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## GENERAL APTITUDE

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# 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**



# Interest

If P = Principal, R = Rate of interest, N = Time in years, I = Interest, A = Amount

Then  $A = P + I$

## Simple Interest

$$S.I. = (P \times R \times N) / 100$$

Basic principal remains constant.

S.I. is good example of AP(Arithmetic Progression)

## Compound Interest

$$A = P (1 + R/100)^T$$

T = periods of compounding,

$$C.I. = A - P$$

R = rate for compounding period

Basic principal keeps on increasing as we get interest on interest.

C.I. is good example of GP(Geometric Progression)



# Interest

Q. A shopkeeper with an OD facility at 18% with a bank borrowed Rs. 15000 on Jan 8, 2011 and returned the money on June 3, 2011 so as to clear the debt. The amount that he paid was -

- A. Rs. 16080      B. Rs. 16280      C. Rs. 16400      D. None of these

**Soln:**

- $P = 15000$ ,  $r = 18\%$ ,  $T = 23(\text{jan}) + 28(\text{feb-nonleap}) + 31(\text{march}) + 30(\text{April}) + 31(\text{may}) + 3(\text{june}) = 146$  days
- $146/365$  days =  $2/5$  years.
- $SI = 15000 \times 18 \times 2/5 \times 1/100 = 30 \times 18 \times 2 = 1080$

$$\begin{aligned}\text{Amount} &= P + SI \\ &= 15000 + 1080 \\ &= \text{Rs. } 16080\end{aligned}$$

**Ans: A**





# Interest

Q. A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. The sum is:

A. Rs. 650

B. Rs. 690

C. Rs. 698

D. Rs. 700

Soln:-

amount after 4 years = amount after 3 years + simple interest in one year

S.I. in one year = Rs.  $(854 - 815) = \text{Rs. } 39$ .

S.I. for 3 years = Rs.  $(39 \times 3) = \text{Rs. } 117$ .

Principal = amount - interest

Principal =  $815 - 117$   
= Rs. 698.

**Ans: C**



# Interest

Q. A farmer borrowed Rs.3600 at 15% simple interest per annum. At the end of 4 years, he cleared this account by paying Rs.4000 and a donkey. The cost of the donkey is -

A. Rs. 1000

B. Rs. 1200

C. Rs. 1550

D. Rs. 1760

**Soln:**

SI for 4 years = Rs.  $(3600 \times 0.15 \times 4) = \text{Rs. } 2160$

Amount after 4 years = Rs.  $(3600 + 2160) = \text{Rs. } 5760$

Cost of donkey = Rs.  $(5760 - 4000) = \text{Rs. } 1760$

**Ans: D**



# Interest

Q. P =Rs. 2000, R =10%, N =2yrs , Find A and CI

**Soln:**

$$\begin{aligned}A &= 2000\left(1 + \frac{10}{100}\right)^2 \\&= 2000\left(\frac{110}{100}\right)^2 \\&= 2000\left(\frac{121}{100}\right) \\&= \text{Rs. } 2420\end{aligned}$$

$$\text{CI} = 2420 - 2000 = \text{Rs. } 420$$

$$2000 \rightarrow 10\% = 200$$

$$10\% \quad 10\%$$

$$2000 \longrightarrow 2200 \longrightarrow 2420$$

$$\text{CI} = 2420 - 2000 = 420$$



# Interest

Q. Simple interest on a certain sum of money for 3 years at 8% per annum is half the compound interest on Rs. 4000 for 2 years at 10% per annum. The sum placed on simple interest is:

A. Rs. 1550

B. Rs. 1650

C. Rs. 1750

D. Rs. 2000

Soln:

$$A = P \left( 1 + \frac{R}{100} \right)^N = 4000 \left( 1 + \frac{10}{100} \right)^2 = 4000 \times \left( \frac{11}{10} \right)^2 = 4000 \times \frac{11}{10} \times \frac{11}{10} = \text{Rs. } 4840$$

