



---

# GENERAL APTITUDE

---

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



# Interest

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

Then  **$A = P + I$**

## Simple Interest

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

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,

$$\text{C.I.} = A - P$$

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. 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**

$$\begin{aligned} 500 &\Rightarrow 15\% \uparrow \Rightarrow 575 \text{ (1<sup>st</sup> case)} \\ 500 &\Rightarrow 16\% \uparrow \Rightarrow 580 \text{ (2<sup>nd</sup> case)} \\ \text{difference} &= 580 - 575 = \text{Rs. } 5 \end{aligned}$$

**Ans : A**



# Interest

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%

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

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

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

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

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

**Ans: C**



# Interest

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

$$4000 \xrightarrow[1^{\text{st}} \text{ yr}]{10\%} 4400 \xrightarrow[2^{\text{nd}} \text{ yr}]{10\%} 4840$$

$$CI = A - I$$

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

**Ans: C**

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

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

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

$$P(\text{sum}) = \frac{420 \times 100}{3 \times 8} \\ = \text{Rs. } 840$$



# 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. 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

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 =  $16.64 - 16.00 = \text{Rs. } 0.64$
- $0.64 \rightarrow 100$
- $128 \rightarrow ?$
- $= \frac{128 \times 100}{0.64} = 20000$
- 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



# Interest

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. 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 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

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

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

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

$\rightarrow$  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. 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 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 partnership 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-


$$= 22500 : 35000$$

$$= 9 : 14$$

$$\begin{aligned}\text{Deepak's share} &= \text{Rs.}(13800 \times 14/23) \\ &= \text{Rs. 8400}\end{aligned}$$



# 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**”.
- 01/01/001 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



# Calendar

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



# Calendar

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



# 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,

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

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,

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

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

For date ,

$$\frac{15}{7} = 1 \text{ (remainder)}$$



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

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

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

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

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  $\rightarrow x + 11$

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

$$2017 + 6 = 2023$$

**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

- 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 5th 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. 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)

Q. If 6th March, 2005 is Monday, what was the day of the week on 6th March, 2004?

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

**Ans: A**

The year 2004 is a leap year. So, it has 2 odd days.

But, Feb 2004 not included because we are calculating from March 2004 to March 2005. So it has 1 odd day only.

The day on 6th March, 2005 will be 1 day after the day on 6th March, 2004.

Given that, 6th March, 2005 is Monday.

6th March, 2004 is Sunday (1 day before to 6th March, 2005).



# 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**



# 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 -  $\frac{6!}{2!}$

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

$2!$  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)

$= 7C_3 \times 4C_2 \times 5!$   $\leftarrow$  each group has 5 letters and they can be arranged in 5! 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. In how many different ways can the letters of the word 'DETAIL' be arranged in such a way that the vowels occupy only the odd positions?

A. 32                      B. 48                      C. 36                      D. 60                      E. 120

**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 =  $(7C3 \times 6C2) + (7C4 \times 6C1) + (7C5)$

$$\begin{aligned} &= \left( \frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{6 \times 5}{2 \times 1} \right) + (7C3 \times 6C1) + (7C2) \rightarrow [\text{using } {}^nC_r = {}^nC_{(n-r)}] \\ &= 525 + \left( \frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{6}{1} \right) + \left( \frac{7 \times 6}{2 \times 1} \right) \\ &= 525 + 210 + 21 \\ &= 756 \end{aligned}$$

**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).

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

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

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

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

$$= 209$$

**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**



