

③ A sum becomes ₹ 1320 in 2 years at 4% per annum Compound Interest. The sum is —

$$P \quad A \\ 4\% = \frac{1}{25} \quad I \quad 25 \quad 26$$

$$\begin{array}{r} II \quad 25 \quad 26 \\ \hline 625 \quad | \quad 676 \\ \times 2 \quad | \\ \hline 1250 \end{array}$$

④ An amount of ₹ 6000 lent at 5% per annum Compound Interest for 2 years will become —

$$P \quad A \\ 5\% = \frac{1}{20} \quad I \quad 20 \quad 21$$

$$\begin{array}{r} 20 \quad 21 \\ \hline 6000 \leftarrow 480 \quad 441 \\ 15 \quad | \quad \times 15 \\ \hline 6615 \end{array}$$

⑤ The Compound interest on ₹ 5000 for 3 years at 10% p.a. will be

$$P \quad A \\ 10\% = \frac{1}{10} \quad I \quad 10 \quad 11$$

$$\begin{array}{r} III \quad 10 \quad 11 \\ \hline 1000 \quad | \quad 1000 \text{ parts} = 5000 \end{array}$$

$$\begin{array}{r} III \quad 10 \quad 11 \\ \hline 1000 - 1331 \end{array}$$

$$C.I = 331 \times 5 = 1655$$

⑥ The C.I. on ₹ 6000 at 10% p.a. for 2 years 4 months, compounded annually is —

$$P \quad A \\ 10\%, 1Y \quad I \quad 20 \quad 23$$

$$2M = 10\%, 4M = ? \quad 10\%, 1Y \quad II \quad 20 \quad 23$$

$$4M = 5\% \quad 5\%, 4M \quad III \quad 20 \quad 21$$

$$\begin{array}{r} 8000 \quad | \quad 1109 \\ \hline \end{array}$$

$$C.I = 3109$$

③ In what ratio a retailer should mix detergent powder at ₹ 11 per kg with detergent at ₹ 8 per kg so that he gains 20% by selling it at ₹ 21.

$$\begin{array}{c}
 11 \quad 8 \\
 \diagdown \quad \diagup \\
 3 \quad 2 \\
 \diagdown \quad \diagup \\
 3 : 2 \\
 \boxed{3:1}
 \end{array}$$

Gains: 20% = $\frac{1}{5}$
 CP = 100
 $\frac{100 \times 21}{120} = \frac{21}{2}$

④ In what proportion must coffee powder worth ₹ 80 per kg be mixed as to gain 20 percent by selling the mixture at ₹ 98 per kg.

$$\begin{array}{c}
 80 \quad 100 \\
 \diagdown \quad \diagup \\
 24 \quad 3 \\
 \diagdown \quad \diagup \\
 25 \quad 5 \\
 \diagdown \quad \diagup \\
 3 : 5 \\
 \boxed{11:1}
 \end{array}$$

CP = 100
 $\frac{100 \times 98}{120} = \frac{245}{3}$

⑤ The amount of water added to 9 litres of alcohol worth ₹ 10. per litre so that the value of the mixture may be ₹ 7.50 a litre?

$$\begin{array}{c}
 \text{alcohol} \quad \frac{x}{10/-} \quad \frac{w}{0/-} \\
 \diagdown \quad \diagup \\
 7.50 \\
 \diagdown \quad \diagup \\
 7.50 \quad 2.50 \\
 \diagdown \quad \diagup \\
 3 \quad 1 \\
 \times 3 \quad \times 3 \\
 9 \quad 3
 \end{array}$$

$9 \times 10 = (x+9)7.50$
 (or) $\frac{90}{7.50} = (x+9)$

⑥ A person buys wine at ₹ 7 per litre and after mixing water in the mixture at ₹ 5 per litre thereby, making a profit of 25%. The proportion of water & wine in the mixture is -

$$\begin{array}{c}
 \text{water} \quad \text{wine} \\
 0 \quad 7 \\
 \diagdown \quad \diagup \\
 32 \\
 \diagdown \quad \diagup \\
 5 \\
 \diagdown \quad \diagup \\
 3 : 32 \\
 \boxed{3:32}
 \end{array}$$

$CP = \frac{100 \times 5}{125} = \frac{32}{5}$

Q. A & B are solutions of acid & water. The ratios of water to acid in A & B are 4:3 & 1:2, respectively. If 3x litres of A is mixed with y litres of B, then the ratio of water and acid in the mixture becomes 8:5. What is x:y?

$$\text{Wt. of Wt. : A}$$

$$3x \times 4 \leftarrow 4:3 \Rightarrow 12x$$

$$y \times 2 \leftarrow 1:2 \Rightarrow 2y$$

$$\therefore 12x + 2y = 8:5 \Rightarrow 12x + 2y = 40$$

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⑬ From a vessel of 50 litres of pure milk, 5 litres of milk was replaced with water. Again 5 litres of mixture was replaced with water. The operation repeated one more time. Find the volume of pure milk in the final sol?

$$\begin{aligned} &= 50 \left(1 - \frac{5}{50}\right)^3 \\ &= 50 \left(\frac{45}{50}\right) \left(\frac{45}{50}\right) \left(\frac{45}{50}\right) \\ &= \frac{729}{8} = 36.45 \end{aligned}$$

⑭ A vessel of 64 litres capacity is full of pure milk. On the first day, $\frac{1}{4}$ th of the milk is drawn and filled with water, on the second day $\frac{1}{4}$ th of the mixture is drawn and filled with water, and again the same thing is done on the third day. Find the quantity of milk at the end?

$$\begin{aligned} &= 64 \left(1 - \frac{16}{64}\right)^3 \\ &= \underline{\underline{27}} \end{aligned}$$

⑮ Three coins of equal weight contain gold and copper in the ratio of 2:1, 2:3 + 1:3 if those are melted and a single coin is made, find the ratio of gold and copper in the newly made coin?

$$\begin{array}{c} \text{G:C} \\ \hline \frac{2}{3} : 2 : 1 : \frac{1}{3} \\ \frac{2}{5} : 2 : 3 : \frac{3}{5} \\ \frac{1}{4} : 1 : 3 : \frac{3}{4} \\ \hline \frac{2}{3} + \frac{2}{5} + \frac{1}{4} : \frac{1}{3} + \frac{3}{5} + \frac{3}{4} \\ \frac{40+24+15}{60} : \frac{20+36+45}{60} \\ \hline \boxed{79:101} \end{array}$$

$$\text{Lcm}(3, 5, 4) = 60$$

$$= \text{G:C}$$

$$20 \times 3 \in 2:1 \Rightarrow 40:2$$

$$12 \times 5 \in 2:3 \Rightarrow 24:3$$

$$15 \times 4 \in 1:3 \Rightarrow 15:4$$

$$\underline{\underline{79:101}}$$

The ratio of Copper to zinc in alloy A & B are 3:4 and 5:9, respectively. If B are taken in the ratio 2:3 and melted to form a new alloy, what is the ratio of copper to zinc in it?

$$\begin{array}{c} \text{C} \quad \text{Z} \\ \hline 2 \times 7 \in 3:4 \Rightarrow (6:8)_2 \Rightarrow 12:16 \\ 1 \times 14 \in 5:9 \Rightarrow (5:9)_3 \Rightarrow 15:27 \\ \hline \boxed{27:43} \end{array}$$

⑩ Tea worth ₹ 126 per kg & ₹ 135 per kg are mixed with a third variety in the ratio 1:1:2. If the mixture is worth ₹ 123 per kg, the price of the third variety per kg will be —

I II III

1 : 1 : 2

$$(1 \times 126) + (1 \times 135) + (2x) = (1+1+2) 123$$

$$126 + 135 + 2x = 612$$

$$261 + 2x = 612$$

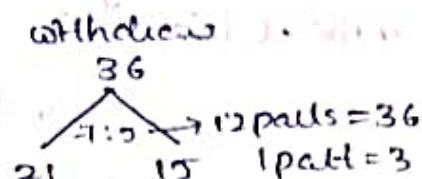
$$2x = 351$$

$$\boxed{x = 175.5}$$

⑪ A vessel contains a mixture of alcohol & water in the ratio of 7:5. 36 litres of mixture is replaced with 63 litres of water so that the ratio of water to alcohol in the resultant solution is 2:1. Find the initial quantity of solution in the vessel ?

$$\frac{A}{7} : \frac{W}{5}$$

$$7x - 21 : 5x - 15 + 63 = 2:1$$



$$2(7x - 21) = 5x - 48$$

$$14x - 42 = 5x - 48$$

$$9x = 90 \quad \boxed{x = 10}$$

$$\text{Initial parts} = 7:5 \rightarrow 12 \times 10 = \underline{\underline{120}}$$

A milkman mixes 15 litres of water with 60 litres of pure milk. After selling $\frac{2}{5}$ th of the mixture, he adds water to replace the quantity that he sold. What is the current proportion of water to milk in the final solution?

$$\frac{W}{15} (1:4) \text{ m}$$

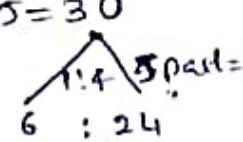
$$15 : 60$$

$$-6 \quad -24$$

$$+30$$

$$\text{mixture} \rightarrow 15 + 60 = 75$$

$$\text{withdraw} \rightarrow \frac{2}{5} \times 75 = 30$$



$$\underline{\underline{31:36}}$$

$$\boxed{\underline{\underline{13:12}}}$$

⑦ A man purchased two articles with a total cost of ₹19500/-
sold one at a profit of 10% and another one at a loss of 5%.
Overall he gained a profit of 8%. Find the cost price of article
which is sold at profit?

$$\begin{array}{c} 10\% \text{ I } 5\% \text{ II } \\ \hline SP_1 = 110 \quad SP_2 = 95 \end{array}$$

$$SP = 105$$

$$13 : 2 \Rightarrow \text{15 parts} = \frac{19500}{1300} \times 1300$$

$$\boxed{16900}$$

⑥ How many Kgs of wheat costing ₹15 per Kg must be traded with 12Kgs of another type wheat costing ₹29.5 per Kg so that after selling the mixture for ₹20 per Kg he should gain 25% profit.

$$\begin{array}{c} \text{I} \quad \text{II} \quad 12 \text{Kg.} \\ 15 \quad 29.50 \end{array}$$

$$CP = \frac{150}{120} \times 20 = 16$$

$$16$$

$$650 : 1$$

$$650 : 105$$

$$13 : 2$$

$$\times 6 \quad \times 6$$

$$\boxed{78 \text{kg}} \quad 12 \text{Kg}$$

The Cost of type 1 wheat is ₹20 per Kg and type 2 wheat is ₹30.
If both type 1 & type 2 are mixed in the ratio 2:3, then the
price per kg of mixed variety of rice is —

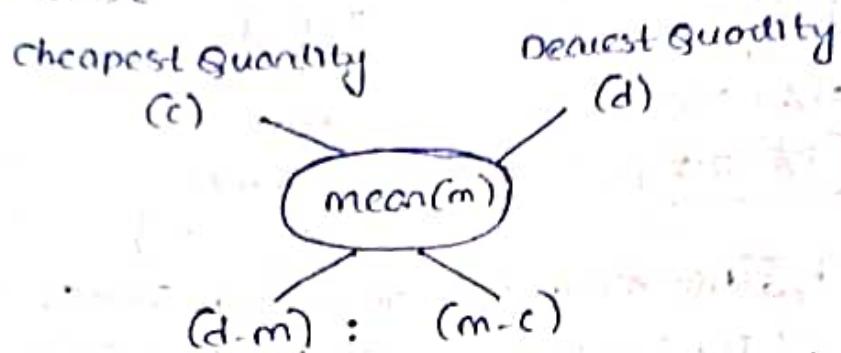
$$\begin{array}{c} \text{I} \quad \text{II} \\ 2 : 3 \end{array}$$

$$CP = 2 \times 20 + 3 \times 30 = 130$$

$$\frac{130}{5} = \boxed{26}$$

ALLEGATION OR MIXTURES

- One or more than one solution are to be mixed to form mixture.
- If c , d are cost price per unit quantity of two different articles.



→ A container contains x litres liquid from which y litres liquid is taken out and replaced with water and again y litres mixture is taken out again replaced with water. After n operations final quantity of liquid is

$$= \text{Initial} \left(1 - \frac{\text{Replacement}}{\text{Initial}} \right)^n$$

[OR]

$$\boxed{x \left(1 - \frac{y}{x} \right)^n}$$

Q) The proportion in which a person mix milk at ₹10.50 a litre with milk at ₹7.50 a litre so that the mixture may be worth ₹8.50 a litre?

$$\begin{array}{ccc}
 10.50 & 7.50 & \\
 \swarrow & \searrow & \\
 8.50 & & \\
 \downarrow & & \\
 8.50-7.50 : 10.50-8.50 & & \\
 1.00 : 2.00 & & \\
 \hline
 1:2 & &
 \end{array}$$

Q) In what ratio must a retailer mix two varieties of pulses costing ₹15 and ₹20 per kg respectively so as to get a mixture worth ₹16.50/kg

$$\begin{array}{ccc}
 15 & 20 & \\
 \swarrow & \searrow & \\
 16.50 & & \\
 \downarrow & & \\
 3.50 : 1.50 & & \\
 \hline
 7 : 3 & & 3
 \end{array}$$

⑥ The compound interest on a certain sum for 2 years at 10% p.a. is ₹ 520. The simple interest on the same sum for double the time at half the rate percent per annum is —

$$\begin{aligned} C.I. &= P(1+R)^T - P \\ &= P(1+10/100)^2 - P \\ &= P(110/100)^2 - P \\ &= P(121/100) - P \\ &= 21/100 \cdot P \\ &= 21/100 \cdot 520 \\ &= 107.2 \end{aligned}$$

$$\begin{aligned} S.I. &= P \cdot R \cdot T \\ &= P \cdot 5/100 \cdot 4 \\ &= 1/20 \cdot P \\ &= 1/20 \cdot 107.2 \\ &= 5.36 \end{aligned}$$

⑦ The difference b/w the C.I. and S.I. on a certain sum of money at 5% rate of interest per annum for 2 years is ₹ 15. Then the sum is —

$$\begin{aligned} 15 &= P \left(\frac{5}{100} \right)^2 \\ 15 &= P \cdot 25/10000 \\ 15 \times 10000 &= P \\ P &= 150000 \end{aligned}$$

$$\left\{ \begin{array}{l} \text{diff b/w C.I + S.I} \\ \boxed{T=2Y} \\ \text{diff} = P \left(\frac{R}{100} \right)^2 \\ \boxed{T=3Y} \\ \text{diff} = P \left(\frac{R}{100} \right)^2 \left(3 + \frac{R}{100} \right) \end{array} \right.$$

⑧ The difference b/w C.I + S.I. on ₹ 20000 for 2 years at 4% p.a. is —

$$\begin{aligned} x &= 20000 \left(\frac{4}{100} \right)^2 \\ x &= 20000 \cdot 16/10000 \\ x &= 320 \Rightarrow \boxed{x=4} \end{aligned}$$

⑨ The difference b/w C.I + S.I. on ₹ 40000 for 3 years at 5% per annum

$$\begin{aligned} x &= 40000 \left(\frac{5}{100} \right)^2 \left(3 + \frac{5}{100} \right) \\ x &= 40000 \cdot 25/10000 \cdot 305/100 \\ x &= 305 \end{aligned}$$

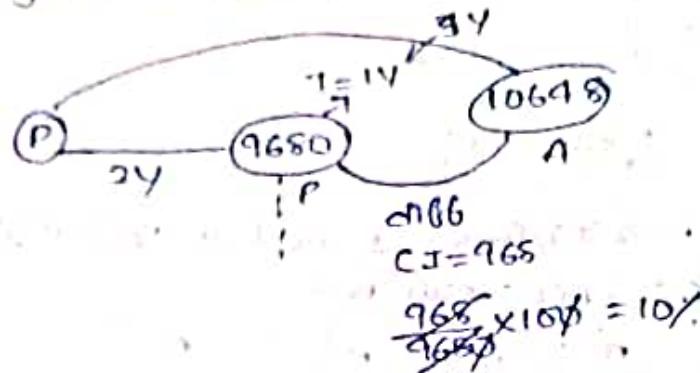
⑩ The S.I + C.I. on a certain sum of money with a given rate for a period of 2 years is ₹ 7000 + ₹ 704 respectively. Find the rate of interest?

$$\frac{7000}{2} = 3500 \quad S.I. \quad 3500 \quad 3500$$

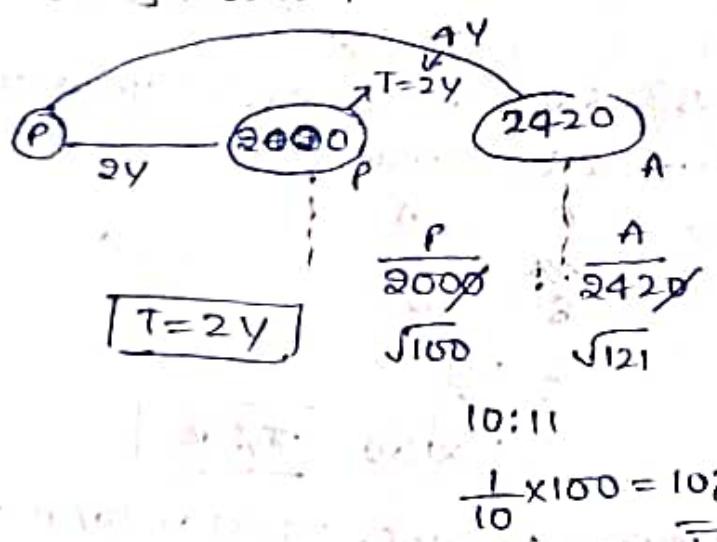
$$\begin{aligned} 704 - 3500 &= 354 \\ &= 504 \end{aligned}$$

$$\frac{54}{3500} \times 100 = \boxed{12\%}$$

- (15) A sum of money on C.I amounts to ₹ 10648 in 3 years and ₹ 9680 in 2 years. The rate of interest per annum is —.



- (16) If a certain sum on C.I becomes ₹ 2000 in 2 years & ₹ 2420, 4 years. Rate of interest per annum is —.



- (17) The Compound interest on a certain sum of money invested for 3 years at 5% per annum is ₹ 328. The Simple interest on the sum for the same rate and for the same period will be: —

{only for 2 years}

$$C.I = R_1 + R_2 + \frac{R_1 \times R_2}{100}$$

$$= 5 + 5 + \frac{5 \times 5}{100}$$

$$= 10.25\%$$

$$\Rightarrow 10.25\% = 328$$

$$\frac{1025}{100}\% = 328$$

$$1\% = 32$$

S.I

$$T \times R = I$$

$$2 \times 5\% = 10\%$$

$$1\% = 32$$

$$10\% = ?$$

$$10\% = 320$$

$$\boxed{T=3Y} \quad P \rightarrow A \\ \frac{3000}{1000} = 3.928 \\ 3.928 \sqrt[3]{3.928} \\ 10 : 11 \\ C.I = 1 \\ \frac{1}{10} \times 100 = 10\%.$$

- (11) If the amount is 2.85 times of the sum after 2 years at C.I,
then the rate of interest per annum is:-

$$2.85 = \frac{2.85}{100} \rightarrow R \quad \boxed{T=2Y} \quad P \rightarrow A \\ \sqrt[2]{100} : \sqrt[2]{2.85}$$

10 : 15

$$\frac{5}{10} \times 100 = 50\%.$$

- (12) If the amount is $3\frac{3}{8}$ times the sum after 3 years at C.I per annum
then the rate of interest per annum is:-

$$3\frac{3}{8} = \frac{27}{8} \quad \boxed{T=3Y} \quad P \rightarrow A \\ \sqrt[3]{8} : \sqrt[3]{27} \\ 2 : 3 \\ \frac{1}{2} \times 100 = \boxed{50\% R}$$

- (13) In what time will ₹ 1000 becomes ₹ 1331 at 10% p.a. compound
annually?

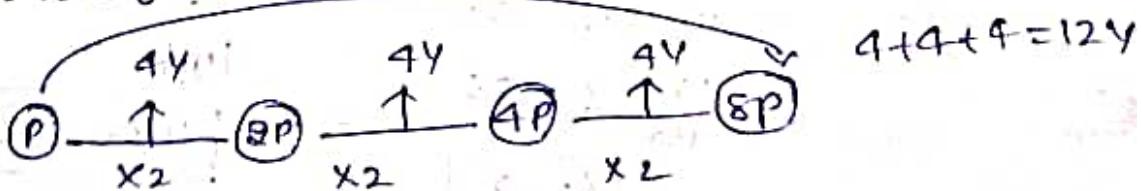
$$(1+10\%)^n = \frac{1331}{1000}$$

$$\left(\frac{11}{10}\right)^n = \left(\frac{11}{10}\right)^3$$

$$\boxed{n=3Y}$$

$$P \rightarrow A \\ T = \sqrt[3]{1331} : \sqrt[3]{1000} \\ 10 : 11 \\ \frac{1}{10} \times 100 = (10\%)R$$

- (14) A sum of money double itself in 4 years at C.I. It will amo
to 8 times itself at the same rate of interest in:-



(OR)

2 Ermes $\rightarrow 4Y$

$$8 \text{ Ermes} \rightarrow 2^3 \rightarrow \boxed{3 \times 4 = 12Y}$$

⑦ The Compound interest on ₹ 1000 at 5% p.a. for 1½ years,
Compounded half yearly is —

P	A
$5\% = \frac{1}{20}$	1 4 5
$\frac{1}{2}$	II 4 5
$\frac{1}{2}$	III 4 5
64 parts = 1280	$\frac{64}{1280} = 125$
• 20	$61 \times 10 = 1220$

⑧ The Compound interest on ₹ 16000 for 9 months at 20%,
Interest being Compounded quarterly, is —

I	P	A
18 → 3M	$5\% = \frac{1}{20}$	20 21
12M → 20%	20	21
3M → 5%	20	21
	8600 parts = $\frac{2}{16000}$	
	$\frac{8600}{16000} = 9261$	
	$1261 \times 2 = \underline{\underline{2522}}$	

⑨ If the rate of interest be 4% p.a. for 1st year, 5% per annum
for 2nd year + 10% p.a. for third year, then the C.I. of ₹ 1000
for 3 years will be —

P	A
$4\% = \frac{1}{25}$	I 25 26
$5\% = \frac{1}{20}$	II 20 21
$10\% = \frac{1}{10}$	III 10 11
	$\frac{5000}{5000} = 6006$
	$1606 \times 2 = \boxed{2012}$

⑩ At what percent per annum will ₹ 3000 amounts to ₹ 3993
in 3 years. If the interest is compounded annually?

$$3993 = 3000 (1 + x\%)^3$$

$$\frac{3993}{3000} = (1 + x\%)^3 \Rightarrow \frac{3993}{3000} = \left(1 + \frac{x}{100}\right)^3 \Rightarrow 1 + \frac{x}{100} = \frac{1331}{1000} \Rightarrow \frac{x}{100} = \frac{1}{10}$$

COMPOUND INTEREST

- Compound Interest is interest calculated on the interest.
- Compounded Annually - $A = P(1 + \frac{R}{100})^n$ {
 n → no. of years
 R → rate of interest
 P → principle / sum
 A → amount}
- Compounded Half yearly $A = P(1 + \frac{\frac{R}{2}}{100})^{2n}$
- Compounded Quarterly - $A = P\left(1 + \frac{\frac{R}{4}}{100}\right)^{4n}$
1Q = 3 months

① The Compound interest on ₹ 200 for 2 years at 10% p.a will be

$$(I) \quad A = 200(1 + 10\%)^2$$

$$= 200\left(\frac{110}{100}\right)^2 = 200\left(\frac{110}{100}\right)\left(\frac{110}{100}\right) = 121 \times 2 \\ = 242$$

$$C.I = A - P = 242 - 200 = 42.$$

(II) {only for 2 years}

$$C.I = R_1 + R_2 + \frac{R_1 \times R_2}{100} \\ = 10 + 10 + \frac{10 \times 10}{100} \\ = 21\%.$$

$$100\% = 200$$

$$\underline{21 \times 2 = 42}$$

(III)

P	A
10	10
10	11
10	11
100 parts	121
100	121

$$C.I = A - P = 21$$

$$\underline{21 \times 2 = 42}$$

② The Compound interest on ₹ 1200 for 2 years at 5% p.a. will be

P	A
5% = $\frac{1}{20}$ I:	20 21
	X X
21 II:	20 21
	1000 441
1200 ✓	
10	
0	
0	

$$1000 \text{ parts} = \frac{3}{1200}$$

$$C.I = 41 \times 0.3 = 123$$

$$5 + 5 + \frac{5 \times 5}{100} \\ = 10 + \frac{25}{100} \\ = 10 + 0.25 \\ = 10.25 \\ = \frac{1025}{100} \\ = \frac{41}{4}$$

MULTIPLICATION TRICKS

- $\rightarrow 47 \times 6 = (40+7)6 = 240 + 42 = 282$
 $\rightarrow 63 \times 8 = (60+3)8 = 180 + 24 = 204$
 $\rightarrow 41 \times 7 = 280 + 7 = 287$
 $\rightarrow 73 \times 4 = 280 + 12 = 292$
 $\rightarrow 64 \times 9 = 540 + 36 = 576$
 $\rightarrow 82 \times 7 = 560 + 16 = 576$
 $\rightarrow 32 \times 9 = 270 + 18 = 288$
 $\rightarrow 78 \times 3 = 270 + 24 = 234$
 $\rightarrow 93 \times 7 = 270 + 21 = 651$
 $\rightarrow 36 \times 4 = 120 + 24 = 144$
 $\rightarrow 79 \times 9 = 630 + 81 = 711$
 $\rightarrow 87 \times 6 = 480 + 42 = 522$
 $\rightarrow 8 \times 45 = 320 + 40 = 360$
 $\rightarrow 53 \times 4 = 200 + 12 = 212$
 $\rightarrow 96 \times 6 = 540 + 36 = 576$
 $\rightarrow 24 \times 11 = 240 + 24 = 264$
 $\rightarrow 76 \times 11 = 760 + 76 = 836$
 $\rightarrow 26 \times 19 = 26(19+1) = 520 - 26 = 494$
- $\rightarrow 46 \times 22 = 46(20+2) = 920 + 92 = 1012$
 $\rightarrow 63 \times 13 = 63(10+3) = 630 + 180 + 9 = 819$
 $\rightarrow 67 \times 31 = 67(30+1) = \frac{2010}{67}$
 $\rightarrow 37 \times 49 = 37(50-1) = \frac{1850}{-37}$
 $\rightarrow 64 \times 39 = 64(40-1) = \frac{2560}{-64}$
 $\rightarrow 64 \times 98 = 64(100-2) = 6336$
 $\rightarrow 26 \times 93 = 2418$

SQUARE OF A NUMBER

$$(47)^2 = 4 \times 7 \times 2 = 56$$

$$\begin{array}{r} 16 \quad 49 \\ \swarrow \quad \searrow \\ 5 \quad 6 \\ \hline 22 \quad 09 \end{array}$$

SQUARE OF A NUMBER ENDING WITH 5

$$(75)^2 = \frac{(70+5)(70+5)}{= 5025}$$

$$\begin{array}{r} 105 \\ +1 \\ \hline 11025 \end{array}$$

MULTIPLICATION OF N DIGIT NUMBER WITH 9999...N TIMES

$$\begin{array}{r} 78 \times 99 \\ -1 \\ \hline 7722 \end{array}$$

$$\begin{array}{r} 234 \times 999 \\ -1 \\ \hline 233766 \end{array}$$

- * Product of two consecutive numbers = $n^2 + n$ or $m^2 - m$
 where m is largest of 2 numbers
 n is smaller of 2 numbers

- * Product of Consecutive even/odd numbers

$$\begin{array}{r} 13 \times 15 \\ 14^2 - 1 \\ 196 - 1 \\ \hline 195 \end{array}$$

- * Sum of unit digits = 10

$$73 \times 77 \text{ then } \cancel{73} \times \cancel{77} - 21$$

$$7(7+1)$$

$$7 \times 8 = 56$$

$$\cancel{6} \times \cancel{6} = 4224$$

- * sum of first numbers = 10

$$43 \times 63 \text{ then } \cancel{43} \times \cancel{63} \\ 2409 \\ +3 \\ \hline 2309$$

$$39 \times 79 \\ 2181 \\ +9 \\ \hline 3081$$

$$26 \times 86 \\ 1636 \\ 6 \\ \hline 2236$$

$$37 \times 43$$

$$(40-3)(40+3)$$

$$= 40^2 - 3^2$$

$$= 1600 - 9$$

$$= 1591$$

$$78 \times 82$$

$$(80-2)(80+2)$$

$$= 6400 - 4$$

$$= 6396$$

$$56 \times 64$$

$$(60-4)(60+4)$$

$$= 3600 - 16$$

$$= 3584$$

$$23 \times 37$$

$$(30-7)(30+7)$$

$$= 951$$

$$46 \times 5$$

$$\frac{46 \times 10}{2} \\ = 230$$

$$26 \times 35$$

$$\frac{26 \times 100}{2} \\ = 800$$

$$42 \times 50$$

$$\frac{42 \times 100}{2} \\ = 2100$$

$$33 \times 75$$

$$\frac{33 \times 100}{3} \\ = 1100$$

$$32 \times 125$$

$$\frac{32 \times 125}{8} \\ = 4000$$

MULTIPLICATION RULE FOR ALL TWO DIGIT NUMBERS "1X1"

$$37 \times 93$$

$$\begin{array}{r} 3 & 3 \\ \times & 9 \\ \hline 2 & 7 \\ | & | \\ 3 & 3 \\ \hline 4 & 9 + 9 \\ \hline 2 & 1 + 6 \\ \hline 2 & 7 \\ \hline 2701 \end{array}$$

$$46 \times 82$$

$$\begin{array}{r} 4 & 6 \\ \times & 82 \\ \hline 8 \\ 32 + 5 \\ \hline 57 \\ 8148 \\ \hline 3772 \end{array}$$

