CHANAKYA 2.0

For CA Foundation

Permutations Combinations

QUANTITATIVE APTITUDE

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TOPICS TO BE COVERED

01 Multiplication Theorem

02 Concept of Factorial

03 Permutations

04 Combinations

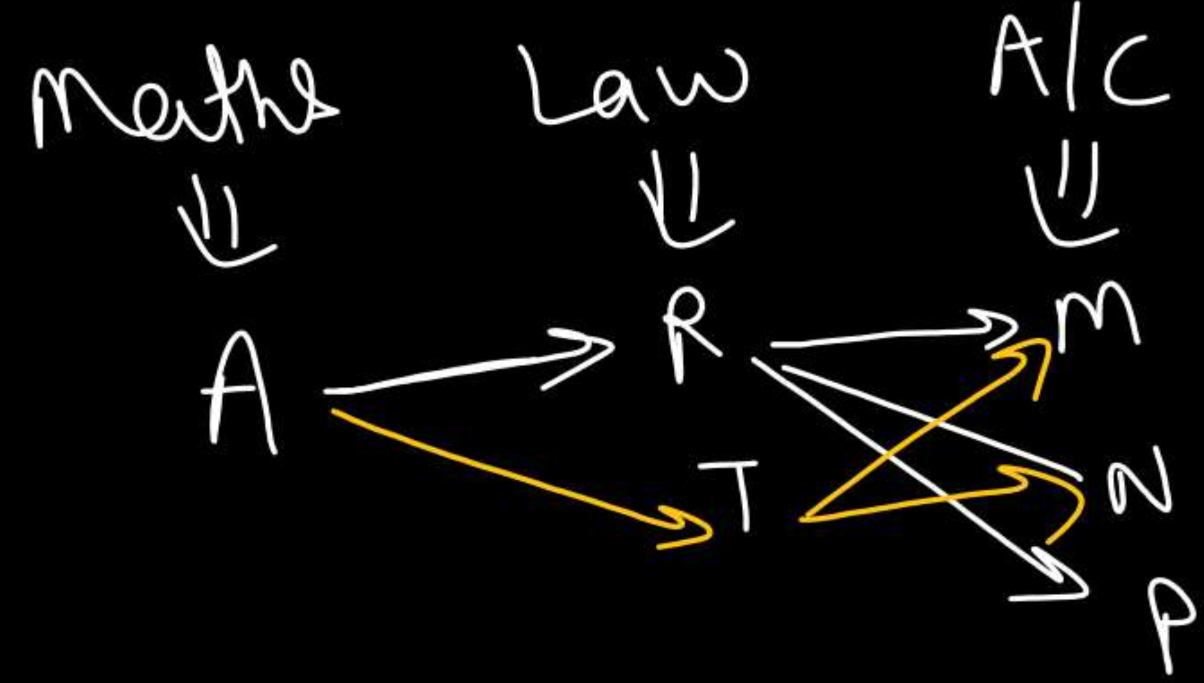
Permutation & Combination

$\Downarrow$

Selection or Arrangement of elements

(Possibilities)

CA - foundation



ARM, ARN, ARP, ATM, ATN, ATP

Total ways

$= 1 \times 2 \times 3$

$= 6$

Rule Of Counting

Fundamental Principle of counting

→ If one event can be performed in 'm' no of ways & then after performing first event another event can be performed in 'n' no. of ways.

Total no of ways of doing two events = $m \times n$

Q A coin is tossed three times.

$$\text{Total outcomes} = \boxed{2} \times \boxed{2} \times \boxed{2} = 8$$

$$\begin{array}{ccc} H & H & H \\ or & or & or \\ T & T & T \end{array}$$

HHH
HHT
HTH
HTT

TTT
TTH
THT
THH

A coin is tossed & then a dice is thrown

Total possibilities = $\boxed{2} \times \boxed{6} = 12$

H or T

1
2
3
4
5
6

H1	T1
H2	T2
H3	T3
H4	T4
H5	T5
H6	T6

How many 4-letter code can be formed using the first 10 letters of the English alphabet, if no letter can be repeated?

a, b, c, d, e, f, g, h, i, j

A. 5040

B. 10000

C. 720

D. None

$\boxed{10} \times \boxed{9} \times \boxed{8} \times \boxed{7} = 5040$

a
b
c
d
e
f
g
h
i
j

How many 6–digit telephone numbers can be constructed using the digits 0 to 9 if each number starts with 987 and no digit appears more than once?

