35 & 35 & 35 & 35 & 35 & 35 \\ + 2 & + 2 & + 2 & + 2 & + 2 & + 2 \\ \hline & & & & & 59kg \end{array}$$

$$24) \begin{array}{cccccc} 1 & 2 & 3 & 4 & 20 & \\ 68 & 68 & 68 & 68 & 68 & \end{array}$$

$$25) 680 \times 2 = (48 + 65) + (72 + 61)$$

$$= 1360 - 113 + 133$$

$$= 1360 + 20$$

$$= \cancel{1360} \frac{1380}{\text{no. of st}} = \frac{1380}{20} = 69$$

$$26) \text{ Total marks of a student} = 9 \times 63 = 567$$

$$\text{Sum of 3 students} = 78 + 69 + 48 = 195$$

$$\text{Sum of Remaining 6} = 567 - 195 = 372$$

$$\text{Avg of Remaining 6} = \frac{372}{6} = 62$$

$$25) \begin{array}{ccc} A & B & C \\ 26 & 26 & 26 \\ 29 & 20 & 29 \\ \hline & & = \\ B & = 20 \text{ years} \end{array}$$

$$\text{Actual avg} = \frac{4050}{50} = 75$$

$$26) \begin{array}{l} \text{Total Student} = 120 \\ \text{Passed Student} = x \\ \text{Failed Student} = 120 - x \end{array}$$

$$\begin{array}{l} \text{Total marks obtained by 120 Student} \\ = 35 \times 120 = 4200 \end{array}$$

$$\begin{array}{l} \text{Total marks of Passed Students} \\ = 35x \end{array}$$

$$\text{Total of Failed Students} = (120 - x) \times 15$$

$$\begin{array}{l} \text{Total} = 35x + (120 - x) \times 15 = 4200 \\ = 35x + 1800 - 15x = 4200 \\ = 20x = 4200 - 1800 \end{array}$$

$$\begin{array}{l} 20x = 2400 \\ x = \frac{2400}{20} = 120 \end{array}$$

$$x = 120$$

$$27) \text{avg marks in Hindi (50)} = 76$$

$$\begin{array}{l} \text{Total marks of 50 students} \\ = 50 \times 76 \\ = 4100 \end{array}$$

$$\begin{array}{l} \text{Actual total marks scored by 54 student} \\ 4100 + 36 + 47 - 60 - 77 \end{array}$$

$$= 4100 + 23 - 137$$

$$= 4100 - 55$$

$$= 4050$$