FINDING SQUARE ROOT OF PERFECT SQUARE VALUE

① Observe last digit

② Strike last two digit

③ Take square value before or equal to remaining value

unit digit number

1 \leftrightarrow 1 or 9

4 \leftrightarrow 2 or 8

5 \leftrightarrow 5

6 \leftrightarrow 4 or 6

7 \leftrightarrow 3 or 7

ii) $\sqrt{2304}$ 4 | 2 3 0 4 | .2,8

iii) $\sqrt{3969}$ 3,7
 $\overline{36}$
 6
 $= 63$

* 2,3,7,8 are not perfect square

If the num ending with 2,3,7,8 not perfect square

FINDING CUBE ROOTS FOR PERFECT CUBE VALUES

1) $\sqrt[3]{6859}$ 19

unit value

2) $\sqrt[3]{13824}$ 24

0 \leftrightarrow 0

1 \leftrightarrow 1

4 \leftrightarrow 4

5 \leftrightarrow 5

6 \leftrightarrow 6

9 \leftrightarrow 9

3) $\sqrt[3]{4096}$ 16

3 \rightarrow 7

4) $\sqrt[3]{12167}$ 23

8 \rightarrow 2

2 \rightarrow 8

7 \rightarrow 3

I PERCENTAGES

Percentages : Per hundred (or)
out of 100

→ denoted by $\% = \frac{1}{100}$

→ To convert percentages into fractions

$$* 20\% = 20 \times \frac{1}{100} = \frac{1}{5}$$

$$35\frac{1}{3}\% = 300\% + 50\% + 7\frac{1}{3}\% \\ = 3 + \frac{1}{2} + \frac{50}{7} \times \frac{1}{100} \\ = 3 + \frac{1}{2} + \frac{1}{14} = \frac{25}{7}$$

$$* 33\frac{1}{3}\% = \frac{100}{3} \times \frac{1}{100} = \frac{1}{3}$$

$$41\frac{1}{9}\% = \frac{4600}{9} \times \frac{1}{100} = 400\% + 1\frac{1}{9}\% \\ = 4 + \frac{100}{9} \times \frac{1}{100} \\ = 4 + \frac{1}{9} = \frac{37}{9}$$

$$* 6\frac{1}{4}\% = \frac{25}{4} \times \frac{1}{100} = \frac{1}{16}$$

$$* 3\frac{1}{8}\% = \frac{25}{8} \times \frac{1}{100} = \frac{1}{32}$$

$$* 12\frac{1}{2}\% = \frac{25}{2} \times \frac{1}{100} = \frac{1}{8}$$

→ To convert fractions into percentages

$$\frac{1}{4} = \frac{1}{4} \times 100 = 25\%$$

$$\frac{100}{10} = 10\% \\ \frac{1}{10} = 1\%$$

$$\frac{1}{11} = \frac{1}{11} \times 100 = 9\frac{1}{11}\%$$

$$\frac{1}{6} = \frac{1}{6} \times 100 = 16\frac{2}{3}\%$$

Q What is the values of 20% in 350

$$\frac{20}{100} = \frac{\lambda}{350} \Rightarrow \frac{20 \times 350}{100} = 70$$

Q 12 $\frac{1}{2}\%$ of 480

$$\frac{25}{200} = \frac{\lambda}{480} \Rightarrow \lambda = \frac{25 \times 480}{200} = 60$$

Q 20% of 57 $\frac{1}{3}\%$ of 350

$$\frac{20}{100} \times 50\% + 7\frac{1}{3}\% \times 350$$

$$\frac{1}{5} \times \frac{1}{2} + 50 \times 350 = 40$$

Q 1) $\frac{1}{9}\%$ of a number is added with itself then result becomes 900. find the original numbers

$$1\% = \frac{100}{9} \times \frac{1}{100} = \frac{1}{9}$$

$$(\frac{1}{9}x) + x = 900$$

$$\frac{10x}{9} = 900$$

$$x = 810$$

1 r adding part

$\frac{1}{9}$ ← original

$$9+1 = 10 \text{ parts} = 900$$

$$1 \text{ part} = 90$$

$$9 \times 90 = 810$$

Q 2) 64 is added to a number then number becomes $157\frac{1}{4}\%$ of itself. find the number

$$64+x = 157\frac{1}{4}\% \times x \quad 157\frac{1}{4}\% = \frac{11}{4} \text{ r after ad}$$

$$64+x = \frac{11x}{4}$$

$$11x = 64 \times 4 + 7x$$

$$4x = 64 \times 4$$

$$x = 112$$

Q 3) The salary of A is 25% more than salary of B. By what % salary of B less than A.

$$1) x \text{ is what percentage of } y = \frac{x}{y} \times 100$$

$$2) x \text{ is what percentage } \underline{\text{more or less}} \text{ than } y = \frac{x-y}{y} \times 100$$

$$\frac{A}{125} + 25\% \frac{B}{100} = \frac{100-125}{125} \times 100 = \frac{25}{125} \times 100 = 20\%$$

$$\frac{\text{difference in sal}}{\text{Compared with A}} \times 100 = \frac{25}{125} \times 100 = 20\%$$

Q 4) The salary of A is $9\frac{1}{11}\%$ less than salary of B. By what % salary of B more than A?

$$9\frac{1}{11}\% = \frac{1-25}{11} \text{ original}$$

$$\frac{1}{11} \times 100 = 10\%$$

$$9\frac{1}{11}\% = \frac{100}{11} \times \frac{1}{100} = \frac{1}{11}$$

$$100 - \frac{1}{11} = \frac{1099}{11}$$

Q 5) The price of an article is increased by 25% & after its decreased by 25%. Find overall percentage change

$$25 + (-25) + \frac{(25)(-25)}{100} = -\frac{625}{100} = -6.25 \\ = 6.25 \text{ dec}$$

$$\left\{ \begin{array}{l} S \text{ inc} \rightarrow + \\ D \text{ dec} \rightarrow - \\ x+y+\frac{xy}{100} \end{array} \right.$$

[or]

$$\text{Ex. } -25\% = \frac{1}{4} \text{ F.F.} \quad \text{I} \quad \text{To 1st part add 25% to value} \\ \text{Ex. } -25\% = \frac{4}{5} \times 100 = 4 \text{ F.F.} \quad \text{II} \quad \frac{16}{15} \times 100 = 6.25 \\ \text{Ex. } -25\% = \frac{4}{5} \times \frac{1}{3} \times 100 = \frac{16}{15} \times 100 = 6.25$$

- ⑥ The price of a car increased by 40% as a result sales are decreased by 30%. Find the percentage change in the revenue

$$40 - 30 = \frac{40(30)}{100}$$

$$\frac{10 - 1200}{100} = 2\% \text{ dec}$$

$$40\% = 2\% \text{ I}$$

$$+2 \left(\frac{5}{7} \right)$$

$$\text{II } 30\% = \frac{3}{10}$$

$$10 \quad 50$$

$$-1 \quad 49$$

$$= \frac{1}{50} \times 100 \\ = 2\%$$

- ⑦ The length & breadth of a rectangle increased and decreased by 8% & 10%. What is the percentage increase in its area

$$8 - 10 + \frac{8(-10)}{100}$$

$$= -2 - \frac{80}{100} = -28 \frac{1}{100} \\ = -2.8\% \text{ dec}$$

$$8\% = 2\frac{1}{25} \text{ I}$$

$$+2 \left(\frac{25}{27} \right) \quad \text{II } 10\% = \frac{1}{10}$$

$$10 \quad 9 \\ -1 \quad = 2.8\% \text{ dec}$$

Price \times Consumption = expenditure \therefore expenditure \rightarrow same
 $\text{price} \times \frac{1}{\text{Consumption}}$

- ⑧ Price of sugar increased by $33\frac{1}{3}\%$. By how much percentage must have holder reduce its consumption as to keep the expenditure same

$$\begin{array}{ccc} \text{initial} & & \text{final} \\ \text{Price} & 3 \xrightarrow{+1} & 4 \\ 33\frac{1}{3} = \frac{1}{3} & & \frac{1}{4} \times 100 = 25\% \end{array}$$

- ⑨ A reduction of 10% in price of sugar enables a house holder to obtain 5kgs more for ₹450. Find the reduced price of sugar per kg as well as original price of it per kg

$$\begin{array}{ccc} \text{Initial} & & \text{final} \\ \text{Price} & 100\% : 90\% \\ & 10 : 9 \end{array}$$

$$\text{Consumption} \quad 9 : 10$$

$$\text{initially } 9 \text{ parts} = 9 \times 5 = 45 \text{ kgs}$$

$$\text{final } 10 \text{ parts} = 10 \times 5 = 50 \text{ kgs} \quad \frac{50}{450} = \frac{10}{9}$$

$$\text{initially } 1 \text{ kg} = \frac{450}{45} = 10$$

$$\text{finally } 1 \text{ kg} = \frac{450}{50} = 9$$

- (ii) Groundnut oil is now being sold at ₹27 per kg during last month its cost was ₹24 per kg. Find how much % expenditure same

Q1

Q7

$$8 : 9$$

$$9 : 8$$

$$\frac{1}{9} \times 100 = 11\frac{1}{9}\%$$

- ⑩ A is 25% more than B, B is 40% less than C. If C is 20% more than A is what % less than D.

A	B	C	D
---	---	---	---

90	72	120	100
----	----	-----	-----

$$\frac{90 - 100}{100} = 10\% \text{ less}$$

- ⑪ If the numerator of certain fraction is increased by 200% & the denominator is increased by 150%, the new fraction thus formed is $\frac{9}{10}$. What is the original fraction?

- a) $\frac{3}{4}$ b) $\frac{1}{4}$ c) $\frac{3}{5}$ d) $\frac{2}{5}$

$$\frac{N}{D} = \frac{N + (200\% \text{ of } N)}{D + (150\% \text{ of } D)} = \frac{9}{10}$$

- ⑫ 40% of the greater number is equal to 60% of the smaller. If the sum is 250 then the smaller number is

$$40\% \text{ of } g = 60\% \text{ of } s$$

$$2g = 3s$$

$$s = \frac{2g}{3}$$

$$g = \frac{3}{2}s$$

$$s + g = 250$$

$$\frac{3}{2}s + g = 250 \quad | \quad 2 + \frac{3}{2}s = 250$$

$$5s = 250 \times 2$$

$$\boxed{s = 100}$$

- ⑬ Two numbers are respectively 40% & 20% less than a 3rd number. What % is the 1st number of the second.

$$\frac{3}{4} \text{ of } \frac{2}{5} = \frac{3}{10}$$

$$\frac{60}{80} \times 100 = 75$$

- ⑭ A student has to get 40% of the maximum marks to pass an examination. Krishna got 170 marks which are 20 above the required marks to pass. The maximum marks in the examination is

$$40\% = 170 - 20 = 150$$

$$100\% =$$

$$100\% \text{ of } x = 150 \text{ of } 100\%$$

$$x = \frac{150}{100} \times 100$$

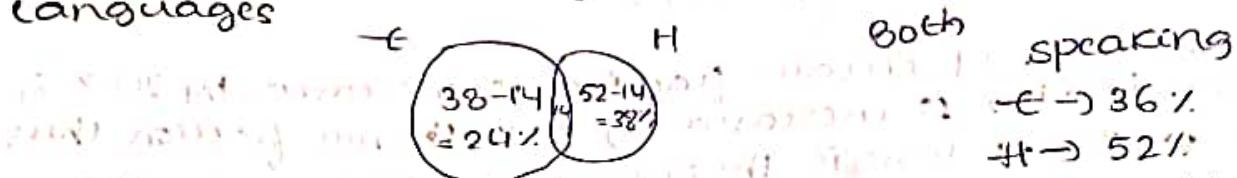
$$x = 375$$

- ⑯ A got 40% of max marks & B got 48% of max marks which are 4 & 20 marks above pass mark. find max marks

always % — Marks

$$\text{Ans} \quad \text{(i)} \quad \begin{bmatrix} 40\% = 4A \\ 48\% = 20A \\ \hline 8\% = 16^2 \\ 100\% = 200 \end{bmatrix}$$

- ⑯ in a locality 38% can speak English, 52% can speak Hindi & 14% speak both what % of them can't speak any of these languages



Atleast one language

$$(E \cup H) = 24 + 38 + 14 = 76\%$$

$$\text{can't} = 100 - 76 = 24\%$$

Both speaking

$$E \rightarrow 36\%$$

$$H \rightarrow 52\%$$

$$90 - 76 = 14\%$$

$$\text{can't} 100 - 76 = 24\%$$

- ⑰ In a group of students, 80% like cricket, 25% don't like football & 10% students don't like both the games & 1300 like atleast one game. the total no of students is —

like don't

cricket	80%	20%
football	75%	25%

$$80 - 10 = 35\% \text{ don't like any game}$$

$$1000 - 35 = 65 = \frac{65}{20} = 1300 \text{ (atleast one)} \\ 100\% = 2000$$

- ⑱ A man spends 75% of his income. his income increased 25% & increased this expenditure by 20%. his savings are then increased by

income

or = exp + savings

salary

I	E	S
100	75	25

$$\begin{array}{ccc} | & 25\% & | \\ 125\% & - & 90 \end{array} \quad \begin{array}{c} | \\ 120\% = 15 \end{array} \quad \begin{array}{c} | \\ 35 + \frac{10}{25} \times 100 = 40\% \end{array}$$

↳ increased by 10

- (23) The value of machine depreciates at the rate of 20% every year it was purchased 3 years ago. If its present value is ₹ 6400 its purchase price was

$$\text{past} \xrightarrow{-20\%} \text{I} \xrightarrow{-20\%} \text{II} \xrightarrow{-20\%} \text{III} \xrightarrow{\text{present}} \\ x \times \frac{80}{100} \times \frac{80}{100} \times \frac{80}{100} = \frac{8400}{x} \\ x = 12500$$

- (24) 405 sweets were distributed equally, in children in such a way that the no. of sweets received by each child is $\frac{1}{5}$ of the total no. of children. How many sweets did each child receive?

$$\text{no. of child} = x$$

$$\text{each one gets} = 20\% = \frac{1}{5} \times x = \frac{45}{5} = 9$$

$$x \times \frac{x}{5} = 405$$

$$x^2 = 2025$$

$$x = 45$$

$$\left\{ \begin{array}{l} \text{Total no. of} \\ \text{sweets} = \text{no. of child} \times \\ \text{each one gets} \end{array} \right.$$

- (25) A person gave 20% of his income to his elder son, 30% of the remaining to the younger son & 10% of the balance he donated to a trust. He is left with ₹ 10080. His income was

100

20% = 20 (Elder son's share)

80

30% = -24 (younger son's share)

56

10% = -5.6 (trust)

50.4 parts = 10080

100 parts = ?

$$50.4 \times 100 = 10080 \times 100$$

- (26) In a certain school 20% of students are below 8 years of age, the no. of students above 8 years of age is 2/3 of the no. of students of 8 years of age which is 48. What is the total no. of students in school?

20% < 8Y = 100

20% < 8Y = 8Y

$$20\% = 80\% - 32\% = 8Y$$

$$80\% = 80$$

$$100\% = 100$$

Average = equal distribution

$$\text{Avg} = \frac{\text{sum of observations}}{\text{total no of observations}}$$

$$\text{sum} = \text{no of observation} \times \text{avg}$$

$$\text{no of observation} = \frac{\text{sum}}{\text{Avg}}$$

Q) find the avg of 15, 12, 23, 38, 47.

$$\frac{15+12+23+38+47}{5} = \frac{135}{5} = 27$$

$$15 \ 12 \ 23 \ 38 \ 47 \\ -15 \ -12 \ -7 \ +8 \ +17$$

$$\text{diff sum} = -15$$

$$30 - 3 = 27 \quad \text{Avg} = \frac{15}{5} = 3$$

Q) find the avg of 26, 32, 38, 22, 34.

$$\frac{152}{5} = 30.4$$

$$26, 32, 38, 22, 34$$

$$-4 \ +2 \ +8 \ -8 \ +4$$

$$\text{Avg} = \frac{30}{5} = 6$$

$$\text{diff sum} = 2$$

$$= 30.4$$

$$\text{Avg} = \frac{2}{5} = 0.4$$

Q) find the avg of 82, 74, 79, 86, 78.

$$82 \ 74 \ 79 \ 86 \ 78 \quad \text{Avg} = 80$$

$$+2 \ -6 \ -1 \ +6 \ -2 \quad = -0.2$$

$$= 79.8$$

$$\text{Avg} = \frac{-1}{5} = -0.2$$

Q) The avg of six numbers is 32. If each of the first three is increased by 2 & each of the remaining three numbers is decreased by 4. then the new avg is

$$\begin{array}{ccccccc} a & b & c & d & e & f & \text{Avg} = 32 \\ +2 & +2 & +2 & -4 & -4 & -4 & \\ \hline -\frac{6}{6} & = -1 & & & & & \end{array}$$

$$\frac{-1}{31}$$

Q) The average of 13 numbers is 18. if each number is

- (i) increased by 3
- (ii) decreased by 3
- (iii) multiplied by 3
- (iv) divided by 3

Q) What is the Avg of 1st 180 natural numbers

$$\frac{181}{2} = 90.5$$

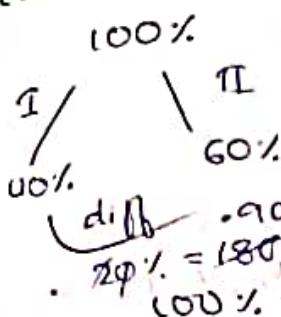
$$\frac{n(n+1)}{2}$$

What is the avg of 1st 9 multiples of 8

first n multiples of K $\frac{k(n+1)}{2}$

$$\frac{8(9+1)}{2} = 40.$$

① In an election b/w two candidates the candidate who gets 40% of the votes polled is defeated by 18000 votes. what is the total number of votes polled.



$$\text{diff} = 100 - 60 = 40$$

$$40\% = 18000$$

$$100\% = 18000 \times \frac{100}{40} = 45000$$

② In an election b/w two candidates, one candidate got 55% of the total valid votes. 15% of the votes are invalid. If the total votes were 15200. what is the no of valid votes the other candidate got?

$$100\% \rightarrow 15200$$

$$45\% \text{ of } 25\% \text{ of } 15200$$

$$\frac{9}{100} \times \frac{15}{100} \times 15200 = 2638$$

$$9 \times 13 \times 38 = 5814$$

$$100\% \leftarrow 85\%$$

$$\begin{array}{c} \text{I} \\ \text{II} \end{array}$$

$$55\% \quad 45\%$$

③ In a village the no of male & female are on the ratio of 4:3. If the no of male is inc by 25% and the no of female is inc by 15%. what will be the new ratio of no of male to that of female?

$$100\% \rightarrow M : F$$

$$\downarrow 25\%$$

$$125\% \text{ of } 4 : 115\% \text{ of } 3$$

$$\frac{125}{100} \times 4 : \frac{115}{100} \times 3 = 100 : 61$$

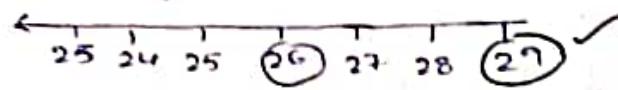
④ fresh grapes contain 80% water while grapes contain 10% water. If the weight of dry grapes is 500 kg, then what is the total weight when it is fresh?

Pulp must be constant in both cases

$$\begin{array}{lll} \text{water} & \text{pulp} & \\ \text{fresh} & 80\% & 20\% \rightarrow 36:9 & 45 \times 500 = 2250 \\ & 4:1 & & 10 \text{ parts} = 500 \text{ kg} \\ \text{dry} & 10\% & 90\% \rightarrow 1:9 & \\ & & 1:9 & \end{array}$$

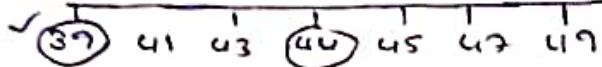
6. The average of 7 consecutive numbers is 26. Find the numbers.

Avg

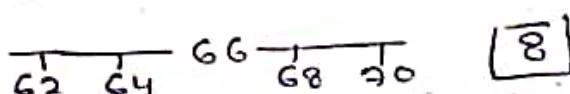


The avg of 6 consecutive odd numbers is 44. Find the smallest number.

Avg



7. The avg of 5 consecutive even numbers is 66. Find the diff b/w the smallest & largest.



i) The avg of 39 consecutive numbers is 51. Find the largest number.

$$\frac{19 \text{ numbers}}{51 - 19 = 32} \quad 51 \quad \frac{19 \text{ numbers}}{51 + 19 = 70}$$

3. The avg age of 30 members in section A is 40 years & 20 members in section B is 30 years. Find the avg of all.

$$\text{no. of observation} \times \text{Avg} = \text{sum}$$

$$30 \times 40 = 1200 - \text{sec A}$$

$$20 \times 30 = 600 - \text{sec B}$$

$$\overline{50} \quad \overline{1800}$$

$$\text{Avg} = \frac{1800}{50} = 36$$

4. The average age of family of 6 members is 35 years. The avg age of family after demises of 65 years, 45 year old member will be.

$$\text{No. of observation} \times \text{Avg} = \text{sum}$$

$$6 \times 35 = 210$$

$$-\underline{210} \quad -(65+45) = -110$$

$$\frac{4}{4} \quad 100$$

$$\text{Avg} = \frac{100}{4} = 25$$

5. The average of 11 observations is 50. If the avg of first six observations is 49 and that of last 6 observations is 52, then 6th observation is

$$\text{No. of } \times \text{Avg} = \text{sum}$$

$$11 \times 50 = 550$$

$$\text{first } 6 \times 49 = 294$$

$$\text{last } 6 \times 52 = 312$$

$$6^{\text{th}} \text{ Observation} =$$

$$606 - 550 = 56$$

The average of first 5 numbers is 30 & that of last three numbers is 35. What is the 6th number?

$$\text{First } 5 \times 30 = 150 \\ \text{Last } 3 \times 35 = 105 \\ \frac{150 + 105}{8} = \frac{255}{8} = 31.875 \\ \text{6th number} = 40.$$

12. The average weight of a group of 3 people A, B & C is 70 kg. When D joins this group, the avg becomes 60 kg, a man E, whose weight is 5 kg more than D replaces A and the avg weight of B, C, D and E now becomes 59 kg. What is the avg weight of A, D and E?

$$\begin{array}{r} A+B+C = 3 \times 70 = 210 \\ A+B+C+D = 4 \times 60 = 240 \\ \hline - \qquad \qquad \qquad 70 = 130 \\ \qquad \qquad \qquad E = 30 + 5 = 35 \end{array}$$

$$\begin{array}{l} A+B+C+D+E = 275 \\ B+C+D+E = 4 \times 59 = 236 \\ \qquad \qquad \qquad A = 39 \end{array}$$

$$30 + 35 + 37 = \frac{102}{3} = 34.6 \approx 35$$

13. The avg age of 35 students in a class is 14 years. If teacher's age is included, the avg age is increased by one. find the age of the teacher.

$$\begin{array}{r} 35 \times 14 = 490 \\ +1 \\ 36 \times 15 = 540 \end{array}$$

$$\text{Age of teacher} = 1 \times 15 + 1 = 16$$

ii) The avg age of 24 boys & their teacher is 15 if the teacher's age is excluded, the avg age decreased by 1 year. The age of teacher.

$$\begin{array}{r} \text{No. of Avg} \\ -1 \left(\frac{25}{24} \rightarrow 15 \right) -1 = 39 \end{array}$$

14. A batsman makes a score of 58 runs in the 15th innnings & thus increases his avg by 3 runs what is the avg after 15th innings?

$$\begin{array}{r} \text{No. of Avg} = \text{sum} \\ 14x = 14x \\ 15(x+3) = 15(x+3) \\ 14x + 58 = 15(x+3) \\ -x = 13 \\ x+3 = 13+3 = 6 \end{array}$$

II	No of	Avg	$(x+3) + 3(14) = 58$
	14	x	$x+3 = 16$
	15	$x+3$	

ii) Virat Kohli has a certain avg for 9 innings. In the tenth inning, he scores 100 runs thereby increasing his avg by 8 runs. His new avg is —

$$\begin{array}{ll} \text{No. of} & \text{Avg} \\ +1 & 9 \rightarrow x \\ 10 & \rightarrow x+8 \end{array}$$

$$x+8+8(9)=100$$

$$x+8=28$$

15. The avg of 8 persons is increased by 2 years when one of them, whose age is 24 years is replaced by new person. The age of new person is

$$\begin{array}{ll} \text{No. of} & \text{Avg} \\ \text{old} = 24 & 8 \quad x \\ +16 & \\ \text{new} & 8 \quad x+2 \\ \hline 40 & \end{array}$$

$$8 \times 2 = 16$$

$$24+16=40.$$

iii) The avg weight of 12 men in a boat is increased by $\frac{1}{3}$ kg when one of the man whose weight is 55 kg is replaced by a new man what is the weight of new person

$$\begin{array}{ll} \text{No. of} & \text{Avg} \\ \text{old} = 55 & 12 \quad x \\ +4 & \\ \hline 59 & 12 \quad x+\frac{1}{3} \end{array}$$

$$12 \times \frac{1}{3} = 4$$

$$55+4=59$$

16. The avg temp for Monday, Tuesday, Wednesday, thus, was 48° the avg temp for Tuesday, Wednesday, thus, was 52° . If temp on Monday as 42° , then the temp on Friday was

$$\begin{array}{l} M + T + W + Th = 4 \times 48 = 192 \\ T + W + Th + F = 208 \end{array}$$

$$M - F = -16$$

$$42 - F = -16 \therefore F = 58.$$

17. The avg. of 20 items is 62 is wrongly written as 26. Find the correct mean

$$\text{avg} \pm \left[\frac{\text{diff}}{\text{no. of observations}} \right]$$

smallest value is taken
in highest (+) 74

PROFIT & LOSS

- Cost Price (CP) :- At price an article which is purchased
- Selling Price (SP) :- At price an article which is sold by
- Profit (P) :- $SP - CP$
- Profit% (P%) = $\frac{P}{CP} \times 100$
- Selling price (SP) = $P + CP$

$$\text{Loss (L)} = CP - SP$$

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

$$SP = CP + L$$

i. Ram buys a book for ₹200 & sells it for ₹240. what is his gain percentage?

$$CP = 200 \quad SP = 240$$

$$P = 240 - 200 = 40$$

$$P\% = \frac{40}{200} \times 100$$

$$P\% = 20\%$$

ii. Gopal purchased an article for ₹600 & sells it for ₹540. what is his loss percentage?

$$CP = 600 \quad SP = 540$$

$$L = 60$$

$$L\% = \frac{60}{600} \times 100 \quad L\% = 10\%$$

iii. A man purchased a mobile for ₹1200 & spent ₹200 on its repair. He sold it for ₹1680. His profit percentage is _____

$$CP = 1200 + 200 = 1400$$

$$SP = 1680$$

$$P = 1680 - 1400 = 280$$

$$P\% = \frac{280}{1400} \times 100 = 20\%$$

i. A shopkeeper purchased a box for ₹300. At what price he has to sell the box to get a gain 20%.

$$P\% = \frac{P}{CP} \times 100 \Rightarrow 20\% = \frac{P}{300} \times 100$$

$$P = 60$$

$$SP = 60 + 300$$

$$= 360$$

ii. A man buys a cycle for ₹1400 & sells it at a loss of 15%. What is the selling price of the cycle?

$$CP = 1400 \quad L\% = 15\%$$

$$SP = 210 + 1400$$

$$15 = \frac{L}{1400} \times 100$$

$$L = 210$$

$$SP = 1190$$

iii. By selling a book for ₹744, a man gains 20%. Find the CP - ?

$$SP = ₹744$$

$$P\% = 20$$

$$CP = 100\% = ?$$

$$1+20$$

$$SP = 120\% = 744$$

$$\frac{100 \times 744}{120} = 620$$

A man purchased a cell phone for ₹ 21000 & sold it at a gain of 10%. Calculated on the selling price the selling price of cell phone was —

$$\frac{10}{8} \times SP = 21000$$

$$CP = 21000 - 21000 = 18900$$

$$CP = \underline{\underline{18900}}$$

ii) A trader sold a cycle at a loss of 10%. If the selling price had been increased by ₹ 200, there would have been a gain of 6%. The cost price of the cycle —

$$CP - 10\% \rightarrow SP_1$$

$$100\% \quad 90\% \quad x$$

$$SP_2 \rightarrow 106\%$$

$$x + 200 \quad x + 200$$

$$16\% = 200$$

$$100\% = 1250$$

$$L = 10\%, \quad \{P, L\} \text{ diff}$$

$$P = 6\%, \quad \{P, L\} (+)$$

$$\frac{10}{16} = \frac{P}{6}$$

$$\frac{4}{5} = \frac{30}{P}$$

$$x 25 \quad x 5$$

$$100\% = \underline{\underline{1250}}$$

iii) A trader sold an article at 10% gain if he had taken ₹ 60 more, the gain would have been 25%. What is the cost price?

$$CP - 10\% \rightarrow SP_1$$

$$100\% \quad 110 \quad x$$

$$SP_2 \rightarrow 125$$

$$x + 60 \quad x + 60$$

$$15\% = 60$$

$$100\% = 400$$

$$P = 10\%,$$

$$P = 25\%,$$

$$\frac{10}{15} = 60$$

$$100\% = 900$$

14) The loss obtained by selling a book for ₹ 76 is same as the gain obtained by selling it for ₹ 114. What is the cost price of the book?

$$L = 9$$

$$CP - 76 = 114 - CP$$

$$2CP = 190$$

$$CP = 95$$

$$IG = P$$

$$\frac{76}{114} = \frac{190}{2} = 95$$

ii) On selling an article for ₹ 300 and 7% causes some loss. It is sold for ₹ 420 and 7% cause some profit 2 times that of loss before find the cost price?

$$L = \frac{7}{CP - SP}$$

$$CP - 300$$

$$-G = \frac{5}{SP - CP}$$

$$= 420 - CP$$

$$-G = 2L$$

$$420 - CP = 2(CP - 300)$$

$$420 - CP = 2CP - 600$$

$$CP = 310$$

Merchant

Merchant
 Retailer
 -
 1kg = 1000
 1kg
 850 gm
 Dives to using weight
 California

$$\textcircled{1} \quad \text{Retailer} \quad 1\text{kg} = 1000 \quad \downarrow 200 = \frac{200}{850} \times 100 = 25\%$$

$$\textcircled{2} \quad \text{Retailer} \quad 1\text{kg} = 1000 \quad \downarrow 50 = \frac{50}{100} \times 100 = 50\% \\ \text{CP} = 1000 \quad \text{SP} = 1500 \\ 10 (900\text{CP} = 96) \\ 10 (900\text{SP} = 96)$$

$$9000\text{CP} = 900 \quad \frac{60}{900} \times 100 = 66.67\% \\ 9000\text{SP} = 960 \quad CP = 10$$

$$\textcircled{3} \quad \text{Retailer} \quad 1000\text{CP} = 100 \Rightarrow 4000\text{CP} = 400 \\ 8500\text{SP} = 110 \quad 4000\text{SP} = 550 \quad \frac{150}{550} \times 100 \\ = 33\frac{1}{2}\% \quad CP = 10$$

DISCOUNT

Marked price (MP) { A price listed above the Cost price is known as

$$\begin{cases} \text{Listed price (LP)} \\ \text{CP} \end{cases}$$

Labelled price (LP)

$$\rightarrow MP = 0.4 SP$$

$$\rightarrow D = MP - SP$$

$$\rightarrow SP = MP - D$$

$$\rightarrow D\% = \frac{D}{MP} \times 100$$

\rightarrow Scales of discounts:-

$$SP = MP \times \frac{100-d_1}{100} \times \frac{100-d_2}{100} \times \frac{100-d_3}{100} \times \dots$$

\rightarrow Single discount from two successive discounts:-

$$= d_1 + d_2 - d_1 \times d_2$$

\rightarrow find the single discount from three successive discount of —

$$\text{ii}, 30\%, 10\%$$

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

$$= 30 + 10 - \frac{30 \times 10}{100}$$

$$= 34$$

$$SP = 54$$

$$D = 100 - 54 = 46\%$$

find the discount

i, Buy 5 get 4 free

$$\text{Let item} = 10/-$$

$$MP = (5+4) \times 10 = 90$$

$$SP = 5 \times 10 = 50$$

$$D\% = \frac{40}{90} \times 100$$

$$= 44.\overline{4}\%$$

$$\begin{array}{l} \text{A price listed above the Cost price is known as} \\ \text{marked price} \\ \text{Listed price (LP)} \\ \text{CP} \end{array}$$

$$\begin{cases} \text{MP} + 10\% \\ CP + 10\% = 10\% = 10\% \\ SP = 100 \end{cases}$$

$$\begin{array}{l} \text{MP} = 100 \\ CP = 100 \\ D = 100 - 100 = 0 \\ D\% = 0 \end{array}$$

6. A discount. Find the profit percentage.

$$CP = 100$$

$$MP = 130 \rightarrow 10\% \text{ discount} \rightarrow 13$$

$$SP = 117 \rightarrow \text{Profit } 17$$

∴ profit percentage is 17%.