OR

$$\begin{array}{ccccc} 4000 & \xrightarrow[1^{\text{st}} \text{ yr}]{10\%} & 4400 & \xrightarrow[2^{\text{nd}} \text{ yr}]{10\%} & 4840 \end{array}$$

$$CI = A - P$$

$$CI = 4840 - 4000 = \text{Rs. } 840$$

**Ans: C**

$$SI = \frac{1}{2} CI$$

$$\frac{PNR}{100} = \frac{1}{2} \times 840$$

$$\frac{P \times 3 \times 8}{100} = 420$$

$$\begin{aligned} P(\text{sum}) &= \frac{420 \times 100}{3 \times 8} \\ &= \text{Rs. } 1750 \end{aligned}$$



# Interest

Q. P =Rs. 4000, R =20% per annum, N =6months.Find CI computed quarterly for given period.

Soln:

N =6months(2 quarterly)

rate(R) = 20 % per annum = 5 % quarterly

After every 3 months CI will be calculated.

	by <u>5%=200</u>	by <u>5%=210</u>	
4000	4200	4410	

$$\begin{aligned} I &= 4410 - 4000 \\ &= \text{Rs. } 410 \end{aligned}$$



# Interest

Q. Difference between Compound interest & simple interest on a sum placed at 8% p.a. compounded annually for 2 years is Rs 128. Find the Principal

- A. 20000
- B. 24000
- C. 26000
- D. 15000

- **Soln:**

- Let the principal be  $P = \text{Rs. } 100$ .
- time  $N = 2$  years, rate of interest  $R = 8\%$  per annum
- simple interest =  $\frac{PNR}{100} = \frac{100 \times 8 \times 2}{100} = \text{Rs. } 16$

- CI (for 2 years)

- 8%      8%
- 100  $\xrightarrow{\quad}$  108  $\xrightarrow{\quad}$  116.64

	16.64		
P	SI	CI	Diff
100	16	16.64	0.64

- $0.64 \rightarrow 100$
- $128 \rightarrow ?$
- $\frac{12800}{0.64} = \text{Rs. } 20000$



# Interest

Q. Difference between Compound interest & simple interest on a sum placed at 8% p.a. compounded annually for 2 years is Rs 128. Find the principal

- A. 20000
- B. 24000
- C. 26000
- D. 15000

- **Soln:**
- Let the principal be  $P = \text{Rs. } 100$ .
- time  $N = 2$  years, rate of interest  $R = 8\%$  per annum
- simple interest =  $\frac{PNR}{100} = \frac{100 \times 8 \times 2}{100} = \text{Rs. } 16$
- compound amount =  $P(1 + \frac{R}{100})^N$
- $= 100 \times (1 + \frac{8}{100})^2 = 100 \times (\frac{108}{100})^2 = 100 \times (\frac{11664}{10000}) = \frac{11664}{100} = 116.64$
- compound interest = compound amount – principal
- $C.I = A - P$   
 $= 116.64 - 100 = \text{Rs. } 16.64$
- the difference between the compound interest and simple interest =  $16.64 - 16.00 = \text{Rs. } 0.64$
- $\frac{0.64}{100} \rightarrow 100$
- $\frac{128}{0.64} \rightarrow ?$
- $= \frac{128 \times 100}{0.64} = 20000$
- Thus, the principal is Rs. 20000.

# Interest

- If the difference between compound and simple interest is of **two years** than,  
**Difference =  $P(R)^2/(100)^2$**   
Where P = principal amount, R = rate of interest
- If the difference between compound and simple interest is of **three years** than,  
**Difference =  $3 \times P(R)^2/(100)^2 + P (R/100)^3$** .  
Here also, P = principal amount, R = rate of interest





# Partnership

Q.A started business with Rs. 45,000 and B joined afterwards with 30,000. If the profit at the end of a year was divided in the ratio 2 : 1 respectively, then B would have joined A for business after.

