

# Aptitude Practice

## Averages

① Consecutive No.

$$x, x+1, x+2, x+3, x+4 \dots$$

e.g.  $x=90$  90 91 92 93 94

② Consecutive odd No.

$$x, x+2, x+4, x+6, x+8 \dots$$

e.g.  $x=1$  1 3 5 7 9

③ Consecutive even no.

$$x, x+2, x+4, x+6, x+8 \dots$$

e.g.  $x=4$  4 6 8 10 12

$$\textcircled{1} 1, 3, 5, 7, 9$$

$$\textcircled{2} 26, 28, 30, 32, 34$$

$$\textcircled{3} 96, 97, 98, 99, 100$$

$$\textcircled{4} 101, 102, 103, 104$$

$$\downarrow \\ 102.5$$

$$\textcircled{5} 52, 54, 56, 58$$

$$\downarrow \\ 55$$

① The average age of A, B, C is 26 yrs, if the avg age of A and C is 29 yrs, what is the age of B in years?

$$\rightarrow \frac{A+B+C}{3} = 26 \quad \frac{A+C}{2} = 29$$

$$A+B+C = 78 \quad A+C = 58$$

$$\begin{array}{r} 78 \\ - 58 \\ \hline 20 \end{array} \quad B = 20 \text{ years}$$

② The avg of 7 numbers is 5. If the avg. of first six of these numbers is 4, the seventh number is?

$$\rightarrow \text{Total of } 7, = 7 \times 5 = 35 \quad \frac{35}{24} \quad 7^{\text{th}} \text{ number is } \textcircled{11}$$

$$\text{Total of } 6, = 6 \times 4 = 24$$

③ The avg of 10 numbers is 7. What will be the new avg if each of the number is multiplied by 8?

$$\rightarrow \text{Total of 10 no's} = 70 \quad \frac{560}{10} = \boxed{56}$$

$$= 70 \times 8 = 560$$

④ The avg of five consecutive even numbers starting with 4 is,

$$\rightarrow \frac{A}{4}, \frac{B}{6}, \frac{C}{8}, \frac{D}{10}, \frac{E}{12} \quad \text{Avg } \boxed{8}$$

⑤ A, B, C and D are four consecutive even numbers resp. and their avg is 65. What is the product of A & D?

$$\rightarrow \frac{A}{62}, \frac{B}{64}, \frac{C}{66}, \frac{D}{68} \quad \frac{62 \times 68}{A \times D} = \boxed{4216}$$

⑥ A, B, C, D are four consecutive odd numbers and their avg is 42. What is the product of B and D?

$$\rightarrow \begin{array}{cccc} A & B & C & D \\ 39 & 41 & 43 & 45 \\ & \downarrow & & \\ & 41 & 45 & \\ & B \times D & = & 1845 \end{array}$$

⑦ Of the three numbers, the first is twice the second and the second is thrice the third. If the avg of the three numbers is 10. The numbers are,

$$\rightarrow \text{Third} = x, \text{Second} = 3x, \text{First} = 6x$$

$$6x + \frac{3x + x}{3} = 10$$

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

$$x = 3$$

$$\text{first} = 6x, \text{second} = 3x, \text{third} = x$$

$$\downarrow$$

$$\downarrow$$

$$\downarrow$$

$$18$$

$$9$$

$$3$$

⑧ The sum of five numbers is 555. The avg. of the first two numbers is 75 and the third number is 115. What is the avg. of the last two numbers?

$$\rightarrow A + B + C + D + E = 555$$

$$\frac{A+B}{2} = 75$$

$$A + B = 150, C = 115$$

$$150 + 115 + D + E = 555$$

$$D + E = 555 - 265$$

$$D + E = \frac{290}{2} = 145$$

⑨ The avg. expenditure of a man for the first five months is Rs 3600 and for next seven months it is Rs 3900. If he saves Rs 8700 during the year, his average income per month is,

$$\rightarrow \text{Total Exp.} = 3600 \times 5 \\ = 18000$$

$$+ \begin{array}{r} 18000 \\ 27300 \\ + 8700 \\ \hline 54000 \end{array}$$

$$\text{Next 7 months} = 3900 \times 7 \\ = 27300$$

$$\Rightarrow 4500$$

⑩ The sum of 3 numbers is 98. If the ratio b/w 1<sup>st</sup> and 2<sup>nd</sup> be 2:3 and b/w 2<sup>nd</sup> and 3<sup>rd</sup> be 5:8, then the 2<sup>nd</sup> number is,