7. If 33% of profit is required after giving 5% rebate then
 (i) what % of the cost price should be the marked price

$$\begin{array}{ccc} CP & SP & MP \\ 100 & +33\% & 133 \\ \xrightarrow{17\times 7} & 17\times 7 & x7 \end{array}$$

$$(i) \frac{MP}{CP} \times 100 = \frac{133}{100} \times 100 = 130\%$$

$$(ii) \text{Diff } \frac{MP - CP}{CP} = \frac{200}{500} \times 100 = 40\%$$

$$(iii) \text{CP : } MP = 5 : 7$$

$$\begin{array}{ccc} CP & MP \\ 100 - d\% & : 100 + p\% \\ 95 & : 133 \\ 5 : 7 & \end{array}$$

$$(iv) \frac{3}{5} \times 100 = 150\% \quad (v) \frac{2}{5} \times 100 = 40$$

8. The cost price of manufacturing an article was 100 and the trader wants to gain 25% after giving a discount of 10%. Find the marked price?

$$\begin{array}{ccc} CP & MP \\ (100-10)\% & (100+25)\% \\ 90 & 125 \\ \downarrow \times 10 & \downarrow \times 10 \\ 900 & 1250 \end{array}$$

SIMPLE INTEREST

$$\rightarrow T = \frac{PTR}{100}$$

P → Principal

T → Time

R → rate of interest

A → amount

$$\rightarrow A = P + T$$

$\rightarrow A = P + RT$

⇒ Find the simple interest on Rs 4000/- at 15% p.a. for 2 years

$$\rightarrow T \times R = T = \frac{PTR}{100} = \frac{4000 \times 15}{100} = 600$$

SI based on %

$$P = 4000$$

$$2 \times 15\% = 30\%$$

$$30\% = 0.03 \times 30 = 0.90$$

Find the simple interest on Rs 12000 at $5\frac{1}{3}\%$ for 2½ years

$$\frac{5}{3} \times \frac{1600}{3} = \frac{40}{3} \%$$

($5\frac{1}{3}\% = 12000 \times 16\% = 12000 \times \frac{16}{100} = 1920$)

$$\frac{40}{3} = \frac{12000 \times 40}{3} = 1600$$

Find the simple interest on Rs 4500 at 8% p.a. for 2 years
4 months

$$8 \times \frac{7}{3} = \frac{16}{3}$$

$$160 = 4500 \times \frac{15}{100}$$

$$\frac{16}{3} = \frac{4500 \times 15}{100}$$

$$= 840$$

Simple interest on a certain sum at 12% p.a. for 3 years
is Rs 8000. Find the sum?

$$8000 = \frac{12 \times P \times 3}{100}$$

$$P = 5000$$

$\rightarrow A = P + \frac{PTR}{100}$
→ Difference between any two consecutive amounts
is interest

\rightarrow sum of money & time

$$A = P +$$

$$t \rightarrow \text{time}$$

$$R \rightarrow \text{rate}$$

$$T \rightarrow \text{time}$$

$$P \rightarrow \text{principal}$$

$$A \rightarrow \text{amount}$$

$$I = \frac{PTR}{100} = \frac{12000 \times 5 \times \frac{16}{3}}{100} = 1200$$

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What sum will amount to Rs 10000 in 3 years at 10% p.a

$$10000 = \left(\frac{3 \times 10 \times P}{100} + P \right) P$$

$$P = 8000$$

$$T \times R + T \\ 3 \times 10\% = 30\% \\ P = 10000 + 10 = 11000$$

$$120\% = 10\% \text{ per year} \\ 120\% = 8000$$

What sum will amounts to Rs 6600 in 4 years

at 8%, p.a S.I.?

$$100 + 32\% = 132$$

$$132 = 6600$$

$$100\% = 5 \times 100 = 500$$

At what rate percent of SI per annum. will a sum of money becomes 3 times in 10 years.

A = 3 times

$$P_1 \nearrow T_{10}$$

$$T = \frac{1 \times 2 \times 10}{100} = 20\%$$

At a certain rate of SI becomes double in 5 years. it will becomes 4 times in how many years:

$$\text{Joro } A = 2 \text{ times } \rightarrow A = 4 \text{ times } \rightarrow A = u \text{ times } \rightarrow \text{to become } 4 \text{ times in how many years?} \\ A = \frac{2}{5} \times T_{10} \rightarrow A = \frac{4}{5} \times T_{10} \rightarrow A = u \times T_{10} \rightarrow \text{to become } u \text{ times in how many years?}$$

$$A = 1 \rightarrow 5 \\ 3 \rightarrow 15 \text{ years}$$

A certain sum of money at a certain rate of SI becomes 3 times in 5 years - it becomes 5 times in how many years

$$A = \text{triple} \quad A = \frac{5 \text{ times}}{P_1 \quad 5\% ?}$$

$$2 \rightarrow 5 \\ u \rightarrow 10$$

→ A sum was invested on SI at a certain rate for 2 years, had it been put 3% higher rate. it would have fetched Rs. 12 more. The sum is

$$\text{Time} = 2 \text{y}, R = 3\%, I = ?$$

$$I = \frac{PTR}{100}$$

$$12 = P \times 2 \times 3$$

$$P = 1200$$

→ Simple interest on certain sum of a certain annual rate of interest is $\frac{16}{25}$ of the sum. If number representing rate % and number in years be equal. find the rate of interest

$$T = R$$

$$SI = \frac{16}{25} \text{ --- SI}$$

$$I = \frac{PTR}{100} = \frac{25 \times R \times R}{1000}$$

$$16 = \frac{R^2}{4} \Rightarrow R = 8$$

→ A sum of money amounts to Rs 4000 in 3 years and to 5000 in 5 years at SI. find the sum.

$$4000 - 3$$

$$5000 - 5$$

$$2Y - 1000$$

$$1Y - 500$$

$$3Y - 1500$$

$$4000 - 1500 = 2500$$

$$4000$$

$$P, \overbrace{I}^{3Y}$$

$$\frac{500}{2500} \times 100 = 20\%$$

→ Rate of interest

→ A sum of money amounts in Rs 1800 in 3 years and Rs 2000 in 5 years at SI. find the sum.

$$1800 - 3Y$$

$$2000 - 5Y$$

$$200 - 2Y$$

$$100 - 1Y$$

$$1800 - 300 = 1500$$

Ratio and Proportion

Ratio or proportion of two or more quantities is called ratio.
It is denoted by $a:b$, ab or $a \div b$.

$a:b$ \ consistent
antecedent

In the ratio $7:12$ antecedent is 12 and consequent

$$\text{Ex: } \frac{12}{7} = 18 \Rightarrow 12 \times 18 = 216$$

Types of Ratios

1) Compound Ratio:

Ratio of the ratios
 $a:b:c:d; e:f$

$$\frac{a}{b} \times \frac{c}{d} \times \frac{e}{f} = \frac{ace}{bdf}$$

Ex: $12:11; 5:6; 33:10$

$$\frac{12}{11} \times \frac{5}{6} \times \frac{33}{10} = 3:1$$

2) Inverse Ratio

Inverse of $a:b$ is $b:a$

Inverse of $a:b:c$ is $\frac{1}{a}:\frac{1}{b}:\frac{1}{c}$

The ratio of speeds of 3 motorbikes is $20:95:6$ find the ratio of time taken by them to cover the same distance

$$\text{① } 20:95:6 \Rightarrow \frac{1}{20}:\frac{1}{95}:\frac{1}{6} = \frac{15:12:50}{300}$$

\therefore Time ratio is $15:12:50$

② Duplicate ratio of $a:b$ is $a^2:b^2$

④ Subduplicate ratio of $a:b$ is $\sqrt{a}:\sqrt{b}$

⑤ Triplicate ratio of $a:b$ is $a^3:b^3$

⑥ Subtriplicate ratio of $a:b$ is $\sqrt[3]{a}:\sqrt[3]{b}$

\Rightarrow Proportion:

equality of two ratios is proportion.

$$a:b = c:d$$

$$ad = bc$$

→ Fourth proportion
a,b,c,d are in proportion then d is called fourth proportion

$$a:b:c:d \text{ or } a:b::c:d \text{ or } a:b:c::d$$

Ex Find the fourth proportion of 3, 19, 18

$$\frac{19 \times 18}{3} = 102$$

→ Third proportion
a,b,c are in continued proportion then c is third proportion

$$a:b = b:c$$

$$b^2 = ac$$

$$c = \frac{b^2}{a}$$

Ex Find the third proportion of 5, 6

$$c = \frac{36}{5} = 7.2$$

→ Second proportion / mean proportion
a,b,c are in continued proportion, b is 2nd proportion

$$a:b = b:c \quad \text{Ratio of b to c is mean}$$

$$b = \sqrt{ac} \quad \text{Ratio of a to c is mean}$$

Ex Find the mean proportion of 8, 18 is 12 = $\sqrt{144}$

If A:B is 3:4 and B:C is 2:5 find A:B:C?

$$\begin{array}{l} a:b = 3:4 \\ b:c = (2:5) \times 2 \\ \hline 3:4:10 \end{array}$$

If A:B is 4:5 and B:C is 6:7 find A:B:C ?

$$\begin{array}{l} 4:5 \times 6 \\ 6:7 \times 5 \\ \hline 24:30:35 \end{array}$$

If a:b = 2:3, b:c = 4:5 and c:d = 6:7 then a:b:c:d ?

$$\begin{array}{l} a:b = 2:3 \\ b:c = 4:5 \\ c:d = 6:7 \\ \hline 16:24:30:35 \quad \text{or} \quad 48:72:90:105 \end{array}$$

- Q) $a : (b+c) = 2 : 3$, $b : (a+b) = 6 : 7$ - find $a:b:c$?
- (1) $\frac{(2a+3b)}{3} = \frac{a}{b+c} \Rightarrow \frac{2a}{3} + b = \frac{a}{b+c}$
 $\frac{2a}{3} = \frac{a}{b+c} - b$
 $\frac{2a}{3} = \frac{a-3b}{b+c}$
 $2a(b+c) = 3(a-3b)$
 $2ab+2ac = 3a-9b$
 $2ab+2ac = 3a-3b$
 $2ab+2ac = 3a-3b$
 $2ab+2ac = 3a-3b$
- a) $24:25:11$ b) $26:31:14$ c) $24:11:25$ d) $32:11:26$
- ⑥ $5a = 6b = 8c$ then find $a:b:c$?
- ⑦ $5a = 6b = 8c$, Lcm (5,6,8),
 $120 : 120 : 120 = 24:20:15 = a:b:c$
- ⑧ $a : \frac{a}{12} = \frac{b}{7} = \frac{c}{9}$ then $a:b:c$
 $\therefore a:b:c = 12:7:9$ Lcm $12,7,9 = 84$
- ⑨ $(10a^3+4b^3) : (11a^3-15b^3) = 7:5$ - then $(3a+5b):(9a-2b)$?
- ⑩ $50a^3+20b^3 = 77a^3-105b^3$
 $125 = 77a^3-105b^3$
 $\frac{125}{27} = \frac{a^3}{b^3} \Rightarrow \frac{5}{3} = \frac{a}{b}$
 $(3a+5b) : (9a-2b)$
 $30 : 39$
 $10 : 13$
- ⑪ a is the mean proportion between 12.8 & 64.8 then
find the value of a ?
 $b = \sqrt{12.8 \times 64.8}$
 $b = \sqrt{819.2}$
 $b = 28.8$
- ⑫ What must be added to the number 10, 20, 30, 40, 50 so that
sums are proportional
- 10 20 30 50
 $\underbrace{10}_{10} : 20$
- add/sub = $\left| \frac{20-30}{1-2} \right| = 10$
- $\frac{ay-yc}{x-y}$

- ⑩ When a is added to each of 115, 21, 31, 6, 10 the numbers obtained are in proportion. what is the mean proportion b/w the no. (3a+2) and (5a+4)?

$$115 : 21 : 31 : 6 : 10$$

$$\text{Mean Proportion} = \frac{90 + 126}{6 + 10} = \frac{36}{4} = 9$$

$$\sqrt{25 \times 49} = 5 \times 7 = 35$$

- ⑪ The ratio of the marks of navi & krishna is 7:8 and that of krishna & hanish is 5:6 the marks obtained by navi is 350 find the marks of hanish

$$7:8 \\ 5:6 \\ \hline 35:40:48$$

(krishna, hanish, marks are 480)

- ⑫ A man earned Rs 13.6 million. He distributed the money to his wife, son and daughter in the ratio of $\frac{5}{2} : \frac{7}{2} : 2$ then find the share of son.

$$a\delta : \pi : 4 \Rightarrow 5\alpha + 7\alpha + 4\alpha = 13.6 \times 2 \\ 16\alpha = 13.6 \times 2 \\ \alpha = 1.7$$

-) If RS 880 is divided among A, B and C so that A gets $\frac{3}{8}$ of what B and C together get and B get $\frac{5}{11}$ of what A & C together get what is the share of C.

$$\text{Total} = A + B + C = 880 \\ \frac{A}{B+C} = \frac{3}{8} \quad \frac{B}{A+C} = \frac{5}{11}$$

$$\frac{3}{11} \times 880 = 240$$

$$880 - (240 + 275) = 365$$

(1) The ratio of monthly income of A & B is 4:5 and that of their monthly expenditure is 3:2 if income of A is equal to expenditure of B. Then what is the ratio of savings of both?

$$\begin{array}{l} \text{A} : 4 : 5 \\ \text{B} : 3 : 8 \end{array}$$

$$\frac{4x - 3y}{3x} = \frac{8y}{2}$$

$$\text{Savings} : A : B$$

$$8-3 : 10-8$$

(2) In a mixture of 36 liters if the ratio of milk and water is another 6 liters of water is added to the mixture find the ratio of milk and water in the resulting mixture.

$$\begin{array}{ll} M & W \\ 3 & 1 \\ 27 & 9+6 \end{array}$$

$$27 : 15$$

(3) In a mixture of 45L the ratio of milk & water is 3:2 if we want to convert the ratio 2:3 now much water should be added

$$\begin{aligned} \text{Milk} &= 45 \times \frac{3}{5} = 27 \\ \text{Water} &= 45 \times \frac{2}{5} = 18 \quad \text{Ratio} (3 : 2) \rightarrow (6 : 4) \text{ MP} \\ 3 : 2 & \rightarrow 27 : 18 + 2 = 2 : 3 \quad \text{MP} \quad (2 : 3) \rightarrow (6 : 9) \text{ MP} \end{aligned}$$

$$B_1 = 36 + 2x$$

$$2x = 45$$

$$x = 22.5$$

(4). In an office they reduced the emp in the ratio 25:18 thus wages in the ratio 9:14 then find the ratio of wages bill of previous salaries and present bill of salaries of the emp.

Prev	Pre	Emp	Wage
25	18	14	14
225	252	85	85

(24) If 372 coins consists of 50P, 25P coins whose values are in the ratio of 13:11:7 & the number of 50P coins would be

$$13x + 11x + 7x = 31x \\ 31x = 372$$

$$13 : 11 : 7 \propto 13 : 11 : 7 \propto 13 : 7 \\ x_1 x_2 x_4$$

$$13 : 22 : 28 \\ 22 \times 6 = 132$$

$$6x = 132 \\ x = 22$$

(25) There are two variables α & y whose α varies directly as y .
Calc. value of α when $y = 8$, $\alpha = 24$. Find α when $y = 216$

$$\alpha \propto y \\ \alpha = k y \\ \alpha = k \cdot 24 \\ 24 = k \cdot 6 \\ k = 4 \\ \alpha = 4y \\ \alpha = 4 \cdot 216 \\ \alpha = 864$$

(26) The price of gold is directly proportional to square of its weight a person broke down the gold in the ratio of 3:2:1 and when sold incurred a loss of RS 4620. find the initial price of gold.

Initial	After	Price (w) ²
$(3+2+1)^2$	$3^2 + 2^2 + 1^2$	$P \propto (w)^2$

$$36 : 14 \\ 36 \text{ kg gold} \text{ at } 210 \text{ per kg} \\ 36 \times 210 = 7560 \\ 14 \text{ kg gold} \text{ at } 162 \text{ per kg} \\ 14 \times 162 = 2268 \\ 7560 - 2268 = 5292$$

$$36 \times 210 = 7560$$

③ A, B and C enter into partnership.

A - 36000 for 4 months

B - 18000 for 3 months

C - 27000 for 5 months

$$\frac{36000 \times 4}{12} : \frac{18000 \times 3}{9} : \frac{27000 \times 5}{15}$$

$$6 : 4 : 9$$

$$58 : 18 : 45 = 16 : 6 : 15$$

$$\text{Total Income} \times \frac{6}{34} = 24000$$

$$\therefore \text{Share of A} = 16 : 24000$$

$$16 \times 1500 = 24000$$

6 months after C - 20000

$$20000 \times \frac{12}{15} : 18000 \times \frac{3}{15} : 20000 \times \frac{9}{15}$$

$$4 : 3 : 3 = 4 : 3 : 3$$

$$25000 \text{ Total Income} \times \frac{3}{70} = 25000$$

$$\therefore \text{Share of A} = 25000 \times \frac{3}{70} = 1057.14$$

A - 8000

$$A - 4000 \text{ after } 12 \text{ months} \\ B - 8000 \text{ after } 32 \text{ months withdraw } 10L$$

$$C - 30L \text{ after } 32 \text{ months} \\ \text{Total Income} = 35 \times 12 + 35 \times 10 + 35 \times 30$$

$$\frac{2}{73} \times 10500 = 890$$

$$\therefore \underline{\underline{890}}$$

A - 25L after 12 months 10L
 B - 35L after 32 months withdraw 10L
 C - 30L after 32 months
 Total Income = 35 \times 12 + 35 \times 10 + 35 \times 30

$$25 \times 1 + (25+10)2 : (35 \times 2) + (35-10)1 : 30 \times 3$$

$$25 + 40 : 70 + 25 : 90$$

$$65 : 95 : 90$$

⑪

$$A:B = 4:5$$

$$4x3 + \left(4 - \frac{4}{5}\right) \Rightarrow 5x3 + \left(5 - \frac{5}{5}\right) \Rightarrow$$

$$\text{Wrong} \quad \left\{ \begin{array}{l} 12 + \frac{15}{5} \times 3 : 15 + \frac{24}{5} \times 3 \\ 15 + 105 : 15 + 54 \end{array} \right. \Rightarrow \frac{48+105}{15} : \frac{273}{5} \Rightarrow \frac{153}{15} : \frac{273}{5}$$

$$= 12+21 : 15+28$$

$$= 33 : 43 \times \frac{33}{43} \times 10 = 330$$

⑫

$$3:1 = 850 \text{ करोड़ } \times 12 : 425 \text{ करोड़ } \times B$$

$$\frac{3}{1} = \frac{850 \times 12}{425 \times B} \Rightarrow$$

\therefore After 6 months

⑬ A - 3500

$$2:3 = 3500 \times 12 : 4 \times B$$

$$\frac{2}{3} = \frac{500 \times 12}{B} \Rightarrow B = 7000$$

⑭ P = 5:7:8

T = 14:8:7

$$T_1 = \frac{5}{14}, T_2 = \frac{7}{8}, T_3 = \frac{8}{7} ; \quad \left(\frac{5}{14} + \frac{7}{8} + \frac{8}{7} \right) \times 10 = (12)$$

$$\frac{5}{14} : \frac{7}{8} : \frac{8}{7} ; \quad (12)$$

$$\frac{5}{14} \times 64 : \frac{7}{8} \times 64 : \frac{8}{7} \times 64$$

$$20 : 49 : 64$$

$$A = \left(\frac{1}{4} \times 64\right) 15 \quad 1 \times 5 : 3 \times 8 : 1 : 2 \\ B = \frac{2}{3} \quad 5 : 8 = 1 : 2$$

$\therefore n = 10 \text{ months}$

- Sumit's revenue received 25000 and 15000 respectively
 Q) in a business if 4% of the profit is given to charity
 and at the end of the year they got the total profit 2000
 find their share of sumit

$$25000 : 15000 \text{ :: } 5:3$$

$$20000 \times \frac{4}{100} = 80$$

$$1920$$

$$\frac{5}{20} \times 1920 = 1200$$

- Q) A & B starts a business with 20,000 & 30,000 resp B is a
 sleeping partner & A wants to be working partner for which
 he received 20% of the total profit at the end of the year
 they make a profit 50,000 share of A

$$2:3 \\ 50000 \times \frac{20}{100} = 10000.$$

$$10000 + 50000 \times \frac{2}{5} \times \frac{8000}{48000} = 16000 + 10000 = 26000$$

- Q) 2:3:5 = A:B:C
 A - 50% inc after 4 months
 B - $33\frac{1}{3}\%$ inc after 6 months
 C - 50% withdraw after 8 months
 (8x4) + ($\frac{5}{3} \times 8$) : (3x6) + $(5 \times \frac{100}{3})$
 $8+24 : 12+(3+1)6 : 50$
 $32 : 48 : 75$
 $8 : 12 : 15$
 $16 : 24 : 25$
 $\frac{14000}{62} \times 86800 = 22400$
 $\frac{14000}{62} \times 86800 = 35000$

$$35000 - 22400 = 12600$$

$$k:s = 8:7$$

$$8x + 9x = 17x + 21x - 18$$

$$17x = 40x - 18$$

$$18 = 40x - 17x$$

$$18 = 23x$$

$$(ii) P = 1 \frac{3}{13} = \frac{16}{13}$$

$$P = \frac{16}{13}(P_0 G)$$

$$13P = 16P - 16G$$

$$\Rightarrow \frac{(8 : 9)}{(9 : 2)} \cancel{\times} \frac{1}{2}$$

$$\frac{16 : 18}{19 : 21} \frac{3}{3 \text{ parts}} = 9$$

ratio

$$16 : 18$$

$$19 : 21$$

$$\text{ratio} \rightarrow 54 : 3 = 51$$

difference is not same between

ratio.

$$\text{Q} \quad S-a \quad \frac{P}{2} : \frac{S}{2} = 5 \text{ year ago} \\ f-3 \quad 1-2 : 1-5 \text{ years ago}$$

$$42 : 18$$

$$24 : 12$$

$$(12) \quad A:B = 4:3 \\ A \times B = 4 \times 3 \\ 12 = 36 \\ \pi = 6$$

$$(12) \quad A:B = 4:3 \\ A \times B = 4 \times 3 \\ 12 = 36 \\ \pi = 6$$

ratio

$$42 : 18$$

$$24 : 12$$

$$(13) \quad \frac{A+B}{2} = 20 \quad \frac{50+C}{3} = 23$$

$$A+B=40$$

$$A+B+C$$

$$C=61-60$$

$$C=9$$

$$\text{after 10 years} \\ A+B=40+20=60$$

ratio

$$P:S$$

$$5-a : 3 = 3 \text{ years ago} \\ 3-(f-3) : 3 = 4 \text{ years ago}$$

$$\cancel{3}P-\cancel{3},$$

$$55 : 25 - \text{ratio}$$

$$48 : 18 - \text{part}$$

$$\therefore \text{part } 48+3 = 51$$

ratio

$$P:S$$

$$3+61-S = 2(5+3)-8$$

$$S=22$$

$$61-22=39$$

Diagram - 2

Percent - 2

Pie chart

$$④ 100\% = 36^\circ$$

$$5\% = 18^\circ$$

$$① \frac{22+20+24}{3} = 22\%$$

$$22\% \text{ of } 24500 = 5390$$

Graduation
(37900)

14 x 249

$$② 4\pi + 3\pi = 3720$$

$$\pi R^2 = \frac{3720}{560}$$

$$4\pi + 3\pi = 5100$$

$$\pi R^2 = \frac{5100}{300}$$

$$2100 - 1680 = 420$$

$$③ \frac{420}{2450} \times 100\% = 20\%$$

$$② \frac{14}{100} \times 223 : \frac{24}{100} \times 249$$

$$14:19 \rightarrow 19:14$$

$$③ \frac{3}{100} \times 24500 : \frac{4}{100} \times 24500 \\ 3:4$$

$$④ \frac{21}{100} \times 24500 : \frac{13}{100} \times 24500 \\ 19:13$$

$$= 2730 + 1901$$

$$3458$$

$$① 17 \times 273 \\ = 2290 + 988$$

$$14 \times 249$$

$$P = 12\% \\ Q = 13\% \\ R = 14\% \\ S = 21\% \\ T = 19\% \\ M = 19\% \\ N = 12\% \\ K = 8\% \\ L = 15\% \\ N = 15\% \\ P = 15\% \\ Q = 13\% \\ R = 14\% \\ S = 21\% \\ T = 19\% \\ M = 19\% \\ N = 12\% \\ K = 8\% \\ L = 15\% \\ N = 15\% \\ P = 15\%$$

Post graduation
(24900)

14 x 249

Venn Diagram

$$25 + 72 + 4 + 3 + 17 + 8 + 30 \\ = 95$$

\rightarrow Right angle 90°

1 hr \rightarrow 2 times
 12 hr \rightarrow 22 times
 24 hr \rightarrow 44 times

12 players

3 players

7 players

25 + 3 = 28 players

30 players

CLOCKS ||

\Rightarrow Represents time in hour

Hours hand Min hand

1hr - 360°

1hr - 30°

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

\Rightarrow Relative angles

The diff between min hand & hrs hand in one minute

$$6^\circ - \frac{1}{2}^\circ = \frac{11}{2}^\circ = 5\frac{1}{2}^\circ$$

\Rightarrow Coincide i.e. 0°

$$1 \text{ hr} = 1 \text{ times}$$

$$12 \text{ hr} = 11 \text{ times}$$

$$24 \text{ hr} = 22 \text{ times}$$

\Rightarrow Opposite (180°)

$$1 \text{ hr} = 1 \text{ times}$$

$$12 \text{ hr} = 11 \text{ times}$$

$$24 \text{ hr} = 22 \text{ times}$$

\rightarrow Many straight lines can be formed in a day but not in opposite direction

$$24 - 22 = 2 \text{ hrs}$$

Model-T

① What is the angle made by both the hands by 7:20

$$\begin{array}{rcl} \text{Hr} & : & \text{min} \\ \times 60 & & \times 11 \\ \hline \text{diff} & = & \text{answ} \end{array}$$

$$420 - 220 = \frac{200}{2} = 100^\circ$$

$$\theta = \left| 30h - \frac{11}{2}m \right|$$

$$\Rightarrow 4 : 20$$

$$\frac{20}{2} = 10^\circ$$

$$\rightarrow 10:45$$

$$600 - 405$$

$$\frac{105}{2} = 52.5^\circ$$

$$\rightarrow 3:36$$

$$180 - 376$$

$$\frac{216}{2} = 108$$

$$\Rightarrow 12:15 \Rightarrow 00:5$$

$$720 - 55 \rightarrow \frac{55}{2} = 27.5^\circ$$

\Rightarrow What is the reflexive angle made by both hands by 7:15

$$7:15$$

$$450 - 165$$

$$\frac{255}{2} = 127.5$$

$$\Rightarrow 3:50$$

$$\frac{11:60}{3:50}$$

\Rightarrow Between 2 & 3 exact min & hour hand coincide time.

$$\boxed{\text{Time} = \frac{2}{11} | 30n \pm A |} \quad \text{H-Start}$$

Model-2

\Rightarrow If actual time in the clock is 4:20 what is the time clock shows in the mirror

$$\rightarrow 11:60 \text{ Subtract}$$

$$7:40$$

$$\Rightarrow \text{Original + Mirror} = 11:60$$

$$\frac{2}{11} | 30(2) + 0 |$$

$$= \frac{120}{11} = 10\frac{10}{11} \text{ min}$$

\Rightarrow Between 7 & 8

$$\frac{420}{11} = 38\frac{2}{11} \text{ min}$$

\Rightarrow Between 11 & 12

$$\frac{2}{11} | 30 \times 7 \pm 0 |$$

$$= 60 \text{ min}$$

$\Rightarrow 12$. (exactly)

d. none.