A. 1 month

B. 2 months

C. 3 months

D. 4 months

**Soln:**

- Capital of A = Rs. 45,000                      Capital of B = Rs. 30,000
- Ratio of P1:P2=2:1
- using formula,
- $\frac{C_1T_1}{C_2T_2} = \frac{P_1}{P_2}$
- In this type , the time period is 12 months i.e. one year
- $\frac{45000 \times 12}{30000 \times T_2} = \frac{2}{1}$
- $T_2=9$
- B would join business after  $(12 - 9) = 3$  months
- **Ans: C**



# Partnership

Q. If 4 (A's capital) = 6 (B's capital) = 10 (C's capital), then out of a profit of Rs. 4650, C will receive \_\_\_\_\_

A) Rs.700

B) Rs.800

C) Rs.900

D) Rs.1000

**Soln:**

$$4A = 6B = 10C$$

$$A = 10/4C = 5/2C \quad \text{and} \quad B = 10/6C = 5/3C$$

$$A + B + C = 4650$$

$$5/2C + 5/3C + C = 4650$$

$$C = 900$$

Share of C or C will receive Rs.900

**Ans: C**



# Partnership

Q. A, B & C enter into a partnership with total of Rs 8,200. A's capital is Rs 1000 more than B's & Rs 2000 less than C's. What is B's share of annual profit of Rs 2,460?

A. Rs 1320

B. Rs 720

C. Rs 420

D. Rs 520

**Ans: C**



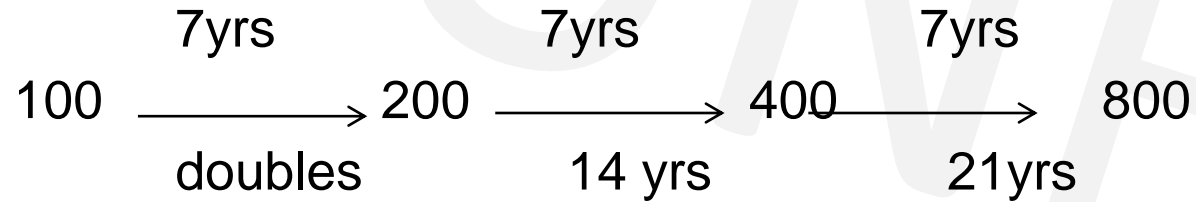
# Interest(Assignment)

Q. A sum of money placed at compound interest doubles in 7 years. In how many years the principal becomes-

- a. 4 times of itself
- b. 8 times of itself

Soln:

Let initial value be 100



- a. In 14yrs
- b. In 21 yrs

**OR**

100----->200 in 7 years  
200----->400 in again 7 years then,  
400----->800 in 7 years again, thus  
the time becomes=  $7+7+7= 21$  years.



# Interest(Assignment)

Q. A started a business by investing Rs. 32000. After 2 months B joined him with some investments. At the end of the year the total profit was divided in the ratio 8:5. How much capital was invested by B?

A. Rs. 30,000      B. Rs. 28000      C. Rs. 24000      D. Rs. 19000

- Soln:
- using formula,
- $\frac{C_1 T_1}{C_2 T_2} = \frac{P_1}{P_2}$
- $\frac{32000 \times 12}{C_2 \times 10} = \frac{8}{5}$
- $C_2 = \text{Rs. } 24000$