$$\rightarrow a+b+c = 98$$

$$a:b = 2:3$$

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

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

$$b:c = 5:8$$

$$\frac{b}{c} = \frac{5}{8}$$

$$\boxed{c = \frac{8b}{5}}$$

$$\frac{2b}{3} + b + \frac{8b}{5} = 98$$

$$\frac{10b + 15b + 24b}{15} = 98$$

$$\frac{49b}{15} = 98$$

$$\boxed{b = 30}$$

Trick

$$a:b = 2:3$$

$$b:c = 5:8$$

$$a:b:c = 2:3:\boxed{15}$$

$$\boxed{5:5:8}$$

$$10:15:24$$

$$10x + 15x + 24x = 98$$

$$49x = 98$$

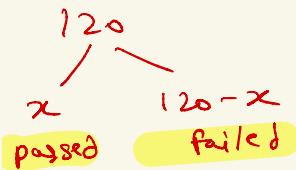
$$\boxed{x = 2}$$

$$\begin{aligned} 2^{\text{nd}} &= 15x \\ &= 15 \times 2 \\ &= 30 \end{aligned}$$

## Based on Equation

① The avg. of marks obtained by 120 candidates was 35. If the avg. of marks of passed candidates was 39 and that of failed candidates was 15, the number of candidates who passed the examination is,

$$\rightarrow \text{Total marks obtained by } 120 \text{ candidates} = 120 \times 35 = 4200$$



$$4200 = x \times 39 + (120 - x) \times 15$$

$$4200 = 39x + 1800 - 15x$$

$$2400 = 24x$$

$$x = \frac{2400}{24} \therefore x = 100 \quad \therefore 120 - 100 = 20 \text{ failed}$$

② In a school, the avg. age of students is 6 years and the avg. age of 12 teachers is 40 years. If the avg. age of the combined group of all the teachers and the students is 7 years, then the number of students is,

$$\rightarrow \text{Teachers} = 12 \quad \text{Student} = x$$

$$(12 + x) \times 7 = 12 \times 40 + x + 6$$

$$84 + 7x = 480 + 6x$$

$$x = 480 - 84$$

$$\boxed{x = 396}$$

③ The avg. monthly salary of all the employees in an industry is Rs 12000. The avg. salary of male employees is Rs 15000 and that of female employees is Rs 8000. What is the ratio of male employees to female employees?

$$\rightarrow \text{Male} = x$$

$$\text{Female} = y$$

$$(x+y) \times 12000 = x \times 15000 + y \times 8000$$

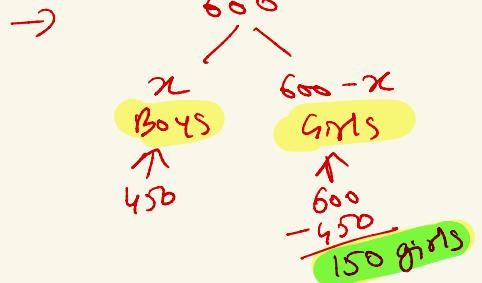
$$12x + 12y = 15x + 8y$$

$$12y - 8y = 15x - 12x$$

$$4y = 3x$$

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

④ In a school with 600 students, the avg. age of the boys is 12 years and that of the girls is 11 years. If the avg. age of the school is 11 years and 9 months, then the number of girls in the school is,



$$\text{9 months} = \frac{9}{12}$$

$$600 \times 11 \frac{9}{12} = x \times 12 + (600 - x) \times 11$$

$$600 \times \frac{150}{4} = x \times 12 + (600 - x) \times 11$$

$$7050 = 12x + 6600 - 11x$$

$$450 = x$$

⑤ The avg. salary of all the staff in an office of a corporate house is Rs 5000. The avg. salary of the officers is Rs 14000 and that of the non-officers is Rs 4000. If the total number of staff is 500, the number of officers?

→

$$500 \times 5000 = x \times 14000 + (500 - x) \times 4000$$

$$2500 = 14x + 2000 - 4x$$

$$2500 - 2000 = 10x$$

$$10x = 500$$

$$x = 50$$

### True & false Avg

① The mean of the marks obtained by 100 students is 60. If the marks obtained by one of the students was incorrectly calculated as 75, whereas the actual mark obtained by him was 65, what is the correct mean of the marks obtained by the students?

$$\rightarrow 100 \times 60 = 6000$$

Avg. marks	wrong Reading
$65 \xrightarrow{+10} 75$	

$$\frac{6000 - 10}{100}$$

$$\frac{5990}{100} = 59.9$$

② A mathematics teacher tabulated the marks secured by 35 students of 8th class. The avg. of their marks was 72. If the marks secured by Reema was written as 36 instead of 86 then find the correct average marks up to two decimal places.

