



# GENERAL APTITUDE

Trainer : Sujata Mohite  
[sujata.mohite@sunbeaminfo.com](mailto:sujata.mohite@sunbeaminfo.com)



# 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:**

Type 1  
60

Type 2  
120

75

$$x = d - m$$

$$y = m - c$$

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

CP of cheaper  
ingredient (c)

CP of costlier  
ingredient (d)

**Mean Price (m)**

CP of costlier ingredient  
- Mean Price

Mean Price - CP of  
cheaper ingredient

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

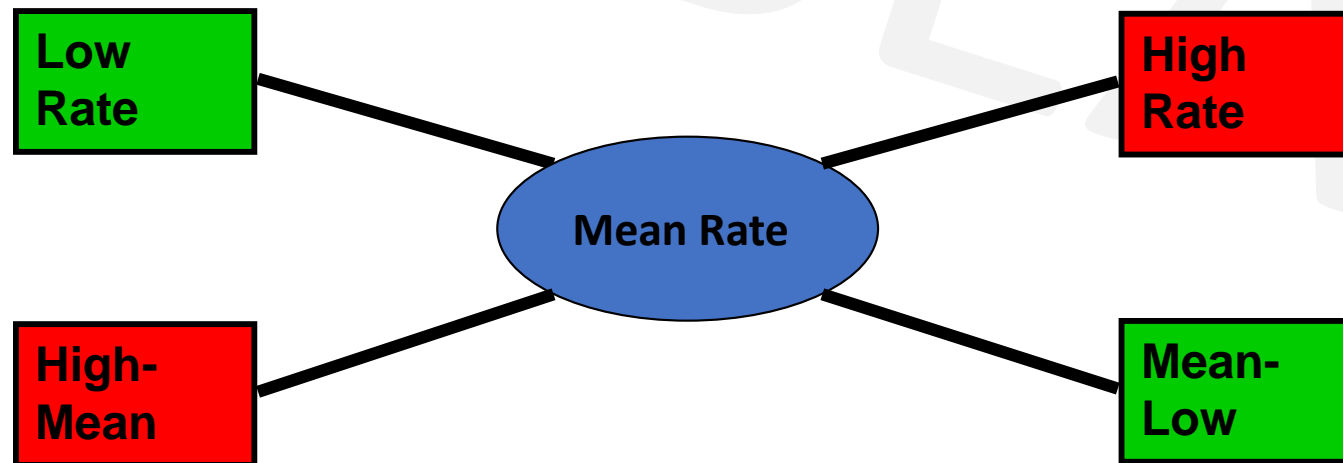


# Mixtures & Alligation

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

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

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



# 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.

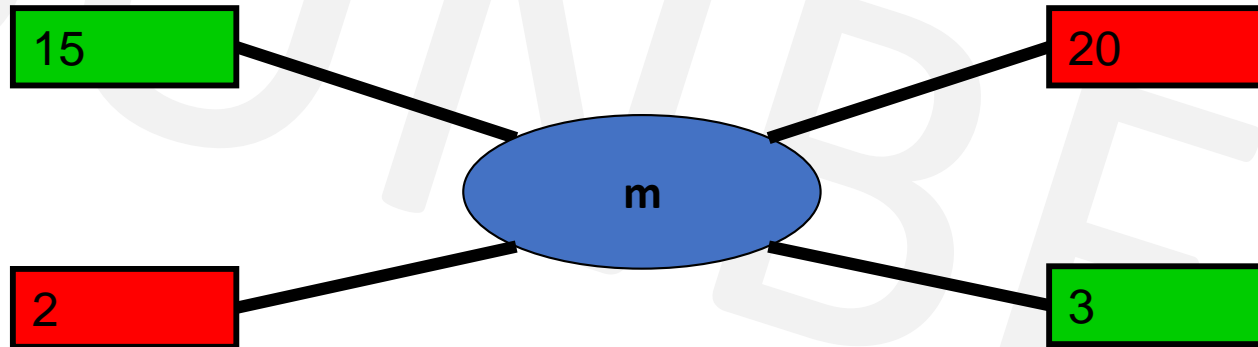
A. Rs. 28

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%.