\rightarrow Clock shows time in the mirror is 10:15 what is the time in actual

$$1:45$$

⑭ At what time between 4 & 5 hours hand & min hand are in opposite direction

$$\text{Between } 4 \text{ & } 5 \\ \frac{2}{11} (300 + 90)$$

$$\frac{2}{11} [30(11) + 180]$$

$$\frac{2}{11} [120 + 180] = 30\frac{10}{11}$$

$$\frac{2}{11} [300 + 180] = 54$$

$$54 \frac{6}{11} \text{ min}$$

$$= \frac{120}{11} = 10\frac{10}{11} \text{ or } 20\frac{2}{11} \text{ min}$$

$$10 + 60 + 10\frac{10}{11} = 11:10\frac{10}{11} \text{ min}$$

847

$$\text{Between } 10 \text{ & } 11 \\ \frac{2}{11} (300 + 90)$$

$$\frac{2}{11} (240 - 180)$$

$$\frac{2}{11} \times 60 = \frac{120}{11} = 10\frac{10}{11} \text{ min}$$

$$n-m =$$

$$5 \text{ & } 6$$

$$\frac{2}{11} \times 60 = \frac{120}{11} = 10\frac{10}{11} \text{ min}$$

at 6 o'clock none

⑯ A man runs at the number of rotations of hour hand and minute hand of a clock respectively in 72 hours, then

$$\begin{aligned} \text{min} - 92 \text{ rotation} \\ \text{hour} - 6 \text{ rotation} \\ 12 - 6 = 66 \end{aligned}$$

⑰ At what time between 4 & 5 hours min hand form right angle

$$6:19\frac{1}{2} \text{ pm}$$

$$\frac{2}{11} (120 \pm 90)$$

$$\frac{420}{11} \text{ or } \frac{60}{11}$$

$$38\frac{2}{11} \text{ or } 5\frac{5}{11}$$

$$\text{⑱ } 5:30 \text{ and } 6$$

$$\frac{2}{11} \times 150 \pm 90$$

$$\begin{aligned} &= \frac{480}{11} \\ &= 43\frac{9}{11} \text{ min} \end{aligned}$$

⑲ A clock gains 5 minutes in every 24 hrs it was at night at 6 AM on Monday. What will be the time on 6 PM on Thursday

$$\textcircled{3} \quad \frac{15 \times 10}{15+10} = \frac{150}{25} = 6$$

$\therefore A$ days

$$A - 10 \text{ days}$$

$$B - 15 \text{ days}$$

$$? \text{ together?}$$

$$\textcircled{1} \quad A+B = 10 \text{ days}$$

$$B+C = 15 \text{ days}$$

$$C+A = 12 \text{ days}$$

$$A, B, C \text{ together?}$$

Lcm method

$$\begin{array}{l} A \\ 10 \\ B \\ 15 \\ \hline 30 \end{array}$$

$$1 \text{ unit}$$

$$30 \text{ units}$$

$$60 \quad \frac{30}{10} = 3 \quad \frac{30}{15} = 2 \quad 2 - 5 \Rightarrow 30 \cdot \frac{1}{3} = 6 \text{ days}$$

$$\textcircled{2} \quad \frac{6 \times 18}{18-6} = \frac{6 \times 18}{12} = 9 \text{ days}$$

Lcm method

$$A+B \rightarrow A \text{ total work}$$

$$\textcircled{3} \quad A \quad 18 \quad 18 \text{ units}$$

then B alone 2

$$\frac{18}{2} = 9 \text{ days}$$

$$\textcircled{4} \quad A - 20 \text{ days}$$

$$\textcircled{5} \quad B \quad \frac{2}{3} \text{ of some work in 12 days}$$

$$A+B - ?$$

$$1 - \frac{2}{3} = \frac{1}{3} = 6 \text{ days}$$

$$\frac{2}{3} = 12 \text{ days}$$

$$\textcircled{6} \quad P - 6 \text{ days}$$

$$Q - 8 \text{ days}$$

$$? \text{ together?}$$

$$R - 12 \text{ days}$$

$$2 \times \frac{\frac{4}{24} \times 18}{\frac{42}{24} + 1} = 10 \frac{2}{3} \Rightarrow 20 \frac{4}{3}$$

$$\begin{array}{l} P \\ 6 \\ Q \\ 8 \\ R \\ 12 \end{array}$$

$$24 \text{ units}$$

$$\begin{array}{l} A \\ 10 \\ B \\ 15 \\ C \\ 12 \end{array}$$

$$? \text{ together?}$$

$$\frac{24}{2^3} = \frac{8}{3} \text{ days}$$

(7)

A - 75% in 9 days
 B - 50% in 8 days

$$A+B = ?$$

$$\frac{25}{100} \times 3 \times 75^3 = 12 \text{ days}$$

$$2 \times 8 = 16 \text{ day}$$

$$\frac{1}{2} \times \frac{75 \times 75}{100} \times 3 = 3\frac{3}{4}$$

8) A & B - worked 3 days &

$$\begin{array}{l} A \\ - 10 \\ B \\ - 12 \end{array}$$

lcm (total work)

$$\begin{array}{r} A \\ 10 \\ B \\ 12 \\ \hline 60 \end{array}$$

$$6 =$$

$$\frac{60}{11} = 5\frac{5}{11} \text{ days}$$

$$11 \times 3 = 33 \text{ units}$$

$$\frac{27}{5} \Rightarrow 5\frac{2}{5} + 3 = 60 - 33 = 27 \text{ units}$$

$$= 8\frac{2}{5}$$

$$5 \times 10 = 60, \quad \text{by B}$$

$$5 \times 2 = 10, \quad \frac{40}{5} = 8$$

$$60 - 10 = 50, \quad 10 + 8 = 18 \text{ days}$$

$$\frac{50}{2} = 25, \quad 25 + 2 = 27.$$

after 2 days A left abt
after 2 days C left

Wrong

$$\begin{array}{l} A \\ 10 \\ B \\ 12 \\ C \\ 15 \\ \hline 60 \end{array}$$

$$2 \times 15 = 30$$

$$60 - 30 = 30$$

$$9 \times 2 = 18 \Rightarrow 30 - 18 = 12$$

(8)

A - 20 days
 B - 30 days
 A, B - work together - 6 days

A, B worked - 11 days
 C alone - ?

$$\begin{array}{l} A \\ 20 \\ B \\ 30 \\ C \\ 60 \\ \hline 120 \end{array}$$

$$9 \times 6 = 54$$

$$120 - 54 = 66$$

$$11 \times 6 = 66$$

$$x = 6 - 5 = 1$$

$$A - 20 \text{ days}$$

B - 30 days
 A, B work together 6 days before 10

$$\begin{array}{r} A \\ - \\ B \\ \hline 60 \end{array}$$

$$5$$

$$10 \times 2 = 20 \text{ units}$$

$$5 \times 10 = 50, \quad \text{by B}$$

$$5 \times 2 = 10, \quad \frac{40}{5} = 8$$

$$60 - 10 = 50, \quad 10 + 8 = 18 \text{ days}$$

$$\frac{50}{2} = 25, \quad 25 + 2 = 27.$$

(12)

A B
3n n

~~3n+2n~~ = 5n

new - 1200 wages
A - 8 days
B - 15 days
n, B, C - 11 days

$$\begin{array}{l} \text{3n: } \\ \text{efficiency } 3 : 1 \\ \text{time } 1 : 3 \\ \frac{1}{3} = \frac{30}{30} \\ \frac{1}{3} = 1 \\ \frac{30 \times 30}{120} = 4 \end{array}$$

$$= 22\frac{1}{3} \text{ days}$$

(3) A - 10 days
B - 25% more efficient

A+B together - ?

$$\begin{array}{l} \text{A} \\ \text{B} \\ \text{n} \end{array} \quad \begin{array}{l} 10 \\ 12 \\ \frac{n+1}{n} \end{array}$$

$$\begin{array}{l} n \\ 100 \\ 125 \\ 100 \times 8 \end{array}$$

$$\begin{array}{l} \text{4 : 5 efficiency} \\ \text{100 : 125 : 125} \\ \text{time} \quad 4 : 2 : 1 \\ \frac{1}{4} = \frac{125}{125} \\ \frac{1}{2} = 125 \\ \frac{1}{1} = 125 \end{array}$$

$$\begin{array}{l} 100 \times 8 \\ 125 \times 8 \\ 125 \times 8 = 100 \times 8 \\ 125 = 100 \end{array}$$

5. 98 - 56 = 42 degrees

$$\frac{4}{9}$$

(4)

A B C
8 12 24
3 2 1

$$\begin{array}{l} \frac{8+1}{6} = 4 \\ (3+n+8) \\ 6 = 5+n \Rightarrow n=1 \end{array}$$

$$3 : 2 : 1$$

$$\frac{3}{6} \times \frac{2500}{250} = 200$$

$$\begin{array}{l} 9 \text{ km} - 19 \text{ days} - 10 \text{ hrs} \\ 18 \text{ km} - ? - 5 \text{ hrs} \end{array}$$

$$\begin{array}{l} 18 \times 19 \times \frac{5}{10} = 18 \times 19 \times 5 \\ n = 19 \text{ days} \end{array}$$

(5)

$$\begin{array}{l} 9 \text{ km} - 10 \text{ days} - 10 \text{ hrs} \\ 18 \text{ km} - ? - 5 \text{ hrs} \end{array}$$

$$18 \times 19 \times 5 = 18 \times 19 \times 5$$

5. 56 W - 10 days

$$\frac{56}{5} \times 10 = 112$$

5. 56 W - 112 days

$$\frac{56}{5} \times 14 = 112$$

5. 56 W - 112 days

$$\frac{56}{5} \times 14 = 112$$

5. 56 W - 112 days

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$$\frac{56}{5} \times 14 = 112$$

5. 56 W - 112 days

$$\frac{56}{5} \times 14 = 112$$

(17)

200 cats kill 200 rats in 20 days
 30 " " 30 " in ? days

$$\frac{200 \times 20}{200} = \frac{30 \times x}{30}$$

$$x = 200 \text{ days}$$

(18) ~~100~~
 6 B & 6 W - 6 days
 14 B & 7 W - 4 days
 13 B & 1 W - ?

$$\begin{array}{rcl} B & W \\ 6 & 6 = 6 \\ 14 & 7 = 4 \end{array}$$

(Qv)

$$\begin{array}{rcl} B & W \\ 36 & 36 \\ 56 & 28 \end{array}$$

$$28b = 8w$$

$$\frac{b}{w} = \frac{2}{5}$$

$$\text{Total work} = (6b + 6w) \cdot 6$$

$$= 42 \times 6$$

$$\text{No of days} = \frac{42 \times 6}{\frac{2}{5}} = 36.$$

$$7 = 5+2 = b+w.$$

36 days.

(19)

$$\begin{array}{rcl} 6M & 6B & 10 \\ 26M & 6B & -2 \\ 15M & 6B & \end{array}$$

$$15M = 6B$$

$$\begin{array}{rcl} 60 & 80 \\ 52 & 76 \end{array}$$

$$\begin{array}{rcl} 28M & = 16B \\ \frac{M}{B} & = \frac{8}{3} \end{array}$$

$$(6 \times 8 + 8 \times 3) 10 = \frac{80 \times 10}{\frac{8}{3} + 20} = \frac{240}{28} \text{ days}$$

(20)

16m - 25
 20w - 25
 28, 9, 15 do-

$$16m \times 25 = \frac{5}{2} m \times 25$$

$$\frac{m}{25} \times \frac{5}{4}$$

$$16 \times 6 \times 25 = 1600$$

$$\frac{16 \times 5 \times 25}{120 + 80} = \frac{1600}{200} = 10 \text{ days.}$$

$$\frac{\frac{25}{2} + \frac{1}{3} + \frac{1}{4}}{\frac{1}{4} + \frac{1}{6} + \frac{1}{8}} = \frac{52}{12} = \frac{25 \times 42}{40 \times 3} = 10 \text{ days.}$$

(21)

$$\frac{52}{\frac{1}{2} + \frac{1}{3} + \frac{1}{4}} = \frac{52}{12}$$

$$\frac{52 \times 12}{13} = 48 \text{ days.}$$

(22)

A - 16 d A - begin
 B - 8 d then on alternately

$$\begin{array}{rcl} A & B \\ 16 & 8 \\ 2 & 2 \end{array}$$

$$1+2=3-2 \text{ days}$$

$$\frac{16}{3} = 5 \times 2 \text{ days}$$

$$10+1 = 11 \text{ days.}$$

The speed of a train is 70 mph. What distance can it

② cover in 10 sec.

$$\frac{90 \times 5}{18} = 25 \text{ m/sec}$$
$$10 \times 25 = 250 \text{ m.}$$

③ A car can cover a distance of 160 m in 16 sec. Speed in mph

$$\frac{160}{16} = \frac{10 \times 18}{5} = 36 \text{ kmph}$$

④ The speed of a truck is $\frac{1}{3}$ of the speed of the train. The train covers 1230 km in 5 hrs. What is the speed of the truck?

$$\text{train} = v = \frac{1230}{5}$$
$$\text{truck} = v/3 = \frac{1230}{15} = 82 \text{ kmph}$$

⑤ A 420 m long train crosses a pole in 70 sec. What is the speed of the train?

$$\frac{420}{70} = 6 \text{ m/sec}$$

⑥ A 200 m long train crosses a platform twice the length in 2 min. what is the speed of the train.

$$\frac{200 + 400}{2} = \frac{720}{120} = 6 \text{ m/sec}$$

⑦ $\frac{42}{120} \times \frac{18^2}{5} = 126 \text{ kmph}$

Man \rightarrow 9 kmph

$\frac{126 + 9}{120} = 125 \text{ kmph}$

$$126 - 9 = 117 \text{ kmph}$$

⑧ $\frac{180 + 270}{10.8} = \frac{450 \times 50}{108 \times 5} = 150 \text{ kmph}$

$$150 - 60 = 90 \text{ kmph}$$

⑧ * On walking at $\frac{3}{4}$ th of usual speed a man reaches his office 20 min late. What is the usual time taken by him in reaching his office.

$$\frac{\frac{3}{4}a}{4} = 20 \quad | \text{ wrong}$$

$$a = \frac{20 \times 4}{\frac{3}{4}} = \frac{20 \times 16}{3}$$

time : $4 : 3 - 1$
 $3 - 3 \times 20 = 60 \text{ min.}$

⑨ $a.s = 40 \text{ kmph}$
 $\text{actual a.s} = 20 \text{ kmph}$

$$\frac{2 \times 20 \times a}{80 \times 30} = 26.66 = \frac{80}{3}$$

⑩ .
 $160 - 60 \text{ kmph}$
 $160 - 80 \text{ kmph}$

$$\frac{2 \times \frac{32}{5} \times 80}{76 \times 18} = \frac{16 \times 80}{729} = 31.13 \text{ kmph}$$

⑪
 10 - 50 kmph
 10 - 60 kmph
 10 - 20 kmph

A	B	C
40	60	20
3	2	6

$$\frac{360}{11}$$

⑫
 $39 \text{ km} = 45$
 1st 15 - a kmph
 20 - 2a kmph
 $\frac{10}{2a} - 10 - \frac{a}{2} \text{ kmph}$

$$d = 42 \times \frac{1}{2}, d = 9 \text{ km. } \text{? wrong}$$

$$\frac{a+2a}{60} = 32 \quad 3a = \frac{32 \times 60}{6}$$

$$a = \frac{16 \times 35}{32 \times 6}$$

(15)

s - 4 kmph
 c - 6 kmph
 total time = $5 \text{ hrs} = T_1 + T_2$

Distance.

$$D = \frac{s \times c^2 \times t}{s+c} = 12 \text{ km}$$

(16)

train - 120 mph - without stoppage
 train - 80 mph - with stoppage

$$\text{stoppage time} = \frac{\text{diff in speed}}{\text{highest speed}} \times 60$$

(17)

$A \cdot S = 100 \text{ mph}$ stopping for 3 min after every 75 km
 600 km time taken to travel 600 km .

$$\frac{600}{100} = 6 \text{ hrs} = (\frac{6}{1} \times 3) \text{ min}$$

$$\frac{20}{\frac{20}{100}} = \frac{20 \times 100}{100} = 20 \text{ min.}$$

$$\frac{540}{20} = 8 = 8 \text{ hrs}$$

$$5 \times 18 = 90 \Rightarrow 1 \text{ hr } 30 \text{ min.}$$

$$= 9 \text{ hr } 30 \text{ min.}$$

$$\frac{100 \text{ km}}{\frac{T_1}{100 \text{ kmph}} + \frac{T_2}{60 \text{ kmph}}} \Rightarrow \frac{600}{100+60} = \frac{600}{160} = 6 \text{ hrs}$$

$$\frac{D}{R-S} = T$$

(2)

$$\text{8 km/h} \text{ वेगापर्याप्ति} \\ \text{60 kmph}$$

$$130 - 60 = 70 \text{ km}$$

$$= \frac{70 \times 2}{70 \times 2}$$

$$1 + 2 = 11 \text{ km}$$

(2)

$$I = \frac{10^2}{60} \cdot 10 \quad T_1 = \frac{30}{60} \cdot 2$$

$$\frac{10}{6} \cdot \frac{1}{2} \cdot \frac{4-5}{10} = \frac{2}{5} = \frac{1}{5}$$

$$\frac{1}{5} \times 60 \times 12 = 192 \text{ min.}$$

(2)

$$T = 10 \text{ kmph} \\ P = 11 \text{ kmph}$$

10 : 11
60 : 66

$$10 : 11 \quad \text{Speed} = \frac{5}{6} \times 20 = 100 \text{ kmph}$$

$$11 : 10 \quad \text{Time} = \frac{6}{5} \times 20 = 24 \text{ min.}$$

(2)

$$\begin{array}{c} P \\ \overleftarrow{S} \\ R.S = 50+40 = 90 \text{ kmph} \\ \overrightarrow{Q} \\ P = R+100 \\ Q = R \end{array}$$

$$\begin{array}{c} S \\ P \\ 5 : 4 \\ D \\ 5 : 4 \quad J = 100 \text{ km} \\ 100 \times 9 = 900 \text{ km} \end{array}$$

$$\text{Total dist} = 2R+100$$

$$\frac{100}{50} \times \frac{100+40}{50} \times \frac{100}{50} \cdot \frac{P}{50} = J \times 100 \\ 200+800 = 50P \cdot \frac{100}{50} = 100J \\ 1000 = 100P \cdot 2 \\ P = 50$$

$$R+100 = 50 \Rightarrow R+50 = 50$$

Q4

$$\begin{aligned} D &\rightarrow 60 \text{ cmph} \\ \rightarrow & 80 \text{ min} \\ 80 - 60 &= 20 \text{ cmph} \\ R.S &= 20 \text{ cmph} \\ 60 \times 2 &= 120 \text{ cm} \end{aligned}$$

$$\begin{array}{r} 14:30 \\ 16:30 \\ \hline 14:3 \end{array}$$

$$\frac{120+\lambda}{120} = \frac{\lambda}{60}$$

$$\begin{array}{r} R.S = 80 \\ L = 60 \\ \hline 1 \end{array}$$

$$\lambda = 360 + 120 = 480$$

$$\begin{array}{r} \alpha = 3 \\ L \times \frac{650}{2} = R \\ R = 30 \\ L = 40 \\ \hline 1 \end{array}$$

$$R.S = 30 + 40 = 70.$$

$$30 \times 3 = 90 \text{ km}$$

$$650 - 120 = 530 \text{ km}.$$

$$\begin{array}{r} 8 \times 30 = 240 \\ 8 \times 40 = 320 \\ \hline 240 + 90 = 330 \end{array}$$

$$\frac{330}{2} = 165$$

$$\begin{array}{l} \text{Bij} - 10 \text{ cmph} \\ \omega = 2 \text{ cmph} \\ 35 \text{ min waited} \\ \text{Dist} = s \times t \end{array}$$

$$10 \times t_1 = t_2$$

$$10 \times t - \frac{265}{60} = t$$

$$10t - \frac{265}{60} = t$$

$$9t = \frac{265}{60}$$

$$t = \frac{265}{60} \times 10$$

$$\begin{array}{r} \alpha = 3 \\ L \times \frac{650}{2} = R \\ R = 30 \\ L = 40 \\ \hline 1 \end{array}$$

$$30 \times 3 = 90 \text{ km}$$

$$650 - 120 = 530 \text{ km}.$$

$$\begin{array}{r} 8 \times 30 = 240 \\ 8 \times 40 = 320 \\ \hline 240 + 90 = 330 \end{array}$$

$$\begin{array}{l} t_1 + t_2 = 5 \text{ hrs} \\ = \frac{5}{60} : 25 = \frac{265}{60} \end{array}$$

$$\begin{array}{l} H \\ \overbrace{\hspace{1cm}}^{\text{Distance}} \end{array}$$

$$10t - \frac{265}{60} = t$$

$$9t = \frac{265}{60}$$

$$t = \frac{265}{60} \times 10$$

⑤

d_s	u_s
6	4
3	2
t	3

$$5p - 2hr$$

$$1p = \frac{1}{5}$$

$$2 \times \frac{1}{5} + \frac{2}{5} \times 6 = \frac{12}{5} = 2.4 \text{ km}$$

⑥

$$M = 15 \text{ kmph} \quad [M = \frac{d_s + u_s}{2}]$$

30 km - distance
4.30 hr come back
 $d_s + u_s = 30 \text{ kmph}$

$$s = ?$$

$$s = \frac{d_s - u_s}{2}$$

$$\frac{30}{15+s} + \frac{30}{15-s} = \frac{9}{2}$$

$$40 \text{ with options.} \\ \frac{3}{2} + 3 = \frac{3+6}{2} = \frac{9}{2} \quad (6)$$

$$T_{ds} + T_{us} = 4\frac{1}{2} = \frac{9}{2} \text{ hr.}$$

⑦

$$M = 10 \text{ kmph}$$

$$\frac{26}{14} \text{ km DS}$$

$$\frac{14}{14} \text{ km UP}$$

$$\frac{26}{10+s} = \frac{14}{10-s}$$

$$260 - 26s = 140 + 14s$$

$$120 = 40s$$

$$s = 3 \text{ kmph}$$

⑧

$$T_{ds} = \frac{T_{us}}{2}$$

$$d_s = ? \quad \text{if } \frac{7.5 \times 2}{3} = 5 \text{ kmph}$$

$$u_s = 5 \text{ kmph}$$

$$T_{ds} = 2 \times 5 \text{ kmph} = 10 \text{ kmph.}$$

⑨

$$\frac{d_s}{u_s} : \frac{u_s}{s_2} = \frac{1}{2} : 2 - T$$

Boats & Streams

Formulas

- Speed of the boat in still water $M = \frac{d_s + U_s}{2}$.

- Speed of the water or speed of stream or rate of current.

- Speed of the boat along with water flow (downstream)

$$ds = M + S$$

- Speed of the boat against waterflow upstream.

$$U_s = M - S$$

$$ds = \frac{M + S}{2}$$

$$U_s = \frac{M - S}{2}$$

$$\textcircled{1} \quad 11 \text{ km along stream - } 1 \text{ hr} \\ 5 \text{ km against stream - } 5 \text{ hr} \quad = \frac{11+5}{2} = \frac{16}{2} = 8 \text{ kmph}$$

$$\textcircled{2} \quad \text{downstream } \frac{16}{2} = 8 \text{ kmph}$$

$$U_s = 16/4 = 4 \text{ kmph}$$

Speed in still water?

$$\frac{8+4}{2} = 6 \text{ kmph.}$$

$$\textcircled{3} \quad 15 \text{ kmph speed of stream. } ds = 15$$

$$2.5 \text{ kmph} \quad M = 15 - 2.5 = 12.5 \text{ kmph}$$

$$U_s = 12.5 - 2.5 = 10 \text{ kmph.}$$

$$\textcircled{4} \quad M = 13 \text{ kmph.}$$

$$S = 4 \text{ kmph}$$

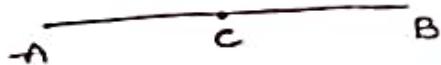
$$ds = 13+4 = 17 \text{ kmph.}$$

$$\textcircled{5} \quad t = \frac{684}{17} = 41 \text{ hrs}$$

$$\begin{aligned} M &= 5 \text{ kmph} \\ S &= 1 \text{ kmph} \end{aligned}$$

$$ds = 6 \text{ kmph}$$

$$\begin{aligned} U_s &= 4 \text{ kmph} \\ d &\rightarrow S \times t = 6/2 = 3 \text{ km.} \\ 1 &= \frac{2}{G} + \frac{2}{4} \quad \pi = \frac{2\pi}{2} \\ 12 &= 5\pi = \dots \end{aligned}$$



$$S = 4 \text{ kmph}$$

$$M = 14 \text{ kmph}$$

$$ds = M + S = 18 \text{ kmph}$$

$$d = 18 \times 19 = 342 \text{ km}$$

$$\frac{114}{3} = \frac{114+114}{3} = 228$$

$$U_s = M - S = 14 - 4 = 10 \text{ kmph}$$

$$\frac{2x}{18} + \frac{x}{10} = 19$$

$$10x + 9x = 19 \times 90 \\ x = 90 \text{ km}$$

$$A \rightarrow B = 2 \times 90 = 180 \text{ kms.}$$

$$(20) T_{us} + T_{ds} = 14 \text{ hours}$$

$S = ?$

$$\frac{4}{M+S} = \frac{3}{M-S}$$

$$4M - 4S = 3M + 3S$$

$$M = 7S$$

$$\frac{M}{S} : \frac{S}{M} = 7 : 1$$

Out 17 Mi. (F)

17 + 9 = 26

17 + 9 = 26

17 + 9 = 26

$$\frac{12}{4/2} + \frac{16}{3/2} = 14$$

$$28x = 14$$

$$x = 1/2$$

$$\frac{4}{1/2} = 8 \text{ kmph}$$

$$3/1/2 = 6 \text{ kmph}$$

$$S = \frac{8-6}{2} = 1 \text{ kmph}$$

CODING - DECODING

Opposite letters

AZ - A to Z
 BY - BY
 CX - copy Xerox
 DW - DO WORC
 EV - LOVE
 FU - FUN
 GT - GST

HS - High school
 IR - Indian Railways
 JQ - JACK & Queen
 KP - Pavan Kalyan
 LO - LOVE
 MN - Money

① TEACHER → YGCEJGT
 DULLARD ?
 G FWNNCTF

⑤ COMPUTER → RFUVQNPC
 MEDICINE → ?

② DELHI → FIRPS
 MUMBAI → ?
 OYS

③ POND → RRSK

HEAR → ?

16 15 14 5
 P O N D
 +2 +3 +5 +3
 R R S K

HEAR → TGFY

④ MENTION → LNEITNO

PATTERN → ?

DTAE

⑥ FASHION → FOISHAN
 PROBLEM - ?

