



GENERAL APTITUDE

Trainer : Sujata Mohite
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

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

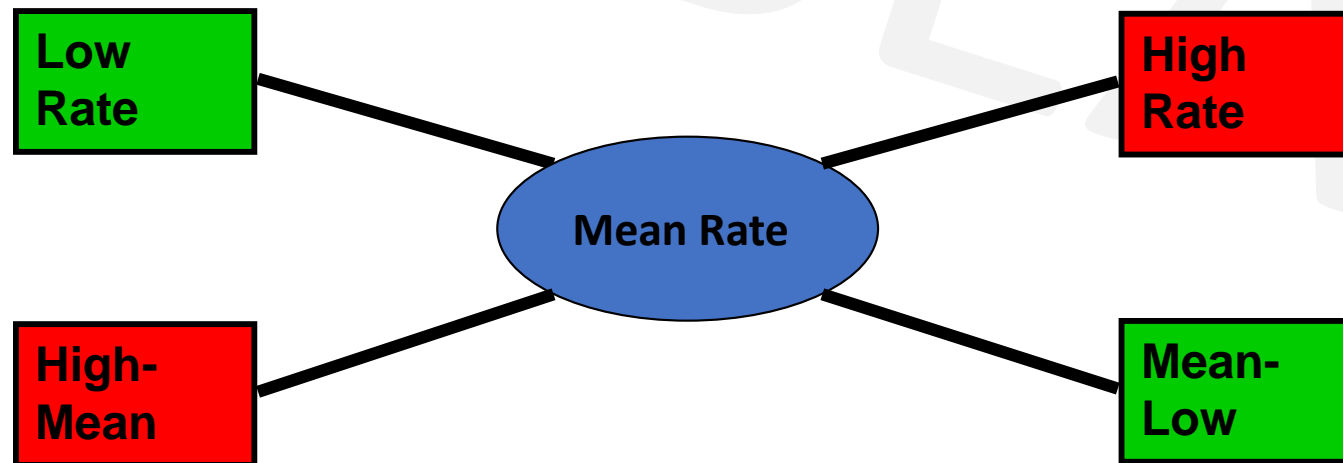


Mixtures & Alligation

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

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

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



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.

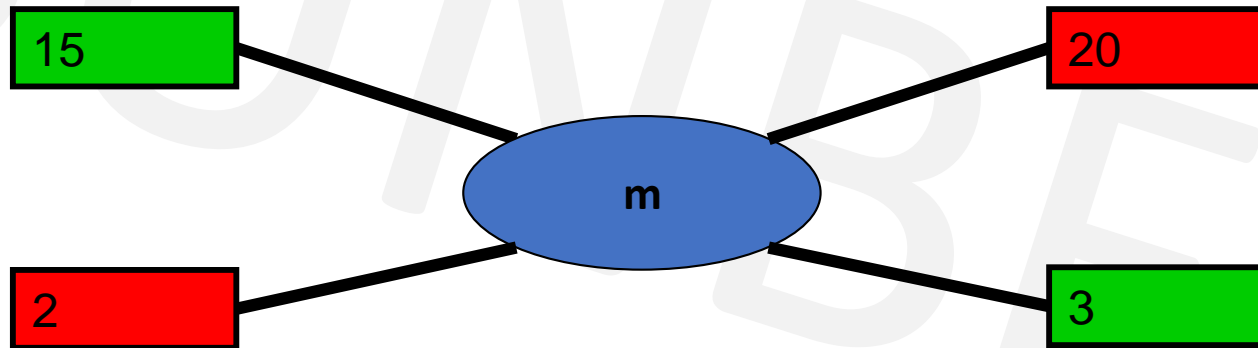
A. Rs. 28

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%.