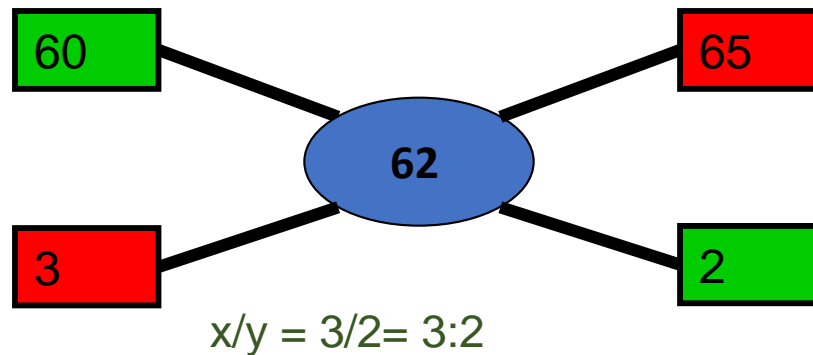
A. 3:2

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 1<sup>st</sup> kind
- C.P. of 1kg dal of 2<sup>nd</sup> 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

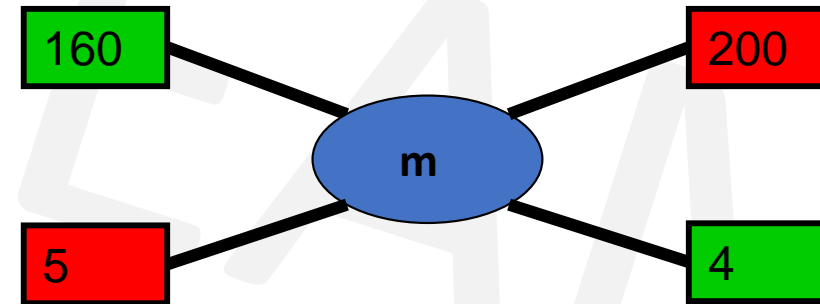
$$\text{Profit\%} = \frac{\text{SP}-\text{CP}}{\text{CP}} \times 100$$

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

**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

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

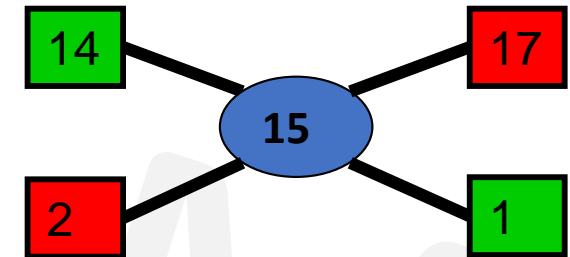
$$\frac{17}{24}$$

C

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

forget denominators,

By rule of Alligation,



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**



# Mixtures & Alligation

Q. Two vessels A and B contain spirit and water mixed in the ratio 5:2 and 7:6 respectively. Find the ratio in which these mixtures are mixed to obtain a new mixture in vessel C containing spirit and water in the ratio 8:5?

- A. 4:3
- B. 3:4
- C. 5:6
- D. 7:9

**Ans: D**



# 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

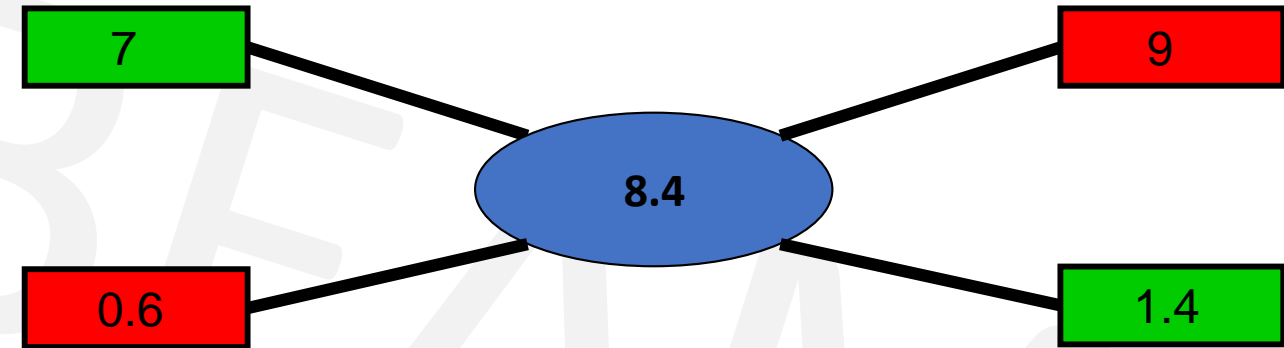
C. 53kg

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

- **Final concentration = Initial  $(1 - \frac{R}{\text{Initial}})^n$**
- where,
- Final concentration is the amount of concentration remaining after the process
- n is the number of times the process is done and
- R is the replaced quantity.
- Initial is the initial concentration