F A S H I O N

FO I H SAN

P R O B L E M

P E L B O R M

⑦ IM TITJU
 TMII UJT

TEM REMP

~~FACTREMP~~
 METRPMG

BLOOD RELATIONS

- ⇒ Grandfathers or GrandMothers father → Great Grandfather
- ⇒ Grandfathers or Grandmothers mother → Great Grandmother
- ⇒ father's brother → Paternal Uncle or Uncle
- ⇒ father's sister → Paternal Aunt or Aunt
- ⇒ Maternal Uncle's wife → Aunt
- ⇒ Wife's father or Husband's father → Father-in-law
- ⇒ Wife's mother or Husband's mother → Mother-in-law
- ⇒ Father's Sister's Son or brothers Son → Cousin.
- ⇒ Daughter's husband - son-in-law
- ⇒ Son's wife - Daughter-in-law
- ⇒ Brother's or Sisters son - Nephew
- ⇒ Brothers or Sisters daughter - Niece
- ⇒ Siblings - own sister & brothers
- ⇒ Spouse - wife
- ⇒ Grandson's son - great grandson
- ⇒ Granddaughter's daughter - great grand daughter

Great Grand father

|
Grandfather

father - mother - father-in-law - uncle - aunt

|
I — brother - sister - wife - husband

|
son - daughter - Nephew - Niece

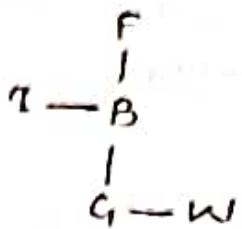
|
grandson

Great grandson

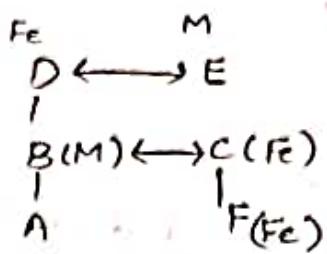
① A is the mother of C and daughter of B



2. ② Brother's father's grandson's wife



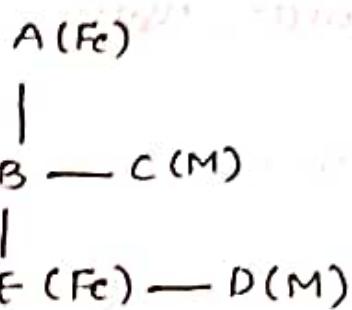
③



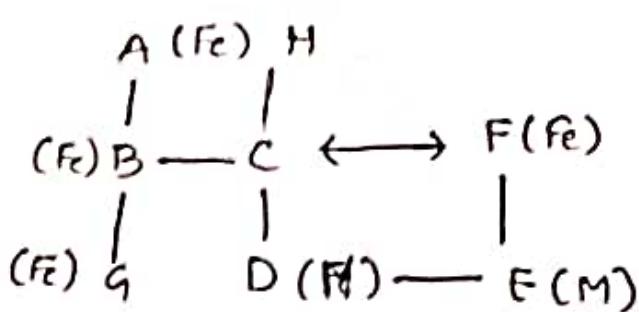
1. C [Either brother or sister]
2. C [Daughter-in-law]

④

B's grandmother is A



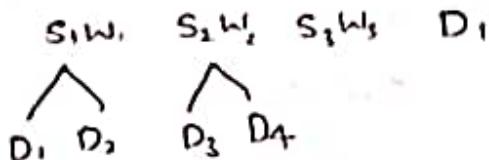
⑤



- b) Daughter in law (F-H)
- c) Sister in law (B-F)

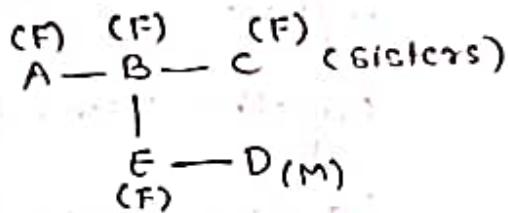
⑦

F M



Total no of females in the family 9

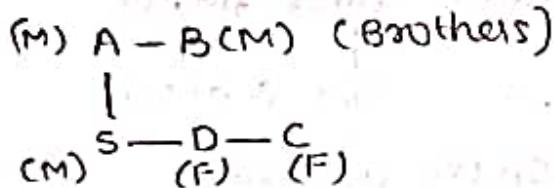
⑧



How A is related to D

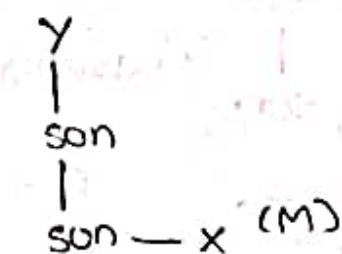
Maternal Aunt

⑨



How is B related to C → Uncle

⑩



How Y is related to X?
can't say

⑪

- A+B means A is the son of B
- A-B means A is the wife of B
- B×P means A is brother of B
- A÷B means A is mother of B
- A=B means A is sister of B

→ What is P+R-Q

$$(F) R \leftrightarrow B (M)$$

|
P M
Q is father of P

→ What is P×R÷Q

$$(M) P \rightarrow Q (F)$$

|
Q
P is uncle of C

⑫

- A×B A is sister of B
- A+B A is mother of B
- A/B A is father of B
- A-B A is brother of B

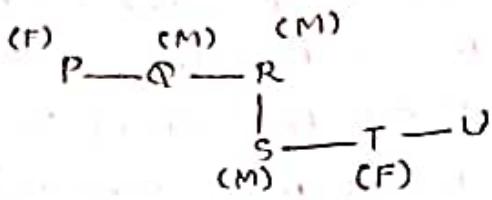
→ What is P×Q/R-S+T

$$(F) P \rightarrow Q (M)$$

$$(M) Q \rightarrow R \rightarrow S (F)$$

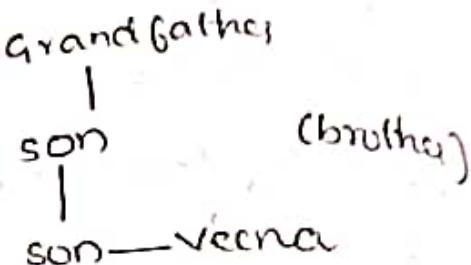
P→T Grand-Aunt

→ What $P \times Q - R / S - T \times U$



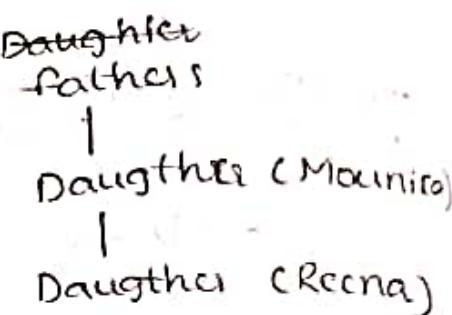
$P \rightarrow U$ → Aunt

⑬ Painting said "He is son of only son of grandfather. How is boy related to Veena"

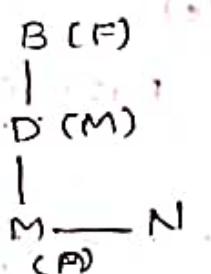


- ⑫ $P * Q$ P is father of Q
 $P - Q$ P is sister of Q
 $P + Q$ P is mother of Q
 $P \div Q$ P is brother of Q

⑭



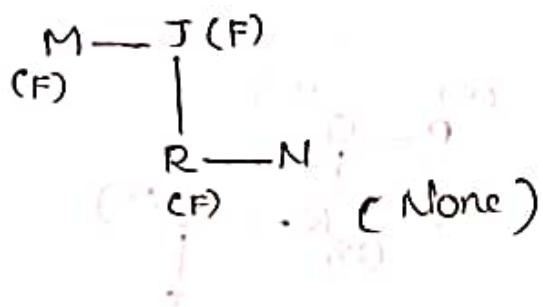
what $B + D * M \div N$



$M \rightarrow B$ → Grand daughter

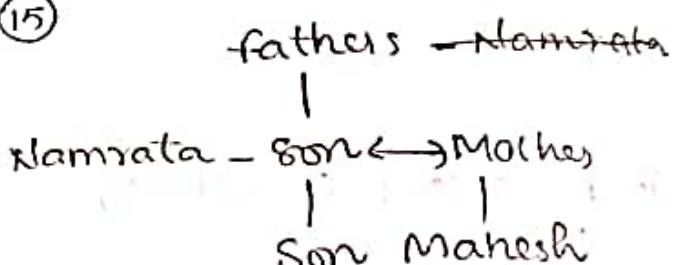
What R is niece of M
According to options.

$M - J + R - N$



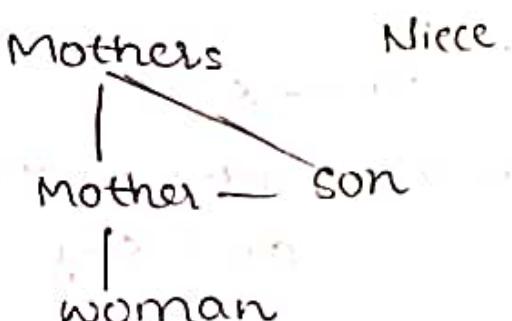
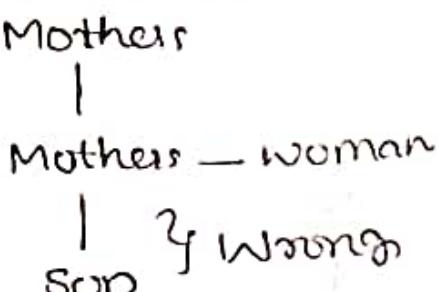
Mounica is mother of Reena

⑮



Sister in law

⑯



26-03-2024

LETTER SERIES & ANALOGY

1. A, I, U, E, O ?

A I U E O
E O A I U
3 3 -3 -3 -3

2. A, I, A, U, O ?

A I A U O A
E O E I O A
-3 -3 -3 -3 -3 -3

3. A, D, H, M, S ?

A, D, H, M, S
+3 +4 +5 +6 +7

4. X, U, R, O, L ?

X U R O L I
-3 -3 -3 -3 -3

5. R, M, ?, F, D, C

18, 13, I 6 4 3
R M F D C

6. A/3, B/10, C/29, D/66, E/127

$\frac{1}{1^2+2}$ $\frac{1}{2^2+2}$ $\frac{1}{3^2+2}$ $\frac{1}{4^2+2}$ $\frac{1}{5^2+2}$

7. D^A, F^C, H^F, J^I, ?
4-4 6-3 8-2 10-1

³⁰
17 12 7
-5 -5 -5

8. JV, OQ, TL, YG ?
10 22 15 20 25

DB
30

9. JR, MP, PN, SIU
10 13 16 17
-3 -3 -2

10. BE, HK, NQ, ? TW
5 11 17
2 8 14
+6 +6

11. HS, IR, JO, KP ? LO
8 7 10

Opposite letters

12. BMR, DPV, FSZ, HVD ?

B M R D P V F S Z H V D J Y H
2 13 18 4 16 22 6 17 26 8 22 4 12

13. NEQ, MGO, LIM, KKK ?
5 17 3 15 9 13 10 11

J M I

14. QPO, SRQ, UTS, WVU ?

17 16 15 19 18 17 21 20 23 22

Y X W

15. KST, JTS, IUR, HVQ ? GWP
11 17 20 10 20 19 9 21 18 8 22 17

16. HYD, IVF, KRH, NAT RGL
8 4 7 6 11 8
245 22 18
-3 -4 -5

17. J2Z, K4X, I7V, LIIT, HIGR?

M22P

NUMBER SERIES

\Rightarrow 1-30 squares

- 1, 4, 9, 16, 25, 36, 49, 64, 81, 100
- 121, 144, 169, 196, 225, 256, 289
- 324, 361, 400, 441, 484, 529
- 576, 625, 676, 729, 784
- 841, 900

21.

\Rightarrow 1-15 cubes

- 1, 8, 27, 64, 125, 216, 343
- 512, 729, 1000, 1331, 1728
- 2197, 2744, 3375

\Rightarrow Power values

$2^2 = 4$	$3^2 = 9$	$4^2 = 16$	$5^2 = 25$	$6^2 = 36$
$2^3 = 8$	$3^3 = 27$	$4^3 = 64$	$5^3 = 125$	$6^3 = 216$
$2^4 = 16$	$3^4 = 81$	$4^4 = 256$	$5^4 = 625$	$6^4 = 1296$
$2^5 = 32$	$3^5 = 243$	$4^5 = 1024$	$5^5 = \frac{3125}{15625}$	$6^5 = 7776$
$2^6 = 64$	$3^6 = 729$	$4^6 = 4096$	$5^6 = \frac{15625}{46656}$	$6^6 = 46656$

\Rightarrow n-series logic

$n^2 + 1$	$n^3 + 1$
$n^2 - n$	$n^3 - n$
$n^2 - 1$	$n^3 - 1$
$n^2 + n$	$n^3 + n$
$n^3 + n^2$	$n^3 - n^2$

$$\frac{n^2}{2}$$

27) 0, 12, 6, 12, 20, 30, 42
 $n^2 - n$

28) 2, 12, 36, 80, 150, 252
 $n^3 + n^2$

29. 12, 21, 37, 73, 49, 94
 reverse the digit.

NUMBER ANALOGY

1. $3:9 :: 5:25$

2. $0:7 :: 26:63$
 $3^3 - 1 \quad 4^3 - 1$

3. $3:10 :: 4:17$
 $3^2 + 1 \quad 4^2 + 1$

4. $8:32 :: 10:50$
 $n^2/2$

5. $123:6 :: 234:9$

6. $123:6 :: 234:24$

7. $123:14 :: 234:29$
 $1^2 + 2^2 + 3^2$

8. $5555:4321 :: 6666:5432$

9. $21:5 :: 34:13$
 $2^2 + 1 \quad 3^2 + 4$

10. $21:5 :: 34:25$
 $2^2 + 1^2$

11. $6:61 :: 47:471$
 $6 \times 10 + 1$

12. $46:4 : 96 :: 149:36$

13. $5:2431 :: 8:5461$
 $\frac{2+4+3+1}{2}$

14. $6:19 :: 7:22$
 $6 \times 3 + 1$

15. $22:16 :: 29:73$
 $2^3 + 2^2 \quad 2^3 + 7^3$

16. $53:43 :: 63:54$
 $5^2 + 3^2 = 34 \quad 6^2 + 3^2 = 45$

17. $123:132 :: 235:253$

18. $2:14 :: 4:84$
 $2^1 + 2^2 + 2^3$

19. $8:56 :: 13:156$
 $8^2 - 8$

20. $6:108 :: 8:258$

21. $\frac{4}{5}:41 :: \frac{3}{5}:34$
 $4^2 + 5^2$

CLASSIFICATION (ODD ONE OUT)

1. a. 3249 b. 6017 c. 9810 d. 2726
 $3+2+4=9$ $6+0+1=7$ $2+7+2=9$

2. a. 4205 b. 6366 c. 3127 d. 4164
 $4 \times 5 = 20$ $6 \times 6 = 36$ $4 \times 6 = 16$

3. a. 253 b. 682 c. 397 d. 891
 $2+3=5$ $6+2=8$ $8+1=9$

4. a. 1496 b. 5465 c. 7756 d. 8192
 $20 = 1+4+9+6$ $5+4+6+5=20$ $8+1+9+7=26$

5. a. 3645 b. 4493 c. 7756 d. 8194
 $3+6+4+5=18$ $4+4+9+3=20$ $7+7+5+6=25$
 $\therefore 8+9+1+4=22$

6. a. 17 b. 19 c. 41 d. 33

7. a. 143 b. 195 c. 256 d. 323

8. a. 6:222 b. 7:350 c. 8:512 d. 9: 938
 n^3+n

9. a. 3:12 b. 9:90 c. 10:100 d. 11:132
 n^2+n

10. a. 3:39 b. 4:84 c. 5:155 d. 2:15
~~3:39~~ $4+4^2+4^3$ $n^2/2$
 $3^1+3^2+3^3$

11. a. 4:8 b. 8:32 c. 12:64 d. 6:18

12. a. 1890 b. 1737 c. 1923 d. 9994
 13 18 15 31

13. a. 4320 b. 4534 c. 2101 d. 5454
 9 16 4 18

LETTER ODD ONE OUT

1. a. A b. B c. E d. D Vitamin C
water B, C
fat A, D, E, F
2. a. KPO b. MTG c. LOC_{12 15} d. MJC_{13 10}
3. RME_{10 13 5} b. SQB_{14 17 2} c. TJJ_{20 10 10} d. FCD_{6 3 4}
4. KBD_{11 2 4 = 17} b. MGC_{13 7, 3 = 23} c. RBI₂₉ d. LTF
5. a. E b. I₉ c. Y₂₅ d. J_{10 + 26 = 36}
6. JF_{10 6 = 16} b. TE_{20 + 5 = 25} c. RR_{18 + 12 = 36} d. MN
7. CI_{3 3^2} b. EY_{5 5^2} c. DG_{1 1^2} d. AA
8. RTV_{12 20 22} b. MOQ_{13 15 17} c. BEH_— d. VXE_{21 24 26}
9. ROK_{-3 -4} b. FCY_{-3 -2} c. XSU_— d. LIE_{-3 -4}
10. MOL_{13 5 12} b. KMT_{11 11 10} c. BEC_{2 5 3} d. RTQ_{12 20 17}
11. a. RW : DI_{opposite letters} b. MF : UN c. OC : XL d. BP : RY
12. a. BF : L_{2x6 = 12} b. MP : Z_{13x16 = 208} c. KC : F_{11x3 = 33}
26 d. DB : H_{42 8}
13. MNT : 452_{11 14 10} b. XLJ : 631 c. UKB : 223 d. PQR : 789
^{no order}
14. FMRZ ↑_{G 13 18 26} b. XLGC ↓_— c. DFAC_— d. BMXY ↑
15. R : 46_{18 - 8 = 10}
GA b. P : 63 c. M : 70 d. S : 81

$$= 16. \quad \underline{KG: 324}$$

$$b. \quad BD: G3$$

$$c. MB: 275$$

212 196

$$17. \quad a. \underline{SMU}$$

$$b. \quad MLK$$

$$c. TSR$$

$$d. \quad BAZ$$

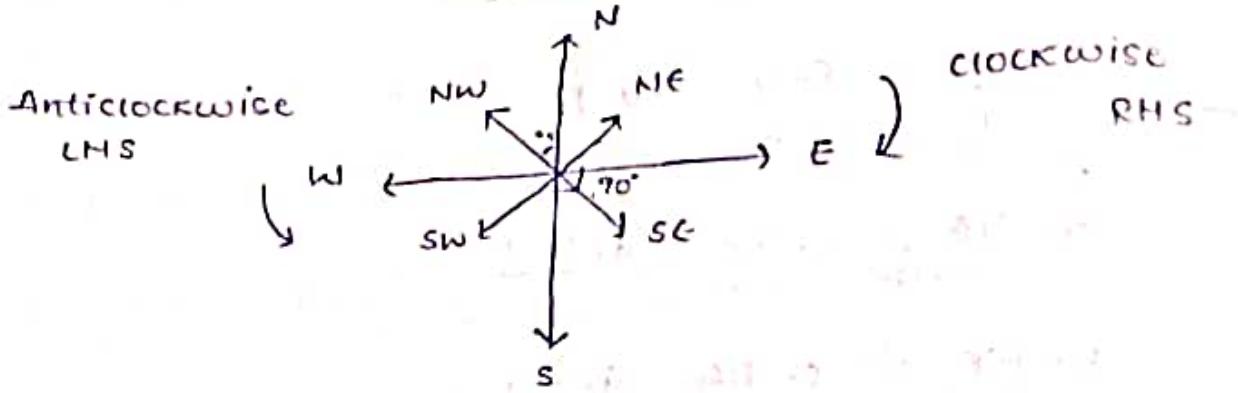
$$18. \quad M: 1G$$

$$b. \quad K: 04$$

$$c. \quad S: 100$$

$$d. \quad R: 3G$$

DIRECTION SENSE TEST



1. $[L, L \text{ or } R+R] \rightarrow \text{add}$

$[LR \text{ or } RL] \rightarrow \text{cancel}$

IR = Turn 90° in clockwise

IL = Turn 90° in anticlockwise

N $\quad f, L/R, Y, f, f \quad \therefore$ Facing North

2. $\begin{matrix} \leftarrow W \\ \curvearrowright \\ \rightarrow E \end{matrix} \quad R, R, R, L, L \quad 90 + 90 = 180$
Facing East

3. $\begin{matrix} \leftarrow W \\ \downarrow \\ \downarrow \text{south} \end{matrix} \quad R, R, R \quad 90 + 90 + 90$

4. $\begin{matrix} N \\ \uparrow \\ \downarrow \\ \downarrow \text{south} \end{matrix} \quad R, R, L, L$

13. $\frac{N}{30}$ $\frac{E}{40}$ $\frac{S}{20}$ $\frac{W}{40}$

Model - IV
 $\frac{N}{10}$ $\frac{E}{20}$
 South 10 km

14. Model - V

$\downarrow \frac{S}{60m}$ $\frac{W}{45m}$ $\frac{N}{30m}$ $\frac{W}{45}$

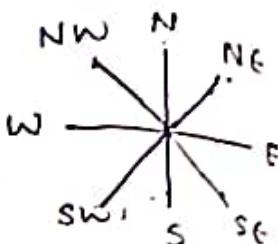
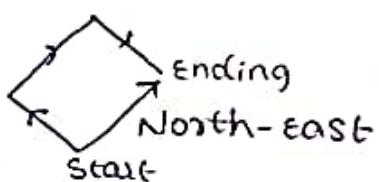
North-East.

N

15.

$\frac{NW}{2K}$ 2km - 90° CW again
 2km - 90° CW

$\frac{NW}{2}$ $\frac{N-E}{2}$ $\frac{S-E}{2}$



16.

90° right 45° left

$\frac{S}{2km}$ $\frac{E}{2km}$ $\frac{SW}{1km}$ ∴ south west

R - ACW
 L - ACW

17.

E 120° CW & 145° ACW

North east.

18

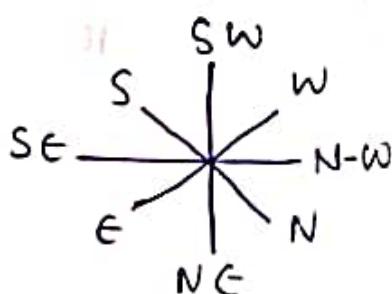
SW

135° CW 225° ACW 90° CW 45° ACW
 South

19.

South east - west?

South east becomes North
 North east becomes West



Number of Factors

$$6 = 2^1 \times 3^1 = (1+1)(1+1) = 2^{1+1-1} = 4$$

$$12 = 2^2 \times 3^1 = (1+1)(1+1)(1+1) = 8$$

$$126 = 2^1 \times 3^2 \times 7^1 = (1+1)(2+1)(1+1) = 12$$

The number of divisors excluding 1 or 126

$$12 - 1 = 11$$

The number of divisors excluding 1 & 126

$$12 - 2 = 10$$

Find the number of prime factors

$$(1+2+1) = 4$$

Find the number of odd factors or divisors

$$\therefore 3^2 \times 7^1 = (2+1) + (1+1) = 3 \times 2 = 6$$

Find the number of even factors

$$2^1 = (1) \text{ do not add one.}$$

$$(1) * (2+1) * (1+1) = 6$$

Find the product of the factors

$$(\text{Number})^{\frac{\text{no of factors}}{2}} = 126^{\frac{12}{2}} = (126)^6$$

Find the pair of the factors

$$\frac{\text{No of factors}}{2} = \frac{12}{2} = 6$$

No of factors odd

$$\Rightarrow \frac{\text{no of factors} + 1}{2}$$

$$\Rightarrow 24^5 \times 30^5$$

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

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

$$= 2^5 \times 2^5 \times 2^5 \times 3^5 \times 2^5 \times 3^5 \times 5^5$$

$$= 35$$



$$\Rightarrow (143)^{12} \times (142)^{10} \times 95^4$$

$$(11 \times 13)^{12} \times (21 \times 2)^{10} \times (17 \times 5)^4$$

$$24 + 20 + 8 = 52$$

\Rightarrow no of divisors of $(70)^4$ excluding 1 & 70

$$(2 \times 7 \times 5)^4 = 5^3 \cdot 125 - 2 = 123$$

\Rightarrow The number of odd positive divisors of $6^3 \cdot 3^4 \cdot 8^2$

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

$$\cancel{3+3+4+7} = (3+1)(4+1) = 4 \times 5 = 20.$$

UNIT DIGIT

$$\Rightarrow (2378)^{1279} = 8$$

$$(\underline{\underline{-0}}) \rightarrow 0$$

$$(\underline{\underline{-1}}) \rightarrow 1$$

$$(\underline{\underline{-5}}) \rightarrow 5$$

$$(\underline{\underline{-6}}) \rightarrow 6$$

even odd

$$\Rightarrow 1676 \times 2543 \times 2117$$

$$(\underline{\underline{-4}}) \rightarrow 6 \quad 4$$

$$6 \times 3 \times 9 = \underline{\underline{42}}$$

$$(\underline{\underline{-7}}) \rightarrow 9 \quad 9$$

$$\Rightarrow 2537 \times 5879 \times 136$$

$$7 \times 9 \times 6 = \underline{\underline{18}}$$

$$\Rightarrow 2^{37} = 2$$

$$\begin{array}{r} n \\ \overline{n^2} \\ \overline{n^3} \\ \overline{n^4} \end{array}$$

$$\frac{37}{4} \rightarrow 1$$

$$\begin{array}{r} 2 \\ \overline{3} \\ \overline{7} \\ \overline{9} \end{array} \quad \begin{array}{r} 2 \\ 4 \\ 3 \\ 6 \end{array}$$

$$\Rightarrow 3^{8736} = 3^4 = 8 \textcircled{1}$$

$$\begin{array}{r} 3 \\ \overline{7} \\ \overline{9} \\ \overline{3} \\ \overline{1} \end{array} \quad \begin{array}{r} 3 \\ 9 \\ 7 \\ 1 \end{array}$$

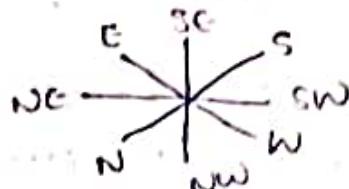
$$\frac{2244}{8736} = 0$$

$$\begin{array}{r} 7 \\ \overline{8} \\ \overline{4} \\ \overline{2} \\ \overline{6} \end{array} \quad \begin{array}{r} 8 \\ 4 \\ 2 \\ 6 \end{array}$$

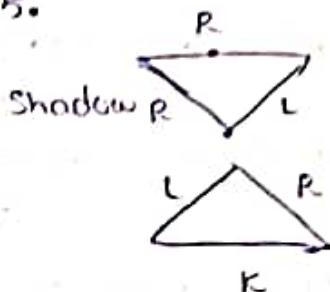
$$\Rightarrow \cancel{4982} \cdot 8456$$

$$\frac{414}{8456} = 6$$

20. NW - E
S - N
W - ? NE

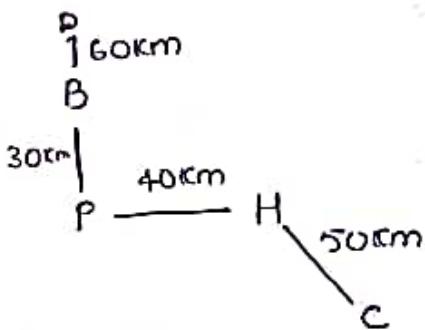


21. 2pm
hour hand - NE
9:30pm
hour hand - ? Northwest



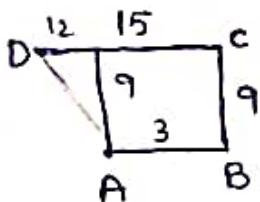
Kavya is facing North

22. 12 → NE
6pm - ? SW.

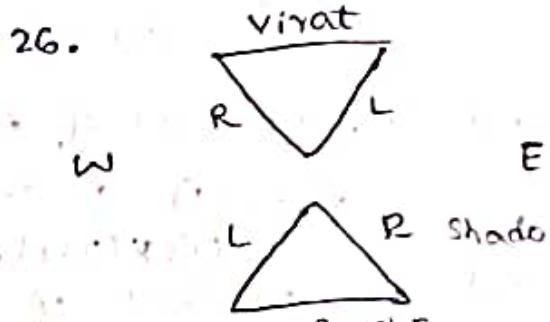


Delhi from pune 90 Km North
Chennai from delhi SE

24. Virat starts from a point A & travels 3cm east to reach B & then turns left & travel 3cm that distance to C. He again turns left & travels 5cm the distance he covered between A & B reaches D. Short dist. b/w A & D



$$\sqrt{144+81} = \sqrt{225} = 15$$



virat is facing south

6. $\text{L}, \text{R}, \text{R}, \text{L}, \text{L}, \text{L}$, Finally NORTH



7. $\text{L}, \text{R}, \text{R}$ $\curvearrowright E$ $\leftarrow W$ anticlockwise

8. L, L $\curvearrowright E$ $\leftarrow W$ clockwise

9. $\begin{array}{l} N-N \\ S-S \\ E-E \\ W-W \end{array}$ $\sum \rightarrow \text{odd}$ $N-S - \text{cancel}$
 $E-W$

~~40m South~~
~~70m East~~
~~40m South~~
~~70m West~~ = 80m south

10. $\frac{E}{35} \quad \frac{S}{80} \quad \frac{W}{72} \quad \frac{N}{64} \quad \frac{E}{25}$ $\frac{W}{12} \quad \frac{S}{16}$
 $\sqrt{12^2 + 16^2} = \sqrt{400} = 20.$

20 south west

11. $\frac{S}{20} \quad \frac{W}{15} \quad R \quad N \quad R \quad E$
 $16m \quad 12m$

$\downarrow \rightarrow E$
 down straight

$$\frac{S}{4} \quad \frac{W}{3} \quad \sqrt{16+9} = 5m$$

12. $\begin{array}{ccccccc} E & N & W & S & & & \\ R & L & L & L & \frac{N}{5m} & \frac{E}{5m} & \sqrt{50} = 5\sqrt{2} m. \\ 10 & 10 & 5 & 10 & & & \end{array}$



14. a. 4520 b. 9654 c. 8342
 d. 5904
15. a. 9363

$$\begin{array}{r} 1-3=6 \\ \hline 36 \end{array}$$

 b. 7252
16. a. 3,4,5 b. 5,12,13
 c. 7,24,25 d. 6,8,10

$$(Pythagorean)$$
17. a. 68 b. 130 c. 222 d. 28:68

$$(2^2:2^3)$$
18. a. 25:29 b. 31:10 c. 42:24 d. 18:72

$$(8/2:4^2)$$
19. a. 8:16 b. 10:25 c. 20:100 d. 81:49

$$(7 \cdot 2:7^2)$$
20. a. 54:01 b. 82:63 c. 72:25 d. 1331

$$10^4:63$$
21. a. 3253 b. 68\cancel{9}\overset{15}{7} c. 59\overset{10}{9}0 d. 5464

$$337$$
22. a. 62\cancel{9}3 b. 48\cancel{2}4 c. 1111 d. 5464

$$11^2$$
23. a. 999 b. 512 c. 215 d. 63 n^3-1

$$10^3-1$$
24. a. 16:46 b. 36:216 c. 49:343 d. 64:215 $7^3=343$

$$2^6 \times 3^3 = 343$$
25. a. 63:27 b. 94:45 c. 82:54 d. 64:28

$$63 - 36 = 27$$

$$94 - 49 = 45$$

$$84 - 28 = 54$$

1. a.

2. a.

3. R

4. K

5. a.

6. D

7. C

8. R

9. R

10. M

11. a.

12. a.

13. a.

14. a.

15. a.