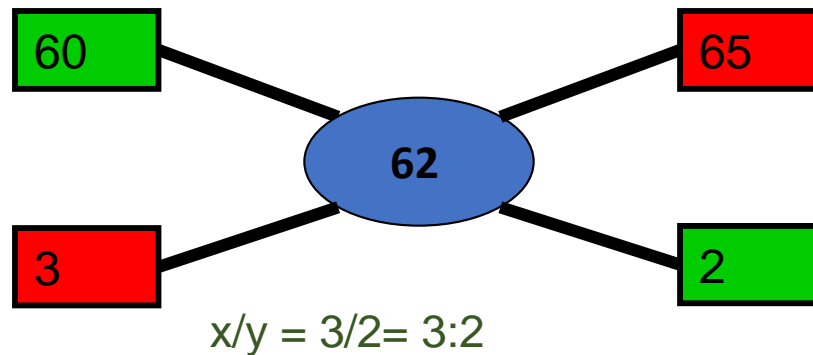
A. 3:2

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 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

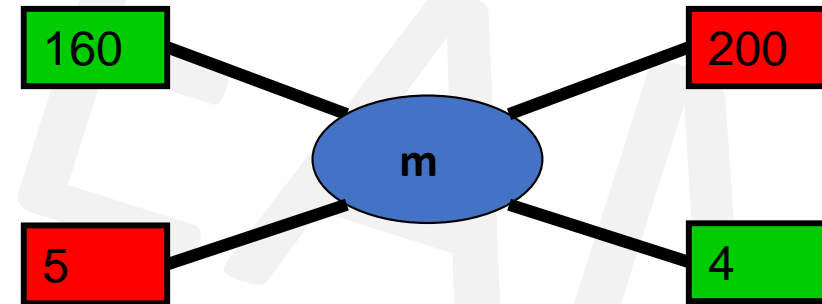
$$\text{Profit\%} = \frac{\text{SP}-\text{CP}}{\text{CP}} \times 100$$

