

Partnership

(Investment × Time) Ratio = Profit Ratio

- Q) A, B & C invested 6300, 4200 & 10500 in a business. Find share of A in profit of 12100 after a year?

A	B	C
6300 × 12	4200 × 12	: 10500 × 12
9	6	: 15
3	2	: 5
		12

$$* \quad A = \frac{\text{Ratio} \times \text{Profit}}{\text{Total Ratio}} = \frac{3}{3+2+5} \times 12100 = \frac{3}{10} \times 12100 \\ \Rightarrow A = 3630$$

- Q) A, B, C invested 6000 for 5 months, 3600 for 6 months & 7500 for 3 months. If total profit is 7910, find A's share?

A	B	C
6000 × 5	3600 × 6	: 7500 × 3
60 × 5	36 × 6	: 75 × 3
100	72	: 75

$$\Rightarrow A = \frac{100}{247} \times 7410 = 3000$$

Q) A & B entered a partnership investing 25000 & 30000. After 6 months, C joined with 35000. What is C's share in annual profit of 47000?

$$\begin{array}{ccc}
 A & B & C \\
 25000 \times 12 : 30000 \times 12 : 35000 \times 8 \\
 25 \times 12 : 30 \times 12 : 35 \times 8 \\
 5 \times 3 : 6 \times 3 : 7 \times 2 \\
 15 : 18 : 14
 \end{array}$$

$$C = \frac{14}{47} \times 47000 = 14000$$

Q) A & B began with 3000 & 4000. After 8 months, A withdraws 1000 & B advances 1000. At end of year, profits amounted to 630. Find A's share.

A	B
(3000×8)	(6000×8)
+	+
(2000×4)	(5000×4)
32000	52000
16	26
8	13

$$A = \frac{8}{21} \times 630 = 240.$$

Q) Types of Partners

- i) Sleeping partner - Only Investment
- ii) Working partner - Investment + Work
Salary
Incentive
%

Q) A, B & C invested 6900 for 6 months, 8000 for 8 months & 10000 for 3 months. A is a working partner & gets 5% of total profit. Find C's share in total profit of 7400.

- * First, working partner receives their amount from total profit.

$$\text{A's extra money} = 5\% (7400) = 370$$

$$\text{Remaining profit} = 7030$$

A	B	C
6500×6	$: 8400 \times 5$	$: 10000 \times 3$
13	14	10

$$C = \frac{10}{37} \times 7030 = 1900$$

- (Q) A is a working partner with 19000 & B is a sleeping partner with 25000. A receives 10% of profit. Out of total profit of 9600, money received by A is?

$$\text{A's extra money} = 10\% (9600) = 960$$

$$\text{Remaining profit} = 8640$$

$$\begin{array}{ccc} A & & B \\ 15000 \times 12 & : & 25000 \times 12 \\ 3 & : & S \end{array}$$

$$A = \frac{3}{8} \times 8640 = 3240$$

∴ Total Money received by A = $3240 + 960 = 4200$

* Profit received by A = 3240.

Q)

Q) A, B, C & D contribute $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ and rest of the capital respectively. What is D's share if profit is 6000?

$$\begin{array}{cccc} A & B & C & D \\ 20 & : & 15 & : 12 : 13 \end{array}$$

$$D = \frac{13}{60} \times 6000 = 1300.$$

Q) A starts with 1200 & B & C join with some investments after 3 & 6 months respectively. If at end of year profit is divided in ratio 2:3:5, what is B's investment?

A B C

$$1200 \times 12 : 6 \times 9 : c \times 6 \\ = 2 : 3 : 5$$

$$1200 \times 12 : x \times 9 : y \times 6 = 2 : 3 : 5$$

* $\frac{1200 \times 12}{x \cdot 9} = \frac{2}{3}$

$$\Rightarrow x = 2400$$

Q) A & B rent a field. A puts on 21 horses for 3 months & 15 cows for 2 months. B puts 15 cows for 6 months & 40 sheep for $7\frac{1}{2}$ months. If one day, 3 horses eat as much as 5 cows & 6 cows as much as 10 sheep, what part of rent should A pay?

Given,

$$18 \text{ horses} : 30 \text{ cows} : 50 \text{ sheep}$$

$$A : 21h \times 3 + 15c \times 2 = 63h + 30c$$

$$B : 15c \times 6 + 40s \times \frac{15}{2} = 90c + 300s.$$

$$3h = 5c \text{ and } 6c = 10s$$

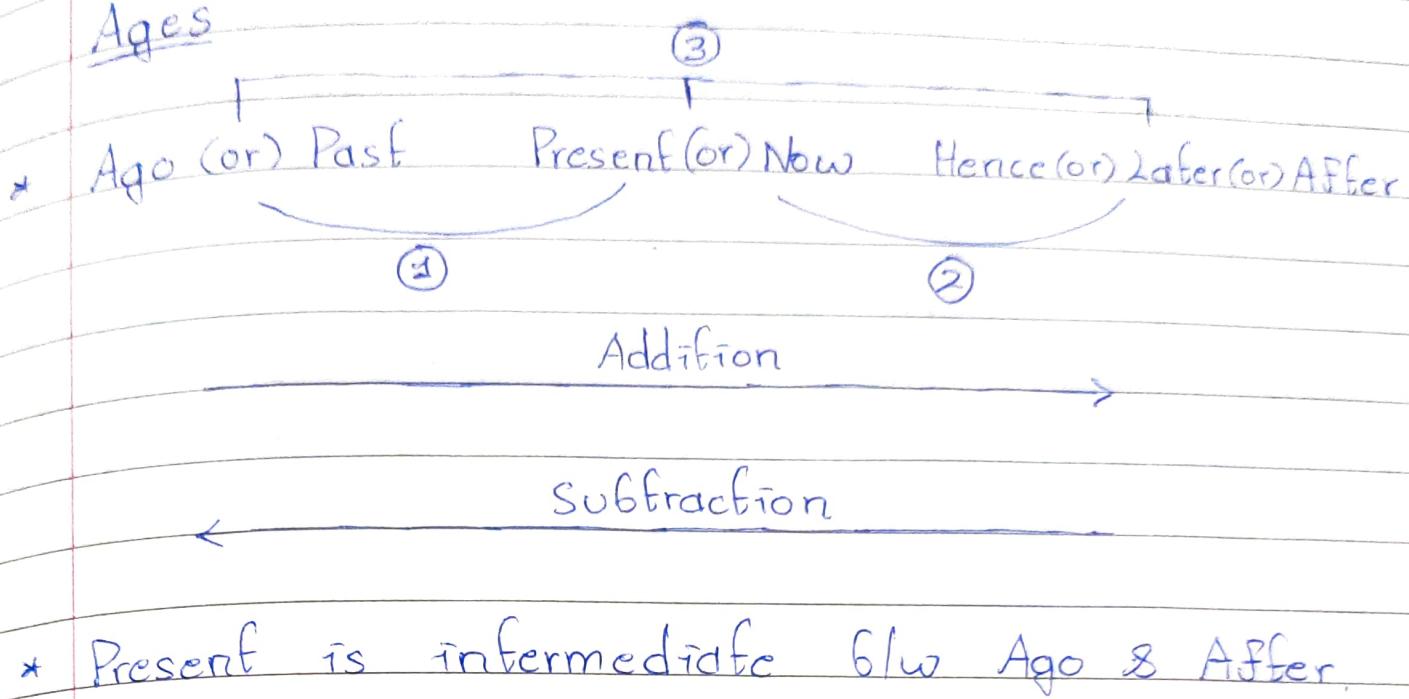
$$\Rightarrow h = \frac{5}{3}c \text{ and } s = \frac{3}{5}c.$$

