



GENERAL APTITUDE

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Mixtures & Alligation

- **Alligation** : It is the rule which enables us to find the ratio in which two or more ingredients at given prices must be mixed to produce a mixture of a desired price.(mixing / linking)
- **Mean Price** : The cost price of a unit quantity of mixture is called the mean price.
- **Dearer** : The more expensive ingredient

- Note :

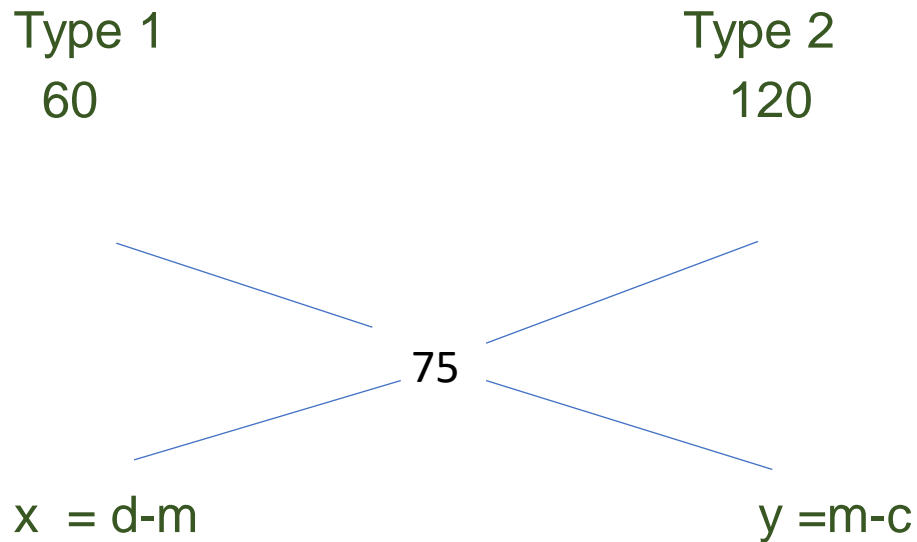
Always maintain the order in which problem is given else answer gets changed



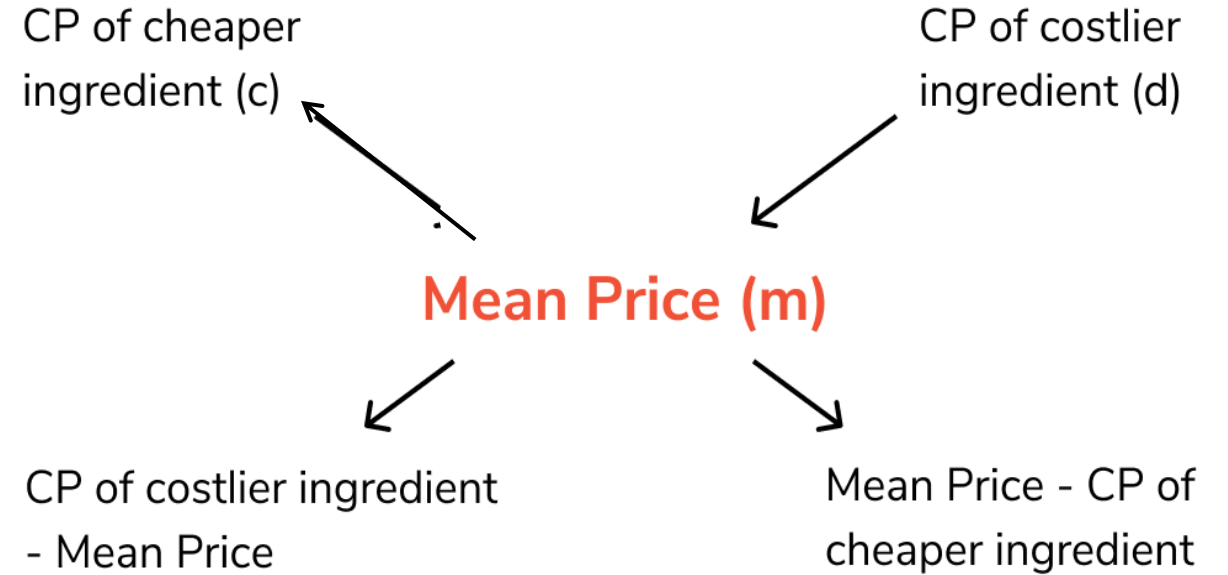
Mixtures & Alligation

Type 1 oranges at Rs.60 per kg and Type 2 oranges at Rs.120 per kg and when mixed cost is Rs.75 per kg. Find the ratio in which Type 1 and Type 2 oranges are mixed.