**Ans: C**



# Interest(Assignment)

Q. When annual compounding is done, a sum amounts to Rs 5000 in 6 years and 7200 in 8 years.  
What is the int rate?

A. 10%

B. 15%

C. 20%

D. 25%

## Soln

Let P be the principal & R the int rate

$$\rightarrow 5000 = P(1+R/100)^6 \dots (1)$$

$$\rightarrow 7200 = P(1+R/100)^8 \dots (2)$$

$$\rightarrow 36/25 = (1+R/100)^2$$

$\rightarrow$  Taking square roots of both sides

$$\rightarrow 1+R/100 = 6/5$$

$$\rightarrow R/100 = 1/5$$

$$\rightarrow R = 20\%$$

**Ans: C**



# Interest(Assignment)

Q. A sum fetched a total simple interest of Rs.7056 at the rate of 8 percent per year in 7 years. What is the sum?

A. Rs 12600

B) Rs 15120

C) Rs 10080

D) Rs 7560

**Ans : A**



# Interest(Assignment)

Q. Find the compound interest on Rs. 15,625 for 9 months at 16% per annum compounded quarterly.

A. Rs. 1851

B. Rs. 1941

C. Rs. 1951

D. Rs. 1961

**Ans: C**





## Interest(Assignment)

Q. What is the difference between the simple interest on a principal of Rs. 500 being calculated at 5% per annum for 3 years and 4% per annum for 4 years?

A.Rs. 5      B.Rs. 10      C.Rs. 20      D.Rs. 40      E. None of these

$$\begin{aligned} SI_1 &= P N_1 R_1 / 100 \\ &= \frac{500 \times 3 \times 5}{100} = \text{Rs. } 75 \end{aligned}$$

$$\begin{aligned} SI_2 &= P N_2 R_2 / 100 \\ &= \frac{500 \times 4 \times 4}{100} = \text{Rs. } 80 \end{aligned}$$

$$\text{Difference} = 80 - 75 = \text{Rs. } 5$$

**OR**

$$500 \Rightarrow 15\% \uparrow \Rightarrow 575 \text{ (1<sup>st</sup> case)}$$

$$500 \Rightarrow 16\% \uparrow \Rightarrow 580 \text{ (2<sup>nd</sup> case)}$$

$$\text{difference} = 580 - 575 = \text{Rs. } 5$$

**Ans : A**



# Interest(Assignment)

Q. A sum of money placed at compound interest doubles itself in 4 years. In how many years will it amount to 8 times?

A. 9 years

B. 8 years

C. 27 years

D. 12 years

**Ans: D**



# Interest(Assignment)

Q. Difference between Compound interest & simple interest on a sum placed at 20% per annum compounded annually for 2 years is Rs. 72. Find the sum.

A. Rs. 2400

B. Rs. 8400

C. Rs. 1800

D. Rs. 900

**Ans : C**



# Interest(Assignment)

Q. What is the simple interest on a sum of Rs. 700 if the rate of interest for the first 3 years is 8% per annum and for the last 2 years is 7.5% per annum?

A.Rs. 269.5   B.Rs. 283   C.Rs. 273   D.Rs. 280   E. None of these

**Ans: C**



# Interest(Assignment)

Q. Rs.2100 is lent at compound interest of 5% per annum for 2 years. Find the amount after two years.

- A.Rs. 2300      B.Rs. 2315.25      C.Rs. 2310      D.Rs. 2320      E. None of these

• **Soln:**

•  $A = P (1 + R/100)^T$

•  $A = 2100(1+5/100)^2$

•  $A = 2100 \times [105/100]^2$

•  $A = \frac{2100 \times 11025}{10000}$

• Amount, A=Rs.2315.25

• **Ans : B**



# Interest(Assignment)

Q. A man borrowed total Rs 2500 at Simple interest from two money lenders. He paid interest at 12% p.a. to one and 14% p.a. to the other. The total interest paid for the year was Rs.326. How much did he borrow at 14%?

A. Rs 1000

B. Rs 1200

C. Rs 1300

D. Rs 1500

**Soln:**

Let,  $x$  = Principal at 12%

&

$2500 - x$  = Principal at 14%

$$\text{SI at Rs. } x = \frac{x \times 1 \times 12}{100} = \frac{12x}{100} = \frac{3x}{25}$$

$$\text{SI at Rs. } 2500 - x = \frac{2500 - x \times 1 \times 14}{100} = \frac{(2500 - x) \times 7}{50} = \frac{17500 - 7x}{50}$$

$$\text{SI at } x + \text{SI at } 2500 - x = 326$$

Substitute and solving the equation gives  $x = \text{Rs. } 1200$

We need Principal at  $2500 - x = 2500 - 1200 = \text{Rs. } 1300$

**Ans: C**



# Interest(Assignment)

Q.A certain sum of money amounts to Rs. 704 in two years and Rs 800 in 5 years. Find the Principal.