A

B

$$(10s + 30)c : (90 + 180)c \\ 1 : 2$$

$$A = \frac{1}{1+2} = \frac{1}{3} \text{ rd.}$$

Ages

* Present is intermediate b/w Ago & After.

Q) Present ages of Ram & Shyam are in ratio 4:5. Five years hence if becomes 5:6. What is Ram's present age?

$$\begin{array}{ccc}
 P & \xrightarrow{(+)} & H \text{ (5 years)} \\
 R = 4x & & \frac{R = 4x + 5}{S = 5x + 5} = \frac{5}{6}
 \end{array}$$

$$\Rightarrow 24x + 30 = 25x + 25$$

$$\Rightarrow \boxed{x = 5}$$

Ram's present age = $4x = 20$ years.

Q) Fifteen years ago, F was three times as old as S. Now, F is twice as old as S. Sum of present ages of F & S is,

$$\begin{array}{ccc} \underline{A} & \xrightarrow{(+)} & \underline{P} \\ F: 3x & & \frac{F: 3x+18}{S: x+18} = \frac{2}{1} \\ S: x & & \end{array}$$

$$\Rightarrow 3x+18 = 2x+36$$

$$\Rightarrow x=18$$

$$x+18+3x+18=4x+36=108$$

∴ Sum of Present ages = 108.

Q) One year ago, P was four times as old as S. Six years hence, P's age will exceed S by 3 years. Ratio of present ages of P & S are,

$$\begin{array}{ccc} \underline{A} & \xrightarrow{(+)} & \underline{P} \xrightarrow{(+)} \underline{H} \\ P: 4x & & P: 4x+1 \quad P: 4x+7 \\ S: x & & S: 4x+1 \quad S: 4x+7 \end{array}$$

$$\Rightarrow 4x+7 = x+7+9$$

$$\Rightarrow 3x=9 \Rightarrow x=3$$

$$\frac{P}{S} = \frac{13}{4}$$

- Q) A's age after six years will be three-seventh of F. Ten years ago, ratio was 1:5. What is F's present age? (50 years)
- Q) TG was 8 times older to T 16 years ago. He would be 3 times her age 8 years from now. Eight years ago, what was ratio of T & TG's age? (11:53)
- Q) Present ages of 3 people are in ratio 4:7:9. Eight years ago, sum of their ages was 56. Find their present ages. (16, 28, 36)

Averages

* $\text{Avg} = \frac{\text{Sum}}{\text{No}} = \frac{\text{Sum of observations}}{\text{No. of observations}}$

Q1) Average of first 2400 odd numbers is?

Q2) Average of first 5 odd numbers.

* $\text{Avg} = \frac{1+3+5+7+9}{5} = \frac{25}{5} = 5$

Average of first 3 = $\frac{1+3+5}{3} = 3$.

Sol.) $\text{Avg} = 2400$

* i) Average of First 'n' odd numbers = n

* ii) Average of upto 'n' odd numbers = $n/2$.

* iii) Average of First 'n' even numbers = $n+1$

* iv) Average of upto 'n' even numbers = $\frac{n}{2} + 1$

Q) Avg. of even upto 800

$$\frac{n}{2} + 1 = 400 + 1 = 401$$

* $\sum n$ (Sum of First 'n' Natural Numbers) = $\frac{n(n+1)}{2}$

* $\sum n^2 = \frac{n(n+1)(2n+1)}{6}$

* $\sum n^3 = \left[\frac{n(n+1)}{2} \right]^2$

Q) Average of squares of first 20 numbers

$$\text{Avg} = \frac{20(21)(41)}{6 \times 20} = \frac{7 \times 41}{2} = 143.5$$

Q) A man purchased 3 dozen mangoes for Rs 36, 5 dozen for Rs 48 & another 4 dozen for Rs. 60. Find average price of mangoes per dozen.

$$\text{Avg} = \frac{36 + 48 + 60}{3 + 5 + 4} = \frac{144}{12} = \text{Rs } 12$$

Q) Average weight of 16 boys is 50 kg & remaining 4 girls is 45 kg. Find average weight of class.

* $\text{Avg} = \frac{\text{Sum of obj}_1 + \text{Sum of obj}_2}{\text{No. of obj}_1 + \text{No. of obj}_2}$

$$\text{Avg} = \frac{16 \times 50 + 4 \times 45}{16 + 4} = \frac{16 \times 50 + 4 \times 45}{20}$$

$$= 8 \times 5 + 9 = 49$$

Q) If average marks of three batches of 55, 60 & 45 students respectively is 50, 55, 60, then average marks of all students is?

$$\text{Avg} = \frac{55 \times 50 + 60 \times 55 + 45 \times 60}{55 + 60 + 45} = \frac{8750}{160} = 54.6875$$

Q) Average weight of class of 16 students is 32 kg. If teacher's weight is included, average weight of class increases by 1 kg. Find weight of teacher.

$$\text{Total weight of 16 students} = 16 \times 32 = 512 \text{ kg}$$

$$\text{Total weight of 17 students} = 17 \times 33 = 561 \text{ kg}$$

$$\text{Weight of teacher} = 69 \text{ kg.}$$

$$\text{Q) } \frac{(16+1)(32+1) - (16 \times 32)}{1 \text{ (teachers)}} = \frac{561 - 512}{1} = 49 \text{ kg.}$$

* Q) For 2 teachers,

$$\frac{(16+2)(32+2) - (16 \times 32)}{2}$$

Q) Average monthly income of P & Q is Rs 5050. Average monthly income of Q & R is Rs 6250 & average monthly income of P & R is Rs 5200. Monthly income of P?

$$P+Q = 5050 \times 2$$

$$Q+R = 6250 \times 2$$

$$P+R = 5200 \times 2$$

$$P+Q+P+R-Q-R = 2 \times [5050 + 5200 - 6250]$$

$$\Rightarrow P = 4000$$

Q) Average temperature of week is 45°C . & average of last five days is 40°C . Temperatures of first & second day are in ratio 13:10. Find temperature on first day.

$$\text{Σ week} = 315^\circ\text{C}$$

$$\text{Σ last 5 days} = 200^\circ\text{C}$$

$$\text{Σ first 2 days} = 118^\circ\text{C}$$

$$13x + 10x = 118 \Rightarrow x = 5$$

$$13 \times 5 = 65^\circ\text{C}$$

$$(7 \times 45) - (5 \times 40) = 115^\circ\text{C}$$

$$\frac{13}{13+10} \times 115 = 65^\circ\text{C}$$

Q) Grocer has sale of 6435, 6927, 6655, 7230 & 6562 for 5 consecutive months. How much sale must he have in sixth month so that average sale is 6500?

$$6500 = \frac{6435 + 6927 + 6655 + 7230 + 6562 + x}{6}$$

$$\Rightarrow x = 5191$$

* Run-rate \rightarrow Average.