Soln:



$$\frac{x}{y} = \frac{d-m}{m-c} = \frac{120-75}{75-60} = \frac{45}{15} = \frac{3}{1} = 3:1$$



$$\frac{\text{Quantity of cheaper ingredient}}{\text{Quantity of costlier ingredient}} = \frac{d - m}{m - c}$$

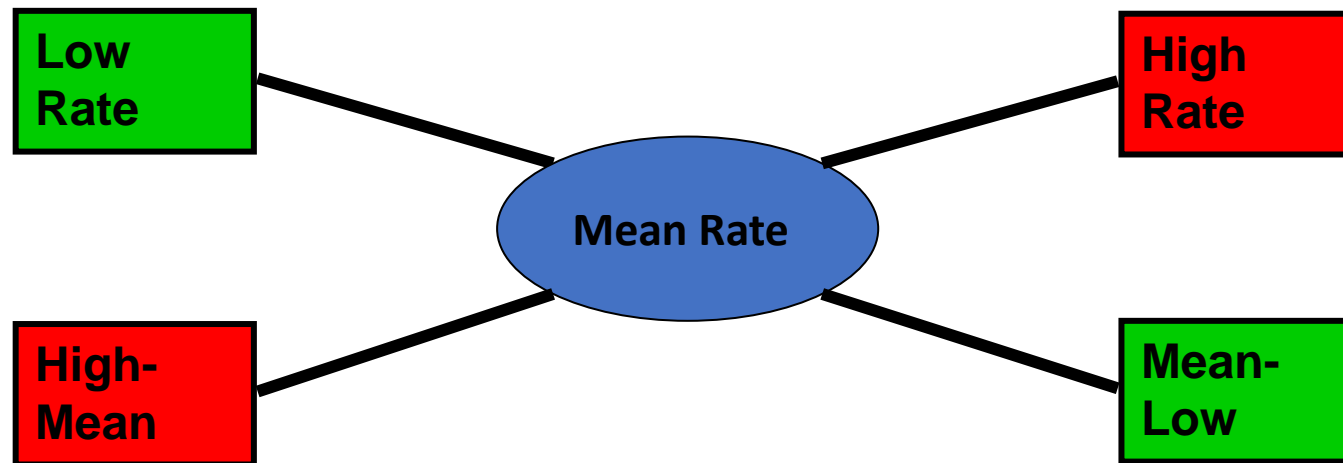


Mixtures & Alligation

$$\frac{\text{Quantity of Lower}}{\text{Quantity of Higher}} = \frac{(\text{C.P. of Higher}) - (\text{Mean Price})}{(\text{Mean Price}) - (\text{C.P. of Lower})}$$

$$\frac{Q_l}{Q_h} = \frac{CP_h - CP_m}{CP_m - CP_l}$$

$$(\text{Qty Low}) : (\text{Qty High}) = (CP_h - CP_m) : (CP_m - CP_l)$$



Mixtures & Alligation

Q. CP of rice A is Rs. 15/kg and CP of rice B is Rs.20/kg. If both A and B are mixed in the ratio 2:3. Then find the price per kg of the mixed rice.

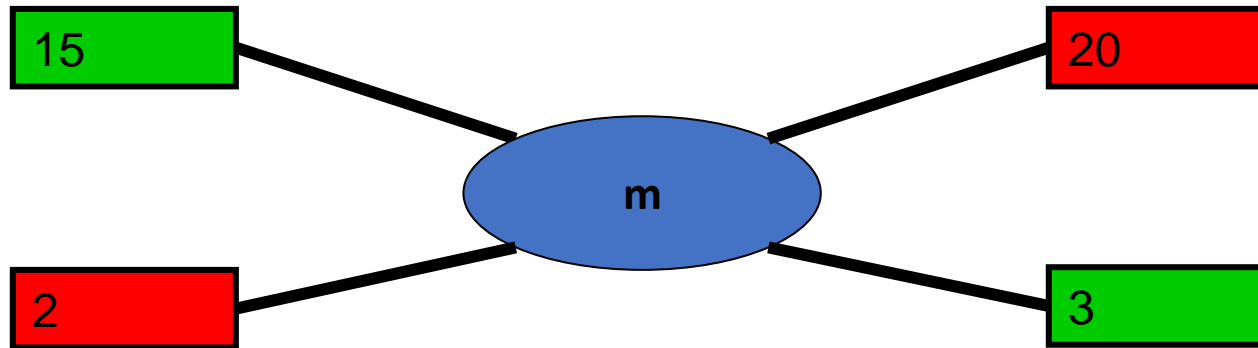
A. Rs. 28

B. Rs. 17

C. Rs. 18

D. Rs. 48

Soln:



$$\frac{x}{y} = \frac{d-m}{m-c}$$

$$\frac{2}{3} = \frac{20-m}{m-15}$$

$$m = \frac{90}{5} = \text{Rs.18}$$

Ans: C



Mixtures & Alligation

Q. In what ratio must a grocer mix two varieties of dal worth Rs. 60/kg & Rs. 65/kg, so that selling the mixture at 68.20/kg, he may gain 10%.

Soln:

- Mean price is always CP
- Steps-
 1. $m = ?$
 2. $m = \text{cost price (CP)}$
 3. $SP = \text{given}$
 4. find $x/y = ?$



Mixtures & Alligation

In what ratio must a grocer mix two varieties of dal worth Rs. 60/kg & Rs. 65/kg, so that selling the mixture at 68.20/kg, he may gain 10%.

A. 3:2

B. 2:3

C. 3:4

D. 4:3

- SP of 1 kg of mixture = Rs. 68.20

- Gain = 10%

- In case of profit, $SP = \frac{C.P. \times (100 + \%gain)}{100}$

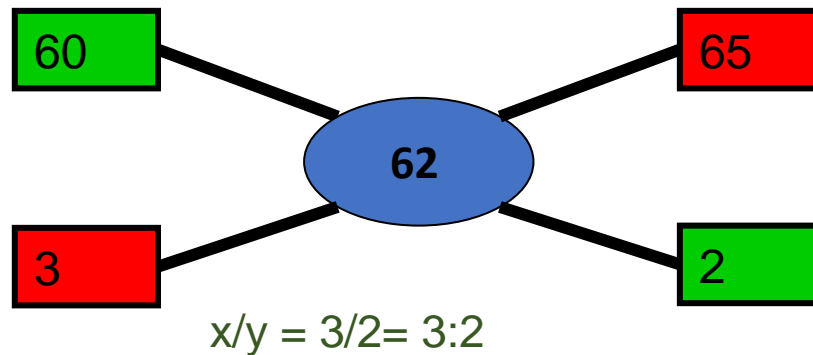
- CP of 1kg of mixture = Rs $(\frac{100}{100+10} \times 68.2)$
 $= \frac{682}{11}$

- Mean price = Rs. 62

- By the rule of alligation, we have :

- C.P. of 1kg dal of 1st kind

C.P. of 1kg dal of 2nd kind



Ans: A

Mixtures & Alligation

Q. A person blends two varieties of tea, one cost Rs. 160/kg and other cost Rs. 200/kg in the ratio 5 : 4. He sells the blended variety at Rs.192/kg. Find the profit %.

- A. 6% B. 8% C. 7% D. 9%

Soln :

$$\frac{x}{y} = \frac{d-m}{m-c}$$

$$\frac{5}{4} = \frac{200-m}{m-160}$$

$$5m - 800 = 800 - 4m$$

$$9m = 1600$$

$$m = \frac{1600}{9}$$

SP=Rs.192(given) , CP =mean price

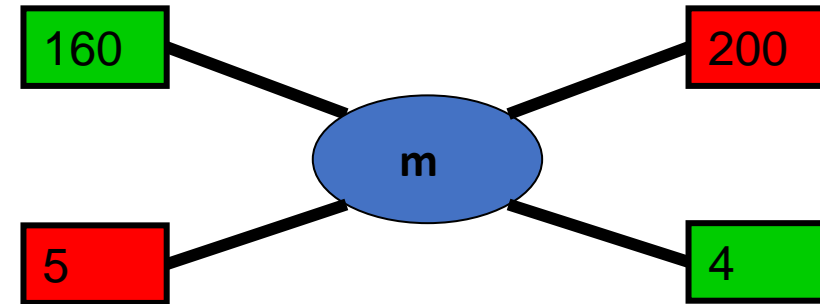
$$\text{Profit\%} = \frac{\text{SP}-\text{CP}}{\text{CP}} \times 100$$

$$= \frac{192 - \frac{1600}{9}}{\frac{1600}{9}} = \frac{1728 - 1600}{1600} = \frac{128}{16} = 8\%$$

Ans: B

cheaper price

dearer price



Mixtures & Alligation

Q. Two jars A and B contain milk and water in the ratio 7:5 and 17:7 respectively. In what ratio mixtures from two vessels should be mixed to get a new mixture containing milk and water in the ratio 5:3?