$$\rightarrow 35 \times 72 = 2520$$

Reema

86	$\longrightarrow$	36
actual marks	$\downarrow -50$	wrong reading

$$\begin{aligned} & \frac{2520 + 50}{35} \\ &= \frac{2570}{35} \\ &= 73.4 \\ &= 73.43 \end{aligned}$$

③ The avg. of marks of 14 students was calculated as 71. But, it was later found that the marks of one student had been wrongly entered as 42 instead of 56 and of another as 74 instead of 32. The correct avg. is,

$$\begin{aligned} & \text{Total no. of students } 14 \quad \underline{994} + 14 - 42 \\ & \times 71 \quad \frac{994 + 14 - 42}{14} \leftarrow \text{total} \\ & = \frac{994 - 28}{14} \\ & = \frac{966}{14} \quad \text{Avg } 69 \end{aligned}$$

Actual marks      wrong reading      Actual marks      wrong reading

56	$\longrightarrow$	42
-14		
32	$\longrightarrow$	74
	$+42$	

④ The avg. marks in science subject of a class of 20 students is 68. If the marks of two students were misread as 48 and 65 of the actual marks 72 and 61, resp., then what would be the correct avg.?

$$\rightarrow 20 \times 68 = 1360 \leftarrow \text{total marks obtained by 20 students}$$

Actual marks      72      61      wrong reading

-24	$\downarrow$	48	$\downarrow +4$	65
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$$\begin{aligned} & 1360 + 24 - 4 \\ & \frac{1380}{20} \Rightarrow 69 \end{aligned}$$

⑥ The avg. marks in Eng subject of a class of 24 students is 56. If the marks of three students were misread as 44, 45 and 61 of the actual marks 48, 59 and 67, resp. then what would be the correct average?

$$\rightarrow 24 \times 56 \Rightarrow 1344 \leftarrow \text{total marks obtained}$$

Actual marks	48	59	67
-4	( -4 )	( -14 )	( -6 )
wrong reading	44	45	61

$$\begin{aligned} & 1344 + 4 + 14 + 6 \\ & = \frac{1368}{24} \Rightarrow 57 \end{aligned}$$

### Replacing a person

① The avg. age of a committee of 8 members is 40 years. A member, aged 55 years, retired and he was replaced by a member aged 39 years. The avg. age of the present committee is,

$$\rightarrow 8 \times 40 = 320 \leftarrow \text{total age of 8 members in committee}$$

$$\frac{320 - 55 + 39}{8} \Rightarrow \frac{320 - 16}{8} \Rightarrow \frac{304}{8} \Rightarrow 38 \text{ years}$$

② The avg. weight of 3 men A, B, C is 84 kg. another man, D joining the group and the avg. weight becomes 80 kg. if another man, E whose weight 3 kg more than that of D, replaces A, then avg. weight of B, C, D and E becomes 79 kg. the weight of A is,

$$\rightarrow \frac{A+B+C}{3} = 84$$

$$A+B+C = 252$$

$$\frac{A+B+C+D}{4} = 80$$

$$A+B+C+D = 320$$

$$\begin{aligned} \text{weight of } D &= 320 - 252 \\ &= 68 \xrightarrow{+3} E = 71 \text{ kg} \end{aligned}$$

$$\frac{B+C+D+E}{4} = 79 \text{ kg}$$

$$B+C+D+E = 316$$

$$B+C+68+71 = 316$$

$$B+C = 316 - 139$$

$$B+C = 177$$

$$A+B+C = 252$$

$$A+177 = 252$$

$$A = 252 - 177$$

$$A = 75$$

## Including (or) Excluding

① The avg. weight of 21 boys was recorded as 64 kg. If the weight of the teacher was added the avg. increased by one kg. what was the teacher's age?

$$\rightarrow \text{Boys} \quad \text{Boy + Teacher}$$

$$(21 \times 64) \sim (22 \times 65)$$

inc. by ①

$$1344 \sim 1430 \quad [= 86 \text{ kg}]$$

② The avg. age of 14 girls and their teacher's age is 15 yrs. If the teacher's age is excluded then the avg. reduced by 1. what is the teacher's age?

$$\rightarrow (\text{Teacher} + \text{girl}) \quad (\text{girl})$$

$$(15 \times 15) \sim (14 \times 14)$$

teacher excluded

$$225 \sim 196 \Rightarrow [29 \text{ age}]$$

③ The avg. age of 5 members of a family is 25 yrs. If the servant of the family is included the avg. age increased by 4%. what is the age of the servant?