Q) In first 10 overs of cricket game, run rate was 3.2. What should run rate be in remaining 40 overs to reach target of 282 runs

$$\text{Score For First 10 Overs} = 10 \times 3.2 = 32 \text{ runs.}$$

$$\text{Remaining Target} = 282 - 32 = 250 \text{ runs}$$

$$\text{Required Run-Rate} = \frac{250}{40} = 6.25$$

Q) Average runs of player of 10 innings was 32. How many runs must he make in his next 3 innings to increase his average of runs by 4?

$$36 = \frac{10 \times 32 + x}{11}$$

$$\Rightarrow x = 396 - 320 = 76$$

$$\frac{(10+1)(32+4) - (10)(32)}{1} = 76$$

Q) Batsman scored 108 runs in 20th innings & thus increased his average by 2 runs per innings. Find average score for first 19 innings?

$$x+2 = \frac{19x + 108}{20} \Rightarrow 20x - 19x = 108 - 20(2) \Rightarrow x = 68$$

$$108 - 20(2) = 68$$

Q) Captain of cricket team of 11 members is 26 years old & wicket keeper is 3 years older than captain. If ages of these two are excluded, average age of remaining players is one year less than average age of whole team. What is average age of the team?

Captain = 26

W.K = 29

$$\frac{26+29+x}{11} - \frac{x}{9} = 1$$

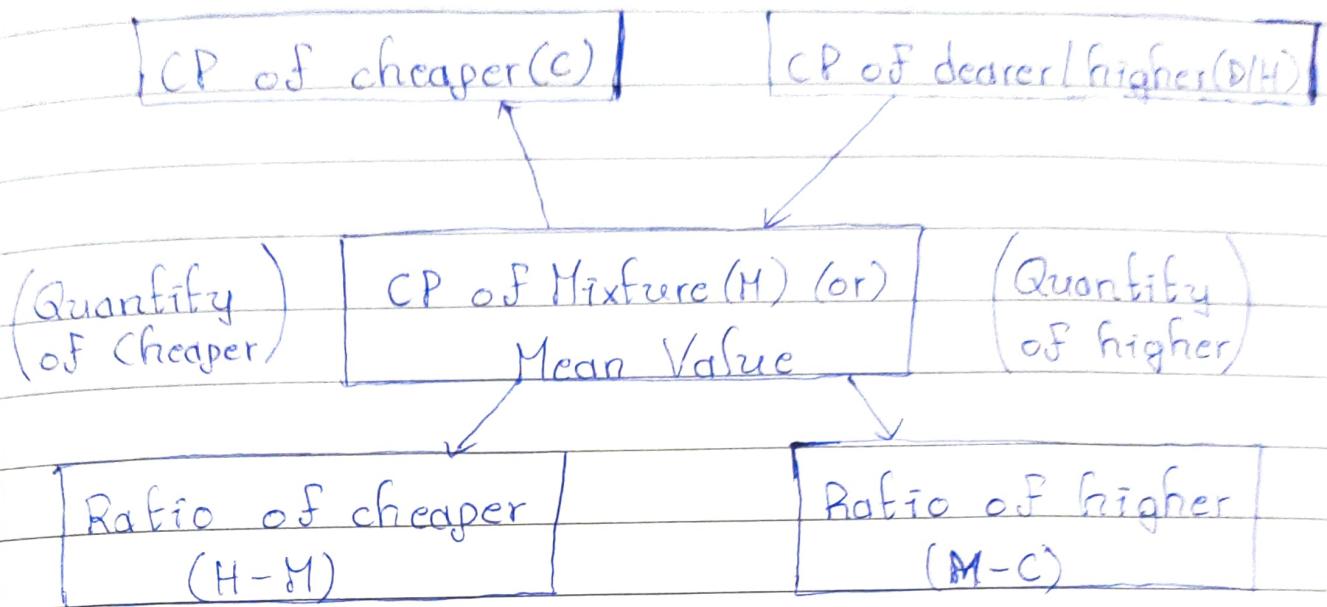
$$\Rightarrow S + \frac{x}{11} - \frac{x}{9} = 1$$

$$\Rightarrow 4 = x \left[\frac{1}{9} - \frac{1}{11} \right] \Rightarrow 4 = x \left[\frac{2}{9 \times 11} \right]$$

$$\Rightarrow x = 2 \times 9 \times 11 = 198$$

$$\text{Avg} = \frac{198 + SS}{11} = 18 + S = 23.$$

Mixtures / Allegations

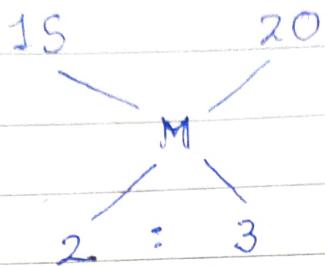


Q) In what ratio must rice at Rs 9.30 per kg is to be mixed with rice at Rs. 10.80 per kg so that mixture is worth Rs 10 per kg?

$$\begin{array}{ccc}
 9.30 & & 10.80 \\
 & \swarrow & \searrow \\
 & 10 & \\
 & \swarrow & \searrow \\
 0.80 & : & 0.70 \\
 & \cdot 8 & : 7
 \end{array}$$

∴ Ratio = 8:7.

Q) Cost of Type 1 Rice is 15/kg & Type 2 is 20/kg. If both are mixed in ratio 2:3, Price per kg of mixed variety of rice is,



$$\Rightarrow 20 - M = 2 \Rightarrow M = 18$$

(or)

$$\Rightarrow M - 15 = 3 \Rightarrow M = 18$$

$$\therefore M = 18$$

Q) We bought 100 kg of Rice. Some quantity is sold at 8% Profit & remaining 18% Profit. Therefore, overall profit is 14%. Find the quantity of rice of both parts.