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

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

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

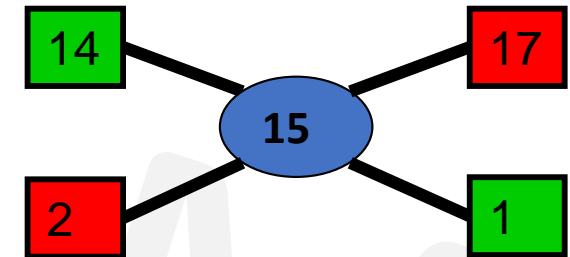
$$\frac{17}{24}$$

C

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

forget denominators,

By rule of Alligation,



2:1

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

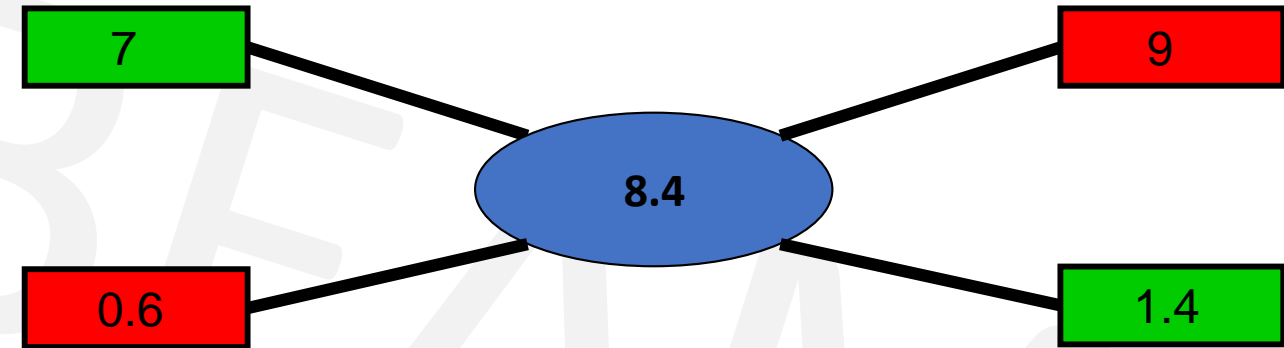
C. 53kg

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

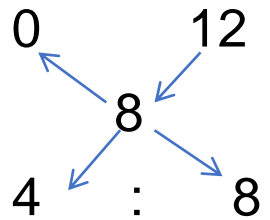
B. 2 : 1

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

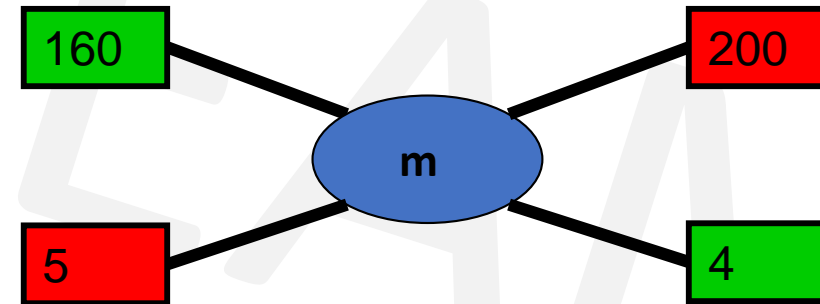
$$\text{Profit\%} = \frac{\text{SP}-\text{CP}}{\text{CP}} \times 100$$

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

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	%
				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 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 = πr^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



Probability

- How likely an event is supposed to happen.
- Probability = $\frac{\text{Favourable outcome}}{\text{Total number of outcomes}}$
- AND → multiply(x) e.g:- 1 green and 1 blue ball in a box
- OR → Add (+) e.g:- 1 red or 1 blue ball in a box
- 1 bag has 3 balls, what is the probability of you picking up 2 balls?

$$\bullet 3C_2 = \frac{3 \times 2}{1 \times 2} = 3$$

↑
Total no. of balls
the bag contains

↑
Out of which how many balls
We need to choose
(tells number of times 3 has to be reduced)

$$\text{Probability} = \frac{\text{Favourable outcome}}{\text{Total number of outcomes}}$$



Points to Remember

- The **probability** of an event will not be less **than** 0.
- This is because 0 is impossible (sure that something will not happen).
- The **probability** of an event will not be **more than** 1. This is because 1 is certain that something will happen.
- The probability of an event is **a number** describing the chance that the event will happen.
- An event that is certain to happen has a probability of 1.
- An event that cannot possibly happen has a probability of 0.
- If there is a chance that an event will happen, then its probability is between 0 & 1.



Probability

- **Atleast** – min to max
- Eg:- 2 bags out of 3



min



max

So various probabilities to be done is 2 and 3

- **Atmost** - max to min
- Eg:- 1 bag has 3 balls out of which probability to pick up 2 balls



atmost 2 → max 2, 1, 0 (min)



Probability

Q. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

A. 10/21 B. 11/21 C. 2/7 D. 5/7

• Soln-

- Total balls = $2+3+2=7$ balls in the bag
- None = blue (neglect whichever color is written after none)
- Draw = 2 balls

• Probability = $\frac{\text{Favourable outcome}}{\text{Total number of outcomes}} = \frac{2R \text{ or } (1R \text{ and } 1G) \text{ or } 2G}{7C_2} = \frac{2C_2 + (2C_1 \times 3C_1) + 3C_2}{7C_2} = \frac{10}{21}$

Ans : A



Probability

Q. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

A. $\frac{1}{3}$ B. $\frac{3}{4}$ C. $\frac{7}{19}$ D. $\frac{8}{21}$ E. $\frac{9}{21}$

Soln:

- Total balls = $8+7+6 = 21$ balls in the box
- Neither red nor green means only blue
- Draw = 1 ball

- Probability = $\frac{\text{Favourable outcome}}{\text{Total number of outcomes}} = \frac{1 \text{ blue out of total } 7}{21C_1} = \frac{7C_1}{21C_1} = \frac{7}{21} = \frac{1}{3}$

Ans: A



Probability

Q. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is:

A. 21/46

B. 25/117

C. 1/50

D. 3/25

Soln:

- Total students = 15 + 10 = 25 students in a class
- Draw = 3 students

$$\text{Probability} = \frac{\text{Favourable outcome}}{\text{Total number of outcomes}} = \frac{{}^{10}C_1 \times {}^{15}C_2}{{}^{25}C_3} = \frac{21}{46}$$