A. Rs. 640

B. Rs. 600

C. Rs. 550

D. Rs. 450

**Ans: A**



# Interest(Assignment)

Q. A started a business by investing Rs. 32000. After 4 months B joined him with some investments. At the end of the year the total profit was divided in the ratio 6:5. How much capital was invested by B?

A. Rs. 30,000

B. Rs. 28000

C. Rs. 40000

D. Rs. 19000

**Ans: C**





# Interest(Assignment)

Q. Three persons started a placement business with a capital of Rs. 3000. B invests Rs. 600 less than A and C invests Rs. 300 less than B. What is B's share in a profit of Rs. 886 ?

- A. Rs. 443
- B. Rs. 354.40
- C. Rs. 265.80
- D. Rs. 177.20

**Ans: C**



# Interest(Assignment)

Q. What should be the simple interest obtained on an amount of Rs 5,760 at the rate of 6% p.a. after 3 years?

- A. Rs 1036.80
- B. Rs 1666.80
- C. Rs 1336.80
- D. Rs 1063.80
- E. None of these

**Ans : A**



# Interest(Assignment)

Q. Anand and Deepak started a business investing Rs.22,500 and Rs.35,000 respectively. Out of a total profit of Rs. 13,800. Deepak's share is

A. Rs 9600

B. Rs 8500

C. Rs 8450

D. Rs 8400

**Ans: D**

Ratio of their shares-

= 22500 : 35000

= 9 : 14

Deepak's share = Rs.(13800×14/23)

= Rs. 8400



# Interest(Assignment)

Q. A started a business with Rs. 21,000 and is joined afterwards by B with Rs. 36,000. After how many months did B join if the profits at the end of the year are divided equally?

A. 4

B. 5

C. 6

D. 7

**Ans: B**

- Capital of A = Rs. 21000
- Capital of B = Rs. 36000
- Ratio of P1:P2=1:1
- using formula,
- $\frac{C_1 T_1}{C_2 T_2} = \frac{P_1}{P_2}$
- In this type , the time period is 12 months i.e. one year
- $\frac{21000 \times 12}{36000 \times T_2} = \frac{1}{1}$
- $T_2 = 7$
- B would join business after  $(12 - 7) = 5$  months



# Interest(Assignment)

Q. A,B,C subscribes Rs. 50000 for a buisness. A subscribes Rs. 4000 more than B and B Rs. 5000 more than C. Out of a total profit of Rs. 35000, A receives :

- A. Rs. 8400
- B. Rs. 11900
- C. Rs. 13600
- D. Rs. 14700

**Ans: D**



# Interest(Assignment)

Q. The simple interest on Rs.1820 from March 9, 2012 to May 21, 2012 at 7.5% rate will be

- A. Rs. 22.50
- B. Rs. 27.30
- C. Rs. 28.80
- D. Rs. 29

**Ans: B**



# Permutation & Combination

- What is permutation?
- It is the number of ways a group of things can be arranged.

E.g: Consider 3 letters A,B,C . In how many ways they can be arranged?