A. 336

B. 210

C. 720

D. None

0, 1, 2, 3, 4, 5, 6, ~~7~~, ~~8~~, ~~9~~

$\boxed{1} \times \boxed{1} \times \boxed{1} \times \boxed{7} \times \boxed{6} \times \boxed{5} = 210$

9 8 7

0 1 2 3 4 5 6

Q

Given 5 flags of different colours, how many different signals can be generated if each signal requires the use of 2 flags, one below the other?

A. 25

B. 9

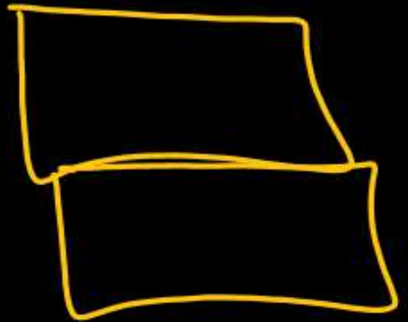
C. 20

D. None

R Y B G W

Total no of signals = $\boxed{5} \times \boxed{4}$

$= 20$



There are 3 candidates for a physics ,5 for a Maths & 4 for a natural science scholarship. In how many way can these scholarships be awarded?

A. 12

B. 60

C. 32

D. None

P = 3

m - 5

NS = 4

$\boxed{3} \times \boxed{5} \times \boxed{4} = 60$

Q

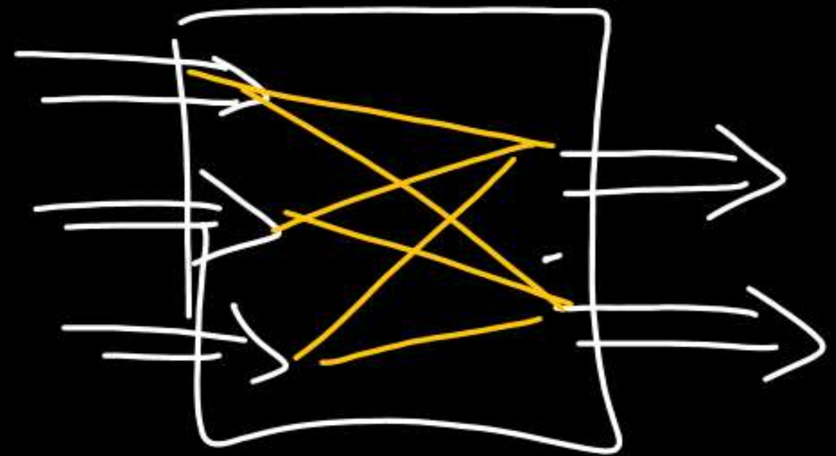
In a cinema hall, there are three entrance doors and two exit doors .In How many ways can a person enter the hall and then come out?

A. 9

B. 4

C. 6

D. None



$\boxed{3} \times \boxed{2} = 6$

Q

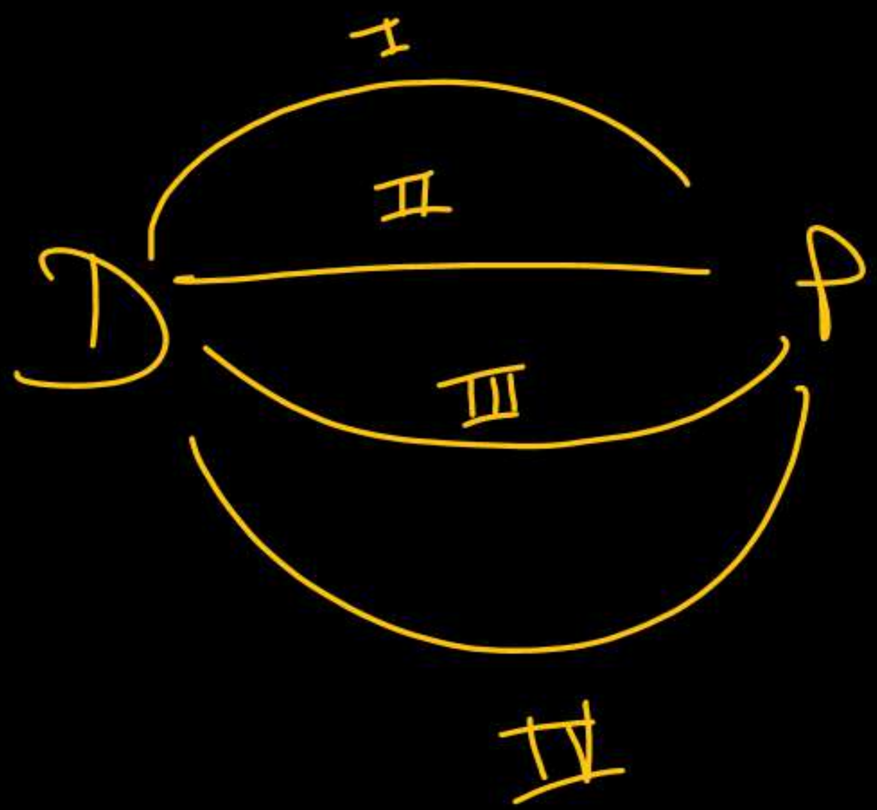
There are 4 routes between Delhi and Patna. In how many ways can a man go from Delhi to Patna and return if for returning any route can be taken