Ans : A



Probability

Q. What is the probability of getting a sum 5 from two throws of a dice?

- A. $1/9$ B. $1/8$ C. $1/7$ D. $1/6$

Soln-

Dice = 6 faces = 6 possibilities

So in two throws of dice, total possibilities = $6 \times 6 = 36$

Sum = 5, so favourable outcomes are - $\{ (1,4), (4,1), (2,3), (3,2) \}$

$$\text{Probability} = \frac{\text{Favourable outcome}}{\text{Total number of outcomes}} = \frac{4}{36} = \frac{1}{9}$$

Ans : A



Probability

Q. Three unbiased coins are tossed. What is the probability of getting utmost two heads?

- A. $\frac{3}{4}$ B. $\frac{1}{4}$ C. $\frac{3}{8}$ D. $\frac{7}{8}$

• **Soln-**

- Total possibilities = {TTT, TTH, THT, HTT, THH, HTH, HHT, HHH}
- Event of getting utmost 2 heads = max 2H or 1H or 0H
- Possibility of getting 2 H = {TTH, THT, HTT, THH, HTH, HHT}
- Probability = $\frac{\text{Favourable outcome}}{\text{Total number of outcomes}} = \frac{7}{8}$

Ans: D



Probability

- A Standard deck of playing cards consist of 52 cards, among them there are 4 subgroups/suits –
- The four suits with there names , symbols and color –