1. 97, 89, 83, 79, 73, 71

prime number series
in decreasing
order

2. 11, 13, 5, 7, 9

3. 2, 3, 5, 7, 11

4. 9, 25, 49, 81, 121, 169

5. 16, 36, 64, 100, 144

6. 11, 24, 39, 416, 525, 636

7. 40, 90, 61, 52, 63
reverse the squares

8. 8, 9, 64, 125, 216, 49

9. 1, 4, 27, 256, 3125

10. 3, 7, 10, 17, 27, 44, 71
 $\begin{array}{ccccccc} 3 & + & 4 & + & 7 & + & 10 \\ & & & & & & \\ & & & & & & \end{array}$

$$\begin{array}{r} 3+7=10 \\ 7+10=17 \end{array}$$

11. 2, 5, 11, 23, 47, 95
 $\begin{array}{ccccccc} 2 & + & 3 & + & 12 & + & 24 \\ & & & & & & \\ & & & & & & \end{array}$

12. 5, 7, 11, 19, 35, 67
 $\begin{array}{ccccccc} 5 & + & 2 & + & 4 & + & 8 \\ & & & & & & \\ & & & & & & \end{array}$

13. 57, 35, 22, 13, 9, 4
 $\begin{array}{ccccccc} 5 & + & 7 & + & 13 & + & 22 \\ & & & & & & \\ & & & & & & \end{array}$

14. 24, 36, 48, 60, 72, 84

15. 2, 5, 16, 65, 326, 1957
 $\begin{array}{ccccccc} 2 & + & 3 & + & 11 & + & 16 \\ & & & & & & \\ & & & & & & \end{array}$

16. 2, 2, 3, 8, 35, 204
 $\begin{array}{ccccccc} 2 & + & 2 & + & 3 & + & 8 \\ & & & & & & \\ & & & & & & \end{array}$

$$2 \times 2 - 2 = 2$$

$$2 \times 3 - 3 = 3$$

$$3 \times 4 - 4 = 8$$

$$8 \times 5 - 5 = 35$$

$$35 \times 6 - 6 =$$

17. 999, 729, 128, 12, 2

18. 2, 2, 12, 12, 30, 30, 56

$$\begin{array}{ccccccc} 1^2 & - & 1 & & & & \\ 2^2 & - & 2 & & & & \\ 3^2 & - & 3 & & & & \\ 4^2 & - & 4 & & & & \end{array}$$

19. 4, 16, 12, 64, 36, 256, 108, 1024

20. 2, 4, 11, 37, 153

$$2 \times 1 + 2 = 4$$

$$4 \times 2 + 3 = 11$$

$$11 \times 3 + 4 = 37$$

$$37 \times 1 + 5 =$$

21. 234, 453, 572, 591

22. 3600, 725, 150, 35, 12, 7.4

$$\frac{3600}{5} + 5 = 725 \quad \frac{12}{5} + 5$$

$$\frac{725}{5} + 5 = 150$$

$$4 \times 5$$

23. 9, 4-5, 6-75, 13-5, 33-75

$$33 \times 75 \times 3 = 10125$$

24. 65, 50, 37, 26, 17

$$\begin{array}{ccccccc} 1 & & 1 & & 1 & & 1 \\ 8^2 + 1 & & 7^2 + 1 & & 6^2 + 1 & & 5^2 + 1 \end{array}$$

25. 2, 9, 28, 65, 126, 217

26. 0, 6, 24, 60, 120

$$\begin{array}{ccccccc} 1^3 - 1 & & 2^3 - 2 & & 3^3 - 3 & & 4^3 - 4 \end{array}$$

WORD ANALOGY

19. NUMBER : UNBMRC
 :: MIRCLE : IMCREL
20. SINGLE : NISELG
 :: POLITE : LOPETI
21. COUNSEL : UCNELOS
 :: BLOCKED : OBCEDLR
22. KPS : 46 :: GLO : 34
23. A/2 : B/3 :: C/5 : D/7
24. $\frac{19}{8^2}$: 64 :: $\frac{13}{7}$: 36
- 25.

- 1: Newspapers : Press ::
 cloth : Textile
- 2: colony : plant : Entomology
 , INSECTS
- 3: MUMBAI : MARIARASTRA ::
 IMPHAL : MANIPUR
- 4: Menu : FOOD : Library : CATALOG
- 5: Moon : satellite : Earth : Planet
- 6: Smog : pollution ::
 forest destruction
- 7: BOOK : publisher :: film :
 producer
- 8: Influenza : Virus : Typhoid :
 bacteria
- 9: Radio : listener : film : viewer
- 10: Safe : secure :: Protect : Gov

18. LNIB, J025, HT32, FW37?

DZAG

n. shg, zip, qsc, pkd, oac

20. flp, ins, lpu oxy
+2 +2

21. ? SIY, OEU, KAQ, QWM,
+2 +2 +2 +2
CSI

WMC

22. ? PSV, EHK, TWZ, ILO
+2 +2 +2 +2

ADG

HVT, ZBNS, ZBNX

23. ACMV, FHND, ? PRNN
+6 +16
UWMS, ZBNX
KMMI
+5 +5

24. AYD, BVF, DRH ? KGL
+2 +2 +2 +2

GMJ

25.

WXY

QXP, RPY, TQD, VZP, ZTQ, ZVQ

26. THH, ZHJ, ZHJ, ZHJ, ZHJ

2 +2 +2 +2 +2

WTT, YII, YET, ZHJ, ZHJ, ZHJ

ZTQ

1. AD : BE :: CF : ? DS

2. ZN : YB :: XC : WD

3. AG : JO :: EK : MS

4. CAT : DDY :: BIG : CLL

5. BDF : HIL :: MOQ : TUX

6. KMF : LLH :: RMS : SLU

7. BYCX : DWEV :: FUGT : HSIG

8. ACDE : OGHJ :: ESTU : EPQJ
+2 +1 +1
vowels consonants

9. BDFH : OMKI :: EGJK : RPN

10. BAC : DEF :: ? GIH : NOP

11. LOVE : KMSA :: HATE : QYQ

12. BDGR : ACFJ :: EGJN : DFIM

13. PRQ : SUT :: GIH : KML

14. BDG : PRU :: LNO : ZBE

15. AGK : LJF :: MTR : SWR

16. QJ : MH :: KR : PL

17. RQJ : LUX :: MTL : NXS

18. LOGIC : CIGOL :: CLERK : KR

21 cloud is called white
white is called ram
ram is called green
what is the colour of
milk ram

→ If A is coded as 1
B as 3, C as 5 and D as 7
then

$$F^A Z \cdot E D = 59$$

22 LHS means RHS
answer ← question

green → red

red → yellow

yellow → blue

blue → orange

orange → green

what is the colour of
clear sky

yellow

23 cook is called butter
butter is called manager
manager is called teacher
teacher is called clerk
clerk is called principal
who will teach class

CLERK

LHS called RHS
Question - Answer

8) INACTIVE
VITCANE

COMPUTER
CTUPMOCR

9) SICKEN
THIJJL
TRAINING

10) COMPUTER
CMOPRTU

MEDICINE
CDGGIIMN

11) CARROM
 $\frac{1-1-1-1-1}{BZQNL}$

HOUSE
GNTRD

12) SWITCH
 $\frac{11-1+1}{TVJSDG}$

COFFEE
BREAD

13) REFRIGERATOR
ROTAREGIRFER

NOITINUMMA
AMMUNITION

14) 93541
DELMHI

CALUTTA
82587662

CALICUT
8251876

15) ROSE BREACH
6821 | 961473

CHAIR
73456

SEARCH
214673

16) PENCIL = 59
PEN = 35

COPY =
 $3+15+16+25 = 59$

17) DISEMPER = 54.5
WALLS = 33.5
PLASTER
 $= 45.5$

18) RAMA = 95
STAGE = 83

ACTOR = 98

$$\textcircled{12} \quad 7 \times \frac{1}{45} + 7 \times \frac{20}{60} + 7 \times \frac{14}{60} = 39$$

$$65x = 60 \times 39$$

$$x = 36$$

- \(\textcircled{13} \) A person has to travel from Point-A to Point-B in a certain time travelling at a speed of 5 kmph he reaches 48 min late and vehicle travelling at a speed of 8 kmph he reaches 15 min early what is the distance from point-A to point-B

$$5 - 48 \text{ min late} = \frac{48}{60} = \frac{4}{5} = x + \frac{u}{5}$$

$$8 - 15 \text{ min early} = \frac{15}{60} = x - \frac{u}{5}$$

$$\frac{D}{5} - \frac{D}{8} = \frac{63}{60}$$

T₁-T₂=T

$$\text{Sp} \quad \text{A} \quad \text{B} \quad 5 \left(x + \frac{u}{5} \right) = 8 \left(x - \frac{u}{5} \right)$$

$$5x + u = 8x - 2u$$

$$3x = \frac{63}{60} \Rightarrow x = \frac{21}{60}$$

$$D = 5 \times \frac{21}{60} \times 8^2 = 74$$

$$8 \left(2 - \frac{1}{5} \right) = 8 \left(\frac{8}{5} \right) = 2 \times 8 = 14 \text{ km}$$

$$\textcircled{14} \quad \text{Distance} = \frac{\text{Product of speeds}}{\text{diff in speeds}} \times \text{Time} = \frac{1}{3} \times \frac{817}{60} = 14$$

Graph - 40 min late
8 kmph - 10 min late

Distance = 8 kmph

$$6 : 8 = \frac{3 : 4}{4 : 3} \quad \text{Distance} = 8 \text{ kmph}$$

$$D = 3 \times \frac{u^2}{\frac{u}{2}} = 6$$

$$6 + 6 = 12 \text{ kmph} \times 2 = 24 \text{ kmph}$$

$$\Rightarrow \text{iii) When time is same : } \frac{x+y}{2}, \frac{x+y+z}{3}$$

iii) Both are not same : Average speed = $\frac{\text{Total distance}}{\text{Total time}}$.

\Rightarrow Relation:

A goes with the speed x m/sec.
B goes with the speed y m/sec.

Speed ratio : $x:y$ or $x:y:z$
Time ratio : $y:x$ or $\frac{1}{x}:\frac{1}{y}:\frac{1}{z}$

Distance ration: $x:y$ or $x:y:z$

\Rightarrow PROBLEMS ON TRAINS

1. Two trains moving in the same direction with x m/s and y m/s then their relative speed is diff

2. Two trains are moving in opposite direction with x m/s and y m/s then their relative speed is sum of the speeds

3. Length of the train is x m to cross a man (or) pole then the distance covered by the train is x m

4. Length of the train is x meter to cross a platform or bridge of length y meter then distance covered by train is $(x+y)$ meter.

Time, SPEED AND DISTANCE

→ speed = $\frac{\text{distance}}{\text{time}}$

⇒ units	Dist Time Speed	Km Hrs Km/Hr	m sec metre
---------	-----------------------	--------------------	-------------------

→ conversion:

To convert n kmph into mps = $n \times \frac{5}{18}$ m/s

$$= n \frac{5}{18} \text{ m/s}$$

mps into Kmph = $n \times \frac{18}{5}$ Km/ph

Ex: A car goes with the speed 90 kmph what is this speed of car in mps

$$90 \times \frac{5}{18} = 25 \text{ mps}$$

Ex: A bicycle goes with speed 105 mps what is its speed in kmph

$$105 \times \frac{18}{5} = 378 \text{ kmph}$$

→ Average Speed:

(i) When distance is same

$$\text{2 speeds } \frac{2xy}{x+y}$$

$$3 \text{ speeds } \frac{3xyz}{xy+yz+zx}$$

③ Pipe A

13 2 1.15

1 2 $\frac{5}{4}$

60 120 75 5 (-8)

10-8 = 2

~~600~~ ~~300~~ ~~300~~

∴ 9:20 PM.

$\frac{2hr}{A+C}$ $\frac{1}{B+C}$

$5-S = -3 - \frac{4}{3} = 1\frac{1}{3}$ hr 20 min

$A + 3hr 20min = 12:20 pm.$

④ A - 32 min fill

Due to leakage

tank full in 48 min.

empty full tank by leakage.

A L (A+B) 96 min
32 48 24 3 times

3 + 2 5 5 times

⑤ $\frac{1}{A} - \frac{1}{B} = (A+B) = 12$

20 200 per hour

A A+B
-3 5

B = 8
total time = $\frac{60}{8} \times 200$
= 1500

⑥

A	B	C	Total
30	40	60	130
4	9	2	

$12 \times 4 = 48$ liters

$\frac{32}{7} \times 1 = 14$ liters

$11\frac{1}{3} \times 60$

10am + 11 hr 20 min

A B
10 16
8 5

$5+8 = 13$ $\frac{80}{13} = 6\frac{2}{13}$

$12\frac{2}{5}$ hrs

A, B alternately working

(23)

PIPES AND CISTERNS

- ① A \rightarrow 12 hours
B \rightarrow 18 hours

$$A = 12 \text{ hours}$$

$$B = 18 \text{ hours}$$

$$A + B = 36 \text{ hours.}$$

$$A = 12$$

$$B = 2$$

$$\frac{36}{5} = 7 \frac{1}{5} \text{ hrs } 12 \text{ min.}$$

- ② inlet pipe - 10 hrs
outlet pipe - 20 hrs

$$A = 10$$

$$B = 20$$

$$A - B = 10 - 20 = -10$$

$$1 \times 20 = 20 \text{ hours}$$

$$= \frac{1615}{190} = 8 \frac{1}{2} \text{ min}$$

- ③ A - 10 hrs
B - 16 hrs
Out - 32 hrs

$$A = 10$$

$$B = 16$$

$$C = 32$$

$$A + B + C = 160 \text{ hours}$$

$$10 + 16 + 32 = 68$$

$$16 - 10 = 6$$

$$26 - 5 = 21$$

$$\frac{160}{68} = \frac{13}{21}$$

- ④ t empty in 30 min
t₂ " " 45 min

$$30 \text{ " } 45 \text{ min}$$

$$3 \text{ " } 2 \text{ min}$$

$$3+2 = \frac{40}{5} = 8 \text{ min}$$

- ⑤ A \rightarrow $3\frac{1}{2}$ min $\frac{3}{2} \rightarrow 350 \text{ liters}$
B $\rightarrow 8\frac{2}{3} \text{ min } \frac{25}{3} \rightarrow 480 \text{ liters}$

$$\frac{3\frac{1}{2}}{2} = \frac{350}{80} = \frac{350}{350} = \frac{1}{2}$$

$$\frac{\frac{350}{350} \times 3}{80} = \frac{350}{80} = 4.375 \text{ liters}$$

- ⑥ P - 24
Q - 32
(P+Q) open
P turned off

$$P = 24$$

$$Q = 32$$

$$P + Q = 56 \text{ liters}$$

$$24 + 32 = 56$$

$$P + Q = 56$$

$$16 \times 3 = 48$$

$$56 - 48 = 8$$

$$\frac{8}{56} = \frac{1}{7}$$

$$16 \times 3 = 48$$

$$\frac{48}{56} = \frac{12}{14} = \frac{6}{7}$$

$$16 \times 3 = 48$$

$$\frac{48}{56} = \frac{12}{14} = \frac{6}{7}$$

$$16 \times 3 = 48$$

$$\frac{48}{56} = \frac{12}{14} = \frac{6}{7}$$

$$16 \times 3 = 48$$

$$\frac{48}{56} = \frac{12}{14} = \frac{6}{7}$$

$$16 \times 3 = 48$$

$$\frac{48}{56} = \frac{12}{14} = \frac{6}{7}$$

$$16 \times 3 = 48$$

$$\frac{48}{56} = \frac{12}{14} = \frac{6}{7}$$

$$\rightarrow 87937^{2349}$$

$$\frac{580}{4} = 3 \quad 5^3 = 125$$

$$\rightarrow \frac{24}{4} = 0 \quad 8^4 = 4096 = 6$$

$$2. \Rightarrow 2^{3^4} \times 3^{4^5} \times 4^{5^6} \times 5^{6^7} \times 6^{7^8} \times 7^{8^9}$$

$$5^{6^2} = 5$$

$$6^{9^8} = 6 \Rightarrow 5 \times 6 = 30 \text{ so unit digit} = 0$$

$$\rightarrow 4375^{2394} \times 8793^{4987} \times 3997^{2391}$$

$$5^1 \times 3^1 \times 2^3 = 3$$

$$5 \times 3 \times 3 = 45$$

$$\rightarrow 222^{888} + 888^{222} + 333^{555} + 555^{333}$$

$$2^4 + 8^2 + 3^3 + 5$$

$$6 + 4 + 9 + 5 = 22$$

$$\Rightarrow (1!)^1 + (2!)^2 + (3!)^3 + \dots + (10!)^{10}$$

$$(1)^1 + (2)^2 + (6)^3 + (24)^4 + (120)^5$$

$$1 + 4 + 6 + 6 + 0$$

$$\therefore = 12 - 7$$

$$\Rightarrow 1^2 + 2^2 + 3^2 + \dots + 100^2$$

$$= \frac{n(n+1)(2n+1)}{6} = \frac{50(50+1)(100+1)}{6 \times 33}$$

$$= 50 \times 51 \times 67 \\ = 0.$$

TIME AND WORK

→ A person can complete a work in n days. Then his
one day work is $\frac{1}{n}$

→ A can do a work in n days & B in y days

(i) ratio of time taken by them : $n:y$ [Time & Work]

(ii) efficiency ratio : $y:n$ more than $n:y$: $\frac{1}{n}$

iii) wages ratio : $y:n$

" " A & B together can do in how many days : $\frac{xy}{x+y}$ days

⇒ A & B together can do a work in n days

i) A alone in y days then B alone - ? $\frac{ny}{(n-y)}$ days

B alone in y days then A alone

⇒ Work equivalence :-

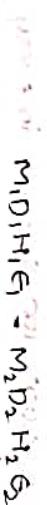
i) total work = No of people \times time \times efficiency

ii) chain rule

$$\frac{M_1 D_1 H_1 E_1}{W_1} \rightarrow \frac{M_2 D_2 H_2 E_2}{W_2}$$

(Work is different)

$$M \propto \frac{1}{Time}$$



(Work done is same)

iii) proportion rule

$$\frac{M_1}{M_2} = \frac{D_1}{D_2} = \frac{H_1}{H_2} = \frac{E_1}{E_2}$$

Work done

TABLE GRAPH

LINE GRAPH

Algebra	70	50
Geometry	100	60
Social	70	50
Religion	80	60
Mathematics	80	50

$$(22) \quad 450 = \frac{55+50+45}{3} \times 1000 \\ = 48.33 \frac{1}{3} \times 1000$$

Rawi	70
Thawar	65

$$(23) \quad C-35 \quad 2005 \\ C-40 \quad 2006$$

$$(1) \quad \frac{720}{1200} = 75.25 - \text{Average}$$

$$\frac{15}{200} \times \frac{150}{120} = 87.5$$

$$(2) \quad \frac{520}{1200} \times \frac{14}{12} = 87.5$$

$$(24) \quad 25 + 45 : 35 + 40 \\ = 50 : 65$$

$$(2) \quad 2 \text{ student got above } 60\%.$$

$$(3) \quad \frac{70}{100} \times 150 + \frac{60}{100} \times 130 + \frac{70}{100} \times 120$$

$$= 235$$

$$\frac{70}{100} \times 150 + \frac{70}{100} \times 130 + \frac{70}{100} \times 120$$

$$\frac{35}{100} \times 150 = \frac{15}{235}$$

$$135 + 70 + 84 + 70 + 75 + 28$$

$$= 15$$

(a) maths by observation

$$(26) \quad 25 + 45 + 30 = 100000$$

$$(5) \quad \frac{65}{100} \times 150 + \frac{35}{100} \times 130 + \frac{50}{100} \times 120 \\ \frac{70}{100} \times 150 + \frac{80}{100} \times 130 + \frac{80}{100} \times 120$$

$$60 + 99 + 48 + 25 + 70.5 + 45.5$$

$$= 103 + 80 + 70 + 40$$

$$= 150 + 140 + 90 = 210 + 150 \\ = 360$$

$$\frac{360}{600} \times 100 = 60\%$$

(15)

$$\frac{1}{3}(P-3) + \frac{1}{2}(P+2) = 20$$

$$\frac{P-3}{3} + \frac{P+2}{2} = 20$$

$$2P-6 + 3P+6 = 120$$

$$5P = 120$$

$$P=24$$

(16)

Peter - Rachhi - 5
Peter - Rachhi - 5
Peter : Rachhi - 5
 $\frac{4P}{P} = \frac{5}{5}$ - 5 : 4 - 25 %

$$5 : 4 = 1 - 5\text{ years}$$

$$5 \times 5 + 4 \times 5 = 45$$

$$45 - 35 \text{ years ago}$$

$$45 + 30 = 115$$

DATA INTERPRETATION

Diagram - 1

→ 20 is how much % in 30 ①

$$\frac{20}{30} \times 100 = 66\frac{2}{3}\%$$

→ 20 is how much % less than 30

$$\frac{30-20}{30} \times 100 = 33\frac{1}{3}\%$$

→ 30 is how much % more than 20

$$\frac{30-20}{20} \times 100 = 50$$

→ $\frac{5}{12\frac{1}{3}} \times 100 = 121\frac{3}{5}\%$ ②

$$10\% = 121\frac{3}{5}\%$$

$$5\% = 60.65$$

$$1\% = 12.19$$

$$18\% = 217\frac{1}{5}\%$$

∴ approximately 18%

→

$$\frac{1416}{3751} \times 100$$

$$100\% = 37.41\%$$

$$10\% = 3.741\%$$

$$5\% = 18.705$$

$$1\% = 3.741\%$$

③

$$1416 - 20 = 32.5$$

$$1416 - 12.5 = 32.5$$

$$10 + 12.5 = 22.5$$

$$\frac{625}{375} = 13:11$$

$$\frac{375}{55} = 13:11$$

$$30\% = 102.3$$

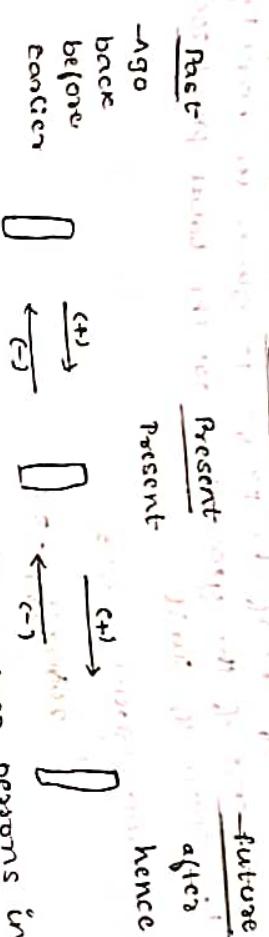
$$5\% = 18.705$$

$$2.5\% =$$

$$100 - 102.3 - 18.705 - 2.5\% = 5\%$$

④

PROBLEMS ON AGES



→ The difference between age of any two persons in past
present and future is same

① Kiran - 15, older than Ramesh.

$$\begin{aligned} & \text{After 10 years Kiran } 28 \\ & 28 - 10 = 18 \quad \text{the same difference} \\ & 18 + 15 = 33 \text{ years} \end{aligned}$$

$$A + B = 72$$

$$A : B = 4 : 5$$

$$4x + 5x = 72 \quad \text{from (1)} \quad A + B = 4x + 5x$$

$$9x = 72$$

$$x = 8 \quad \therefore 15 \text{ years}$$

$$4x = 32$$

$$5x = 40$$

$$A = 32$$

$$B = 40$$

$$C = 15$$

$$A - 10 = 40 - 10 = 30$$

$$B - 10 = 50 - 10 = 40$$

$$C - 10 = 30 - 10 = 20$$

$$32 - 20 = 12$$

$$A = 3 \text{ years ago } 29$$

$$L \quad n - 25 + 15 = n - 10$$

$$M \quad n - 10 = \frac{n+15}{2}$$

$$O \quad n - 10 = \frac{n+15}{2} - 25$$

$$2n - 20 = n + 15$$

$$n = 35 \quad \therefore 35 - 20 = 15$$

$$A = 20 \quad B = 25 \quad C = 15$$

$$A : B : C = 4 : 5 : 3$$

$$4x + 5x + 3x = 72$$

$$12x = 72$$

$$x = 6$$

$$A = 4x = 4 \times 6 = 24$$

$$B = 5x = 5 \times 6 = 30$$

$$C = 3x = 3 \times 6 = 18$$

- ⑦ A 4000 mole than B
 B 5000 mole than C
 $A = 4000 + 5000 + x = 9000 + x$
 $B - 5000 + x$
 $C - x$

$$14000 + 3x = 50000$$

$$3x = 36000$$

$$x = 12000$$

$$21000 : 17000 : 12000$$

$$\frac{21}{50} \times \frac{300}{35000} = 14400$$

$$\textcircled{8} \quad 2A = 3B = 5C$$

$$2A = 3B = 5C$$

$$\begin{matrix} A-15 \\ B-10 \\ C-6 \end{matrix}$$

$$\frac{6}{34} \times 150 = 900$$

$$\textcircled{9} \quad A+B+C = 520$$

$$\begin{matrix} A-7 \\ B-8 \\ C-11 \end{matrix}$$

$$\frac{8}{24} \times 520 = 160 \Rightarrow B \text{ paid } 160$$

$$\textcircled{10} \quad A:B:C = 1/2 : 1/3 : 1/4$$

$$\left(\frac{1}{2}\right) \times A + \left(\frac{0.5}{2}\right) B : \frac{1}{3} \times C : \frac{1}{4} \times D$$

$$1+2.5:4:3 \quad 3.5:4:3$$

$$\frac{4}{9.5} \times 398 : \frac{4}{10.5} \times 398 : \frac{4}{11.5} \times 398$$

$$\frac{40}{95} \times \frac{398}{398} : \frac{40}{105} \times \frac{398}{398} : \frac{40}{115} \times \frac{398}{398}$$

$$= 144 : 140 : 136$$

$$\textcircled{11} \quad 144 : 140 : 136$$

$$144 : 140 : 136$$

PARTNERSHIP

Investment-time is same

- 1. Two or more than two persons run a business jointly - then
 - a. Those two partners are partners & deal (or) agreement (or) understanding among them is known as partnership

Investment ratio = profit ratio / loss ratio

⇒ Investment time interval is different

- 2. a. Investment x time ratio = Profit ratio

$$\text{Invest} : T_1 \times T_2 = P_1 : P_2$$

$$T_1 = \frac{P_1}{P_2} ; \quad T_2 = \frac{P_2}{P_1}$$

3. ⇒ Working partner / Active partner:
Who manages the business

Final share = salary + profit share

4. ⇒ Sleeping Partner:

Share holders, who only invest amount
Final share - only share in profit

- ④ X and Y invest Rs 21000 and Rs 17500 respectively in a business. At the end of the year they make a profit of 26000. What is the X share in the profit?

$$\begin{matrix} \text{X} & \text{Y} \\ 21000 & 17500 \\ 6 & 5 \end{matrix}$$

$$\frac{6}{11} \times 26000 = 14400$$

- i.e. X profit is 14400
 ② Dhoni, Virat and Rohit started a business by investing 12000, 13500 and 15000. Find the share of each in profit.

$$\begin{matrix} \text{X} & \text{Y} & \text{Z} \\ 12000 & 13500 & 15000 \\ 8 & 9 & 10 \end{matrix}$$

$$\frac{8}{27} \times 27000 = 16000$$

the sum monthly they got an inc of 20%, 25% & 18% resp then find
 ② after ratio of new salaries of Gopi, Vithnu & Anand

$$7 : 5 : 8$$

$$\begin{aligned} &= 120 \times 6 \times 7 : 125 \times 6 \times 5 : 118 \times 8 \\ &= 120 \times 7 : 125 \times 5 : 118 \times 8 \\ &= 840 : 625 : 944 \end{aligned}$$

Mukesh had a kiddy bank in this kiddy bank 21 coins, 35 coins, 27 coins and 35 coins are in the ratio 15:23:16 - the total value of 1128. Find the no of 25 p cent coin

$$15\alpha + 23\alpha + 16\alpha = 1128$$

$$\left. \begin{array}{l} 54\alpha = 1128 \\ 27\alpha = 564 \\ 35\alpha = 188 \end{array} \right\}$$

$$\alpha = \frac{188}{9}$$

$$16 \times \frac{188}{9} =$$

$$15\alpha + 46\alpha + 80\alpha = 1128$$

$$111\alpha = 1128$$

$$\alpha = 8$$

$$80 \times 8 = \frac{128}{642} = 128$$

③ A person's purse contains 21, 20P & 10P coins in the ratio 3:4:5 the total value of the purse is a 64.5 find the num of 10P coins.

$$\begin{array}{ccc} 21 & 20P & 10P \\ 3 & 4 & 5 \end{array}$$

$$3 \text{ QAR} \quad 8 \text{ QAR} \quad 5 \text{ QAR}$$

$$13 \text{ QAR} = 64.5 \text{ QAR}$$

$$\alpha = \frac{64.5}{43} = 1.5$$

⑩ 1024 were distributed among A, B, C such that if A had received 2 more, & B had received 3 more and C had received 2 more their shares would be in ratio of 3 : 4 : 5 what is the share of C.

$$3 : 4 : 5$$

$$3x + 4x + 5x = 1024$$

$$12x + 1024 \quad | \begin{matrix} 8 \\ -22 \\ \hline 4 \end{matrix}$$

$$(3+4+5) \times 5 = 450.$$

$$x = 87 + 3 = 10$$

⑪ The ratio of two numbers A & B is 5 : 8 if 5 is added to each of A & B then ratio of A & B becomes 2 : 3 the sum of A & B is

$$\begin{array}{l} A \quad B \\ 5 : 8 \\ 5x \quad 8x \\ 5x+5 : 8x+5 = 2 : 3 \\ 5:8-(5+8)\times 5 \\ 2:3 \quad 3 \\ 5:8-15 = 16x+10 \\ 5x = 5 \\ x=5 \end{array}$$

RATIO & PROPORTION

$$15x+15 = 16x+10 \\ 15 = x+5 \\ x=5 \\ \therefore 25+40 = 65$$

⑫ The ratio of the income of A & B is 3 : 5 whereas as the ratio of their expenditure is 4 : 7 respectively if A & B save ₹ 6000 & ₹ 26000 resp then what is the income of A.