A. 16

B. 4

C. 12

D. None



$$4 \times 4 = 16$$

Q

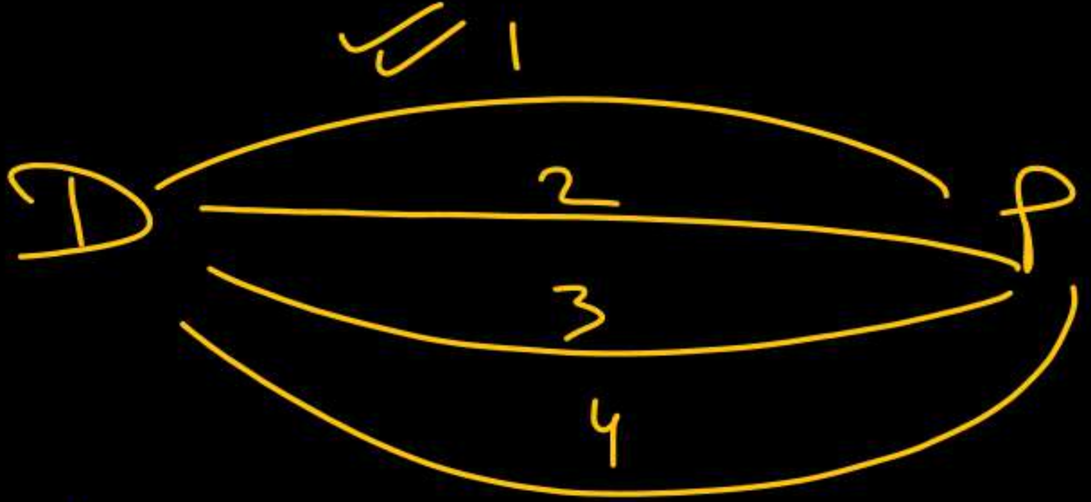
There are 4 routes between Delhi and Patna. In how many ways can a man go from Delhi to Patna and return if for returning same route is taken

A. 16

B. 4

C. 12

D. None



11, 22, 33, 44

$\boxed{4} \times \boxed{1} = 4$

Q

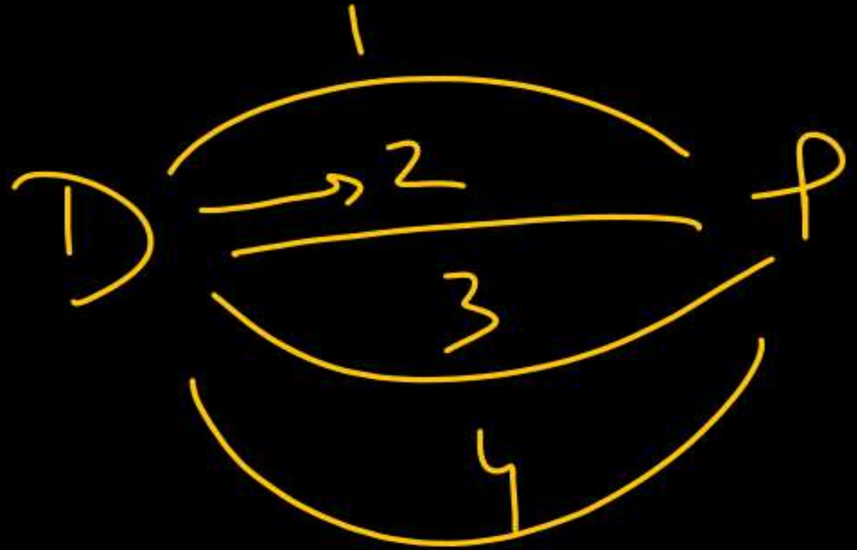
There are 4 routes between Delhi and Patna. In how many ways can a man go from Delhi to Patna and return if for returning same route is not taken