$$\rightarrow \text{family Total age} \quad \text{family + Servant}$$

$$(5 \times 25) \sim (6 \times 35)$$

+1 servant

$$25 + 25 \times \frac{4\%}{100}$$

$$25 + 10 \\ = 35$$

$$125 \sim 210 \Rightarrow [85 \text{ age}]$$

④ The avg. age of 4 members of a family is 25 yrs. If head of family is included in this group then avg. age inc. by 20%. Find out the age of the head?

$$\rightarrow \text{family} \quad \text{family + head}$$

$$(4 \times 25) \sim (5 \times 30)$$

$$100 \sim 150 \Rightarrow \boxed{50 \text{ age}}$$

$$25 \times 20\% = 5$$

$$\frac{25+20}{100} = 5$$

$$25+5 = 30$$

⑤ The avg. age of the class is 35 yrs. 6 new students with an avg. age of 33 yrs joined in that class, thereby decreasing the avg. by half year. The original strength of the class was?

$$\rightarrow \frac{x \times 35 + 6 \times 33}{x+6} = 35 - \frac{1}{2}$$

$$\frac{35x + 198}{x+6} = 34.5$$

$$35x + 198 = 34.5x + 207$$

$$0.5x = 9$$

$$x = \frac{90}{5} = \boxed{18}$$

## Average Speed

Note ① If the certain distance is covered at the speed of  $x \text{ km/hr}$  and the same distance is covered at  $y \text{ km/hr}$  then the avg. speed during entire journey =  $\left(\frac{2xy}{x+y}\right) \text{ km/hr}$

- ① A man goes to a certain place at a speed of  $30 \text{ km/hr}$  and return to original place at a speed of  $20 \text{ km/hr}$ , find out the avg. speed during the entire journey.

$$\rightarrow \left(\frac{2xy}{x+y}\right) \text{ km/hr} \Rightarrow \frac{2 \times 30 \times 20}{50} \Rightarrow \frac{120}{5} \Rightarrow 24 \text{ km/hr}$$

- ② A train covers the first  $160 \text{ km}$  at a speed of  $120 \text{ km/hr}$ , another  $160 \text{ km}$  at  $160 \text{ km/hr}$  and last  $160 \text{ km}$  at  $80 \text{ km/hr}$ . find out the avg. speed of the train for entire journey.

$$\rightarrow \left(\frac{2xy}{x+y}\right) \text{ km/hr}$$

$$\Rightarrow \left(\frac{3xyz}{xy+yz+zx}\right)$$

Note ② If the person covers A km at a speed of  $x$  km/hr  
 B km at a speed of  $y$  km/hr and C km at a speed  
 of  $z$  km/hr. find out avg speed of entire journey

$$\left( \frac{A+B+C}{\frac{A}{x} + \frac{B}{y} + \frac{C}{z}} \right) \text{ km/hr}$$

① A person covers 9 km at a speed of 3 km/hr, 25 km  
 at a speed of 5 km/hr and 30 km at a speed of  
 10 km/hr. find out the average speed of the  
 entire journey?

$$\rightarrow \left( \frac{A+B+C}{\frac{A}{x} + \frac{B}{y} + \frac{C}{z}} \right) \text{ km/hr}$$

$$\left( \frac{9+25+30}{\frac{9}{3} + \frac{25}{5} + \frac{30}{10}} \right)$$

$$\text{speed} = \frac{\text{distance}}{\text{Time}}$$

$$S = \frac{D}{T} \rightarrow \frac{D}{S} + \frac{D}{S} + \frac{D}{S}$$

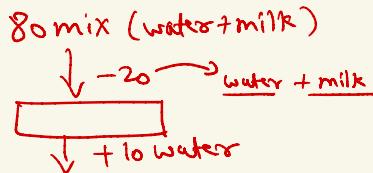
$$\boxed{= \frac{A+B+C}{\frac{A}{x} + \frac{B}{y} + \frac{C}{z}}} \text{ km/hr}$$

# Alligation and Mixture

## Removed and Replaced

- \* Removed and Replace same go with formula method.
- \* If different then apply traditional method.

### ① Traditional method



① A vessel contains 80 litres of ethanol. 20 litres of this liquid is removed and replaced with water. 20 litres of this mixture is again removed and replaced with water. How much water (in litres) is present in the vessel.