# Mixtures & Alligation

Q. A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?

A. 26.34 litres

B. 27.36 litres

C. 28 litres

D. 29.16 litres

**Ans: D**

- The volume of milk remaining after the three processes is,

$$\begin{aligned} \bullet V &= N \left(1 - \frac{R}{N}\right)^n \\ &= 40 \left(1 - \frac{4}{40}\right)^3 \\ &= 40 \left(1 - \frac{1}{10}\right)^3 \\ &= 40(0.729) \\ &= 29.16 \end{aligned}$$

where,

N is the original amount of milk,  
n is the number of processes and  
R is the replaced quantity.



# Mixtures & Alligation(Assignment)

Q. A container contains 100 L of milk. From this container 10 L of milk was taken out and replaced by water. This process was further repeated three times. How much milk does the container have now?

A. 72.9 litres

B. 65.61 litres

C. 34.39 litres

D. 81 litres

**Ans: B**

Final concentration = Initial concentration  $(1 - \text{Replaced}/\text{Initial})^n$



# Mixtures & Alligation(Assignment)

Q. The ratio of milk to water in 80 litres of a mixture is 7 : 3. The water (in litres) to be added to it to make the ratio 2 : 1 is ?

A. 4 litres

B. 5 litres

C. 6 litres

D. 8 litres

**Soln:**

Mixture = 80 litres

Milk : Water

7 : 3 = 7+3 = 10(total parts of mixture)

Quantity of Milk =  $\frac{7}{10} \times 80 = 56$  litres

Quantity of Water =  $\frac{3}{10} \times 80 = 24$  litres

Let quantity of water added be 'x' litres

$$\frac{56}{24+x} = \frac{2}{1}$$

$$56 = 48 + 2x$$

x = 4 litres of water is to be added.

Let, Milk = 7x and Water = 3x

$$7x + 3x = 80 \text{ litres}$$

$$10x = 80$$

$$x = 8 \text{ litres}$$

**OR**

$$\text{Milk} = 7x = 7 \times 8 = 56 \text{ litres}$$

$$\text{Water} = 3x = 3 \times 8 = 24 \text{ litres}$$

$$\frac{56}{24+x} = \frac{2}{1} \quad 56 = 48 + 2x$$

x = 4 litres of water is to be added.

**Ans : A**



# 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**





# Mixtures & Alligation(Assignment)

Q. The ratio of milk to water in 20 litres of a mixture is 3 :1. The Milk (in litres) to be added to the mixture so as to have milk and water in the ratio 4 : 1 is ?

A. 7 litres

B. 4 litres

C. 5 litres

D. 6 litres

**Ans: C**



# Mixtures & Alligation(Assignment)

Q. In what ratio must water be mixed with milk costing Rs. 12 per litre to obtain a mixture worth of Rs. 8 per litre?

A. 1 : 2

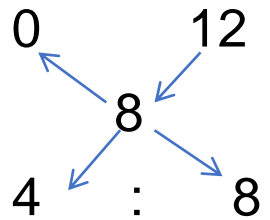
B. 2 : 1

C. 2 : 3

D. 3 : 2

**Ans: A**

By the rule of alligation :



Ratio of water to milk

= 4 : 8

= 1 : 2



# 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. A man bought banana at the rate of 8 for Rs 34 and sold them at the rate of 12 for Rs 57  
How many banana should be sold to earn a net profit of Rs. 45?