A. 16

B. 4

C. 12

D. None



$4 \times 3 = 12$

Q

How many words (with or without meaning) of three distinct letters of the English alphabet are there?

A. 15600

B. 17576

C. Infinite

D. None

$\underbrace{a, b, c, d, \ldots, x, y, z}$

Total alphabets = 26

Total words (3 letters) $= \boxed{26} \times \boxed{25} \times \boxed{24} = 15600$

Q

In an exam 3 true false type questions are asked . If each question is compulsory, in how many way a student can answer the question ?

(A.) 3

(B.) 6

(C.) 8

(D.) None

	I	II	III
1)	T	T	T
2)	T	T	F
3)	T	F	T
4)	T	F	F
5)	F	T	T
6)	F	T	F
7)	F	F	T
8)	F	F	F

$\boxed{2} \times \boxed{2} \times \boxed{2} = 8$

T or F   T or F   T or F

In how many ways can the following prizes be given away to a class of 30 students, first and second in mathematics, first and second in physics , first in chemistry and first in English .

A. 6.8121×10^6

B. 6.8121×10^7

C. 6.8121×10^8

D. None

30 Students

m1 m2 P1 P2 C1 E1

$\boxed{30} \times \boxed{29} \times \boxed{30} \times \boxed{29} \times \boxed{30} \times \boxed{30}$

$= 681210000$

6.8121×1000000

$= 6812100$

6.8121×100000000

681210000

How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that repetition of digit is not allowed

A. 60

B. 120

C. 125

D. None

1, 2, 3, 4 & 5

$\boxed{5} \times \boxed{4} \times \boxed{3} = 60$

1
2
3
4
5

123, 124, 125

231, 234

Q

How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that repetition of digit is allowed

A. 60

B. 120

C. 125

D. None

1, 2, 3, 4 & 5

$\boxed{5} \times \boxed{5} \times \boxed{5} = 125$

1, 2, 3, 4, 5 | 1, 2, 3, 4, 5 | 1, 2, 3, 4, 5

111, 131

234, 233

How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4 , 5 & 6 assuming that repetition of digit is allowed

A. 216

B. 108

C. 60

D. None

{1, 2, 3, 4, 5, 6}

3 digit even no. = $\boxed{6} \times \boxed{6} \times \boxed{3} = 108$

1 1 2
2 2 4
3 3 6
4 4
5 5
6 6

0
2
4
6
8

1 5 2

3 2 6

4 2 1
odd no.

How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4 , 5 & 6 assuming that repetition of digit is not allowed

A. 216

B. 108

C. 60

D. None

$\boxed{4} \times \boxed{5} \times \boxed{3} = 60$

2
4
6

How many 3 digit numbers can be formed using the digits 0, 1,2,3,4 & 5 if repetition of digit is allowed

A. 180

B. 216

C. 100

D. None

0, 1, 2, 3, 4 & 5

Total 3 digit numbers $= \boxed{5} \times \boxed{6} \times \boxed{6} = 180$

~~0~~	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5

Q

How many 3 digit numbers can be formed using the digits 0, 1,2,3,4 & 5 if repetition of digit is not allowed

A. 180

B. 216

C. 100

D. None

3 digit no = $\boxed{5} \times \boxed{5} \times \boxed{4} = 100$

~~0~~

1 2 3 4 5

Q

How Many 4 digit numbers are there if no digit is repeated

A. 4536

B. 5040

C. 10000

D. None

$\underbrace{0, 1, 2, 3, 4, 5, 6, 7, 8, 9}$

$\boxed{9} \times \boxed{9} \times \boxed{8} \times \boxed{7} = 4536$

1
2
3
⋮
9

Q

How many numbers can be made using Atleast 2 digits from 1 ,2 ,3 and 4 if no repetition is allowed ?