### → ① Tra. method

$$80 \text{ L (E)} \\ \downarrow -20 \\ 60 : 20 \\ (\text{E}) \quad w$$

$$\text{Ratio} \quad 3 : 1 \\ (\text{E}) \quad (\text{w})$$

$$-20 \text{ L (E (?)) (w (?))} \\ (\text{E}) \quad \frac{3}{4} \times 20 \quad | \quad (\text{w}) \quad \frac{1}{4} \times 20 \\ = 15 \qquad \qquad \qquad = 5 \\ 60 - 15 \quad : \quad 20 - 5 \\ 45 : (15 + 20) \\ 45 : 35 \text{ litres}$$

### ② Formula method

$$\frac{\text{final Quantity}}{\text{Initial Quantity}} = \left(1 - \frac{x}{c}\right)^t$$

↗ how much mixture remove  
 ↘ no. of times  
 ↙ tank capacity

### ② Formula method

$$\frac{F_Q}{I_Q} = \left(1 - \frac{x}{c}\right)^t \quad [(\text{E}) \rightarrow \text{Ethanol}]$$

$$F_Q = I_Q \left(1 - \frac{x}{c}\right)^t$$

$$F_Q = 80 \left(1 - \frac{20}{80}\right)^2$$

$$= 80 \left(1 - \frac{1}{4}\right)^2$$

$$= 80 \left(\frac{3}{4} \times \frac{3}{4}\right)$$

$$= 45 \text{ Litres (E)}$$

$$80 \text{ L} \rightarrow 45 (\text{E})$$

$$35 (\text{w}) \leftarrow \text{water}$$

② A vessel contains 20 litres of acid. 4 litres of acid is taken out of the vessel and replaced by the same quantity of water. Next 4 litres of mixture are withdrawn, and again the vessel is filled with the same quantity of water. Then find the ratio of acid left in the vessel with the quantity of acid initially in the vessel is,

→ ① Tra. method

$$\begin{matrix} 20 \text{ (A)} \\ \downarrow \\ 16 : 4 \\ (\text{A}) \quad (\text{w}) \end{matrix}$$

$$\text{Ratio} \quad 4 : 1 \\ (\text{A}) \quad (\text{w})$$

$$4L \text{ (mix)} (A(?) / w(?))$$

$$\begin{array}{c|c} \frac{4}{5} \times 4 & \frac{1}{5} \times 4 \\ \hline = \frac{16}{5} \text{ (A)} & = \frac{4}{5} \text{ (w)} \end{array}$$

$\Rightarrow 16 - \frac{16}{5} : 4 - \frac{4}{5} + 4$

+ bcz we sub.  
 from acid

$$\Rightarrow \frac{64}{5} \text{ (A)} : x(\text{w})$$

$$\Rightarrow \frac{64}{5} : 20$$

$$\Rightarrow \cancel{64} : \cancel{20}$$

$$\Rightarrow 16 : 25$$

② formula Method

$$\begin{aligned} FQ &= IQ \left(1 - \frac{x}{c}\right)^t \\ FQ &= 20 \left(1 - \frac{4}{20}\right)^2 \\ &= 20 \left(\frac{16}{20} \times \frac{16}{20}\right) \end{aligned}$$

$$\frac{FQ}{(A)} \rightarrow \frac{64}{5}$$

$$\frac{64}{5} : 20$$

$$\begin{matrix} \cancel{64} : \cancel{20} \\ 16 : 25 \end{matrix}$$

③ A vessel contains 10 litre of acid, out of which 2 litre are withdrawn. The vessel is then filled with water. Next 2 litre of the mixture are withdrawn, and again the vessel is filled up with water. The ratio of the acid left in the vessel with that of the original quantity is,

→ ① Tota. method

$$\begin{array}{c} 10 \text{ L} \\ / - 2 \\ 8 : 2 \\ (\text{A}) \quad (\omega) \end{array}$$

$$\text{Ratio} = \frac{4}{(\text{A})} : \frac{1}{(\omega)}$$

2 L mix (A (?) w(?)

$$\left. \begin{array}{l} \frac{4}{5} \times 2 \\ = \frac{8}{5} (\text{A}) \\ 8 - \frac{8}{5} \\ = \frac{32}{5} (\text{A}) \\ = \frac{32}{5} : 10 \\ = 32 : 50 \\ \boxed{= 16 : 25} \end{array} \right\} \begin{array}{l} \frac{1}{5} \times 2 \\ = \frac{2}{5} (\omega) \\ 2 - \frac{2}{5} + 2 \\ \downarrow \\ \boxed{\text{2 liter removed from acid that's why we added in water}} \end{array}$$