$\text{Income} = \text{Exp} + \text{Saving}$

$$A = 3 : 5 \quad 3x, 5x$$

A's Income - A's Exp = A's Saving
B's Income - B's Exp = B's Saving
A's Saving : B's Saving = 16000, 26000

$$6_1 : 6_2 = 4 : 7$$

$$3x - 16000 : 5x - 26000 = 4 : 7$$

$$21x - 112000 = 20x - 104000 \\ x = 8000$$

$$\text{Income of A} = 24000$$

Q) Ravi purchased two articles at ₹3000 each. He sold one at a gain of 10% and the other at a loss of 10%. What is the overall loss or gain in percent?

I II

$$I: \left(\frac{10}{100} + 1 \right)^{-1} = 20\% CP$$

$$II: \left(\frac{10}{100} + 1 \right)^{-1} = 20\% SP$$

no profit or loss.

A man purchased two watches for ₹2900 each. He sold one of them at 15% profit & the other at 15% loss. Then find his gain/loss% on his whole transaction?

$$\text{Avg} = \frac{15+15}{2} = \frac{30}{2} = 15\% \text{ gain.}$$

Q) A company sold two boxes at ₹200 each. On one he gained 25% & on the other he lost 25%. What is the overall gain or loss in percentage?

$$I: \left[\frac{4 \times 3 + 4 \times 5}{5 \times 3 + 3 \times 5} \right]^{-1} \Rightarrow 12 + 20 = 32(CP)] \quad \frac{2}{32} \times 100 = 6.25\%$$

$$II: \left[\frac{5 \times 3 + 3 \times 5}{5 \times 3 + 3 \times 5} \right]^{-1} \Rightarrow 15 + 15 = 30(SP)$$

$$SP_1 = SP_2$$

A man sold two watches for ₹600 each. He sold one of them at a profit of 20% & the other at a loss of 40%. Then find his loss/profit percentage on whole transaction.

$$I: \left[\frac{5}{6} + \frac{5 \times 2}{3 \times 2} \right]^{-1} = 15(CP)] \quad \frac{3}{15} \times 100 = 20\% L$$

$$II: \left[\frac{5}{6} + \frac{3 \times 2}{3 \times 2} \right]^{-1} = 12(SP)] \quad \frac{3}{12} \times 100 = 25\% P$$

$$P = 25\% P$$

$$25\% P$$

$$25\% P$$

$$20\% L$$

$$75\% \text{ overall loss}$$

$$25\% P$$

$$For 20\%$$

$$\begin{array}{|c|c|} \hline & P \\ \hline 25\% P & 20\% L \\ \hline 75\% P & 25\% P \\ \hline \end{array}$$

⑧ The selling price of 6 bananas is equal to the cost price of 8 bananas. Then the percentage profit is _____

$$6SP = 8CP$$

$$3SP = 4CP$$

$$\frac{CP}{SP} = \frac{3}{4} \quad] P = 1$$

$$P\% = \frac{1}{3} \times 100 = 33\frac{1}{3}\%$$

iii. The cost price of 10 articles is equal to the selling price of 15 articles. What is the profit or loss percentage?

$$10CP = 15SP$$

$$2CP = 3SP$$

$$\frac{SP}{CP} = \frac{2}{3} \quad] Loss = 1$$

$$1\% = \frac{1}{3} \times 100$$

$$= 33\frac{1}{3}\%$$

⑨ A fruit seller buys 20 lemons for ₹10 & sells them at ₹20 for ₹30. His profit percentage is _____

$$5(20CP = 10) \Rightarrow 100CP = 50 \quad] P = 10$$

$$9(50SP = 30) \Rightarrow 100SP = 60$$

$$\frac{10}{50} \times 100 = 20\%$$

⑩ A shopkeeper purchased each packet of 12 articles for ₹51 & sold them as packet of 15 articles, each for ₹71.25. If he gets a profit of ₹90 then the no. of articles he sold is _____

$$5(12CP = 51) \Rightarrow 60CP = 255$$

$$4(15SP = 71.25) \Rightarrow 60SP = 285 \quad \Rightarrow P = \frac{X_3}{90}$$

$$\frac{X_3}{180}$$

⑪ A vendor purchased 20 mangoes for a rupee. How many for a rupee must he sell to gain 25%.

$$CP \quad SP$$

$$\text{Ratio: } 100 : 125 \quad |$$

$$4 : 5$$

$$\text{Consumption: } 8 : 6$$

$$\times 4 \downarrow \quad \times 6$$

$$20 \quad 16$$

⑫ A man purchased a bedsheet for ₹400 and sold it at a gain 20%. Calculated on the selling price. The selling price of the bedsheet was -

$$10\%$$

$$\frac{1 \leftarrow P}{10 \leftarrow SP} \Rightarrow 10 \times 50 = 500$$

$$CP = 10 - 1 \Rightarrow 9 parts = 450$$

TRAILING ZEROS

$$\rightarrow 2^5 \times 15^{12} \times 13^5 \times 12^{16} \times 30^8$$

$$(2^2 \times 5)^5 \times (3 \times 5)^{12} \times (2^2 \times 3)^{16} \times (2 \times 3 \times 5)^8$$

$$= 2^{10+32+8} \times 5^{5+12+8}$$

$$= 2^{50} \times 5^{25} \Rightarrow 25 \text{ zeroes}$$

$$\Rightarrow 3^{2!} \times 5^{4!} \times 7^{6!} \times 11^{10!} \times \dots \times 101^{100!}$$

No of zeroes is none

because it is a prime no of series

$$\rightarrow 100!$$

$$\begin{array}{r} 5 \mid 100 \\ 5 \mid 20-0 \\ 5 \mid 4-0 \\ 0-4 \end{array}$$

$$= 20 + 4 + 0 = 24$$

$$\begin{array}{r} 5 \mid 143 \\ 5 \mid 28-3 \\ 5 \mid 5-3 \\ 1-0 \\ 0-1 \end{array}$$

$$28 + 5 + 1 = 34$$

$$\begin{array}{r} 5 \mid 120 \\ 5 \mid 24-0 \\ 5 \mid 4-4 \\ 0-4 \end{array}$$

$$24 + 4 = 28$$

$$\Rightarrow 750!$$

$$\begin{array}{r} 5 \mid 750 \\ 5 \mid 150 \\ 5 \mid 30 \\ 6 \end{array}$$

$$187$$

$$\cancel{\rightarrow 500!}$$

$$\begin{array}{r} 5 \mid 500 \\ 5 \mid 100 \\ 5 \mid 20 \\ 4 \end{array}$$

$$124$$

$$\Rightarrow 11 \times 12 \times 13 \times 14 \times \dots \times 170 \times 10!$$

$$\begin{array}{r} 5 \mid 170 \\ 5 \mid 34-0 \\ 5 \mid 6-4 \\ 1-0 \\ 0-1 \end{array}$$

$$41$$

$$101 \times 102$$

$$\begin{array}{r} 5 \mid 170 \\ 5 \mid 34-0 \\ 5 \mid 6-4 \\ 1-0 \\ 0-1 \end{array}$$

$$101 - \frac{1}{100}$$

CALENDAR

Q. Represents time in days

\Rightarrow Ordinary Year 365 $\frac{365}{7} = 52 + 1$ odd day

\Rightarrow Leap Year 366 $\frac{366}{7} = 52 + 2$ odd day

\Rightarrow no of days which are divisible by 7 and the remainder we get is called odd day

\Rightarrow Jan - 3 March, May, July, Aug, Oct $\rightarrow 3$
Feb $\leftarrow 1$

April, June, Sep, Nov - 2

\Rightarrow Mon 1

Tue 2

Wed 3

Thu 4

Fri 5

Sat 6

Sun 0

Q. How many odd days in 125 days

$$\frac{125}{7} = 6 \text{ odd days}$$

Q. How many odd days in 413

$$\frac{413}{7} = 0 \text{ odd days}$$

LEAP YEAR

(i) Century Year : 1900, 1800, 2000 etc.

If it is divisible by 400 then it is a leap year

Non century years : 2012, 2004, 1971... etc
If it is divisible by 4 then it is a leap year

Q. How many odd days in 1-20 Years

$$\begin{aligned} 2 \times 5 &= 10 \\ 1 \times 15 &= 15 \end{aligned}$$

$$\frac{25}{7} = 4 \text{ odd days}$$

$$SP = 1470 \quad P\% = 16 \frac{2}{3} = \frac{50}{3} \quad CP = 100\% = ?$$

$$\frac{50}{3} \times \frac{1}{100} = 1\%$$

$$\frac{1 \leftarrow P}{6 \leftarrow CP} \Rightarrow 6 \times 210 = 1260$$

$$SP = 611 = ? \text{ profit } 1 = 210$$

$$\frac{150}{100} = 150\%$$

$$SP = \frac{310}{3} = 1030$$

$$\frac{100 \times 100 + 150}{350} = 126.0$$

Q.i. By selling an article for ₹ 630, 5% gain is made. At what price it must be sold to lose 5%.

$$SP = 630 \quad P\% = 5 \quad 1\% = 5\%$$

$$CP = 100\%$$

$$SP_1 = 105\% = 630$$

$$\frac{95 \times 630}{100} = 595$$

$$SP_2 = 95\% = ?$$

ii. A gain of 30% is made by selling a book for ₹ 390. At what price it should be sold to get a gain of 25%.

$$CP = 100\%$$

$$SP_1 = 130\% = 390$$

$$\frac{125 \times 390}{130} = 375$$

$$SP_2 = 125\% = ?$$

iii. Ravi sells a book to Raju at 20% profit. Raju sells it to Anand at a gain of 25%. If Anand pays ₹ 925, what did Ravi pay for it?

Ravi → Raju → Anand

$$100 \times \frac{120}{100} \times \frac{125}{100} = 225$$

$$x = 150$$

iv. A sells a house to B at 30% profit & B sells it to C at a loss of 20%. If C pays ₹ 520000 for it. At what price did A buy?

A → B → C

$$100/x \times \frac{130}{100} \times \frac{280}{100} = 520000$$

$$x = \frac{520000 \times 100 \times 100}{13 \times 2} = 500000$$

v. A shopkeeper mixes 30kg of sugar at ₹ 360 per kg with 26kg of sugar at ₹ 2 per kg & sells the mixture at ₹ 3 per kg. What is the profit percentage?

I II

$$CP = 30 \times 360 + 26 \times 2 = 160$$

$$SP = (30+26) \times 3 = 168$$

$$P = 8$$

$$P\% = \frac{8}{160} \times 100$$

$$P\% = 5$$

Q) 1st 100 years no of odd days - WRONG

$$2 \times 25 + 75 = \frac{125}{7} = 6 \text{ odd days}$$

$$28 \times 2 + 75 = \frac{123}{7} = 4 \text{ odd days}$$

$$= 4 + 1 = 5 \text{ odd days}$$

NOTE :

First 100 years 5 odd days - 500, 900, 1300 - Friday
 First 200 Years 3 odd days - 600, 1000, ... Wednesday
 First 300 Years 1 odd days - 700, 1100, 1500 - Monday
 First 400 Years 0 odd days - 800, 1200, 1600 - Sunday

Q) Last day of the century - 5 odd days - Friday
 Last day of the 200 years - Wednesday

Q) 1st day of the century - Sun, Tue, Sat, Thu

Q) What day of the week lies on 13 April 2024 ?

$$[2000] + 23 + [Jan + Feb + Mar + 13]$$

o $\begin{matrix} 5 \\ 18 \end{matrix}$

$$o + 18 + 18 + 3 + 1 + 3 + 13 = \frac{48}{7} = 6 \text{ odd days}$$

= Saturdays

$$1600 + 300 + 46 + [Jan - Aug]$$

$$o + 1 + \frac{11}{2} + 35 + 3 + 0 + 3 + 2 + 3 + 2 + 3 + 15$$

$$= \frac{89}{7} = 5 \text{ odd days}$$

SHORTCUT

Month code :

J	F	M	A	MY	J	JUL	A	S	O	N.	D
0	3	3	6	1	4		6	2	5	0	3

Year code

1500 - 1599	- 0
1600 - 1699	- 6
1700 - 1799	- 4
1800 - 1899	- 2
1900 - 1999	- 0
2000 - 2099	- 6

$$\text{Day} = \frac{\text{Date} + \text{M-code} + \text{No. of years} + \text{No. of leap} + \text{Y-code}}{7}$$

⇒ Example 13 Apr 2024

$$\begin{aligned} &= 13 + 6 + 24 + 6 + 6 \\ &\quad \frac{-}{7} \text{ (odd days)} \quad \frac{1+0+3+1}{7} \\ &= \frac{55}{7} = 7[6] = \text{Saturday} \end{aligned}$$

⇒ 14, Feb 2021

$$\begin{aligned} &= 14 + 3 + 21 + 5 + 6 \\ &\quad \frac{-}{7} \text{ (odd days)} \quad \frac{5+1+3+1+1}{7} \\ &= \frac{49}{7} = 0 \text{ odd days Sunday} \end{aligned}$$

⇒ 26, Aug, 1989

$$= \frac{26 + 2 + 89 + 29 + 0}{7}$$

= 6 odd days Saturday

⇒ 20, Jun, 2000

$$\begin{aligned} &= \frac{20 + 4 + 0 + 0 + 6}{7} = 2 \text{ odd days} \\ &\quad \text{Tuesday} \end{aligned}$$

⇒ 16, July, 2003

$$= \frac{16 + 6 + 3 + 0 + 6}{7}$$

= Wednesday

⇒ 1, Jan, 2024

$$= \frac{1 + 0 + 24 + 6 + 6}{7}$$

$$= \frac{37}{7} = 5(2) + 1 \rightarrow 1 + 3 + 5 = 9$$

Given year is a leap year date lies in Jan, Feb sub-1

The mean of 20 observations is 36. It was found later that one observation 23 was wrongly taken as 48. The correct mean is

$$\text{Avg} = \left[\frac{25}{50} \right]$$

$$36 - \frac{23-2}{50} = 36 - \frac{1}{2} + \frac{72-1}{2} - \frac{71}{2} = 35.5$$

15. The marks obtained by Rahul in mathematics, English, biology are respectively 93 out of 100, 78 out of 100, 127 out of 200. Find his avg score in percent?

$$\frac{93+78+77}{100+150+200} = \frac{348}{450} \times 100 = 73.33\%$$

16. These are three fractions A, B & C of $A = \frac{1}{4}$ & $B = \frac{1}{6}$ & the avg of A, B & C is $\frac{1}{12}$. What is the value of C

$$A+B+C = \frac{1}{12} \times 3$$

$$\frac{1}{4} + \frac{1}{6} + C = \frac{1}{4}$$

$$C = -\frac{1}{6}$$

$$\rightarrow \frac{31+6+4+1+6}{7} = 6 \text{ saturday}$$

\Rightarrow on what date of Oct 2006 did 2nd Friday fall?

$$\frac{1+6+6+1}{7} = \text{sunday} - \text{Oct } 1^{\text{st}}$$

13 Oct is 2nd Friday

\Rightarrow on what date of May 2005 did last Thursday fall?

$$\frac{31+1+5+1+6}{7} = 2 \text{ (Tuesday)}$$

31 - T

30 - M

29 - S

28 - Sat

27 - Fri

26 - Thu

$$\Rightarrow 3^{\text{rd}} \text{ Nov } \frac{3+3+7+1+6}{7} = \text{Saturday} - 1 \text{ Friday}$$

$$8^{\text{th}} \text{ Aug } \frac{8+2+6+1+6}{7} = \text{Tuesday} \text{ but Monday is given}$$

\Rightarrow Month 3rd day Monday

26th day Wednesday

\Rightarrow Today is Tuesdays After 45th will be

$$\frac{45}{7} = 3 + \text{Tues} = \text{Fri}$$

\Rightarrow Today is Monday 61st day will be

$$\frac{61}{7} = 5 + 1$$

\Rightarrow How many days from 10th Jan to 5th April

$$22 + 28 + 31 + 5 = 86 \text{ days}$$

(from to → including)

.. 40

⇒ How many days lie between 15th Jan & 5th April in 2022
 $16 + 29 + 31 + 4 = 80$ days.

⇒ The calendar for the year 1997 will be the same for the year

1997 1998 1999 2000, 2001 2002 2003 same year
1 1 1 2 1, 1

SHORTCUT

A leap year + 1 year = add six years

leap year + 2/3 = add 11 years

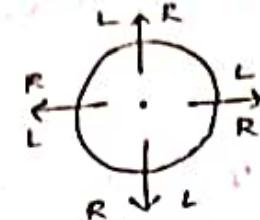
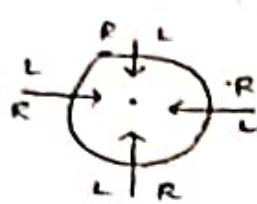
Given year is leap = add .28

$$\Rightarrow 2007 + 11 = 2018$$

$$\Rightarrow 1996 + .28 = 2024$$

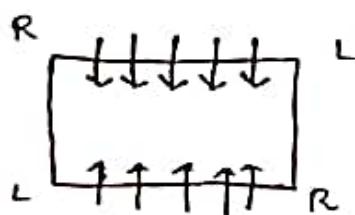
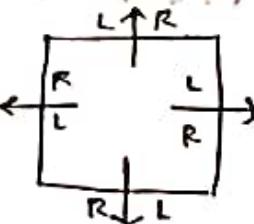
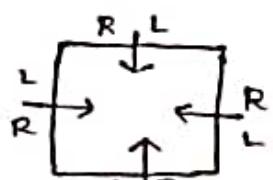
SEATINGARRANGEMENT

2. Circular arrangement.



- Some key points to the seating arrangement
- A is opposite to B

2. SQUARE / RECTANGULAR Arrangement



- A is forth to the right
(or) B

A is fourth to the right

A

- C is between A & B or C is the neighbour of A

ACB or BCA

- A is neighbour of H
AH (or) HA

3. Linear Arrangement

- A is immediate right of H

(i) Single row arrangement

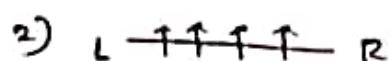
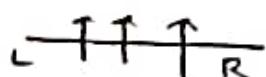
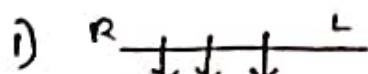
North facing $\uparrow^L \uparrow^R$

South facing $\downarrow^R \downarrow^L$

East facing $\frac{L}{R} \rightarrow$

West facing $\leftarrow^R_L \leftarrow^R_L$

(ii) Parallel arrangement



$$\Rightarrow \rightarrow 1800 \times 25 \times 4^8 \times 21^2 \times 45^2 \text{ find the no}$$

$$9 \times 200$$

$$7 \times 25 \times 8$$

$$2^3 \times 2^{16} = 3+16=19$$

\Rightarrow find the highest of 2 in $20!$

$$\begin{array}{r} 2(20) \\ 2(10) \\ 2(5) \\ 2(2) \\ \hline = 18 \end{array}$$

\Rightarrow And the highest of 3 in $67!$

$$\begin{array}{r} 3(67) \\ 3(22-1) \\ 3(7-2) \\ \hline = 31 \end{array}$$

\Rightarrow find the highest power 5 in $140!$

$$\begin{array}{r} 5(140) \\ 5(28) \\ 5(5) \\ \hline = 34 \end{array}$$

\Rightarrow 11 in $243!$

$$\begin{array}{r} 11(243) \\ 11(22) \\ \hline = 2 \end{array}$$

$$\Rightarrow 22+2=24$$

\Rightarrow 6 in $70!$

$$\begin{array}{r} 6(70) \text{ wrong} \\ 6(11) \\ \hline = 12 \end{array}$$

2×3 highest

$$\begin{array}{r} 3(70) \\ 3(23) \\ 3(2) \\ \hline = 32 \end{array}$$

\Rightarrow 9 in 120

$$\begin{array}{r} 9(120) \\ 9(12) \\ \hline = 13 \end{array}$$

$$\begin{array}{r} 3(120) \\ 3(40) \\ 3(13) \\ \hline = 4 \end{array}$$

$$\begin{array}{r} 58 \\ 3 = 3^{29} \times 2^{19} \\ = (3^2)^{29} = (9)^{29} \end{array}$$

PERMUTATIONS AND COMBINATIONS

1. Linear $\rightarrow {}^n P_r = \frac{n!}{(n-r)!}$
circular $= n!$

$$\Rightarrow {}^n P_n = n!$$

$$\rightarrow \frac{n!}{P_1 Q_1 R_1 S_1}$$

2. circular $(n-1)!$

$$\Rightarrow \text{ENTRANCE} = \frac{8!}{2! 2!} = 10080$$

$$\Rightarrow \text{PART} = n! = 4! = 24$$

$$\Rightarrow \text{MACHINE} = 7! = 5040$$

\Rightarrow 5 players out of 8 players

$${}^8 C_5 = \frac{8!}{5! 3!} = \frac{8 \times 7 \times 6}{3 \times 2} = 56$$

\Rightarrow TOMORROW such that all vowels do not occur together

$$\frac{8!}{3! 2!} - \frac{6! 3!}{3! 2!} = \frac{\frac{8!}{5}, \frac{3!}{1}}{12} = \frac{40320 - 4320}{12} = \frac{36000}{12} = 3000$$

\Rightarrow How many diagonals in heptagon

$$\frac{n(n-3)}{2} = \frac{7(7-2)}{2} = 14$$

\Rightarrow 1, 2, 3, 4 & 5 no of 4 digits numbers

$${ }^5 P_4 = \frac{5!}{4!} = 120$$

\Rightarrow 5 girls in a row

$$5! = 120 = (n-1)! = 4! = 24$$

\Rightarrow Q _____ N Question

$$6! = 720$$

11 -- 40

\Rightarrow LOGARITHMS . 10!

$$10_{\text{eq}} \times 7_{\text{eq}} \times 8 \times 7 = 5040$$

share hands 210

$$\Rightarrow n_{C_2} = \frac{n(n-1)}{2} = 210$$

$$n^2 - n = 420$$

$$\therefore n = 21$$

\Rightarrow 8W, 3B, 4R

$$\left[{}^3C_1 \times {}^6C_2 \right] + \left[{}^3C_2 \times {}^6C_1 \right] + \left[{}^3C_3 \right]$$

$$15 + 18 + 1 = 34$$

\Rightarrow 16 non collinear points, no of st lines

$$\frac{n(n-1)}{2} = \frac{16 \times 15}{2} = 120.$$

\Rightarrow 9m & 4W - \Rightarrow mem - comi

$$\text{exactly 3W } {}^4C_3 \times {}^9C_4 = 4 \times 126 = 504$$

$$\text{Atleast 3W } {}^4C_3 \times {}^9C_4 + {}^4C_4 \times {}^9C_3 = 504 + 84 = 588$$

$$\text{At most 3W } {}^4C_2 \times {}^9C_4 + {}^4C_2 \times {}^9C_5 + {}^4C_1 \times {}^9C_6 + {}^4C_0 \times {}^9C_7 = 504 + 756 \\ + 336 + 36 = 16$$

\Rightarrow 5 letters from EQUATION

a) All are vowels - 1

b) Only two vowels - ${}^5C_2 \times {}^3C_3 = 20$

c) 3 Vowels - ${}^5C_3 \times {}^3C_2 = 10 \times 3 = 30$

d) Atleast 3 vowels - ${}^5C_3 \times {}^3C_2 + {}^5C_4 \times {}^2C_1 + {}^5C_5 = 30 + 15 + 1 = 46$

\Rightarrow 35 - - - telephone number, no repetition

$$8_{C_4} = \frac{8 \times 7 \times 6 \times 5}{4 \times 3 \times 2 \times 1} = 70.$$

NUMBER SYSTEM

Natural numbers : positive / counting numbers

Ex: 1, 2, 3, ... ∞

Whole numbers : counting numbers & 0

Ex: 0, 1, 2, 3, ... ∞

Integers : Whole numbers & negative numbers

Ex: -∞ ... -3, -2, -1, 0, 1, 2, 3, ... ∞

Prime numbers : Which has two factors i.e. itself

Identification of prime number

Ex:

151

12²

2, 3, 5, 7, 11

$$\frac{151}{2} = 1$$

$$\frac{151}{5} = 1$$

$$\frac{151}{11} = 0$$

$$\frac{151}{3} = 1$$

$$\frac{151}{7} = 4$$

∴ 151 is a prime

Twin primes : The diff any two prime numbers is 2

Ex: (3, 5) (5, 7) (11, 13) (17, 19)

(29, 31) (41, 43) (59, 61) (71, 73)

Co-primes : HCF of any two numbers is 1 → those two numbers are co-prime

Ex: (13, 29) (31, 8) (9, 25)

→ All primes are co-primes

→ All coprimes are not primes

Composite numbers : More than 2 factors

Place value : position

→ 100 millions 24.32

→ Millions 24.32

→ 0.481 = 4 tenths 8 hundredths

→ 4.32 = 4 ones 3 tenths 2 hundredths

→ What is the place value of given number

8996532

face value - 6

place value - $6 \times 1000 = 6000$

→ diff btwn face value & place value of 6

$$6000 - 6 = 5994$$

$$\text{Ex: } \begin{array}{r} 456456 \\ 555555 \end{array}$$

→ n +ve

$$n < 193$$

$$\underline{193} \left(\begin{array}{r} 96 \\ + 92 \end{array} \right)$$

$$= 18528$$

$$= 18528$$

⇒ Division Rule

$$\star \text{Dividend} = \text{Divisor} \times \text{Quotient} + R \Rightarrow R = 40.$$

÷ 2 = even

÷ 3 = sum of digits multiple of 3.

÷ 4 = last two digits multiple of 4

÷ 5 = last digit 0 or 5

÷ 6 = divisible by 2 & 3

÷ 8 = last 3 digits all divisible by 8

÷ 9 = sum of the digits all multiple of 9

÷ 10 = last digit 0

÷ 11 = diff btwn sum of the digits in the even & odd places is multiple of 11, or 0

÷ 7 = last digit multiple with 2 & subtracted from remaining number.

$$1 \boxed{4} \times_2 = 8$$

$\rightarrow 8 - 1 = 7 \div 7 = 1 \Rightarrow 53 * 46 \text{ divisible by 3}$
replace with smallest number

$$126 \Rightarrow 12 - 12 = 0 \div 7 = 0$$

$$5040 \Rightarrow 040 - 5 = 35 \div 7 = 5$$

$$2401 \Rightarrow 401 - 2 = 399 \div 7 = 57$$

$$\frac{R}{\text{divisor}} = \frac{29}{8} = 5$$

$$5+3*4+6 = 18+0=18$$

$$\therefore * = 0,$$

NOTE: Any six digit number which is in the form abcabc abcabc is always divisible by 9, 11, 13 & 31

\Rightarrow How many numbers are there from 1-200 which are divisible by 7

$$28 \times \frac{200}{7} = 28$$

\Rightarrow How many numbers are between 200 and 500 which are divisible by 7

$$\frac{500-13}{7} - \frac{200}{7} = \frac{487}{7} - \frac{280}{7} = \frac{207}{7}$$

$$38 - 15 = 23$$

\Rightarrow How many numbers from upto 700 shall which are divisible by 3 or 5

$$3 \times 5 = 15 \quad \frac{700}{15} = 46 \quad \frac{233}{2} = \frac{200}{2} = 100$$

$$373 - 46 = 327$$

\Rightarrow How many numbers are there b/w 200 & 500 which are divisible by 3 or 5

$$200 - 500$$

$$\frac{499}{3} = 166 - \frac{66}{3}$$

$$500 - 5 + 2 = 100$$

$$\frac{499}{5} = 99 - \frac{200}{5} = 40 \\ = 59$$

$$\frac{33}{7} = 33 - \frac{200}{7} = 20$$

$$100 + 59 - 20$$

$$= 139$$

\Rightarrow from 200-500 $\Rightarrow 199-500$

\Rightarrow How many numbers are there from 200-500 which are neither divisible by nor divisible by 7

$$\frac{199}{7} = 28 \quad \frac{114}{7}$$

$$114 - 28 = 86$$

$$\frac{199}{5} = 39 \quad \frac{160}{5}$$

$$160 - 39 = 121$$

$$\frac{199}{3} = 66 - \frac{800}{3} = 22$$

$$22 - 5 = 17$$

$$\Rightarrow 121 + 86 - 17 = 190$$

$$601 - 190 = 411$$

FINDING REMAINDERS

+ve approach

$$\frac{26}{7} \rightarrow 21 \quad \left(\begin{array}{l} 21 \\ 26-21=5 \end{array} \right)$$

$$\frac{39}{9} \rightarrow 36 \quad \left(\begin{array}{l} 36 \\ 39-36=3 \end{array} \right)$$

$$\Rightarrow \frac{79 \times 137}{9}$$

$$= \frac{79}{9} \times \frac{137}{9}$$

$$= 62 \times 8$$

$$= \frac{-4}{9} = 5 \quad \left(\begin{array}{l} 08 \\ -4+12=8 \\ 08 \\ \hline 08 \end{array} \right) = \frac{08}{08} + \frac{08}{08}$$

$$\Rightarrow \frac{1223 \times 2334}{5} \quad \left(\begin{array}{l} 22 \\ 5 \end{array} \right)$$

$$1223 \quad 2335$$

$$\frac{1223}{5} \times \frac{2334}{5} \quad \left(\begin{array}{l} 2334 \\ 5 \\ \hline 2334 \end{array} \right)$$

$$-2 \times -1 = \frac{2}{5} = 2$$

$$\Rightarrow 1440$$

$$\frac{1443}{10} \times \frac{1443}{10} \times \frac{1442}{10} \times \frac{1425}{10} \quad \left(\begin{array}{l} 1443 \\ 10 \\ \hline 1443 \end{array} \right)$$

$$= +3 \times +3 \times +2 \times 5 = \frac{90}{10} = 0$$

-ve approach

$$\frac{26}{7} \rightarrow -2+7=5$$

$$\frac{62}{7} \rightarrow -1+9=6$$

$$\Rightarrow \frac{72 \times 73 \times 78 \times 76}{35}$$

$$\frac{2 \times 3 \times 8 \times 6}{35} = \frac{36}{35} \times \frac{8}{35}$$

$$\frac{1 \times 8}{35} = \frac{8}{35}$$

$$\Rightarrow \frac{9}{8} \quad \left(\begin{array}{l} (+1) \\ 9 \\ 8 \end{array} \right)$$

$$= \frac{(+1)}{8} = \frac{1}{8} = 1$$

$$\Rightarrow \frac{100}{11} \quad \left(\begin{array}{l} 100 \\ 11 \end{array} \right)$$

$$\frac{1}{11} = 1$$

$$\Rightarrow \frac{(75)^{1235}}{4} = \frac{25}{4} = \frac{(-3)^{1235}}{4}$$

$$4-1=3$$

	H	I	
H	X	✓	1. B
I	✓	X	2. C
C	.	.	3. C
A	✓	X	4. A
D	X	.	5. D

→ for the same principal amount compound interest for two years at 5% per annum exceeds the simple interest for 3 years at 3% per annum by 1125, then the principal amount in Rupees.