A. 12

B. 24

C. 60

D. None

or(या) = +

{1, 2, 3 & 4}

2 digit numbers = $\boxed{4} \times \boxed{3} = 12$

3 digit number = $\boxed{4} \times \boxed{3} \times \boxed{2} = 24$

4 digit number = $\boxed{4} \times \boxed{3} \times \boxed{2} \times \boxed{1} = 24$

Total numbers = 12 + 24 + 24 = 60

Digits ⇒ 1, 2, 3

Total numbers

one Digit	2 digit	3 digit
1	12	123
2	13	132
3	21	231
	23	213
	31	312
	32	321

one Digit = 3

2 digit = 3 × 2 = 6

3 digit = 3 × 2 × 1 = 6

Total no = 3 + 6 + 6 = 15

Q

Given 6 flags of different colours, how many different signals can be generated if each signal requires the use of atleast 3 flags, one below the other?

A. 720

B. 1920

C. 120

D. None

signal 3 flag $= \boxed{6} \times \boxed{5} \times \boxed{4} = 120$

4 flags $= \boxed{6} \times \boxed{5} \times \boxed{4} \times \boxed{3} = 360$

5 flags $= 6 \times 5 \times 4 \times 3 \times 2 = 720$

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

Total signal $= 1920$

Factorial

$n!$

= Product of first 'n' natural numbers

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

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

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

$8! = 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$
$= 40320$

$8! = 8 \times 7 \times 6 \times 5!$
$= 8 \times 7 \times 6!$

Eg $\dfrac{10!}{8!} = \dfrac{10 \times 9 \times \cancel{8!}}{\cancel{8!}} = 90$

Eg $$\frac{12!}{3! \times 9!}$$

$$= \frac{12 \times 11 \times 10 \times \cancel{9!}}{3 \times 2 \times 1 \times \cancel{9!}}$$

$$= 220$$

Eg $\cancel{\frac{8!}{4!}}$ $2!$

$4|4$

Eg $$\frac{8!}{4!} = \frac{8 \times 7 \times 6 \times 5 \times \cancel{4!}}{\cancel{4!}}$$

Eg $8! - 6!$

$= 2!$

पाप

Eg $8! - 6!$

$= \underbrace{8 \times 7} \times \underbrace{6!} - \underbrace{6!}$

$= 6! \times [8 \times 7 - 1]$

$= 720 \times 55$

$= 39600$

$HCF(a!, b!, c!)$

$$= \underbrace{a! \text{ or } b! \text{ or } c!}_{\text{whichever is smallest}}$$

$LCM(a!, b!, c!)$

$$= \underbrace{a! \text{ or } b! \text{ or } c!}_{\text{whichever is Highest}}$$

eg $HCF(4!, 5!)$

$= HCF(24, 120)$

$= 24 = 4!$

eg $LCM(2!, 3!, 4!)$

$= LCM(2, 6, 24)$

$= 24$

$= 4!$

$n! =$ Product of first 'n' natural no.

$n! = n(n-1)(n-2)(n-3)\ldots 2.1$

$(2n)! = 2n(2n-1)(2n-2)(2n-3)\ldots 2.1$

$(n+2)! = (n+2)(n+1)(n)(n-1)(n-2)\ldots 2.1$

$1(1!) + 2(2!) + 3(3!) + \dots + n(n!) = (n+1)! - 1$

Eg $1(1!) + 2(2!) + 3(3!)$

$= 1(1) + 2(2) + 3(6)$

$= 1 + 4 + 18$

$= 23$

or

$4! - 1 = 24 - 1 = 23$

Eg $1(1!) + 2(2!) + 3(3!) + \dots + 12(12!)$

$= 13! - 1$

If $\frac{1}{9!}+\frac{1}{10!}=\frac{x}{11!}$, find x?