- A B C
  - A C B
  - B A C
  - B C A
  - C A B
  - C B A
- 6 ways to arrange these 3 letters

- For 3 letter / 4 letter words its possible but for more number of letters we need a formula-

- $${}^nPr = \frac{n!}{(n-r)!}$$



# Permutation & Combination

Q. Consider 4 letters A,B,C,D and arrange them in 3 spaces

- - - 3 spaces

No . Of letters = 4

No of spaces = 3

$$nPr = 4P_3 = \frac{4!}{(4-3)!} = \frac{4!}{1!} = 4! = 4 \times 3 \times 2 \times 1 = 24 \text{ ways it can be arranged}$$

Q. Arrange 7 letters A,B,C,D,E,F,G in 4 spaces

- - - - 4 spaces

$$nPr = 7P_4 = \frac{7!}{(7-4)!} = \frac{7!}{3!} = \frac{5040}{6} = 840$$





# Permutation & Combination - Remember

$$0! = 1$$

$$1! = 1$$

$$2! = 2 \times 1 = 2$$

$$3! = 3 \times 2 \times 1 = 6$$

$$4! = 4 \times 3 \times 2 \times 1 = 24$$

$$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$$

$$6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$$

$$7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$$



# Difference between permutation and combination

## Combination ( order does not matter)

***"My fruit salad is a combination of apples, grapes and bananas"*** We don't care what order the fruits are in, they could also be "bananas, grapes and apples" or "grapes, apples and bananas", its the same fruit salad.



## Permutation (When the order does matter )

***"The combination to the safe is 472"***. Now we **do** care about the order. "724" won't work, nor will "247". It has to be exactly **4-7-2**.



# Difference between permutation and combination

## What is permutation?

**Permutation:** The various ways of arranging a given number of things by taking some or all at a time are all called as permutations.

Permutation includes word formation, number formation, circular permutation, etc. **In permutation, objects are to be arranged in particular order.** It is denoted by  ${}^n P_r$  or  $P(n, r)$ .

**Example:** Arrange the given 3 numbers 1, 2, 3 by taking two at a time.

Now these numbers can be arranged in 6 different ways: **(12, 21, 13, 31, 23, 32).**

Here,

12 and 21, 13 and 31 or 23 and 32 do not mean the same, because here order of numbers is important.



# Difference between permutation and combination

- **What is combination?**

**Combination:** Each of different groups or selections formed by taking some or all number of objects is called a combination.

Combination is used in different cases which include team/group/committee.

**In combination, objects are selected randomly and here order of objects doesn't matter.** It is denoted by  ${}^n C_r$  or  $C(n, r)$  or  ${}^n C_r = {}^n C_{(n-r)}$ .

**Example:** If we have to select two girls out of 3 girls X, Y, Z, then find the number of combinations possible.

Now only two girls are to be selected and arranged. Hence, this is possible in 3 different ways: **(XY, YZ, XZ,).**

Here,  
You cannot make a combination as XY and YX, because these combinations mean the same.



# Permutation & Combination

Q. In how many ways can the letters of the word 'LEADER' be arranged?

A. 72      B. 144      C. 360      D. 720      E. None of these

**Soln:**

The word LEADER has 6 letters. So it can be arranged in  $6!$  ways.

Out of these 6 letters, 2 letters are repeated (letter E repeated twice)

So we write it as -  $\frac{6!}{2!}$

$6!$  → 6! ways to arrange letters in the word LEADER

$2!$  → 2! In the denominator as letter E is repeated twice

$$= \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \times 1}$$

$$= 360 \text{ ways}$$

**Ans : C**



# Permutation & Combination

Q. In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

- A. 360                      B. 480                      C. 720                      D. 5040                      E. None of these

**Soln:**

L E A D I N G  $\longrightarrow$  vowels in this word are E, A I

Remaining letters(consonants) are - L D N G

now we can arrange the vowels together in the remaining spaces as

\_ L \_ D \_ N \_ G \_ in 5! ways and vowels be rearranged in those spaces in 3! ways

$$5! \times 3! = 720 \text{ ways}$$

**Ans : C**



# Permutation & Combination

Q. In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?

- A. 810                      B. 1440                      C. 2880                      D. 50400                      E. 5760