* C < M < H

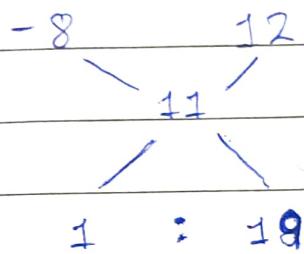
* Profit $\rightarrow (+)$, Loss $\rightarrow (-)$

$$\begin{array}{ccc}
 +8 & & +18 \\
 \backslash & & \diagup \\
 +14 & & \\
 \diagdown & & \\
 18-14=4 & & 14-8=6
 \end{array} = 2:3$$

$$1^{\text{st}} = \frac{2}{2+3} \times 100 = [40 \text{ kg}] \text{ (8% Profit)}$$

$$2^{\text{nd}} = \frac{3}{2+3} \times 100 = [60 \text{ kg}] \text{ (18% Profit)}$$

Q) A man has 60 pens & sells some for a profit of 12% & rest at 8% loss. On the whole, he gets 11% Profit. Find quantity of pens sold at 8% loss & 12% Profit.



$$8\% \text{ Loss} = \frac{1}{20} \times 60 = [3]$$

$$12\% \text{ Profit} = \frac{19}{20} \times 60 = [57]$$

Q) In what ratio water must be mixed with milk to gain 25% on selling mixture at cost price?

* Take $25 : 100 = 1 : 4$

* Q) In what ratio must water be mixed with milk to gain $16\frac{2}{3}\%$ on selling mixture at C.P?

$$\Rightarrow 16\frac{2}{3} : 100 = \frac{16 \times 3 + 2}{3} : 100$$

$$= \frac{50}{3} : 100 = 50 : 100 \times 3$$

$$= [1 : 6]$$

Q) In what ratio must water be mixed with milk to gain $14\frac{2}{7}\%$ on selling mixture at C.P?

$$\Rightarrow 14\frac{2}{7} : 100 = \frac{100}{7} : 100$$

$$= [1 : 7]$$

Q) In what ratio must water be mixed with milk to gain 12.5% on selling mixture at C.P?

$$\Rightarrow \frac{25}{2} : 100 = 25 : 200$$

$$= [1 : 8]$$

Q) In what ratio must water be mixed with milk to gain $11\frac{1}{9}\%$ on selling mixture at C.P?

$$\Rightarrow 11\frac{1}{9} : 100 = \frac{100}{9} : 100 = [1 : 9]$$

Ques 1. ~~Basmati Rice~~
How many kgs of Basmati Rice costing 42/kg

- * Q2. How many kgs of Basmati Rice costing 42/kg should a shopkeeper mix with 25 kgs of Ordinary rice costing 24/kg so that he makes profit of 25% on selling mixture at 40/kg?

24 42

40 (Selling Price) (x)

2 : 16

1 : 8

= 25 : 200

24 42

* 125% = 40

25 32 ?

$$100\% = 32 = \frac{100 \times 40}{125}$$

and with
C.P.

10 : 8

5 : 4

25 : 20

Ques 2. Basmati Rice (42/kg) = 20 kgs

with
C.P.

Q) How many kgs of sugar costing 6.10/kg must be mixed with 126 kg of sugar costing 2.85/kg so that 20% is gained by selling at 4.80/kg?

$$2.85 \quad / \quad 6.10 \quad 120\% = 4.80$$

$$\textcircled{126} \quad / \quad 4 \quad (\times) \quad \Rightarrow 100\% = 4.$$

$$2.10 \quad \backslash \quad 1.15$$

$$\frac{126}{x} = \frac{2.1}{1.15} \Rightarrow x = \frac{126 \times 1.15}{2.1} = \boxed{69 \text{ kgs.}}$$

* Q) Amount of 1450 is to be divided among 800 boys & girls, so that each girl gets 2 & each boy got 1.50. What is the ratio of number of boys and girls?

$$\Rightarrow 800 \times 1.5 = 1200 \text{ (cheaper/Minimum Amount)} \\ \Rightarrow 800 \times 2 = 1600 \text{ (Higher/Maximum Amount)}$$

$$1200 \quad 1600 \\ \backslash \quad / \\ 1450 \\ / \quad \backslash$$

3 : 5

g 6.10/kg must be losting 2.88/kg
sing at 4.80/kg =

$$20\% = 4.80 \\ 100\% = 4.$$

Eggs.

Q) There are pigeons & rabbits in a zoo. If heads are counted then there are 90 total & if legs are counted then there are 224 total. Find number of pigeons & rabbits.

ed among
girl gets 2
the
girls?
mounf)
ount)

Q) Sum of Rs. 5000 is lent out in 2 parts in such a way that 1st part at 4%/annum & 2nd part at 5%/annum. If total interest received after 2 years is Rs 440. Find sum lent at 4% & 5%?

5000

$\times \frac{1}{5000-x}$

$$\frac{x \cdot 2 \cdot 4}{100} + \frac{(5000-x) \cdot 2 \cdot 5}{100} = 440$$

$$\Rightarrow 8x + 5000 - 10x = 4400$$

$$\Rightarrow x = 3000$$

$$\Rightarrow 5000 - x = 2000$$

* Q)

A container contains 100L milk. From this container, 20L milk was taken & replaced by water. This process was further repeated two times. How much milk is left in container?

$$\Rightarrow M \cdot Q = a \left(1 - \frac{b}{a}\right)^n$$

a → Initial Quantity (100)

b → Replacing Quantity (20)

n → No. of operations. (3)

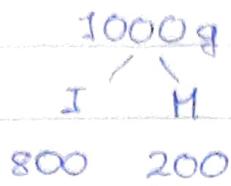
$$\Rightarrow M \cdot Q = 100 \left(1 - \frac{20}{100}\right)^3 = 100 \left(\frac{4}{5}\right)^3 = 100 \times \frac{64}{125}$$

$$\Rightarrow M \cdot Q = 51.2$$

Q) Container contains 40L milk. From this, 4L milk was taken out & replaced by water. Process was repeated further 2 times. How much milk is left in container now?

$$M \cdot Q = 40 \left(1 - \frac{4}{40}\right)^3 = 40 \times \left(\frac{9}{10}\right)^3 = 40 \times \frac{729}{1000} = 29.16$$

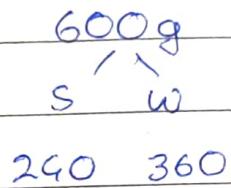
Q) In 1kg mixture of Fe & Mn, 20% is Mn. How much Fe should be added so that proportion of Mn becomes 10%?



$$\Rightarrow \frac{800+x}{200} = \frac{90}{10}$$

$$\Rightarrow x = 1000g$$

Q) 600g of Sugar solution has 40% Sugar in it.
 How much sugar should be added to make
 it 50% in the solution?