A. 2:1

B. 1:2

C. 2:3

D. 3:4

Soln:

For these type of questions consider 1 ingredient out of the two ingredients and represent as fraction of one.

A

m:w

7:5

B

m:w

17:7

C

m:w

5:3

We consider milk here, so fraction of milk,

A

$$\frac{7}{7+5} = \frac{7}{12}$$

B

$$\frac{17}{17+7} = \frac{17}{24}$$

C

$$\frac{5}{5+3} = \frac{5}{8}$$

Ans: A

To make calculations easier, convert all denominator into common one

So, find $\text{LCM}(12, 24, 8) = 24$

A

$$\frac{7}{12} \times \frac{2}{2} = \frac{14}{24}$$

B

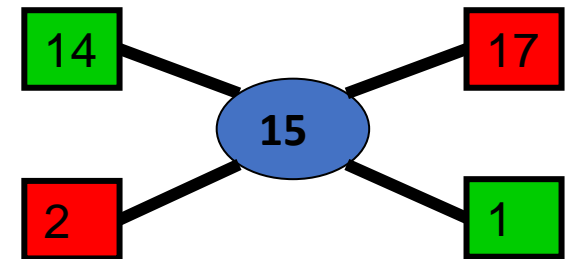
$$\frac{17}{24}$$

C

$$\frac{5}{8} \times \frac{3}{3} = \frac{15}{24}$$

forget denominators,

By rule of Alligation,



2:1



Mixtures & Alligation

Q. How many kg of sugar costing Rs. 9 per kg must be mixed with 27kg of sugar costing Rs. 7 per kg, so that there maybe a gain of 10% by selling the mix at 9.24 per kg ?

A. 62kg

B. 63kg

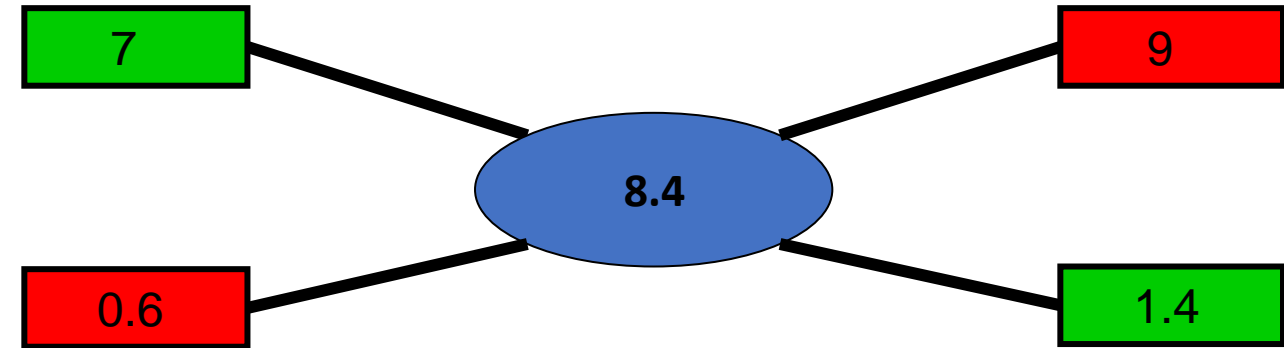
C. 53kg

D. 59kg

Soln:

$$SP = \frac{C.P. \times (100 + \%gain)}{100}$$

$$CP \text{ (Mean)} = 9.24 \times 100/110 = 8.4$$



- Qty of Low : Qty of High = $0.6/1.4 = 6/14 = 3/7$
- $27 / Q_H = 3/7$
- $Q_H = 27 \times 7/3 = 63 \text{ kg}$

Ans: B



Mixtures & Alligation(Assignment)

Q. What quantity of sugar costing Rs 21.20 per kg must be mixed with 144 kg of sugar priced at Rs 26.20 per kg so that 10% may be gained by selling mix at Rs 25.30/kg ?

A. 256 kg

B. 265 kg

C. 244 kg

D. 144 kg

Ans: A



Mixtures & Alligation(Assignment)

Q. Find the ratio in which the contains of 2 jars A & B containing spirit & water in the ratio 1:3 & 3:2 respectively must be mixed so that resulting mixture contains 45% spirit?