$11^2 = 121$

A. 81

B. 100

C. $\boxed{121}$

D. None

$$\frac{1}{9!}+\frac{1}{10\times 9!}=\frac{x}{11\times 10\times 9!}$$

$$\Rightarrow \frac{1}{\cancel{9!}}\left[1+\frac{1}{10}\right]=\frac{x}{11\times 10\times \cancel{9!}}$$

$$\Rightarrow \frac{10+1}{\cancel{10}}=\frac{x}{11\times \cancel{10}}$$

$$\Rightarrow \boxed{x=121}$$

Q

Find n if $(n+2)! = 2550 \times n!$

A. 47 ✗

B. 48 ✗

C. $\boxed{49}$ ✓

D. None

$$(n+2)! = 2550 \times n!$$

$$(n+2)(n+1)\cancel{n!} = 2550 \times \cancel{n!}$$

$$(n+2)(n+1) = 2550$$

$\rightarrow n = 47$	$49 \times 48 = 2352$
$\rightarrow n = 48$	$50 \times 49 = 2450$
$\rightarrow n = 49$	$51 \times 50 = 2550$

LCM OF (4! , 5! , 6!) = ?

A. 120!

B. 4!

C. 6!

D. 1

Highest = 6!

HCF OF $(4!, 5!, 6!) = ?$

least

$\Downarrow$

4!

A. 120!

B. 4!

C. 6!

D. 1

$1(1!)+2(2!)+3(3!)+....+7(7!)=?$

A. 5040

B. 362880

C. $\boxed{40319}$

D. None

$= 8! - 1$

$= 40320 - 1$

Value of $\sum_{r=1}^{10} r(r!) = ?$

$\Sigma \Rightarrow$ sum

A. 10!

B. 11!

C. $\boxed{11!-1}$

D. 11!+1

$$\sum_{r=1}^{10} r(r!)$$

$$= 1(1!) + 2(2!) + 3(3!) + \cdots + 10(10!)$$

$$= 11! - 1$$

Permutations

$\Downarrow$

Arrangement of elements where order of elements is important

eg $\boxed{A, B, C}$

$\Downarrow$

Arrangement using 2 elements

$\{AB, AC, BA, BC, CA, CB\}$

Combination

$\Downarrow$

Selection of elements where order of elements is not important.

eg $\boxed{A, B \& C}$

$\Downarrow$

Selection of 2

A & B, A & C, B & C

$\boxed{^nP_r = \dfrac{n!}{(n-r)!}}$

where $n \geq r$

Total elements $= n$

elements used at a time $= r$

$$^3P_2 = \frac{3!}{(3-2)!} = \frac{3!}{1!} = \frac{6}{1} = 6$$

$$3 \times 2 = 6$$

eg

$$^5P_3 = \frac{5!}{(5-3)!}$$

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

$$= \frac{5 \times 4 \times 3 \times \cancel{2!}}{\cancel{2!}}$$

$$= 60$$

eg

$$^8P_5 = \frac{8!}{3!}$$

$$= \frac{8 \times 7 \times 6 \times 5 \times 4 \times \cancel{3!}}{\cancel{3!}}$$

$$= 6720$$

Eg ${}^{10}P_4$

$= 10 \times 9 \times 8 \times 7$

$= 5040$

or

$${}^{10}P_4 = \frac{10!}{6!} = \frac{10 \times 9 \times 8 \times 7 \times \cancel{6!}}{\cancel{6!}} = 5040$$

Eg ${}^{n}P_3 = n(n-1)(n-2)$

Eg ${}^{2n}P_4 = (2n)(2n-1)(2n-2)(2n-3)$

Or

$${}^{n}P_3 = \frac{n!}{(n-3)!} = \frac{n(n-1)(n-2)\cancel{(n-3)!}}{\cancel{(n-3)!}}$$

$$\boxed{0! = 1}$$

$$\boxed{1! = 1}$$

$$\boxed{{}^{n}P_{n} = n!}$$

eg ${}^{4}P_{4}$

$= \frac{4!}{0!}$

$= \frac{4!}{1}$

$= 4!$

$= 24$

eg ${}^{6}P_{6}$

$= 6!$

$= 720$

Q

If ${}^{n}P_4 = 20 \times {}^{n}P_2$ Then n?