$$\Rightarrow \frac{240+x}{360} = \frac{50}{50}$$

$$\Rightarrow x = 120$$

Q) 3 Utensils contain equal mixtures of milk & water
 in ratio 6:1, 5:2 & 3:1. If all solutions are
 mixed, find ratio of milk & water in
 the final mixture?

$$\left(\frac{6}{7} + \frac{5}{7} + \frac{3}{4} \right) : \left(\frac{1}{7} + \frac{2}{7} + \frac{1}{4} \right)$$

$$= \left(\frac{11}{7} + \frac{3}{4} \right) : \left(\frac{3}{7} + \frac{1}{4} \right) = \boxed{65:19}$$

Q) Cup of milk containing sugar & pure milk in ratio 4:1 is mixed with another cup of milk of same volume & containing 30% Sugar. Determine ratio of total sugar to total milk.

$$\left(\frac{4}{5} + \frac{3}{10} \right) : \left(\frac{1}{5} + \frac{7}{10} \right)$$

$$= \left(\frac{11}{10} \right) : \left(\frac{9}{10} \right) = \boxed{11:9}$$

Q) 2 Vessels A & B contain spirit & water in ratio 5:2 & 8:5. Find ratio in which mixtures are to be mixed to obtain new mixture with 9:4 ratio.

$$\frac{5}{7} : \frac{8}{13}$$

$$\begin{array}{c} \diagup \frac{9}{13} \diagdown \\ 1 \end{array}$$

$$\frac{-1}{13} : \frac{-2}{91}$$

$$\frac{2}{13} : \frac{2}{91}$$

$$\frac{91}{13} : \frac{2}{1}$$

$$\boxed{7:2}$$

Q2) Proportion of 1st & 2nd liquids in mixture is 2:3 while in another mixture it is 5:4. In what ratio should liquids be mixed so that new mixture contains equal amount of 2 liquids?

$$P + R = 90 \text{ - } ①$$

$$2P + 4R = 224 \text{ - } ②$$

Solving ① & ②,

$$P = 68$$

$$R = 22$$

Coding & Decoding

- Q) In a certain code, MONKEY is XDJMNK.
How is TIGER written in that code?

~~M O N K E Y~~ ~~T I G E R~~
~~X D J M N K~~ ~~Q D F H S~~

- Q) IF FRIEND is coded as HUMJJK?
How is CANDLE written in that code?

1st-2, 2nd-3, 3rd-4, 4th-5, 5th-6, 6th-7
 CANDLE — EDRIRH

- Q) IF ROSE is coded as 6821, CHAIR as 73456
 & PREACH as 961473, what will be the
 code for SEARCH?

ROSE CHAIR
 6 8 2 1 7 3 4 5 6

SEARCH
 2 1 4 6 7 3 1

Q) In certain code language, 134 means good & tasty, 478 means see good pictures & 729 means pictures are faint. Which digit stands for 'see'?

4 - good, 7 - pictures, 8 - see
∴ see - 8

Q) In a certain code language,
pit na som means bring me water
na go fod means water is life
fub od gif means give me toy
go fin kof means life and death.
Which represents 'is' in that language?

'na' - water, 'go' - life, 'fod' - is.
∴ is - 'fod'

Q) In a certain code language,
'pit dar na' means you are good
'dar fok pa' means good and bad
'tim nd fok' means they are bad
In what language, which word stands for 'they'?

'na'-are, 'fok'-bad, 'tim'-they.

oo [they - 'tim']

- Q) If air is green, green is blue, blue is sky, sky is yellow, yellow is water & water is pink, then what is colour of clear sky?

Colour of clear sky is 'blue' which is 'sky'.
oo [Sky]

- Q) If green is red, red is white, white is black, black is yellow & yellow is pink, what is the colour of milk?

Colour of milk is 'white' which is 'black'.
oo [Black]

- Q) If $Z=52$ & $ACT=48$, then BAT will be equal to,

$$A=2, B=4, C=6, \dots, Z=52$$

$$ACT = 2+6+40=48$$

$$BAT = 4+2+40=46$$

BAT = 46

Q) If Z=2197 & R=729, how would 'J' be written in that code?

$$Z \rightarrow 26 \Rightarrow 26/2 \Rightarrow 13 \Rightarrow (13)^3 = 2197$$

$$R \rightarrow 18 \Rightarrow 18/2 \Rightarrow 9 \Rightarrow (9)^3 = 729$$

$$J \rightarrow 10 \Rightarrow 10/2 \Rightarrow (5)^3 = 125$$

$$\text{∴ } J = 125$$

Q) If 3=S, 6=3, 9=4, 7=5, then 12=?

3 → THREE, 6 → SIX, 9 → NINE, 7 → SEVEN

$$\text{∴ } 12 = 6$$

Q) If 27(1S)33 & 41(13)53, then what is the value of 'A' in 26(A)35?

$$2+7+3+3 = 15$$

$$4+1+5+3 = 13$$

$$\text{∴ } 2+6+3+5 = 16$$

$$\text{∴ } A = 16$$

Q) If 'L' stands for '+', 'M' stands for '-',
'N' stands for 'x', 'P' stands for '÷', then,
 $14N10L42P2M8 = ?$

$$= 14 \times 10 + 42 / 2 - 8$$

BODMAS Rule

$$= 14 \times 10 + 21 - 8 = 140 + 21 - 8$$

$$= \boxed{153}$$

Q) The following equation is incorrect. Which two signs should be interchanged to correct the equation?

$$18 \times 12 - 3 \div 10 + 2 = 64$$

$$18 \times 12 \div 3 - 10 + 2$$

$$= 18 \times 4 - 8$$

$$= 64$$

∴ $\boxed{\div \text{ and } -}$

Percentages

Conversions

$$1 = 100\%$$

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

$$\frac{1}{3} = 33\frac{1}{3}\%$$

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

$$\frac{1}{5} = 20\%$$

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

$$\frac{1}{7} = 14\frac{2}{7}\%$$

$$\frac{1}{8} = 12\frac{1}{2}\%$$

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

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

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

$$\frac{1}{12} = 8\frac{1}{3}\%$$

$$6 \overline{)100} (16 \\ \underline{-40} \\ \underline{36} \\ \underline{4}) \\ = 16\frac{4}{6} = 16\frac{2}{3}.$$

Q) If 75% of number is added to 75, result is the number itself. The number is?

$$\frac{3x}{4} + 75 = x \Rightarrow \frac{x}{4} = 75 \quad (\text{or}) \quad 25\% = 75$$

$$\Rightarrow x = 300$$

$$(\text{or}) \quad 100\% = 300.$$

Q) If 20% of $a = 6$, then 6% of 20 is the same as?

$$6 = \frac{a}{5} \rightarrow a = 30$$

$$6\% 20 = \frac{6}{100} \times 20 = \frac{a}{100} \times 4 = a \% 4 = [4\% a]$$

Q) 60% of a number is added to 80 & result is same number itself. Find number

$$\Rightarrow 40\% = 80$$

$$\Rightarrow [100\% = 200.]$$

* $x\%y = y\%x.$

Q) If A's salary is 20% more than B. How much percent is B's salary less than that of A?