1. The suit of Hearts



13 cards

2. The suit of Diamonds



13 cards

3. The suit of Clubs



13 cards

4. The suit of Spades



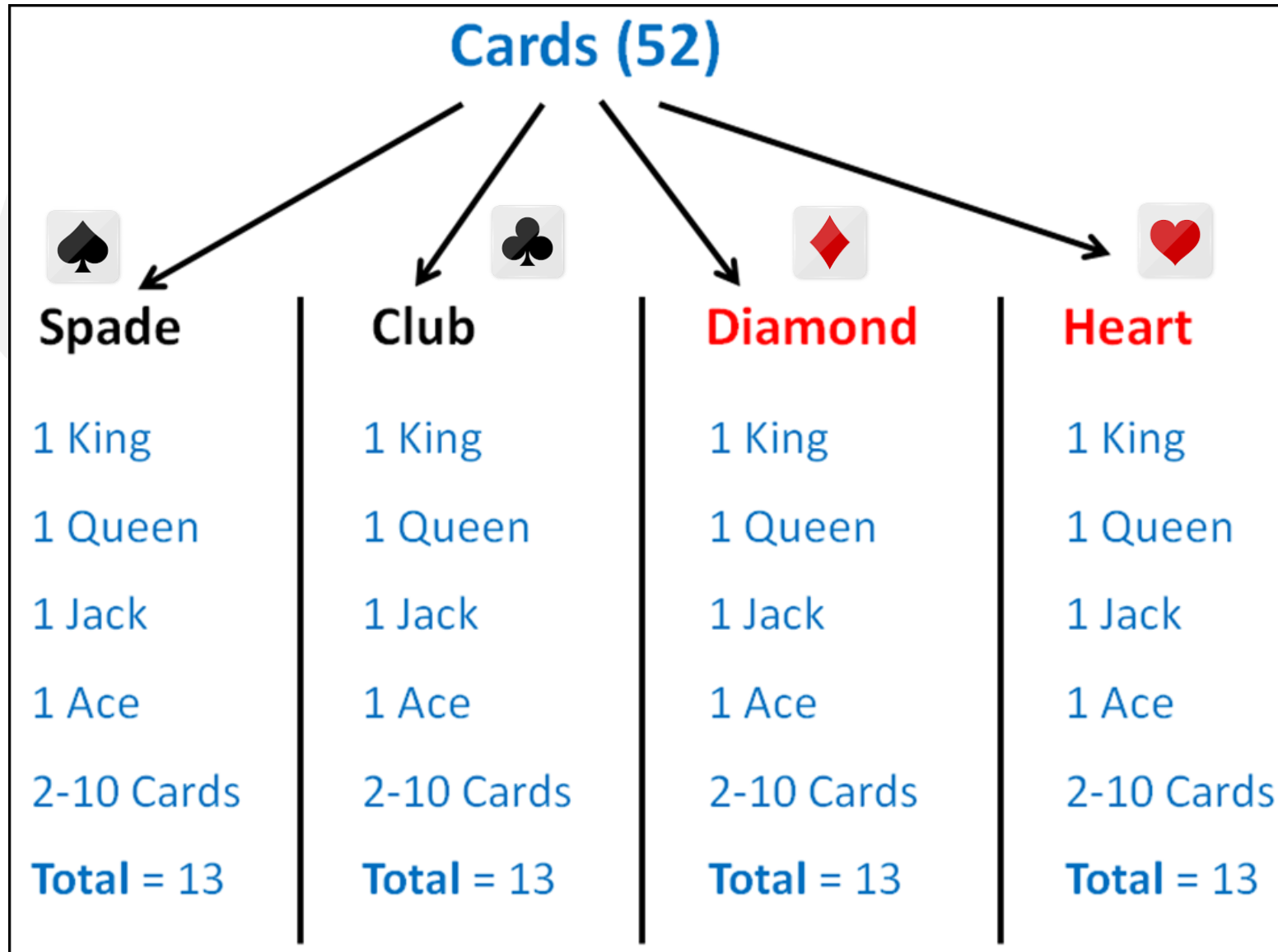
13 cards

26 red cards

26 black cards

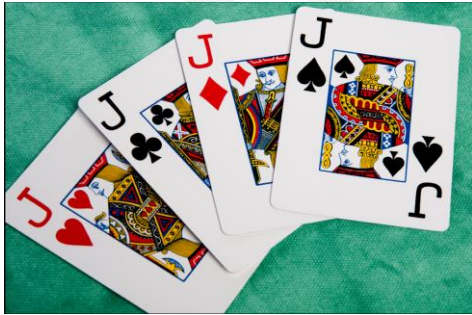


Probability

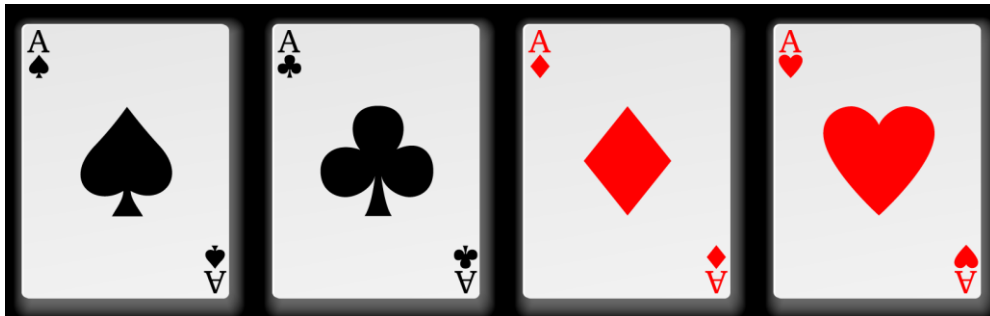


Probability

- King, Queen and Jack (or Knaves) are **face cards**. So, there are **12 face cards** in the deck of 52 playing cards.
- **Jokers** are not normally considered to be **face cards**



- **Aces**
- There are 4 Aces in every deck, 1 of every suit.



Probability

Q. From a pack of 52 cards, two cards are drawn together at random. What is the probability of both the cards being kings?

A. 1/15

B. 25/57

C. 35/256

D. 1/221

• **Soln-**

• **Total cards in a pack =52**

• **Total kings in a pack = 4**

• **Drawn =2**

• **Probability = $\frac{\text{Favourable outcome}}{\text{Total number of outcomes}} = \frac{4C_2}{52C_2} = \frac{1}{221}$**

Ans : D



Probability(Assignment)

Q. Two dice are rolled. Find the probability of getting a sum of 8 or 11 on both the dices.

A. $5/36$

B. $9/36$

C. $7/36$

D. $11/36$

Ans: C

- Favorable outcomes for sum of 8 or 11 on both the dices are-
- $(2,6), (3,5), (4,4), (5,3), (6,2), (5,6), (6,5)$
- Number of favorable outcomes = 7
- Probability = $\frac{7}{36}$



Probability(Assignment)

A man tossed two dice. What is the probability that the total score is a prime number?