- A. 90                      B. 100                      C. 135                      D. 150

**Soln:-**

<u>Cost Price</u>		<u>Selling Price</u>	
banana →	Rs	banana →	Rs
• 8 →	34	• 12 →	57
• 1 →	$\frac{34}{8} = \frac{17}{4}$	• 1 →	$\frac{57}{12} = \frac{19}{4}$

- SP > CP, so profit
- Profit = (SP – CP)
- $= \frac{19}{4} - \frac{17}{4} = \frac{1}{2}$

No. of banana to make a profit of Rs.45

$$= \frac{\text{Profit total}}{\text{Profit one}} = \frac{45}{1/2} = 90 \text{ banana}$$

**Ans: A**



# Profit & Loss

Q. A shopkeeper purchases 11 sword for Rs.10 and sells them at the rate of 10 sword for Rs. 11. He earns a profit % of?

A. 11%

B. 15%

C. 20%

D. 21%

**Ans: D**



# 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. If the cost price of 6 pencils is equal to the selling price of 5 pencils, then the gain per cent is

- A. 10%                      B. 20%                      C. 15%                      D. 25%

Soln:

Let the cost price of one pencil be Rs.1.

CP of 5 pencils =Rs. 5

CP of 6 pencils =Rs. 6

as, SP of 5 pencils = CP of 6 pencils

SP of 5 pencils = Rs.6

if,  $SP > CP$  so it's a profit

profit =  $SP - CP$

=  $6 - 5$

= 1

Profit % =  $\text{profit}/\text{cp} \times 100$

=  $1/5 \times 100$

= 20%

$SP = CP + \text{gain}$

6 times CP is equal to 5 times SP

$6CP = 5SP$

$6CP = 5(CP + \text{gain})$

$6CP = 5CP + 5\text{gain}$

$CP = 5 \text{ gain}$

Gain % =  $\text{gain}/CP \times 100$

=  $1/5 \times 100$

= 20%

**Ans: B**





# 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

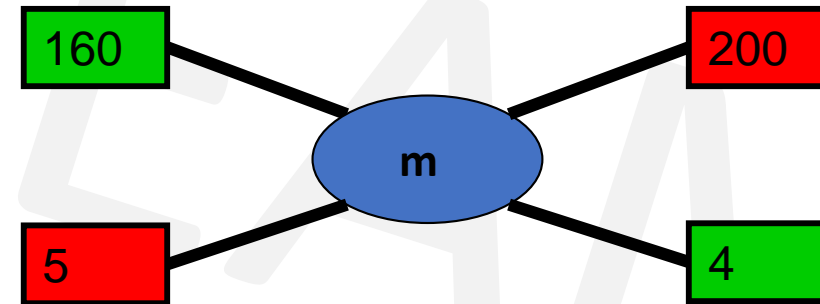
$$\text{Profit\%} = \frac{\text{SP}-\text{CP}}{\text{CP}} \times 100$$

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

**Ans: B**

cheaper price

dearer price



# Profit & Loss(Assignment)

If gain is half of SP, the gain percentage is \_\_\_\_?

A. 50%

B. 33.33%

C. 25%

D. 100%

**Soln:**

we know profit = SP – CP

As per given,

$$1/2SP = SP - CP$$

$$CP = SP - 1/2SP$$

$$SP = 2CP$$

$$\text{But, Profit} = SP - CP = 2CP - CP = CP$$

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

**Ans : D**



# 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. By selling 100 pencils, a shopkeeper gains the selling price of 20 pencils. His gain per cent is

A) 25

B) 20

C) 15

D) 12

**Ans: A**

SP – CP = gain here gain = SP of 20 pencils

S.P. of 100 pencils – C.P. of 100 pencils = S.P. of 20 pencils

S.P. of 80 pencils = C.P. of 100 pencils

Let C.P. of 1 pencil = Rs. 1

S.P. of 80 pencils = Rs. 100

C.P. of 80 pencils = Rs. 80

$$\text{Profit \%} = \frac{100-80}{80} \times 100 = 25\%$$



# 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**



# 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 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**



# Percentage

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

Fract ion x100	% ÷100	Fracti on	%	Fracti on	%	Fracti on	%	Fracti on	%
3/4	75%	5/4	125%	1/1	100%	1/6	16.66 %	1/11	9.09 %
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 x100	%	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

- 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  $\implies$  20% $\downarrow$ (Decrease in Price)  $\implies$  80  $\implies$  20% $\uparrow$ (Increase in Consumption)  $\implies$  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 100 =  $100 + 60\% \text{ of } 100 = 100 + 60 = 160$
- 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. 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 =  $\pi r^2$  where  $r$  is the radius  
 $\Rightarrow$  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(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**