A. 5 ✗

B. 6 ✗

C. 7 ✓

D. None

$${}^{n}P_4 = 20 \times {}^{n}P_2$$

$$\cancel{n}(\cancel{n-1})(n-2)(n-3) = 20 \times \cancel{n}(\cancel{n-1})$$

$$(n-2)(n-3) = 20$$

$n = 5$

$n = 6$

$3 \times 2 = 6$

$4 \times 3 = 12$

$5 \times 4 = 20$

$$\frac{\cancel{n!}}{(n-4)!} = 20 \times \frac{\cancel{n!}}{(n-2)!}$$

$$\frac{(n-2)!}{(n-4)!} = 20$$

$$\frac{(n-2)(n-3)\cancel{(n-4)!}}{\cancel{(n-4)!}} = 20$$

$$(n-2)(n-3) = 20$$

If ${}^{n}P_3 : {}^{n}P_2 = 3:1$ Find Value of n

A. 5

B. 6

C. 7

D. None

$$\Rightarrow \frac{{}^{n}P_3}{{}^{n}P_2} = \frac{3}{1}$$

$$\Rightarrow \frac{\cancel{n}\cancel{(n-1)}(n-2)}{\cancel{n}\cancel{(n-1)}} = 3$$

$$\Rightarrow n-2 = 3$$

$$\Rightarrow \boxed{n=5}$$

Q

How many $\boxed{\text{4 letters words}}$ with or without meaning, can be made out of the letters of the word "LOGARITHMS" if repetition of letters is not allowed

A. 5040

B. 10000

C. 3024

D. None

L O G A R I T H M S

Total letters = 10

$= \boxed{10} \times \boxed{9} \times \boxed{8} \times \boxed{7}$

or

$^{10}P_4 = 10 \times 9 \times 8 \times 7$

L G A R

O R I T

O R T I

In how many way 6 persons can stand in a queue ?

A. 6!

B. 36

C. 120

D. None

$^6P_6$

$= 6!$

$= 720$

$^3P_3$

a, b & c

abc
acb
bca
bac
cab
cba

$3! = 6$

How many words with or without meaning, can be made using 3 letters of the word "EQUATION"

A. 40320

B. 336

C. 3

D. None

$$^8P_3 = \frac{8!}{5!}$$

ANT

ATN

$$= 8 \times 7 \times 6$$

Eg {MARKS}

i) How many words can be made using all letters?

Sol: i) Total words $= {}^5P_5 = 5!$

$= 120$

ii) In how many words letter 'M' & 'A' are always together?

Sol: ii)

$\boxed{MA}$, R, K, S

consider M & A as a single unit

Total words where M & A are together $= \underbrace{4!}_{\text{4 elements}} \times \underbrace{2!}_{\text{Box के अन्दर वाले elements}}$

$= 24 \times 2 = 48$

iii) Total words when M & A never come together?

Sol: $120 - 48$

$= 72$

How many words can be formed from the letters of the word "EQUATION" so that The vowels always occur together

(A.) 2880

(B.) 40320

(C.) 37440

(D.) None

$\boxed{E\ U\ A\ I\ O}$, Q, T, N

these vowels will be treated as a single element

Total words when all vowels come together $= \underbrace{4!}_{\text{total element}} \times \underbrace{5!}_{\text{elements inside the box}} = 24 \times 120 = 2880$

How many words can be formed from the letters of the word "EQUATION" so that The vowels never occur together

A. 2880

B. 40320

C. 37440

D. None

Total words using all 8 elements = 8!

= 40320

Total words when all vowels come together = 2880

Total words when all vowel don't come together = 40320 − 2880

= 37,440

~~E U A I O~~ ~~Q T N~~

How many words can be formed from the letters of the word "FAILURE" so that The vowels are always together

A. 576

B. 575

C. 570

D. None

$\boxed{AIUE}$ F, L, R

single element

$4! \times 4!$

$= 24 \times 24 = 576$

Q

10 examination papers are arranged in such a way that the best and worst papers always come together. The number of arrangements is

A. 2(9!)

B. 9!

C. 10!-9!

D. 10!-2(9!)

a, b, c, d, e, f, g, h, $\boxed{i, j}$

i → Best, j → worst

$9! \times 2!$

$9! \times 2 \times 1$

Q

10 examination papers are arranged in such a way that the best and worst papers never come together. The number of arrangements is

(A.) 2(9!)

(B.) 9!

(C.) $\boxed{8(9!)}$

(D.) None

Never come together

= Total arrangement − they come together

$= 10! - 9! \times 2$

$= 10 \times 9! - 9! \times 2$

$= 9! \times (10-2) = 9! \times 8$

Find the number of ways in which 5 boys and 3 girls can be seated in a row so that no two girls are together .?