② formula method

$$\begin{aligned} FQ &= IQ \left(1 - \frac{x}{c}\right)^t \\ FQ &= 10 \left(1 - \frac{2}{10}\right)^2 \\ &= 10 \left(\frac{8}{10} \times \frac{8}{10}\right) \end{aligned}$$

$$\frac{FQ}{(\text{A})} = \frac{32}{5} : 10$$

$$= 32 : 50$$

$$\boxed{= 16 : 25}$$

④ A vessel has 30 L of wine and 10 L of water mixture. 4 litre of mixture is taken out from vessel and 4L of water is added. This process is repeated one more time. The ratio of quantity of wine is left and initial quantity if wine is,

→ formula method

$$\begin{aligned} FQ &= I \cdot Q \left(1 - \frac{x}{c}\right)^t \\ (w) &= 30 \left(1 - \frac{4}{40}\right)^2 \\ &= 30 \left(\frac{36}{40} \times \frac{36}{40}\right) \end{aligned}$$

$$FQ = \frac{81 \times 3}{10}$$

$$\frac{81 \times 3}{10} : 30 : 10 \therefore \boxed{81 : 100}$$

⑤ In a Jar, 120 litres of milk was mixed with 24 litres of water. 12 litres of this mixture was taken out and 3 litres of water is added. If 27 litres of newly formed mixture is taken out, what will be the resultant quantity of water (in liter) in the Jar?

→ formula method not work  
bcz removed and replaced  
are different.

Tra. method

$$\begin{array}{l} 120 : 24 \\ (\text{m}) \quad (\text{w}) \end{array}$$

$$\begin{array}{r} 5 : 1 \\ (\text{m}) \quad (\text{w}) \end{array}$$

$$\Rightarrow 12 \text{ L } (m(?) / w(?))$$

$$\frac{5}{8}x + 2^2 \mid \frac{1}{8}x + 2^2$$

$$\begin{array}{l} 120 - 10 \rightarrow 110 : 22 \\ (\text{m}) \quad (\text{w}) \end{array} \quad \begin{array}{l} 10 : 2 \\ (\text{m}) \quad (\text{w}) \end{array} \quad \begin{array}{l} 24 - 2 \\ (\text{m}) \quad (\text{w}) \end{array}$$

$$110 : 22 + 3$$

$$\begin{array}{l} 110 : 25 \\ (\text{m}) \quad (\text{w}) \end{array}$$

$$\frac{25 - 5}{+35} \times 27 = 5 \text{ (L)}$$

$$\begin{array}{l} 25 - 5 \text{ (L)} = 20 \text{ L} \\ (\text{w}) \end{array} \quad \text{Water}$$

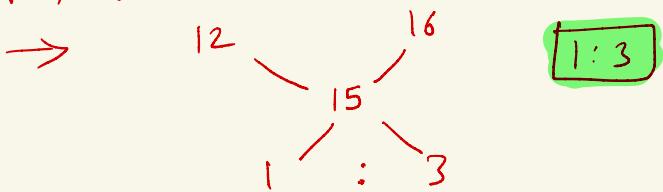
## Rule to Solve

Mean Price / Final Price / Cost Price



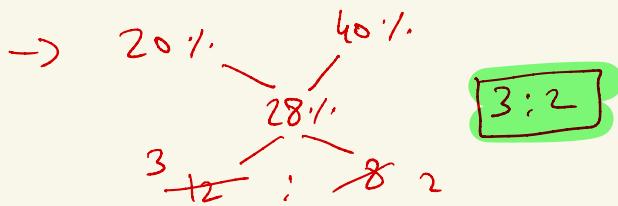
$$(Item II - MP) : (MP - Item I)$$

① A gold worker has two qualities of gold, one of 12 carats and another of 16 carats. In what proportion should he mix both to make an ornament of 15 carats purity?



$$1 : 3$$

② In what ratio should 20% acid be mixed with 40% acid solution to obtain a 28% acid solution?



$$20\% \quad 40\%$$

$$3 : 2$$

③ In two vessels A and B there is mixture of milk and water. The ratio of milk and water in these vessels is 5:2 and 8:5 resp. In what ratio these mixtures be mixed together so that the ratio of milk and water in the new mixture becomes 9:4?