A. 2:3

B. 3:5

C. 3:2

D. 3:4

Ans D



Mixtures & Alligation(Assignment)

Q. Two solutions have milk : water ratio of 2:3 and 4:5. In what ratio must they be mixed such that the resultant solution has milk : water ratio of 3:4?

A. 8:3 B. 3:8 C. 5:9 D. 9:5

Ans : C



Mixtures & Alligation(Assignment)

Q. In what ratio rice at Rs. 9.30/kg be mixed with rice at Rs. 10.80/kg. So that the mixture be worth Rs. 10/kg.

A. 6:5

B. 8:7

C. 3:7

D. 6:1

Ans : B



Mixtures & Alligation(Assignment)

Q. The ratio, in which tea costing Rs. 192 per kg is to be mixed with tea costing Rs. 150 per kg so that the mixed tea when sold for Rs. 194.40 per kg, gives a profit of 20%.

A. 2 : 5

B. 3 : 5

C. 5 : 3

D. 5 : 2

Ans : A



Mixtures & Alligation(Assignment)

Q. In what ratio must a mixture of 30% alcohol strength be mixed with that of 50% alcohol strength so as to get a mixture of 45% alcohol strength?

A. 1 : 2

B. 1 : 3

C. 2 : 1

D. 3 : 1

Ans : B



Mixtures & Alligation(Assignment)

Q. A mixture of 70 litres of alcohol and water contains 10% of water. How much water must be added to the above mixture to make the water 12.5% of the resulting mixture?

A. 1 litre B. 1.5 litres C. 2 litres D. 2.5 litres

Ans: C

- Water=10% of 70 lit=7 lit,
- alcohol=90% of 70 lit=63 lit.
- Let, x lit water must be added.
$$\frac{(7+x)}{63} = \frac{12.5\%}{87.5\%}$$
- $7 + x = 787.5/87.5$
 $7 + x = 9$
- x=2 litres



Mixtures & Alligation(Assignment)

Q. In what ratio should two qualities of coffee powder having the rates of ₹47 per kg and ₹32 per kg be mixed in order to get a mixture that would have a rate of ₹37 per kg?

A. 1 : 2

B. 4 : 1

C. 1 : 3

D. 3 : 1

E. 1 : 4

Ans: A



Mixtures & Alligation(Assignment)

Q. How many kilograms of tea worth Rs. 3. 60 per kg. must be mixed with 8 kg. of tea worth Rs. 4.20 per kg. so that by selling the mixture at Rs. 4.40 per kg. There may be a profit of 10%.

A) 4 kg

B) 3 kg.

C) 6 kg.

D) 8 kg.

Ans: A



Percentage

- Percentage is a fraction whose denominator is 100(per 100)

Fract ion x100	% ÷100	Fracti on	%	Fracti on	%	Fracti on	%	Fracti on	%
				1/1	100%	1/6	16.66 %	1/11	9.09 %
3/4	75%	5/4	125%						
4/5	80%	3/2	150%	1/2	50%	1/7	14.28 %	1/12	8.33 %
2/3	66.66 %	1/16	6.25%	1/3	33.33 %	1/8	12.5 %	1/13	7.69 %
5/6	83.33 %			1/4	25%	1/9	11.11 %	1/14	7.14 %
6/5	120%			1/5	20%	1/10	10%	1/15	6.66 %



Percentage

Q. x is 83.33% of y . So y is _____% of x

Solution:

$$x = 83.33y$$

$$x = \frac{5}{6} y$$

$$\text{So, } y = \frac{6}{5} x$$

$y = 120\%$ (from chart)

Fraction $\times 100$	%	Fraction	%
	100		
$3/4$	75%	$5/4$	125%
$4/5$	80%	$3/2$	150%
$2/3$	66.66 %	$1/16$	6.25%
$5/6$	83.33 %		
$6/5$	120%		



Percentage

Q. x is 80% of y. So y is _____% of x

Solution:

$$x = 80y$$

$$x = \frac{4}{5} y$$

$$\text{So, } y = \frac{5}{4} x$$

$$y = 125\%$$



Percentage

Q. A number x is increased by 20% then the number is decreased by 20%. Find the net % change.

- **Soln** :
- If a number is increased / decreased by $x\%$ then there is always a loss of $-(x/10)^2$
- Net % Change = $-(20/10)^2 = -(400/100) = -4\%$ (loss)
- **OR**
- Let the number be 100
- $100 \uparrow$ by 20% = 120
- So 20% \downarrow of 120 = 96

• 100 120 96

-4% = net change




Percentage

Q. A number x is increased by 50% then the number is increased by 20% and again by 10%. Find the net % change

Soln:

- Let the number be 100
- $100 \uparrow$ by 50% = 150
- Again, $150 \uparrow$ by 20% = 30, So $150 + 30 = 180$
- $10\% \uparrow$ of 180 = 18, So, $180 + 18 = 198$

• 100 150 180 198



98% = net change



Percentage

- **Two Step change of Percentage**

In first step if number is changed by a% and the result is again changed by b% the net percentage change of original number is given by

$$\text{Net \% Change in Number} = a + b + \frac{ab}{100} \quad (+ve \text{ or } -ve)$$



Percentage

Q. If a number is increased by 12 % & then decreased by 18% then the net % change in number is

Soln:

Net % Change in Number = $a + b + \frac{ab}{100}$ (+ve or -ve)

$$\begin{aligned}\% \text{ Change} &= 12 - 18 + (12 \times -18)/100 \\ &= -6 - 2.16 \\ &= -8.16\%\end{aligned}$$



Percentage

- Percentage Change & effect on Product

If $A \times B = \text{Product}$

If A is changed by $a\%$ & also B is changed by $b\%$ then

Net % Change in Product = $a + b + \frac{ab}{100}$ (+ve or -ve)



Percentage

Q. Find % Change of area of rectangle if length increases by 30% & breadth decreases by 12%

Soln :

Net % Change in Number = $a + b + \frac{ab}{100}$ (+ve or -ve)

$$\begin{aligned}\% \text{ Change of Area} &= +30 - 12 + (30 \times -12)/100 \\ &= 18 - 3.6 = + 14.4\%\end{aligned}$$



Percentage

Q. If the radius of a circle is decreased by 50%, find the percentage decrease in its area.

- A. 55%
- B. 65%
- C. 75%
- D. 85%

• **Soln:**

- Area of a circle = πr^2 where r is the radius
=> Area is directly proportional to r^2
- Assume the old radius is = $r_1=100$
- $A_1 = \pi \times 100^2 = 10000\pi$

Assume the new radius is = $r_2=50$

$$A_2 = \pi \times 50^2 = 2500\pi$$

$$\text{Decrease in area} = 10000\pi - 2500\pi = 7500\pi$$

$$\text{Percentage decrease in area} = \frac{\text{difference}}{\text{old}} \times 100 = \frac{7500\pi}{10000\pi} \times 100 = 75\%$$

• **Ans : C**



Percentage

- Expenditure = Price x Consumption
- $P \propto \frac{1}{\text{Consumption}}$
- So, for expenditure to remain constant, when one quantity increases the other quantity should decrease proportionally.
- **Eg:** If the price of a commodity is decreased by 20% and its consumption is increased by 20%, what will be the increase or decrease in expenditure on the commodity?
- Soln:

Net % Change = a + b + ab/100 (+ve or -ve)

$$\begin{aligned}\% \text{ Change} &= -20 + 20 + (-20 \times 20)/100 \\ &= 0 - 4 = -4\%\end{aligned}$$

OR

100 ==> 20%↓(Decrease in Price) ==> 80 ==> 20%↑(Increase in Consumption) ==> 96.
| Thus, there is a decrement of 4%



Percentage

Q. Two numbers are respectively 40% and 60% more than a third number. The ratio of the two numbers is:

A. 7:8

B. 3 : 5

C. 4 : 5

D. 6 : 7

Soln:-

- Let the third number be 100
- First number = 40% more than 100 = $100 + 40\% \text{ of } 100 = 100 + 40 = 140$
- Second number = 60% more than 10 = $x + 60\% \text{ of } 100 = 100 + 60 = 160$
- Ratio = $\frac{\text{first number}}{\text{second number}} = \frac{140}{160} = \frac{7}{8} = 7 : 8$

Ans: A



Percentage using x

Q. Two numbers are respectively 40% and 60% more than a third number. The ratio of the two numbers is:

A. 7:8

B. 3 : 5

C. 4 : 5

D. 6 : 7

Soln:-

- Let the third number be x.

- First number = 40% more than x = $x + 40\% \text{ of } x = x + \frac{40}{100}x = \frac{100x+40x}{100} = \frac{140x}{100}$

- Second number = 60% more than x = $x + 60\% \text{ of } x = x + \frac{60}{100}x = \frac{100x+60x}{100} = \frac{160x}{100}$

- Ratio = $\frac{\text{first number}}{\text{second number}} = \frac{\frac{140x}{100}}{\frac{160x}{100}} = \frac{140x}{160x} = \frac{7}{8} = 7 : 8$

Ans: A



Percentage(Assignment)

Q. If the price of sugar increases by 25%, by what percent will a housewife have to reduce her consumption to leave total expenditure on sugar unchanged?