A. $5/12$

B. $5/14$

C. $5/20$

D. $5/24$

• **Soln-**

• **Dice = 6 faces = 6 possibilities**

• 2 Dice = $6 \times 6 = 36$ possibilities

• Sum = prime number

• So favourable outcomes are - $\{ (1,1), (1,2), (1,4), (1,6), (2,1), (2,3), (2,5), (3,2), (3,4), (4,1), (4,3), (5,2), (5,6), (6,5), (6,1) \}$

• Probability = $\frac{\text{Favourable outcome}}{\text{Total number of outcomes}} = \frac{15}{36} = \frac{5}{12}$

Ans : A



Probability(Assignment)

Q. A brother and sister appear for an interview against two vacant posts in an office. The probability of the brother's selection is $\frac{1}{5}$ and that of the sister's selection is $\frac{1}{3}$. What is the probability that one of them is selected?

A. $\frac{1}{5}$

B. $\frac{2}{5}$

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

D) $\frac{2}{3}$

Soln: -

(brother is selected and sister is not selected) OR (brother is not selected and sister is selected)

$$\begin{aligned}\text{Probability} &= \frac{1}{5} \times \frac{2}{3} + \frac{4}{5} \times \frac{1}{3} \\ &= \frac{6}{15}\end{aligned}$$

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

Ans: B

$$\begin{aligned}\text{sister not selected} &= 1 - \text{prob. of sister selected} \\ &= 1 - \frac{1}{3} \\ &= \frac{2}{3}\end{aligned}$$

$$\begin{aligned}\text{brother not selected} &= 1 - \text{prob. of brother selected} \\ &= 1 - \frac{1}{5} \\ &= \frac{4}{5}\end{aligned}$$



Probability(Assignment)

Q. Probability of occurrence of event A is 0.5 and that of event B is 0.2. the probability of occurrence of both A and B is 0.1. what is the probability that none of A and B occur?

A. 0.4 B. 0.5 C. 0.2 D. 0.1

Soln:

probability of sure event = 1

- Given $P(A) = 0.5$ and $P(B) = 0.2$
- $P(A \text{ or } B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$
 $= 0.5 + 0.2 - 0.1 = 0.6$
- And $P(\text{neither A nor B}) = P(A' \cap B') = 1 - P(A \cup B) = 1 - 0.6 = 0.4.$

Ans: A

- Note: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- This is also known as the addition theorem of probability.



Probability(Assignment)

Q. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red, is?

A. $1/22$

B. $3/22$

C. $2/91$

D. $2/77$

Ans : C



Probability(Assignment)

Q. What is the probability of getting a sum 9 from two throws of a dice?

- A. $1/6$ B. $1/8$ C. $1/9$ D. $1/12$

Ans : C



Probability(Assignment)

Q. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

- A. $\frac{3}{4}$ B. $\frac{4}{7}$ C. $\frac{1}{8}$ D. $\frac{3}{7}$

Ans : B



Probability(Assignment)

Q. A bag contains 6 blue balls, 3 white balls and 4 green balls. If two balls are drawn at random what is the possibility that they are not of the same color?

A. $6/13$

B. $7/13$

C. $9/13$

D. $10/13$

• **Ans: C**



Probability(Assignment)

Q. One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card (Jack, Queen and King only)?

A. $1/13$

B. $1/4$

C. $3/13$

D. $9/52$

Ans: C



Probability(Assignment)

Q. One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is not a face card (Jack, Queen and King only)?

A. $5/13$

B. $10/13$

C. $1/13$

D. $1/26$

Ans: B



Probability(Assignment)

Q. A basket contains 6 apples ,4 pears and 3 oranges. If two fruits are picked up at random, what is the probability that both are pears?

A. $4/13$

B. $1/13$

C. $2/13$

D. $3/26$

Ans: B