$$a = \frac{120}{100} b \Rightarrow a = \frac{6}{5} b$$

$$= \frac{\frac{6}{5}b - b}{\frac{6}{5}b} \times 100 = \frac{\frac{1}{5}(100)}{100} = [16 \frac{2}{3}\%]$$

Q) In the new budget, price of Kerosene is 25% more. By how much % must a person reduce his consumption to have no effect on cost?
 New = $\frac{5}{4}$ old

$$\times 25\% \Rightarrow \frac{1}{4} \\ \text{more} \Rightarrow \frac{1}{4+1} = \frac{1}{5} = [20\%]$$

Q) In a class of 45 students & 8 teachers, each student got sweets = 20% (students) & each teacher got sweets = 40% (students). How many sweets were there?
 $= 45(9) + 8(18) = 405 + 144 = 549$

$$1 \text{ student} = 20\% (45) = 9$$

$$1 \text{ Teacher} = 40\% (8) = 18$$

$$\text{Total} = 45 \times 9 + 8 \times 18 = [549]$$

Q) Student has to get 30% marks to get through. If he gets 40 marks & fails by 20 marks, find maximum marks set for exdm.
 $30\% (x) = 60 \quad (\text{Fails } 6y \rightarrow +)$
 $\Rightarrow \frac{30x}{100} = 60 \quad (\text{Passed } 6y \rightarrow -)$
 $\Rightarrow x = 200$

a) A student multiplied a number by $\frac{3}{5}$ instead of $\frac{5}{3}$. What is percentage error in calculation?

$$\begin{aligned} & \frac{5x}{3} \quad \frac{3x}{5} \\ & = \frac{5x}{3} \times 100 = \frac{25 - 9}{\frac{5}{3}} \times 100 = \frac{16}{\frac{5}{3}} \times \frac{3}{5} \times 100 \\ & = 64\% \end{aligned}$$

* Error % = $\frac{O.V - W.V}{O.V} \times 100$

Q) Number is decreased by 10% & increased by 10% & number so obtained is 10 less than original. What is the original number?

$$y = \frac{90x}{100} = \frac{9x}{10} \quad \begin{matrix} 10\% \\ \frac{1}{10}(100) \end{matrix} \quad \begin{matrix} 10\% \\ \frac{1}{10}(90) \end{matrix}$$

$$y' = \frac{11 \times 9}{100} x \quad \begin{matrix} \swarrow \\ 100_p \end{matrix} \quad \begin{matrix} \downarrow \\ -10_p \end{matrix} \quad \begin{matrix} \swarrow \\ 90_p \end{matrix} \quad \begin{matrix} \downarrow \\ +9_p \end{matrix} = 99_p$$

$$\Rightarrow \frac{99}{100} x = x - 10 \quad 1_p = 10$$

$$\Rightarrow \frac{x}{100} = 10 \quad \Rightarrow 100_p = 1000$$

$$\Rightarrow x = 1000$$

Q) Rishi spends 40% salary on rent, 10% (remaining) on travel, $16\frac{2}{3}\%$ (remaining) on food & remaining save. If 2250 is saved, what is spent on food?

$$\text{rent} = \frac{40}{100}x = \frac{2x}{5}$$

$$\text{travel} = \frac{400}{10000} x = \frac{x}{25}$$

$$\text{Food} = \frac{50 \times 400}{3 \times 10^8} \times = \frac{20 \times}{3 \times 100}$$

$$\text{Saved} = x \left[1 - \frac{50 \times 400}{3 \times 10^3} \right] = x - \frac{2x}{5} - \frac{x}{25} - \frac{20x}{300}$$

$$\Rightarrow 75x - 30x - 3x =$$

$$\Rightarrow \frac{300x - 120x - 12x - 2x}{300} = 2250$$

$$\Rightarrow \cancel{166} \times = \cancel{875} \times 10^3$$

$$\Rightarrow x = \cancel{40}66.26$$

*	40%	10%	$16\frac{2}{3}\%$
	$\frac{2}{5}(100)$	$\frac{1}{10}(60)$	$\frac{1}{6}(54)$
	100P ✓ - 40P 60P ✓	- 6P 54P ✓	- 9P = 45P
	(rent)	(travel)	(Food)

$$4Sp = \underline{2250}$$

$$\Rightarrow q_p = 450.$$

Army lost 10% men in war, 10% (remaining) lost to disease, 10% (remaining) were dissolved. Army was reduced to 7,29,000 active men. What was original strength of army?

$$90\% \times 90\% \times x = 729 \times 10^3$$

$$\Rightarrow \frac{729 \times 10^3}{100} \times x = 729 \times 10^3$$

$$\Rightarrow x = 1000000.$$

2) 50% of total population, 85% are males. 50% of total females, 60% are literate & remaining 360 are illiterate. If 70% of males are literates, how many males are illiterates?

~~$$50\% \times 45\% \times x = 360$$~~

$$\Rightarrow \frac{2}{5} \cdot \frac{9}{10} \times x = 360$$

$$\Rightarrow x = 20 \times 500 \times 4 = 2000$$

$$30\% \times (35\%) 2000$$

$$\Rightarrow \frac{3}{10} \cdot \frac{11}{20} \times 2000 = 33 \times 10 = 330$$

Q) Population of town was 1,60,000 3 years ago. If it increased by 3%, 2.5% & 5% in last 3 years, present population is?

$$\frac{103}{100} \times \frac{102.5}{100} \times \frac{103}{100} \times 160 \times 10^4$$

$$= \frac{21}{20} \times \frac{41}{40} \times \frac{103}{100} \times 16 \times 10^4$$

$$= 21 \times 41 \times 103 \times 2 = \boxed{177366}$$

Q) Value of machine depreciates at rate of 10% every year. If was purchased 3 years ago. If its present value is 8748, purchase price is?

$$\frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \times x = 8748$$

$$\Rightarrow x = \frac{8748 \times 10^3}{729}$$

$$\Rightarrow x = \boxed{12000}$$

Q) In an election only 2 candidates contested. 20% of voters did not vote & 120 were invalid. Winner got 200 votes more than opponent & secured 41% votes of total voters on voter list. Percentage of votes of defeated candidate out of total votes is?