- A. 25% B. 35% C. 20% D. 15%

Ans: C



Percentage(Assignment)

Q. 1.14 expressed as a per cent of 1.9 is:

- A. 6% B. 10% C. 60% D. 90%

Ans: C



Percentage(Assignment)

Q. A number x is increased by 20% then the number is increased by 10% and again by 50%. Find the net % change.

A. 77% B. 75% C. 88% D. 98% E. 99%

Ans : D



Percentage(Assignment)

Q. If the altitude of a triangle increases by 5% and the base of the triangle increases by 7%, by what percent will the area of the triangle increase?

A. 12.25% B. 12.35% C. 6.00% D. 5.25%

Ans B



Percentage(Assignment)

Q. The length and breadth of a room are increased by 25% and 40% respectively. While the height is decreased by 20%. Find % change.

A. 16%

B. 40%

C. 60%

D. 30%

Ans B



Percentage(Assignment)

Q. If the length of a rectangle is increased by 37.5% and its breadth is decreased by 20%, find the change in its area.

A. 15% increase B. 13% decrease C. 10% increase D. 10% decrease

Ans: C



Profit & Loss

- Basics

Profit (Gain) = (S.P – C.P)

Loss =(C.P – S.P)

% gain = (Gain / C.P) x 100

% loss = (Loss / C.P) x 100

- Multipliers to find S.P

In Case of Profit : S.P. = C.P. x **(100 +%gain)/100**

In Case of Loss : S.P. = C.P. x **(100 - %loss)/100**

i.e For sale at 25% profit S.P. = 125 % of C.P.

For sale at 25% loss S.P. = 75% of C.P.



Profit & Loss

Q. A man bought certain no of oranges at the rate of 5 for Rs 4 and sold them at the rate of 4 for Rs 5. Find his overall profit/loss percentage?

A. 25.5% Pr

B. 36.5% Pr

C. 56.2% Pr

D. 64.5% Pr

Soln

Cost Price

Oranges→	Rs	Oranges→	Rs
5 →	4	4 →	5
20 →	16	20 →	25

SP>CP, so profit

$$\begin{aligned}P\% &= (SP - CP)/CP \times 100 \\&= (25-16)/16 \times 100 \\&= 225/4 = 56.20\%\end{aligned}$$

Ans: C

Cost Price

Oranges→	Rs
5 →	4
1 →	$\frac{4}{5}$

Selling Price

Oranges→	Rs
4 →	5
1 →	$\frac{5}{4}$

SP>CP, so profit

$$\begin{aligned}P\% &= (SP - CP)/CP \times 100 \\&= \frac{\left(\frac{5}{4} - \frac{4}{5}\right)}{\frac{4}{5}} \times 100 = \frac{\left(\frac{9}{20}\right)}{\frac{4}{5}} \times 100 \\&= 225/4 = 56.20\%\end{aligned}$$



Profit & Loss

Q. If selling price is doubled, the profit triples. Find the profit %.

A. $66\frac{2}{3}\%$

B. 100%

C. $105\frac{1}{3}\%$

D. 120%

Soln:

Let, CP = C , SP=S

As they ask profit % , we know profit = SP – CP

As per given,

$$3(S-C) = 2S-C$$

$$3S - 3C = 2S - C$$

$$S = 2C$$

$$\text{But, Profit} = S - C = 2C - C = C$$

$$\text{Profit \%} = \frac{\text{profit}}{\text{CP}} \times 100 = \frac{C}{C} \times 100 = 100\%$$

Ans : B



Profit & Loss

Q. A shopkeeper sells his goods at 20% profit and to make an extra profit he gives only 800 gm per kg. Find his profit %

A. 25% Pr B. 33.33% Pr C. 50% Pr D. 25% Ls

Soln

CP	SP	Profit
100	120	20
80	120	40
% Profit	$= 40/80 \times 100$ $= 1/2 \times 100$ $= 50\%$	

Ans: C



Alligation

Q. A person blends two varieties of tea , one cost Rs. 160/kg and other cost Rs. 200/kg in the ratio 5 : 4. He sells the blended variety at Rs.192/kg. Find the profit %.