# Percentage(Assignment)

Q. The ratio 5 : 4 expressed as a percent equals :

A. 125%

B. 80%

C. 40%

D. 12.5%

**Ans: A**

Required % =  $5/4 \times 100 = 125\%$



# Percentage(Assignment)

Q. 12% of 5000 = ?

A. 600

B. 620

C. 680

D. 720

**Ans: A**



# Percentage(Assignment)

Q. 280% of 3940 = ?

A. 10132

B. 11032

C. 11230

D. 11320

**Ans: B**



# Percentage(Assignment)

Q.  $15\%$  of 578 +  $22.5\%$  of 644 = ?

A. 231.4

B. 231.6

C. 231.8


D. 233.6

**Ans: B**





# Calendar

- In Non Leap year –
  - 365 days
  - 1 year = 52 weeks + 1 odd day(extra day)
  - 28<sup>th</sup> February
- In Leap year –
  - 366 days
  - 1 year = 52 weeks + 2 odd days
  - 29<sup>th</sup> February 
- A **century leap year** is a **year** that is exactly divisible by 400
  - **years** 1600 and 2000 were **century leap years**; (400,800,1200,1600,2000 – century leap years till date)
  - **years** 1700, 1800, and 1900 were not **century leap years**.
- To find the day of a week on a given date we use the concept of “**odd days**”.
- 01/01/0001 A.D(Anno Domini) was a Monday and 1<sup>st</sup> day of week so 1<sup>st</sup> January 0001 was a Monday.



# Calendar

- In a century,
  - 24 leap year
  - 76 non leap years

100 years

Leap year      non leap year

$$\begin{array}{rcl} 24 \times 2 & + & 76 \times 1 \\ = \frac{48}{7} & & = \frac{76}{7} \\ \downarrow & & \downarrow \\ 6 & + & 6 \end{array}$$

remainder

$$= 12 \div 7 = 5 \leftarrow \text{remainder}$$

5 extra(odd) days in a century (100 years)

100 years = 5 odd days ← remainder

200 years =  $10 \div 7 = 3$  odd days

300 years =  $15 \div 7 = 1$  odd days

400 years = 0 odd days (as century leap year)



# Calendar

Years	No. of odd
Ordinary year	1
Leap year	2
100 years	5
200 years	3
300 years	1
400 years	0

BEAM



# Calendar

Day of week	No. of odd
Sunday	0
Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6

BEAM



# Calendar

S

Month		Remainder
January	$31 \div 7$	3
February	$28 \div 7$ or $29 \div 7$	0(non leap) or 1(leap)
March	$31 \div 7$	3
April	$30 \div 7$	2
May	$31 \div 7$	3
June	$30 \div 7$	2
July	$31 \div 7$	3
August	$31 \div 7$	3
September	$30 \div 7$	2
October	$31 \div 7$	3
November	$30 \div 7$	2
December	$31 \div 7$	3

M



# Calendar

Q. What was the day of the week on 15<sup>th</sup> August, 1947?

**Soln:**

Completed till 1946

$$\begin{array}{l} 1946 \\ \swarrow \quad \searrow \\ \frac{1900}{400} = 300 \quad \frac{46}{4} = 11(\text{quotient}) \\ \downarrow \\ 1 \text{ odd day} \quad 46 + 11 = 57 \quad \frac{57}{7} = 1(\text{remainder}) \end{array}$$

In 1946, odd days are,

$$\begin{array}{rcl} 1900 & 46 & \\ 1 & + & 1 = 2 \text{ odd days} \end{array}$$

1946    month    date

$$\text{Total odd days} = 2 + 2 + 1 = 5 \text{ odd days}$$

As per table for days of a week , 5  $\longleftrightarrow$  Friday

As month is August, go till July as per table,

$$\begin{array}{cccccc} J & F & M & A & M & J & J \\ 3 & + & 0 & + & 3 & + & 2 & + & 3 & + & 2 & + & 3 = 16 \end{array}$$

$$\text{Now, } \frac{16}{7} = 2 (\text{remainder})$$

$$\begin{array}{l} \text{For date ,} \\ \frac{15}{7} = 1 (\text{remainder}) \end{array}$$