votes \rightarrow voters (list)

$$\text{valid} = x - \frac{x}{5} - 120$$

45%

$$w + l = x - \frac{x}{5} - 120 = \frac{4x}{5} - 120$$

$$w + l = 200$$

$$\Rightarrow l = \frac{2x}{5} - 160 \Rightarrow w = 40 + \frac{2x}{5}$$

$$\text{Total} = w + l + \text{invalid} = x$$

$$\frac{41x}{100} = 40 + \frac{2x}{5} \Rightarrow \frac{x}{100} = 40 \Rightarrow x = 4000.$$

$$l = \frac{8000}{5} - 160 = 1440.$$

$$\frac{1440}{4000} \times 100 = 36\%$$

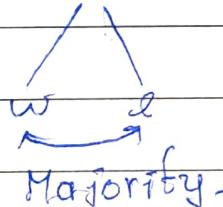
* 1000 (voters list / total voters)

| 100 (Did not cast)

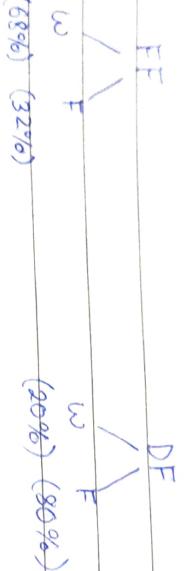
900

| 100 (Invalid)

800 (Valid votes)



Q) Fresh fruit contains 68% water & Dry fruit contains 20% water. How much Dry fruit can be obtained from 100kg of fresh fruits?



$$32\% \text{ (FF)} = 80\% \text{ (DF)}$$

$$\Rightarrow 32 \text{ kg} = \frac{4}{5} (\text{DF})$$

$$\Rightarrow \boxed{\text{DF} = 40 \text{ kg}}$$

Q) At an exam with total 500, A got 10% less than B, B got 25% more than C & C got 20% less than D. If A got 360 marks, what percentage of full marks was obtained by D?

Profit & Loss

$$\rightarrow C.P \text{ (Cost Price)} = 100\%$$

$$S.P \text{ (Selling Price)} = C.P \pm P/2$$

$$P \text{ (Profit)} = + (S.P - C.P)$$

$$L \text{ (Loss)} = - (C.P - S.P)$$

$$P\% = \frac{P}{C.P} \times 100$$

$$L\% = \frac{L}{C.P} \times 100$$

Q) A radio bought for 1000 & sold for 1200. Find Gain Percent?

$$C.P = 1000$$

$$S.P = 1200$$

$$P = 200$$

$$P\% = \frac{200}{1000} \times 100 = 20\%$$

2) A girl bought a pen for 20 & sold it for 18. Find Loss Percent?

$$C.P = 20$$

$$S.P = 18$$

$$L = 2$$

$$L\% = \frac{2}{20} \times 100 = \boxed{10\%}$$

3) A man sold a TV set for 6000 at a loss of 20%. Find cost price of TV?

$$S.P = 6000$$

$$L = 20\%$$

$$20 = \frac{2}{C.P} \times 100$$

$$\Rightarrow \frac{1}{5} = \frac{C.P - 6000}{C.P}$$

$$\Rightarrow C.P = S.P - 25000$$

$$\Rightarrow 4C.P = 25000$$

$$\Rightarrow C.P = 6250$$

Q) Shiva sold a book for 600 at a gain of 20%. Find C.P?

$$S.P = 600$$

$$P = 20\%$$

$$120\% \rightarrow 600$$

$$100\% \rightarrow x$$

$$\Rightarrow x = \frac{600 \times 100}{120} = \boxed{500}$$

Q) A dealer sold an article at a loss of $2\frac{1}{2}\%$. Had he sold it for 100 more, he would have gained $7\frac{1}{2}\%$. Find C.P?

$$L\% = 2.5\% \rightarrow S.P = x$$

$$P\% = 7.5\% \rightarrow S.P = x + 100$$

* P P (-)

$$x = 97.5\%, x + 100 = 107.5\%$$

L L (-)

P L (+)

$$\Rightarrow 100 = 10\%$$

2 P (+)

$$\Rightarrow \boxed{1000 = 1000}$$

Q) C.P of 12 articles is equal to S.P of 9 articles. Find Loss (or) Gain Percentage?

$$12x = 9y$$

$$\Rightarrow \frac{y}{x} = \frac{12}{9} \quad (\text{cross multiply})$$

$$\Rightarrow P\% = \frac{\frac{x}{3}}{x} \times 100 = \boxed{33.33\%}$$

Q) Profit obtained by selling goods for 425 is equal to loss obtained by selling same goods for 355. C.P. of goods is?

$$\begin{aligned} (425 - C.P.) &= (C.P. - 355) \\ \Rightarrow 2C.P. &= 780 \\ \Rightarrow C.P. &= 390 \end{aligned}$$

1/2%,
have

Q) A man purchases 2 clocks A & B at total cost of 650. He sells A with 20% profit & B at 25% loss & gets same selling price for both clocks. What are purchasing prices of A & B?

$$a + b = 650 \Rightarrow C.P.A + C.P.B = 650$$

$$\frac{120}{100}(C.P.A) = \frac{75}{100}(C.P.B) \rightarrow \frac{6}{5}C.P.A = \frac{3}{4}C.P.B \Rightarrow C.P.B = \frac{8}{5}C.P.A$$

$$\Rightarrow \frac{13}{5}C.P.A = 650 \rightarrow C.P.A = 250, C.P.B = 400$$

3) Ramkumar has 24 kg apples & sells a part of a gain of 20% & balance at loss of 5%. If on the whole he earns profit of 10%, amount of apples sold at a loss is.

$$x = 24 - x$$

$$\frac{110}{100} CPx + \frac{95}{100} CP(24-x) = \frac{110}{100} \times CP \times 24$$

$$\Rightarrow \frac{6x}{5} + \frac{19}{20}(24-x) = \frac{11}{10} \times 24$$

$$\Rightarrow \frac{26x - 19x}{20} = 24 \left(\frac{22-19}{20} \right)$$

$$\Rightarrow 5x = 72 \Rightarrow x = 14.4$$

$$24 - x = 24 - 14.4 = \underline{\underline{9.6 \text{ kg}}}$$

Q) A man bought 30 kgs sugar for 6.75/kg & other 120 kgs of sugar for 8/kg. He mixed both & sold it when he got 20% Profit on whole transaction. What should have the man sold?

$$\begin{array}{l} C.P_a = 540, C.P_b = 960 \Rightarrow C.P = 1500 \\ (80 \text{ kg}) \quad (120 \text{ kg}) \end{array}$$

$$S.P_f = \frac{120}{100} \times 1500 = 1800$$

$$\boxed{S.P = 9 \text{ rs/kg.}}$$

Q) Ranjan purchased 120 tables at 110/table. He sold 30 tables at profit of 12/table & 75 tables at profit of 14/table. Remaining tables were sold at loss of 7/table. What is the average profit per table?