Soln :

$$\frac{x}{y} = \frac{d-m}{m-c}$$
$$\frac{5}{4} = \frac{200-m}{m-160}$$

$$5m - 800 = 800 - 4m$$

$$9m = 1600$$

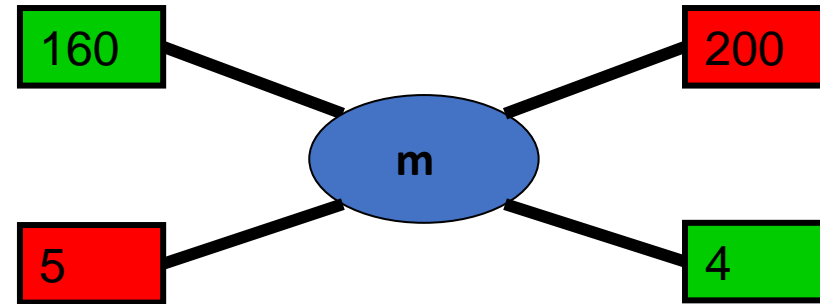
$$m = \frac{1600}{9}$$

SP=Rs.192(given) , CP =mean price

$$\text{Profit\%} = \frac{\text{SP}-\text{CP}}{\text{CP}} \times 100$$
$$= \frac{192 - \frac{1600}{9}}{\frac{1600}{9}} = \frac{1728 - 1600}{1600} = \frac{128}{16} = 8\%$$

cheaper price

dearer price



Profit & Loss(Assignment)

Q. A bookseller sells 84 books at the cost of 72 books. Find his profit or loss%

A. 14.28% B. 28.24% C. 20.4% D. 12.86%

Ans : A



Profit & Loss(Assignment)

Q. A vendor bought 6 oranges for Re 10 and sold them at 4 for Re 6. Find his loss or gain percent.

A. 8% gain

B. 10% gain

C. 8% loss

D. 10% loss

Ans: D



Profit & Loss(Assignment)

Q. A shopkeeper sells his goods at 10% loss but uses a weight of 750gms instead of 1kg. Find profit %

- A. 20% Pr B. 14.28% Pr C. 30% Pr D. 25% Ls**

Ans: A



Profit & Loss(Assignment)

Q. A fruit seller buys oranges at 4 for Rs. 3 and sells them at 3 for Rs. 4. Find its profit percent.

A. 43.75% Pr

B. 77.7% Pr

C. 75% Pr

D. 65.7% Ls

Ans: B



Profit & Loss(Assignment)

Q. A man buys a cycle for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the cycle?

A. Rs. 1090

B. Rs. 1160

C. Rs. 1190

D. Rs. 1202

Ans: C



Profit & Loss(Assignment)

Q. 100 oranges are bought at the rate of Rs. 350 and sold at the rate of Rs. 48 per dozen. The percentage of profit or loss is:

- A. $14 \frac{2}{7}\%$ gain B. 15% gain C. $14 \frac{2}{7}\%$ loss D. 15 % loss

Ans: A



Profit & Loss(Assignment)

Q. A man bought a horse & carriage together for Rs 15600 & sold them together, the horse at 36% profit & the carriage at 15% loss. If selling price of both is equal. Find the cost of the carriage?

A. Rs.6000

B. Rs.7600

C. Rs.3600

D. Rs.9600

- **Soln**

- Let CP of horse be H & Carriage be C $\rightarrow H+C= 15600$

- SP of both is equal

- So, comparing the CPs

- $136H/100 = 85C/100$

- $H = 5C/8$

- $5C/8 + C = 15600$

- $13C/8 = 15600$

- $C = 1200 \times 8$

- $C = 9600$

Ans: D



Ages(Assignment)

Q. The sum of the ages of two brothers 21 years hence will be twice the sum of their ages today. If the difference in their ages is 12 years, how old is the younger brother?

A. 27 years

B. 21 years

C. 17 years

D. 15 years

Ans : D

Soln-

Present age of elder brother = x

Present age of younger brother = y

After 21 years , elder brother = $x+21$ and younger brother = $y+21$

As per given condition,

$$x+21 + y+21 = 2(x + y) \quad \text{----- (1)}$$

$$x - y = 12 \quad \text{----- (2)}$$

Solving 1 and 2 , we get ,

$x = 27$ years and $y = 15$ years



Ratio & Proportion(Assignment)

Q. The incomes of A & B are in the ratio 3:2. Their respective expenditures are in the ratio 5:3. If each of them saves Rs. 2000, what is the income of B?

A. Rs 12,000

B. Rs 8,000

C. Rs 16,000

D. Rs 6,000

Ans : B