$$\rightarrow A = m:w = 5:2$$

$$B = m:w = 8:5$$

$$M.P = m:w = 9:4$$

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

$$\frac{1}{13} \quad \frac{9}{13}$$

$$\frac{1}{13} : \frac{2}{9+7}$$

$$7:2$$

$$\frac{9}{13} - \frac{5}{7} \\ = \frac{63-65}{91} = \frac{2}{91}$$

④ In two blends of mixed tea, the ratio of Darjeeling and Assam tea are 4:7 and 2:5. The ratio in which these two blends should be mixed to get the ratio of Darjeeling and Assam tea in the new mixture as 6:13 is,

$$\rightarrow B_1 = 4:7 \quad \frac{4}{11} \backslash \quad \frac{2}{7}$$

$$B_2 = 2:5$$

$$m = 6:13$$

$$\begin{array}{c} \frac{2}{7} - \frac{6}{19} \quad \frac{6}{19} - \frac{4}{11} \\ \hline \frac{38-42}{19 \times 7} : \quad \frac{66-76}{19 \times 11} \\ \frac{42}{19 \times 7} : \quad \frac{10}{19 \times 11} \end{array}$$

$$22:35$$

⑤ Two vessels containing mixture of milk and water in the ratio 4:3 and 3:5 resp. The ratio of the volumes if quantities from the two vessels to be mixed together so that the new mixture may contain same volume of milk and water?

$$\rightarrow V_1 = 4:3 \quad \frac{4}{7}^{\text{(M)}} \quad \frac{3}{8}^{\text{(W)}}$$

$$V_2 = 3:5$$

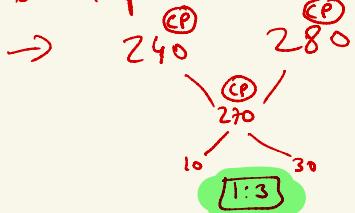
$$\text{M.P.} = 1:1$$

$$\frac{3}{8} - \frac{1}{2} \quad \frac{1}{2} - \frac{4}{7}$$

$$\frac{3-4}{8} \quad \frac{7-8}{14}$$

$$\frac{1}{8} : \frac{1}{14} \quad \therefore [7:4]$$

⑥ In what ratio tea at Rs 240/kg should be mixed with tea at Rs 280/kg so that on selling the mixture at Rs 324/kg there is a profit of 20%?



$$\begin{aligned} 100\% &= x \\ 120\% &= 324 \\ 120x &= 324 \times 100 \\ x &= \frac{324 \times 100}{120} \end{aligned}$$

$$\textcircled{P} x = 270$$

CP → Cost Price

$$\begin{aligned} CP &= \frac{100}{100 + P\%} \times S.P \\ &= \frac{100}{100 + 20} \times 324 \\ &= \frac{100}{120} \times 324 = \boxed{270} \end{aligned}$$

## New Vessel

① Three equal glasses are filled with mixture of milk and water. In the first glass as 3:1 and in second glass as 5:3 and in the third glass 9:7. The contents of the glass are emptied into a single vessel. What is the proportion of milk and water in it?

$$\rightarrow \begin{array}{ccc} V_1 & V_2 & V_3 \\ 3:1 & 5:3 & 9:7 \end{array}$$

$$\begin{array}{c} \text{milk} \quad \quad \quad \text{water} \\ \boxed{\frac{3}{4} + \frac{5}{8} + \frac{9}{16}} \cdot \boxed{\frac{1}{4} + \frac{3}{8} + \frac{7}{16}} \end{array}$$

$$\frac{12+10+9}{16} : \frac{4+6+7}{16}$$

$$\frac{31}{16} : \frac{17}{16} \quad \boxed{31:17}$$

② Three glasses of equal volume contain milk mixed with water. The ratio of milk and water are 2:3, 3:4, 4:5 resp. Contents of these glasses are poured into a large vessel. The ratio of milk and water in the large vessel is,

$$\rightarrow \begin{matrix} v_1 & v_2 & v_3 \\ 2:3 & 3:4 & 4:5 \end{matrix}$$

Water

milk

$$\left[ \frac{2}{5} + \frac{3}{7} + \frac{4}{9} \right] : \left[ \frac{3}{5} + \frac{4}{7} + \frac{5}{9} \right]$$

$$\frac{126 + 135 + 140}{315} : \frac{189 + 180 + 175}{315}$$

$$\frac{401}{315} : \frac{544}{315} \quad \therefore \boxed{401 : 544}$$

③ Three equal glasses of size 3 liters, 4 liters, and 5 liters contains mixture of milk and water in the ratio 2:3, 3:7, 4:11 resp. The contents of all the three glasses are poured into a single glass vessel. Find out the ratio of milk and water in the resultant mixture?