$$\frac{+12(30) + 75(14) - 7(15)}{120} = \frac{360 + 1050 - 105}{120} \quad (*)$$

$$\text{Total } C.P = 120 \times 110 = 13200$$

$$S.P_1 = 12 \times 30 \times (122) = 3660$$

$$S.P_2 = 75 \times (124) = 9300$$

$$S.P_3 = 15 \times (103) = 1545$$

$$\text{Total } S.P = 14505$$

$$\text{Profit} = 14505 - 13200 = 1305$$

$$\text{Avg. Profit} = 1305 / 120 = \boxed{10.875}$$

Q) Trader purchased 30 dozen oranges at 11/dozen. $\frac{1}{5}$ th were spoiled & thrown away. He sold $\frac{3}{4}$ th of remaining at 15/dozen. At what price per dozen should he sell remaining to get neither profit nor loss?

$$C.P = (3960 \text{ (360)}) = 330$$

Removing Spoiled, $n = 288$

$$n_1 = 216, S.P_1 = 18 \times 15 = 270$$

$$n_2 = 72, S.P_2 = x.6$$

$$\Rightarrow 270 + 6x = 330$$

$$\Rightarrow 6x = 60$$

$$x = 10.$$

Q) A man buys articles at 3 for Rs 1 & an equal number at 4 for Rs 2. & sells whole at 6 for Rs. 3. Find Loss (or) Gain Percent?

* m articles.

$$CP_3 = \frac{m}{3}$$

$$CP_2 = \frac{m}{2}.$$

Q) A shopkeeper got profit of 20% by allowing discount of 10% on an article with List Price of 4000. Find Cost Price of article?

- * Marked Price = List Price = Labelled Price
 $M.P - \text{Discount} = S.P = C.P \pm P/2$.

$$M.P = 4000, * \text{Discount} = 10\% (M.P) = 400$$

$$\Rightarrow S.P = 3600$$

$$3600 \rightarrow 120\%$$

$$x \rightarrow 100\%$$

$$\Rightarrow x = \frac{3600 \times 100}{120}$$

$$\Rightarrow x = 3000.$$

Successive Discounts

Q) What is final discount on successive discount of 20% & 10%.

$$\frac{x+y - \cancel{xy}}{100}$$

$$* \quad x+y - \frac{xy}{100}$$

$$= 20+10 - \frac{200}{100} = 30 - 2 = \boxed{28\%}$$

Series and Sequences

Q) ~~12, 6, 12, 20, 30, 42, 56, ?~~

Pattern: $1 \times 2, 2 \times 3, 3 \times 4, 4 \times 5, 5 \times 6, 6 \times 7, 7 \times 8, 8 \times 9$
 $= 8 \times 9 = 72$

Q) Find wrong number in series,
~~1, 2, 6, 15, 31, 56, 91~~

Difference of consecutive numbers = 1, 4, 9, 16, 25, 35
~~91~~ is wrong

Q) Find wrong term in series,
~~2, 5, 10, 50, 500, 5000~~

$10 = 5 \times 2, 50 = 5 \times 10, 500 = 50 \times 10, \dots$
~~5000~~ is wrong.

Q) ~~8, 15, 28, 53, ?, 199~~

Series is of the form $2x^2 - 1, 2x^2 - 2, 2x^2 - 3, \dots$

$$8^2 - 1 = 15, 15^2 - 2 = 28, 28^2 - 3 = 53$$

$$53^2 - 4 = 106 - 4 = \boxed{102}$$

Q) 132, 156, ?, 210, 240, 272

$$11 \times 12, 12 \times 13, 13 \times 14, 14 \times 15, 15 \times 16$$

$$\therefore 13 \times 14 = \boxed{182}$$

Q) 7, 18, 18, 57, ?, 1165, 6996

$$8 = 7 \times 1 + 1, 18 = 8 \times 2 + 2, 57 = 18 \times 3 + 3$$

$$57 \times 4 + 4 = \boxed{232}$$

Q) 7, 26, 63, 124, 215, 342, ?

$$(2^3 - 1), (3^3 - 1), (4^3 - 1), (5^3 - 1), (6^3 - 1), (7^3 - 1)$$

$$\Rightarrow 8^3 - 1 = \boxed{511}$$

Q) 2, 12, 36, 80, 180, ?

$$1^3 + 1^2 = 2, 2^3 + 2^2 = 12, 3^3 + 3^2 = 36$$

$$\Rightarrow 6^3 + 6^2 = \boxed{252}$$

Q) 4, 18, ?, 100, 180, 294, 448

$$\hat{2}^3 - \hat{2}^2 = 8 - 4 = 4$$

$$\hat{3}^3 - \hat{3}^2 = 27 - 9 = 18$$

$$4^3 - 4^2 = 64 - 16 = \boxed{48}$$

Q) 7, 7, 14, 42, 168, ?

$$7 \times 1 = 7, 7 \times 2 = 14, 14 \times 3 = 42, 42 \times 4 = 168$$

$$168 \times 5 = \boxed{840}$$

Q) 8, 7, 11, 12, 14, 17, 17, 22, ?

$$(8, 11, 14, 17, 20), (7, 12, 17, 22)$$

$$\textcircled{o} \quad \boxed{20}$$

Q) 3, 7, 6, 5, 9, 3, 12, 1, 15, ?

$$(3, 6, 9, 12, 15), (7, 5, 3, 1, -1)$$

$$\textcircled{o} \quad \boxed{-1}$$

Q) 2, 6, 10, 14, 18, ?

$$18 + 4 = \boxed{22}$$

Q) 10, 21, 36, ?, 78, 105, 136

$$\begin{array}{ccccccccc}
 & 10 & 21 & 36 & ? & 78 & 105 & 136 \\
 & \swarrow & \searrow & \swarrow & \searrow & \swarrow & \searrow & \swarrow \\
 +11 & & +15 & +19 & +23 & +27 & +31 \\
 & \downarrow & & & & & \\
 & +4 & & & & &
 \end{array}$$

$$\textcircled{o} \quad \boxed{55}$$

$$\begin{aligned}
 2 \times 5 &= 10 \\
 3 \times 7 &= 21 \\
 4 \times 9 &= 36 \\
 5 \times 11 &= \boxed{55}
 \end{aligned}$$

Q) 516, 210, 339, 81, 452, 40, 565, ?

$$5 \times 7 \times 6 = 210$$

$$3 \times 3 \times 9 = 81$$

$$4 \times 5 \times 2 = 40$$

$$\Rightarrow 5 \times 6 \times 5 = \boxed{150}$$

Q) $5+3+2 = 15 \quad 10 \quad 22$

$$5 \times 3 = 15, \quad 5 \times 2 = 10, \quad 15 + 10 - 3 = 22$$

$$\Rightarrow 7 + 2 + 5 = 14 \quad 35 \quad 47$$

$$\text{oo } \boxed{14 \ 35 \ 47}$$

2015

2016

* Schichtenmethode

Set-1: Squares & lobes

Set-2: Combination of Set-1 & Set-2