$$\frac{3P \times 3}{100} + 1125 = P \left(1 + \frac{3}{100}\right)^2 - P$$

$$\frac{3P \times 3}{100} + 1125 = P \left(\left(1 + \frac{5}{100}\right)^2 - 1\right)$$

$$1125 = P \left(\left(\frac{105}{100}\right)^2 - 1\right) - \frac{9P}{100}$$

$$1125 = P \left(\frac{105 \times 105}{100 \times 100} - 1\right) - \frac{9P}{100}$$

$$1125 = P \left[\left(\frac{105 \times 105}{100 \times 100} - 1\right) - \frac{9}{100}\right]$$

$$1125 = P \left[\frac{11025 - 10000}{10000} - \frac{900}{10000} \right]$$

$$1125 = P \left[\frac{-125}{10000} \right]$$

$$C.I = R_1 + R_2 + \frac{R_1 \times R_2}{100}$$

$$5+5 + \frac{5 \times 5}{100} = 10.25\%$$

$$T \times R = I$$

$$3 \times 3 = 9\%$$

$$1.05\% = 1125$$

$$\frac{1125}{100} = 112.5\%$$

$$112.5\% = 900$$

	A	B	C	D	E
G	X	✓	X	X	X
J	X	X	.	X	X
E	X	X	X	X	X
P	X	.	.	.	X
S

1. D



All hats are Temp
Some Temp are hats

④

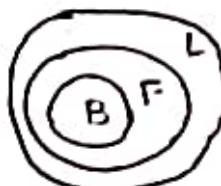


⑤



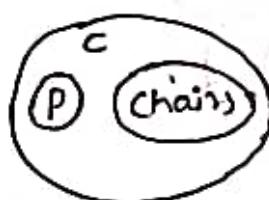
neither nor

⑥

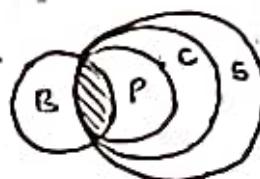


I ✓
II ✗
III ✗
IV ✓

⑦

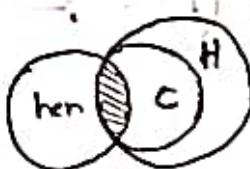


⑧

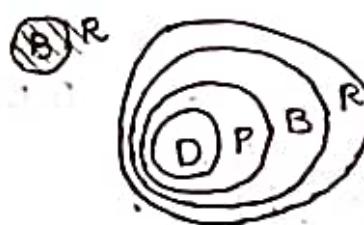


I ✓
II ✗
III ✓
IV ✓

⑨



⑩



I ✓
II ✓
III ✓
IV ✓

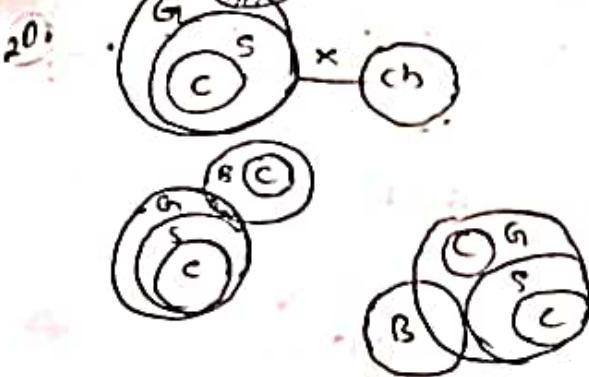
⑪



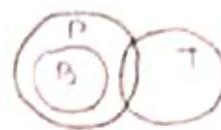
⑫



I ✓
II ✓

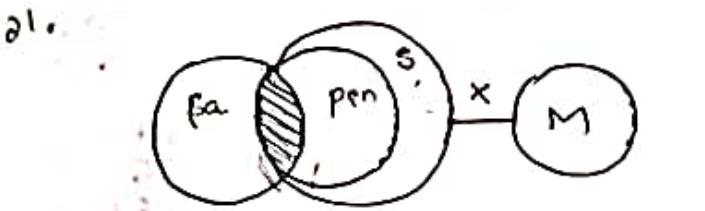


23.



$\frac{1}{2} \times \frac{1}{2}$ either or

BD PD random either or
✓ ✗ ✗ ✓ ✓

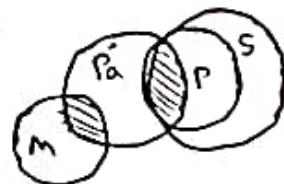


24.

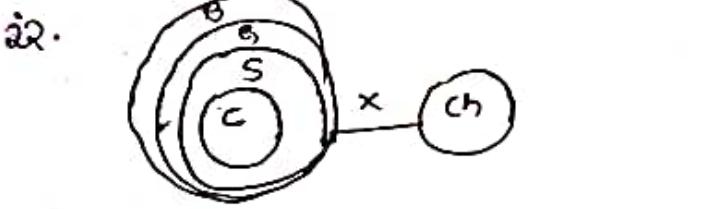
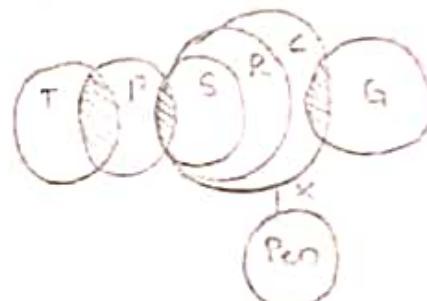


BD PD
✗
BD PD Either or
✓ ✗ ✓

18. II



25.



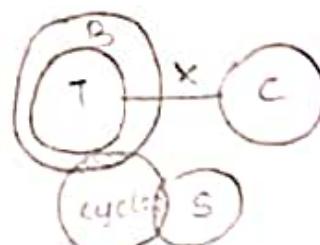
BD PD
✗
BD PD Either or
✓ ✗ ✓

23. Model-5
(Complementary Pair)
or
Either or
No conclusion

B.D	P.D	valid
✓	✗	
✓	✓	} invalid
✗	✓	
✗	✗	

Some not
BD P.D
100% 100%
✓ ✗

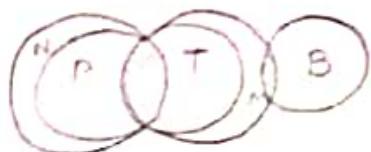
27.



BD
✗
BD PD
✓ ✗] either or

Some pen are rubber ✗
No pen is rubber ✓ ✓

28.



BD

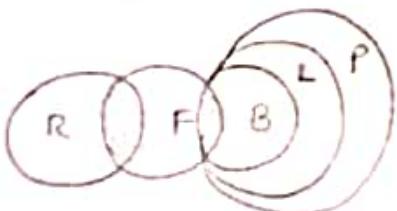
X

BD
PD

✓ Y

Fifth of

29.



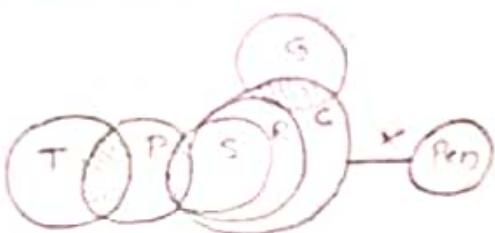
I Some plants are flowers ✓

II Some roses are buds X

III No leaves are roses X

IV No roses are buds ✓

30.



Some pens are rubber X

No pen is rubber ✓

All pens are trees BD PD X

No pen is tree ✓

d

⇒ find the odd one out

- A) BYW B) UXC C) GDO D) GDS

⇒ FROG → 634

BOTT → 953

F	R	O	G
G	18	15	7
21			

11	361
361	361
229	4
229	229

EST

12. $\frac{1}{15}$

$$\frac{1C_1 + 1C_1}{52C_1} \cdot \frac{2}{52} = \frac{1}{26}$$

$$\frac{12}{52} = \frac{3}{13}$$

$$\frac{13+3}{52} - \frac{16}{52} = \frac{4}{13}$$

$$\frac{16}{52} = \frac{4}{13}$$

13. $\frac{4C_2}{52C_2} = \frac{4 \times 3}{52 \times 51} = \frac{2}{221}$

$$\frac{4C_1 \times 3C_1}{52C_1 \times 51} = \frac{4 \times 3}{52 \times 51} = \frac{1}{221}$$

14. $\frac{8C_2 + 6C_2}{14C_2} = \frac{43}{91}$

15. $\frac{8 \times 6}{14 \times 3} = \frac{48}{91}$

15. $\frac{4 \times 6 \times 5}{15C_3} = \frac{24}{91}$

16. $\frac{2 \times 4 \times 6C_3}{12C_3} = \frac{6 \times 5 \times 4}{12 \times 11 \times 10} = \frac{1}{11}$

17. $\frac{5C_1 \times 4C_1}{9C_1 \times 8C_1} = \frac{5}{18}$

$$\frac{4C_1 \times 3C_1}{9 \times 8^2} = \frac{1}{9}$$

$$\frac{5C_1 \times 4C_1}{9C_1 \times 8C_1} = \frac{5}{18}$$

18.

$$\frac{6C_2}{14C_2}, \frac{6C_1}{14C_1} = \frac{9}{49}$$

$$\frac{6C_1 \times 8C_1}{14C_1 \times 14C_1} = \frac{6 \times 8}{14 \times 14} = \frac{12}{49}$$

19. $\frac{3 \times 2}{10C_2} + \frac{3C_2 \times 3C_1}{10C_2} = \frac{21+3}{45} = \frac{8}{15}$

20. $35\% = 875$

$18\% = 450$

$3\% = 195$

$875 - 195 = 680 = \frac{680}{2800} = \frac{3}{25}$

$$\frac{35}{28} \cap \frac{18}{28} = \frac{28\%}{100\%} = \frac{3}{25}$$

21. $1 - \frac{6C_4}{12C_4} = 1 - \frac{1}{32} = \frac{31}{32}$

22. $\frac{5 \times 21}{26C_2} = \frac{21}{65}$

23. $1 - \frac{1}{10!}$

24. $\frac{5! \times 3!}{3!} = \frac{1}{7}$

25. $\frac{5+3}{25} = \frac{8}{25}$

26. $\frac{33+25-8}{200} = \frac{50}{200} = \frac{1}{4}$

27.
$$\frac{2/3}{3} + \frac{4/5}{5} - \frac{1/9}{9} = \frac{2}{3} + \frac{4}{5} - \frac{4}{45} = \frac{14}{45}$$

$$28. \quad 3/8$$

$$\frac{P}{P_0} = \frac{P_0 + \rho g h}{P_0}$$

$$29. \quad \left[\begin{matrix} 4R & 5R & 4F \\ 3B & 4B & 4B \end{matrix} \right]$$

$$\begin{aligned} & 4 \times 5 \times 4 + 3 \times 5 \times 4 \\ & + 4 \times 4 \times 4 \\ & \hline 7 \times 9 \times 8 \end{aligned}$$

$$= \frac{200}{504} = 13\% \text{ OR } 13/42$$

$$30. \quad 1 - [0.6 \times 0.7 \times 0.8 \times 0.9]$$

$$= 1 - 0.3024$$

$$= 0.6976$$

31.

$$1\frac{1}{2}, 2\frac{2}{3}$$

$$\frac{5}{3} + \frac{8}{3} - 1 = \frac{10}{3} = 3\frac{1}{3}$$

~~$$\frac{5}{3} + \frac{8}{3} - 1 = \frac{10}{3} = 3\frac{1}{3}$$~~

$$\frac{1}{101} \approx 0.00$$

$$\frac{1}{e} = \frac{18 \times 10}{70} \text{ OR } \frac{1}{e} = \frac{18}{70}$$

$$P_{\text{out}}^2 = \frac{e^2}{2e} \text{ OR } P_{\text{out}}^2 = \frac{e}{2e}$$

$$P_{\text{out}}^2 = \frac{O^2}{O^2 + S^2} = \frac{S - O^2 + S^2}{O^2 + S^2}$$

BILITY

1. 4-coins - $2^4 = 16$
 $= \frac{6}{16} = \frac{3}{8}$

$n(S) = [2H, 2T] = \frac{4!}{2!2!}$

2. $\frac{5!}{3! \times 2!} = \frac{120^{10}}{6 \times 2} = \frac{10}{32} = \frac{5}{16}$

3. $\frac{3!}{2!} 3_{C_2} \times 3_{C_1} + 3_{C_3} \times 3_{C_0} = 3 \times 1 + 1 \times 4$
 $\cdot \frac{4}{8} = \frac{1}{2}$

4. $5_{C_0} \times 5_{C_5} + 5_{C_1} \times 5_{C_4} + 5_{C_2} \times 5_{C_3} \rightarrow \text{wrong}$
 $n(S) - n = 32 - 1 = 31$
 $\frac{31}{32}$

5. $\frac{1}{6}, \frac{1}{2}, \frac{1}{3}, \frac{1}{3}, \frac{1}{3}, \frac{1}{6}$

6. $\frac{1}{6}, \frac{5}{12}, \frac{1}{4}, \frac{5}{18}, \frac{7}{36}$

7. $\frac{11}{36}$

8. $E \times 0 = E \neq E \times E = E$

$$\frac{27}{36} = \frac{3}{4}$$

9. $\frac{1}{6}, \frac{1}{4}$

10. $\frac{11}{36}$

11. $216 - 10 = 206$

$$= \frac{206}{216} = \frac{103}{108}$$

DATA SUFFICIENCY

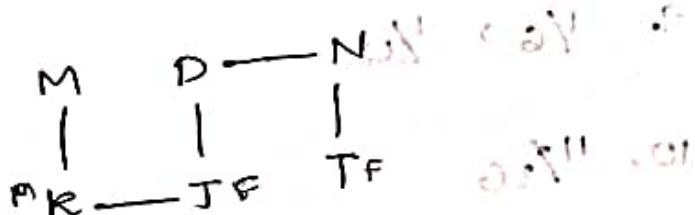
Given Answer

- a) If data in Stmt 1 alone
is sufficient to answer
- b) If data in Stmt 2 alone is
sufficient to answer
- c) If data in either Stmt 1 or
II alone is sufficient to
answer
- d) Neither nor condition
- e) If both Stmts 1 & 2
are sufficient to answer
- f) I 100% ✓ b) II 100% X
II 100% X c) I 100% ✓

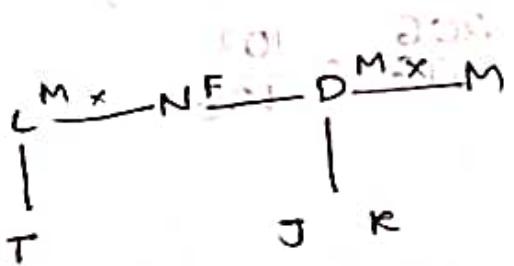
- g) I 100% ✓ d) I 100% X ✓
II 100% ✓ II 100% X

- e) I 40%
II 60%

7.



$$0.008 - 0.1 = 0.15 \text{ m}$$



MODEL C2
(NO conclusion)

Rule

B.D.

✓

✓

✗

✗

P.D.

✓

✗

✓

✗

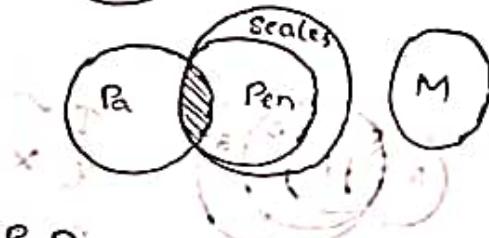
valid

invalid

14.



B.D.

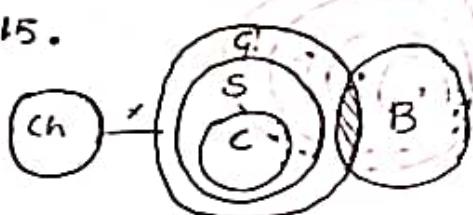


P.D.

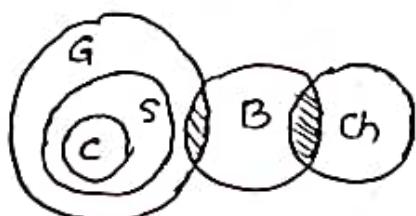


Only conclusion 2 follows

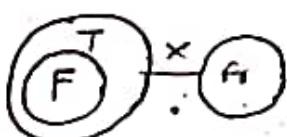
15.



B.D.



16.



I & II.

MODEL - 3
(Possibility)

17. Rules

BD

✓

✓

✗

✗

✗

P.D.

✓

✗

✓

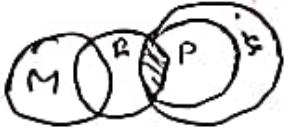
✗

✗

BD



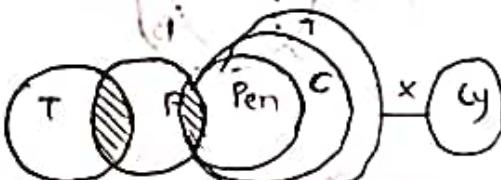
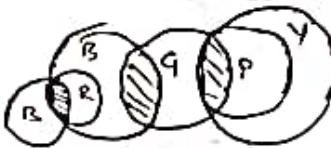
Conclusion



18.

BD

PO



19.

SYLLOGISMS

I. All cats are Dogs
 → some dogs are cats



II. Some ^{Cats} Dogs are dogs
 → some dogs are cats



III. No cat is Dog



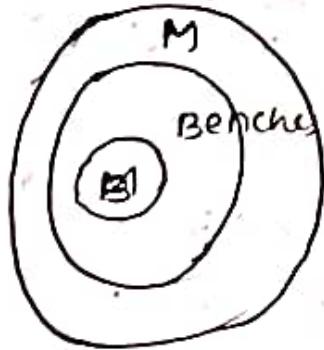
→ No dog is a cat

IV. Some cats are not dog



Some dogs are not cats

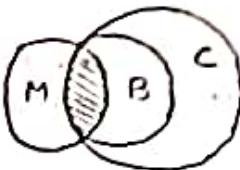
Q → All bags are benches
 All benches are markers



con
 ⇒

Some benches are bags
 Some markers are benches
 = All bags are markers
 Some markers are bags

Q) Some mobiles are books
 All books are computers



⇒ Some books are mobiles
 Some computers are mobiles
 Some mobiles are computers
 Some computers are mobiles

Model - I. All / some

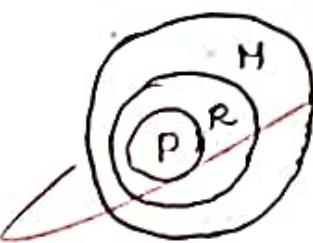
① st - All men are dogs:
 - All dogs are cats

con - All men are cat;
 All cats are men



Some dogs are men
 Some cats are dogs

② - All men are cat
 Some cat are men



⇒ All Pens are houses
 Some houses are pens

$$\Rightarrow \frac{12^{2014}}{13} \Rightarrow \frac{(-1)^{2014}}{13} = 1$$

~~TP~~
 $\text{Rem}\left(\frac{a^n+b^n}{a+b}\right) = 0 \text{ if } n \text{ is even}$

$$\Rightarrow \frac{3^{81}}{28} \rightarrow \frac{(3^3)^{27}}{28} = \frac{(27)^{27}}{28}$$

$\text{Rem}\left(\frac{a^n+b^n+c^n+d^n}{a+b+c+d}\right)$,

$$\frac{(-1)^{27}}{28} = -27$$

if a, b, c, d are
 $\in \mathbb{Z}$ & n is odd

$$\Rightarrow \frac{77^{77}+77}{78}$$

$$\Rightarrow \frac{2^{101}+3^{101}}{5} - \frac{2^{101}+3^{101}}{2+3} = 0$$

$$\frac{77^{77}}{78} + \frac{77}{78}$$

$$\Rightarrow \frac{\frac{70}{5} + \frac{70}{7}}{74}$$

$$\frac{(-1)^{77}}{78} + -1$$

$$\frac{70}{74} + \frac{70}{74} \Rightarrow \frac{(5^2)^{35} + (7^2)^{35}}{74}$$

$$\Rightarrow \frac{5^{16} \text{ and } 5^{25}}{6} \quad \frac{R_1+R_2}{R_2}$$

$$= \frac{25 + 49^{35}}{74} = 0$$

$$\frac{5^{16}}{6} \quad \frac{5^{25}}{6}$$

$$\Rightarrow \frac{29^{11} + 37^{11}}{33}$$

$$\frac{(-1)^{16}}{6} = 1 \quad \frac{-1}{6} = -\frac{1}{6}$$

$29+37 = 66$ is a multiple of 33

$$\frac{1+5}{5} = \frac{6}{5}$$

$$\Rightarrow \frac{25^{11} + 37^{11}}{33} = 0$$

$$\Rightarrow \frac{1!+2!+3!+4!}{5!} = 33$$

$$\Rightarrow \frac{16^3 + 17^3 + 18^3 + 19^3}{51} = 0$$

When a number is divided by 119 the remainder is 42 if same number is divided by 19 then remainder will be

$$\frac{42}{19} = 2 \text{ R } 14$$

$$\Rightarrow \frac{N}{14} = 9 \Rightarrow \frac{N^2}{14} = ?$$

$$\frac{R^2}{14} = \frac{81}{14} = 11$$

$$\therefore \text{Remainder} = 11$$

$$\Rightarrow \frac{N}{6} = 2 \Rightarrow \frac{n^2+n+2}{6} = ?$$

$$\frac{2^2+2+2}{6} = \frac{8}{6} = 2$$

$$\Rightarrow 7^{81} + 7^{82} + 7^{83} = 7^{80}(7+7^2+7^3)$$

$$7^{80}(399)$$

$$\therefore 399$$

$$\Rightarrow 3^{25} + 3^{26} + 3^{27} + 3^{28}$$

$$= 3^{25}(1+3+9+27)$$

$$= 3^{25}(40) \Rightarrow 3^{24} = 120$$

$$= 30$$

$\Rightarrow n^2(n^2-1)$ is always divisible by

$$n=2 \Rightarrow 12 \div 12$$

$$n=3 \Rightarrow 92 \div 12$$

$$n=4 \Rightarrow 240 \div 12$$

$\therefore 12$ is always

$\Rightarrow 3475$ divisible by 4.

$$k=2$$

$$\Rightarrow 114345 \sim 18$$

$$9-7=0$$

$$\Rightarrow \underline{16324} = 8-8-0$$

$$324-16 = 308 = 7$$

$$\Rightarrow 2+3+9+6+8+5 = 33$$

\Rightarrow 9 digit $\rightarrow 897642877$

is divisible by 72

$$3x+2y$$

$$8+9+6+9+2+8+7 = 44+7+7$$

$$4=2, 3 \times 8 + 2 \times 4 = 28$$

$$x=8$$

$$\Rightarrow 777925148 \quad \frac{10x^3 - 3y^2}{64}$$

$$y=8, x=\frac{7}{4}$$

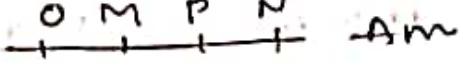
$$9+7+9+2+5+1+8+8 = 47$$

$$\begin{array}{r} 490 \\ - 92 \\ \hline 248 \end{array} \Rightarrow 298$$

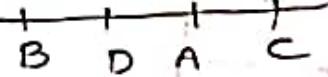
$$\Rightarrow 5z-3x4y$$

$$5+4+3=12$$

$$5+4-3=6$$

17. 

→ O M P N A M



In

PUZZLE TEST

1. A - cs, P, h, M

B - D, CS, P

C - P, H, M

D - P, H, D

E - H, D, CS

Q. 2. ~~Find the number of ways in which the letters of the word "BANANA" can be arranged.~~

2. R - b, h, v

K - h, v, c

S - b, h, k

Q - b, v, c, R

M - b, R

3.

B → Take four cases

D → G

G → F

A → G

E → P

C →

I → B

F → A

A →

G →

H →

V →

N →

N →

A →

G →

H →

V →

N →

N →

A →

$$\Rightarrow P_{\frac{180}{720}} = 180$$

\Rightarrow 7 boys & 5 girls no two girls together

$$7 \text{ boys} = 7! = 5040$$

$$5 \text{ girls} = \frac{8!}{3!} = \frac{8 \times 7 \times 6 \times 5 \times 4 \times 3!}{3!} = 6720$$

$$5040 \times 6720 = 33,868,800$$

\Rightarrow 1, 2, 3, 4, 5, 5 digit number, starting with 13

$$13 \quad 5P_3 = \frac{5!}{2!} = 5 \times 4 \times 3$$

$$3! = 6.$$

\Rightarrow 6M & 5W committee of 5 persons

$${}^5C_0 \times {}^6C_5 + {}^5C_1 \times {}^6C_4 + {}^5C_2 \times {}^6C_3$$

$$6 + 5 \times 15 + 10 \times 20$$

$$= 6 + 75 + 200$$

-

\Rightarrow 7M & 6W

$${}^7C_3 \times {}^6C_2 + {}^7C_4 \times {}^6C_1 + {}^7C_5 \times {}^6C_0$$

$$35 \times 15 + 35 \times 6 + 21$$

$$525 + 210 + 21 = 756$$

\Rightarrow 6B, 4G \neq selection, atleast one boy

$${}^6C_1 \times {}^4C_3 + {}^6C_2 \times {}^4C_2 + {}^6C_3 \times {}^4C_1 + {}^6C_4 \times {}^4C_0$$

$$= 6 \times 4 + 15 \times 6 + 20 \times 4 + 15$$

$$= 24 + 90 + 80 + 15$$

$$= 209$$

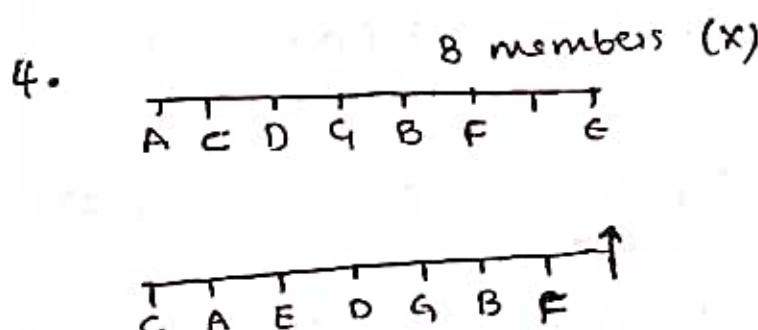
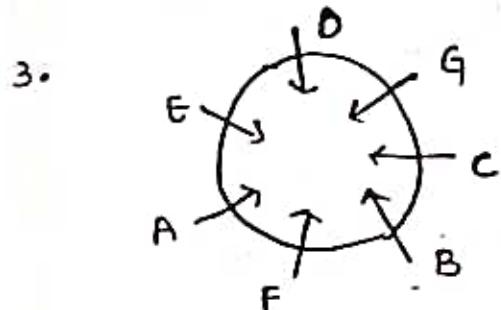
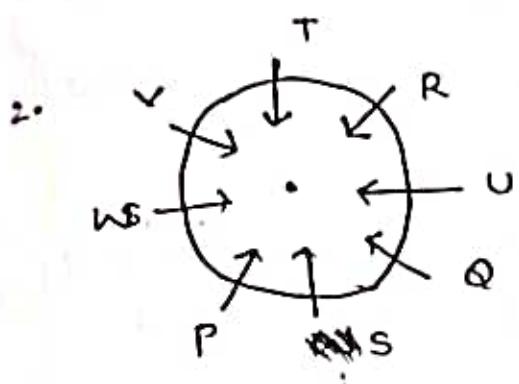
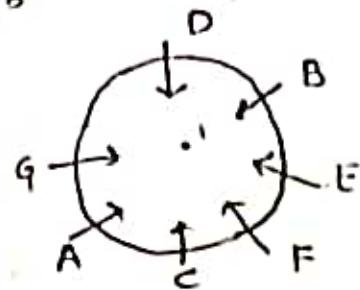
\Rightarrow 3W, 3B, 4R

$${}^3C_2 \times {}^3C_1 \times {}^4C_0 + {}^4C_2 \times {}^3C_1 \times {}^3C_0 + {}^3C_1 \times {}^4C_1 \times {}^3C_1 + {}^3C_2 \times {}^4C_1 + {}^3C_3 \times {}^3C_1 + 1$$

$$= 3 \times 3 \times 1 + 6 \times 3 + 3 \times 4 \times 3 + 3 \times 4 + 18$$

$$= 9 + 18 + 36 + 12 + 9 + 1$$

$$= 85$$



5. F D A C E B ↑

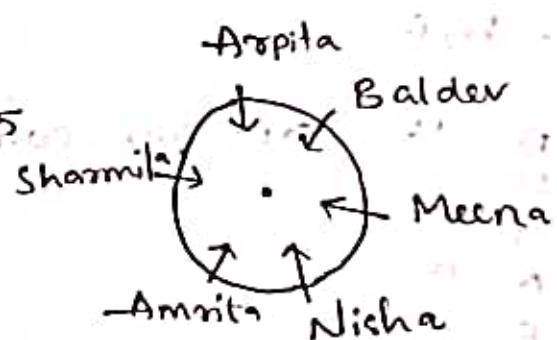
6. Alka
Gopal
Mala
Ram
Kapil

11. H B A C E D E G ↑
Between A, e is c

12. Rachi → P
Anunima
Shwetha
Bhumika
vibha ↓ South end

13. P R S M U T ↑
second to the right of S u

14. P S Q R T, R ↓ L

15. 

16. 