$$\rightarrow \begin{matrix} v_1 (3L) & v_2 (4L) & v_3 (5L) \\ 2:3 & 3:7 & 4:11 \end{matrix}$$

$$\underbrace{\frac{2}{5} \times 3 + \frac{3}{10} \times 4 + \frac{4}{15} \times 5}_{\text{milk}} : \underbrace{\frac{3}{5} \times 3 + \frac{7}{10} \times 4 + \frac{11}{15} \times 5}_{\text{water}}$$

$$\frac{6}{5} + \frac{12}{10} + \frac{20}{15} : \frac{9}{5} + \frac{28}{10} + \frac{55}{15}$$

$$\frac{36 + 36 + 40}{30} : \frac{54 + 84 + 110}{30}$$

$$112 : 248$$

$$\boxed{14 : 31}$$

④ Three containers whose volumes are in the ratio of 2:3:4 are full of mixture of milk and water. In the 1st container the ratio of milk and water is 4:1 and In 2nd is 11:4 and In 3rd is 7:3. All the three mixture are mixed in a big container. The ratio of milk and water in the resultant mixture is,

$$\rightarrow \underbrace{\frac{4}{5} \times 2 + \frac{11}{15} \times 3 + \frac{7}{10} \times 4}_{\text{milk}} : \underbrace{\frac{1}{5} \times 2 + \frac{4}{15} \times 3 + \frac{3}{10} \times 4}_{\text{water}}$$

$$\frac{8}{5} + \frac{33}{15} + \frac{28}{10} : \frac{2}{5} + \frac{12}{15} + \frac{12}{10}$$

$$\frac{48 + 66 + 84}{30} : \frac{12 + 24 + 36}{30}$$

$$198 : 72$$

$11 : 4$

find the value of  $x$

① A vessel contains milk and water in the ratio  $1:x$ , when  $300\text{ml}$  of the mixture and  $50\text{ ml}$  of water are mixed, the ratio of milk and water becomes  $2:5$

What is the value of  $x$ ?

→  $\boxed{M:W} \Rightarrow 300\text{ml}$  final ratio  
 $1:x \qquad \qquad M:W$   
 $\qquad \qquad \qquad 2:5$

option method  
 $\cancel{x}x=1 \quad \cancel{1}x=2$   
 $M:W \qquad \qquad M:W$   
 $1:1 \qquad \qquad 1:2$   
 $150:150 \qquad 100:200$   
 $+50 \qquad \qquad +50$   
 $150:200 \qquad 100:250$   
 $\boxed{3:4} \qquad \qquad \boxed{2:5}$

Traditional Method

$$\boxed{M:W} \Rightarrow 300\text{ml} \qquad \qquad \text{final ratio}$$
$$1:x \qquad \qquad M:W$$
$$2:5$$

$$\frac{\frac{1}{1+x} \times 300}{\frac{x}{1+x} \times 300 + 50} = \frac{2}{5}$$

$$\frac{\frac{300}{1+x}}{\frac{300x + 50(1+x)}{1+x}} = \frac{2}{5}$$

$$\frac{300}{300x + 50 + 50x} = \frac{2}{5}$$

$$\frac{300}{350x + 50} = \frac{2}{5}$$

$$1500 = 700x + 100$$

$$700x = 1400$$

$$\boxed{x = 2}$$

② A jar containing a mixture of milk and water in the ratio  $5:x$ . When 1 litre of water is added to 4 litres of the mixture the ratio of milk and water becomes 1:1. What is the value of  $x$ ?

$$\rightarrow \boxed{M:W} \xrightarrow[4L \text{ jar}]{\Rightarrow} M:W \\ 5:x \quad 1L \quad 1:1$$

**final ratio**

$4L \rightarrow 4000 \text{ ml}$   
 $1L \rightarrow 1000 \text{ ml}$

option  
method

(a)  $x = 3$

$$5:3$$

$$2500 \text{ ml} : 1500 \text{ ml} \\ + 1000 \text{ ml}$$

$$\left. \begin{array}{l} \frac{5}{8} \times 4000 \\ = 2500 \end{array} \right| \quad \left. \begin{array}{l} \frac{3}{8} \times 4000 \\ = 1500 \end{array} \right|$$

$$2500 : 2500$$

$$(1:1)$$

∴ Ans  $\Rightarrow$  (a) 3

Traditional  
method

$$\frac{\frac{5}{5+x} \times 4L}{\frac{x}{5+x} \times 4L + 1L} = \frac{1}{1}$$

$$\frac{\frac{20}{5+x}}{\frac{4x+5+x}{5+x}} = \frac{1}{1}$$

$$\frac{20}{5x+5} = \frac{1}{1}$$

$$20 = 5x + 5$$

$$5x = 15$$

$$\boxed{x = 3}$$