**Soln:**

C O R P O R A T I O N----- vowels in this word are O,O,A,I,O

Remaining letters(consonants) are - C R P R T N

now we can arrange the vowels together in the remaining spaces as

\_C\_R\_P\_R\_T\_N\_ in 7! ways and vowels be rearranged in those spaces in 5! Ways

But the repeated letters are 2R in consonants and 3O in vowels

$$\frac{7!}{2!} \times \frac{5!}{3!} = 50400 \text{ ways}$$

**Ans : D**



# Permutation & Combination

Q. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

- A. 210                      B. 1050                      C. 25200                      D. 21400                      E. None of these

**Soln:**

we need to form a 5 letter word with 3 consonants & 2 vowels = C C C V V

Ways to select, (3 consonants out of 7) AND (2 vowels out of 4)

$$= {}^7C_3 \times {}^4C_2 \times 5! \quad \leftarrow \text{each group has 5 letters and they can be arranged in } 5! \text{ ways}$$

$$= \frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{4 \times 3}{2 \times 1} \times 5!$$

$$= 35 \times 6 \times 120$$

$$= 25200 \text{ ways}$$

**Ans : C**





# Permutation & Combination

Q. From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?

- A. 564                      B. 645                      C. 735                      D. 756                      E. None of these

**Soln:**

We may have (3 men and 2 women) or (4 men and 1 woman) or (5 men only).

Required number of ways =  $({}^7C_3 \times {}^6C_2) + ({}^7C_4 \times {}^6C_1) + ({}^7C_5)$

$$\begin{aligned} &= \left( \frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{6 \times 5}{2 \times 1} \right) + ({}^7C_3 \times {}^6C_1) + ({}^7C_2) \rightarrow [\text{using } {}^nC_r = {}^nC_{(n-r)}] \\ &= 525 + \left( \frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{6}{1} \right) + \left( \frac{7 \times 6}{2 \times 1} \right) \\ &= 525 + 210 + 21 \\ &= 756 \end{aligned}$$

**Ans: D**



# Permutation & Combination(Assignment)

Q. In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?

- A. 159                      B. 194                      C. 205                      D. 209                      E. None of these

**Soln:**

(1 boy and 3 girls) or (2 boys and 2 girls) or (3 boys and 1 girl) or (4 boys).

$$= ({}^6C_1 \times {}^4C_3) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_4)$$

$$= ({}^6C_1 \times {}^4C_1) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_2) \rightarrow \text{using } {}^nC_r = {}^nC_{(n-r)} \text{ (to reduce calculation)}$$

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

$$= (24 + 90 + 80 + 15)$$

$$= 209$$

**Ans: D**



# Permutation & Combination(Assignment)

Q. How many 4-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed?

- A. 40
- B. 400
- C. 5040
- D. 2520

**Ans: C**



# Permutation & Combination(Assignment)

Q. In how many different ways can the letters of the word 'MATHEMATICS' be arranged so that the vowels always come together?