# Calendar

For Months -

J	F	M	A	M	J	J	A	S	O	N	D
0	3	3	6	1	4	6	2	5	0	3	5

For years -

1600 – 1699	6
1700 – 1799	4
1800 – 1899	2
1900 – 1999	0
2000 – 2099	6



# Calendar

Q. What was the day of the week on 26<sup>th</sup> January, 1947?

Soln:

1. Last 2 digits of the year → 47
  2. Divide by 4 ( $47 \div 4$ ) = 11 (quotient)
  3. Take the date → 26
  4. Take the no. of month → 0 (from table)
  5. Take the no. of year → 0 (from table)
- 84

(add)
- $\frac{84}{7} = 0$  (remainder)
6. Divide by 7 →

Check table for day of the week

0 ↔ Sunday





# Calendar

Q. What was the day of the week on 29<sup>th</sup> February, 2012?

**Soln:**

1. Last 2 digits of the year → 12
2. Divide by 4 ( $12 \div 4$ ) = 03( quotient)
3. Take the date → 29
4. Take the no. of month → 03 (from table)
5. Take the no. of year → 06 (from table)

---

53 (add)

6. Divide by 7 →  $\frac{53}{7} = 4$  (remainder)

subtract 1 from remainder

In this case for all dates of **January & February** in a leap year ,  $4 - 1 = 3$

Check table for day of the week

3  $\longleftrightarrow$  Wednesday



# Calendar

It was Sunday on Jan 1, 2006. What was the day of the week Jan 1, 2010?

A. Sunday

B. Saturday

C. Friday

D. Wednesday

**Ans: C**

On 31st December, 2005 it was Saturday.

Number of odd days from the year 2006 to the year 2009 =  $(1 + 1 + 2 + 1) = 5$  days.

On 31st December 2009, it was Thursday.

on 1st Jan, 2010 it is Friday.



# Calendar

Q. If we have preserved the calendar of 2017. Find the next immediate year in which we can reuse.

A. 2027

B. 2023

C. 2025

D. 2029

**Soln:**

$x/4$  (  $x$  = given year)

$$\frac{2017}{4} = 1 \text{ (remainder)}$$

For any year divide by 4, the possibility of remainder is 0,1,2,3

If remainder = 0  $\rightarrow x + 28$

If remainder = 1  $\rightarrow x + 6$

If remainder = 2/3  $\rightarrow x + 11$

So,  $\frac{2017}{4} = 1 \text{ (remainder)}$

$$2017 + 6 = 2023$$

**Ans: B**



# Calendar

Q. Which of the following days can never be the last day of a century?

A. Sunday    B. Monday    C. Tuesday    D. Wednesday

- **Soln:**
- The last day of century can be only
- 1 odd day(Monday)
- 3 odd days (Wednesday)
- 5 odd days ( Friday )
- 7 or 0 odd days (Sunday)
- So, century can never end in **Tuesday** , **Thursday** or **Saturday**.
- **Ans: C**



# Calendar(Assignment)

- Q. The day on 5<sup>th</sup> April of a year will be the same day on 5<sup>th</sup> of which month of the same year?
- A. 5<sup>th</sup> July                      B. 5<sup>th</sup> August                      C. 5<sup>th</sup> June                      D. 5<sup>th</sup> October
- **Ans A**
- April & July for all years have the same calendar. So, a day on any date of April will be the same day on the corresponding date in July.
- The same day will fall on 5<sup>th</sup> July of the same year.



# Calendar(Assignment)

Q. What was the day of the week on your birthdate?

Q. 13<sup>th</sup> October 2019 is a Sunday. Find the day on 13<sup>th</sup> October 1989?

A. Sunday      B. Monday      C. Friday      D. Wednesday

**Ans: C**

Q. 1<sup>st</sup> March 2006 falls on a Wednesday .What day does 1<sup>st</sup> March 2010 fall on?

A. Tuesday      B. Monday      C. Friday      D. Wednesday

**Ans: B**

Q. Today is Monday. Which day will be after 64 days?

A. Tuesday      B. Monday      C. Friday      D. Wednesday

**Ans: A**

Q. Today is Monday. After 30 days it will be?

A. Tuesday      B. Monday      C. Friday      D. Wednesday

**B. Ans: D**



# Calendar(Assignment)

Q. 15<sup>th</sup> August 1947 was a Friday. Find the day on 15<sup>th</sup> August 1977?

• Soln:

$$\begin{array}{r} 1977 \\ - 1947 \\ \hline 30 \text{ years} \end{array}$$

Leap years between 1947 to 1977

1948	1964	} 8 years
1952	1968	
1956	1972	
1960	1976	

$$30 + 8 = 38$$

total years    leap

$$\frac{38}{7} = 3 \text{ (remainder)}$$

As 15<sup>th</sup> August 1947 was a Friday ,

So, Friday + 3 days = **Monday**



# Calendar(Assignment)

Q. 4th January 2016 falls on Monday. What day of the week does 4th January 2017 lies?

A. Wednesday

B. Thursday

C. Tuesday

D. Monday

**Soln:**

Normal year = 1 odd day

Leap year = 2 odd days

Jan 4, 2016 → Monday

+ 2 (as leap year)

Jan 4, 2017 → Wednesday

**Ans: A**





# Calendar(Assignment)

Q. Wednesday falls on 5th of a month .So which day will fall 5 days after 22<sup>nd</sup> of the same month?

A. Tuesday

B. Friday

C. Thursday

D. Wednesday

**Ans: B**

5<sup>th</sup> = Wednesday

+7

12<sup>th</sup> = Wednesday

+7

19<sup>th</sup> = Wednesday

22<sup>nd</sup> = Saturday

+5

27<sup>th</sup> = Thursday

5 days after 22<sup>nd</sup> will be **Friday**



# Calendar(Assignment)

Q. What dates of May 2002 did Monday fall on?

**Soln:**

Lets take date = 1<sup>st</sup> May 2002

1. Last 2 digits of the year → 02
  2. Divide by 4 ( $02 \div 4$ ) = 00( quotient)
  3. Take the date → 01
  4. Take the no. of month → 01 (from table)
  5. Take the no. of year → 06 (from table)
- 
- 10 (add)
6. Divide by 7 →  $\frac{10}{7} = 3$  (remainder)

Check table for day of the week

3  $\longleftrightarrow$  Wednesday

1<sup>st</sup> May 2002 falls on Wednesday

1	2	3	4	5	6
W	Th	F	Sa	Su	M

↑  
first Monday

Now add 7 to it to find remaining Mondays

Dates on which Monday falls are -  
6, 13, 20, 27



# Calendar(Assignment)

Q. On what dates of April, 2001 did Wednesday fall?

A. 1<sup>st</sup>, 8<sup>th</sup>, 15<sup>th</sup>, 22<sup>nd</sup>, 29<sup>th</sup>

B. 2<sup>nd</sup>, 9<sup>th</sup>, 16<sup>th</sup>, 23<sup>rd</sup>, 30<sup>th</sup>

C. 3<sup>rd</sup>, 10<sup>th</sup>, 17<sup>th</sup>, 24<sup>th</sup>

D. 4<sup>th</sup>, 11<sup>th</sup>, 18<sup>th</sup>, 25<sup>th</sup>

**Ans: D**



# Calendar(Assignment)

Q. What is the day on 22 April 2222?

A. Monday

B. Tuesday

C. Saturday

D. Sunday

**Ans: A**



# Calendar(Assignment)

Which of the following is not a leap year?

- A. 700      B. 800      C. 1200      D. 2000

**Ans: A**

The century divisible by 400 is a leap year.  
The year 700 is not a leap year.



# Calendar(Assignment)

Q. Today is Monday. Which day will be on 61st day?

**Soln:**

1 week = 7 days. Taking the multiple of 7

56 - Monday	or	63 - Monday
57 - Tuesday		62 - Sunday
58 - Wednesday		61 - Saturday

59 - Thursday

60 - Friday

61 - Saturday

$56 + 5 = 61$ days		$63 - 61 = 2$ days
(add 5 days)	or	(subtract 2 days)



# Calendar(Assignment)

Q. January 1, 2007 was Monday. What day of the week lies on Jan. 1, 2008?

- A. Monday
- B. Tuesday
- C. Wednesday
- D. Sunday

**Ans: B**