- A. 10080
- B. 4989600
- C. 120960
- D. None of these

**Ans: C**



# Permutation & Combination(Assignment)

Q. In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?

- A. 120
- B. 720
- C. 4320
- D. 2160
- E. None of these

**Ans: B**



# Permutation & Combination(Assignment)

Q. How many Permutations of the letters of the word APPLE are there?

A.600

B.120

C.240

D.60

**Ans: D**



# Permutation & Combination(Assignment)

Q. How many different words can be formed using all the letters of the word ALLAHABAD?

A.7560

B.7890

C.7650

D. None of these

**Ans: A**



# Permutation & Combination(Assignment)

Q. Find the value of  ${}^{50}P_2$

- A. 4500
- B. 3260
- C. 2450
- D. 1470

**Ans : C**





# Permutation & Combination(Assignment)

Q. How many words can be formed by using letters of the word 'DELHI'?

- a. 50
- b. 72
- c. 85
- d. 120

**Ans : D**



# Permutation & Combination(Assignment)

Q. Find the number of ways the letters of the word 'RUBBER' can be arranged?

- A. 450
- B. 362
- C. 250
- D. 180

**Ans: D**



# Permutation & Combination(Assignment)

Q. Out of 5 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

- A. 60
- B. 200
- C. 5230
- D. 7200

**Ans : D**



# Permutation & Combination(Assignment)

Q. In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?

- A. 63
- B. 90
- C. 126
- D. 45
- E. 135

**Ans: A**



# Races

## Races

- A contest of speed in running, riding, driving, sailing or rowing is called a race.
- If in a race Ram is at starting point & Shyam starts from 20 mts ahead, then it is said that Ram has given Shyam a start of 20 mts or Ram gives Shyam 20 mts.
- This means that if they start from same point Ram would beat Shyam by 20 mts.



# Races

Q. In a 100 mt race A gives B a start of 25 mt & still wins by 9 sec. Find the speed of A if speed of B is 6 kmph.

A. 8 kmph

B. 9 kmph

C. 10 kmph

D. 12 kmph

Soln

!-----100 m-----!  
A<---25--->B<-----75m-----> A=t-9, B=t

$$S_b = 6 \text{ kmph} = 6 \times \frac{5}{18} = \frac{5}{3} \text{ m/s}$$

$$T_b = D_b / S_b = 75 / (\frac{5}{3}) = 45 \text{ sec}$$

$$T_a = T_b - 9 = 36 \text{ sec}$$

$$\begin{aligned} S_a &= D_a / T_a \\ &= 100 / 36 \text{ m/s} \\ &= 100 / 36 \times \frac{18}{5} \\ &= 10 \text{ kmph} \end{aligned}$$

**Ans C**



# Races(Assignment)

Q. In a 100 m race, A can beat B by 25 m and B can beat C by 4 m. In the same race, A can beat C by:

A. 21 m

B. 26 m

C. 28 m

D. 29 m

• **Soln:-**

$$A : B = 100 : 75$$

$$B : C = 100 : 96$$

$$A:C=(\frac{A}{B}\times\frac{B}{C})=(\frac{100}{75}\times\frac{100}{96})=100:72$$

A beats C by  $(100-72)=28$  m.

**Ans: C**



# Circular Motion

- Use of both relative speed & LCM
- Let  $S_a, S_b$  = speeds of two persons.

$S_r$  = Their relative speed

Distance traveled in 1 round = circumference

**Case A** : Both running in Same direction

Both meet again first time when  $\rightarrow$  **Time =  $\text{dist}/S_r = \text{Circumference}/S_a - S_b$**

**Case B** : Both running in opposite directions( **$\text{DistA} + \text{DistB} = \text{Circumference}$** )

Both meet first time when  $\rightarrow$  **Time =  $\text{Circumference}/S_a + S_b$**

**Case C** : Both running in same/opposite directions

Both meet again at starting point at LCM of their Lap times.





# Circular Motion(Races)

Q. Two friends P & Q start from same point at the same time on a circular track 336 meters long in opposite directions at 6 m/s & 8 m/s respectively. After how much time will they meet again at the starting point for the first time?

A. 56 sec

B. 112 sec

C. 168 sec

D. 214 sec

**Ans : C**

Step1 – find the time taken by each member /player to complete 1 round

Step2 – Calculate LCM(Lap time)

$$\text{LapTm(P)} = \frac{\text{Circumference}}{S_p} = \frac{336}{6} = 56 \text{ sec}$$

$$\text{LapTm(Q)} = \frac{\text{Circumference}}{S_Q} = \frac{336}{8} = 42 \text{ sec}$$

$$\text{LCM}(42,56) = 168 \text{ sec}$$



# Circular Motion(Assignment)

Q. A, B & C start together running along a circular track of 500 m at 8 km/hr, 5 km/hr & 3 km/hr respectively. After how much time will all three meet again at the starting point for the first time?

A. 20 min

B. 24 min

C. 30 min

D. 36 min

**Ans: C**