A. 720

B. 14400

C. 40320

D. None

5 - B & 3 - G

_ B_1 _ B_2 _ B_3 _ B_4 _ B_5 _

$$\underbrace{{}^5P_5}_{\text{Boys}} \times \underbrace{{}^6P_3}_{\text{Girls}}$$

$= 5! \times 6 \times 5 \times 4 = 14,400$

Q

It is required to seat 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible?

A. (9!)

B. (8!)

C. 2880

D. None

m - 5

w - 4

1 2 3 4 5 6 7 8 9

w w w w

$$^4P_4 \times {}^5P_5 = 4! \times 5!$$

$$= 24 \times 120$$

$$=$$

If the letters word 'DAUGHTER' are to be arranged so that vowels occupy the odd places, then number of different words are

(A) 2880

(B) 676

(C) 625

(D) 576

Vowels = A, U, E

Consonants = D, G, H, T, R

1 2 3 4 5 6 7 8

$\boxed{V}$ $\boxed{V}$ $\boxed{V}$ $\boxed{V}$

$${}^4P_3 \times {}^5P_5 = 4 \times 3 \times 2 \times 5!$$

$$= 2880$$

What is the sum of all 3 digit numbers which can be made using each digit from 1,3 & 5 ?

A. 1950

B. 1998

C. 2198

D. None

135
153
315
351
513
531

1998

Sum

$$= \left[\text{Sum of all Digits}\right] \times \frac{n!}{n} \times \left[111 \ldots\ldots n \text{ times}\right]$$

$$= (1+3+5) \times \frac{3!}{3} \times 111$$

$$= 9 \times 2 \times 111$$

$$= 1998$$

The sum of all 4 digit number containing the digits 2, 4, 6, 8, without repetitions is

A. 1,33,230

B. 132,320

C. 312320

D. 1,33,320

$(2+4+6+8) \times \frac{4!}{4} \times 1111$

$= 20 \times 6 \times 1111$

$= 1,333,20$

Permutation when some elements Repeat

n = Total element

one element repeat = r times

another repeat = t times

another repeat = l times.

$$\text{Total permutations} = \frac{n!}{r!\,t!\,l!}$$

M, A, A

1) M A A $\quad$ M ~~A~~ A

2) A M A $\quad$ A ~~M~~ A

3) A A M $\quad$ A ~~A~~ M

$$\frac{3!}{2!} = \frac{6}{2} = 3$$

A G A I N

A → 2

Total words

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

$$= \frac{120}{2}$$

$$= 60$$

How many permutations of the letters of word "APPLE" are there?

A. 120

B. 60

C. 30

D. None

$P \longrightarrow 2$

$$\frac{5!}{2!}$$

$$= 60$$

How many permutations of the letters of word "ALLAHABAD" are there?

A. 7560

B. 9!

C. (4!)(3!)

D. None

$A \longrightarrow 4$

$L \longrightarrow 2$

$$\frac{9!}{4! \times 2!} = \frac{362880}{24 \times 2} = 7560$$

Q

Words can be formed by using all the letters of the word "ALLAHABAD". In how many of them both L do not come together?

A. 7560

B. 9!-3!

C. 5880

D. None

single element

$\boxed{LL}$, A, A, A, A, H, B, D

Total words when two L come together $= \dfrac{8!}{4!} \times \dfrac{\cancel{2!}}{\cancel{2!}}$

$= \dfrac{40320}{24}$

$= 1680$

Both L don't come together

$= 7560 - 1680$

$= 5880$

Q "PUNCH"

How many words start with P

Sol:

$$\boxed{1} \times \boxed{4} \times \boxed{3} \times \boxed{2} \times \boxed{1}$$

P U N C H

$$= 1 \times 4!$$

$$= 24$$

Q "PUNCH"

In how many words they start with P & ends at H.

Sol:

$$\frac{1}{P} \times \frac{3}{} \times \frac{2}{} \times \frac{1}{} \quad \frac{1}{H} = 6$$

$$= 3!$$

$$= 6$$

How many permutations of the letters of word "PUNCH" are there when there are exactly two letters between P & C ?

A. 6

B. 12

C. 24

D. None

$\underline{P}\ \_\ \_\ \underline{C}\ \_ = 3! = 6$

$\_\ \underline{P}\ \_\ \_\ \underline{C} = 3! = 6$

$\underline{C}\ \_\ \_\ \underline{P}\ \_ = 3! = 6$

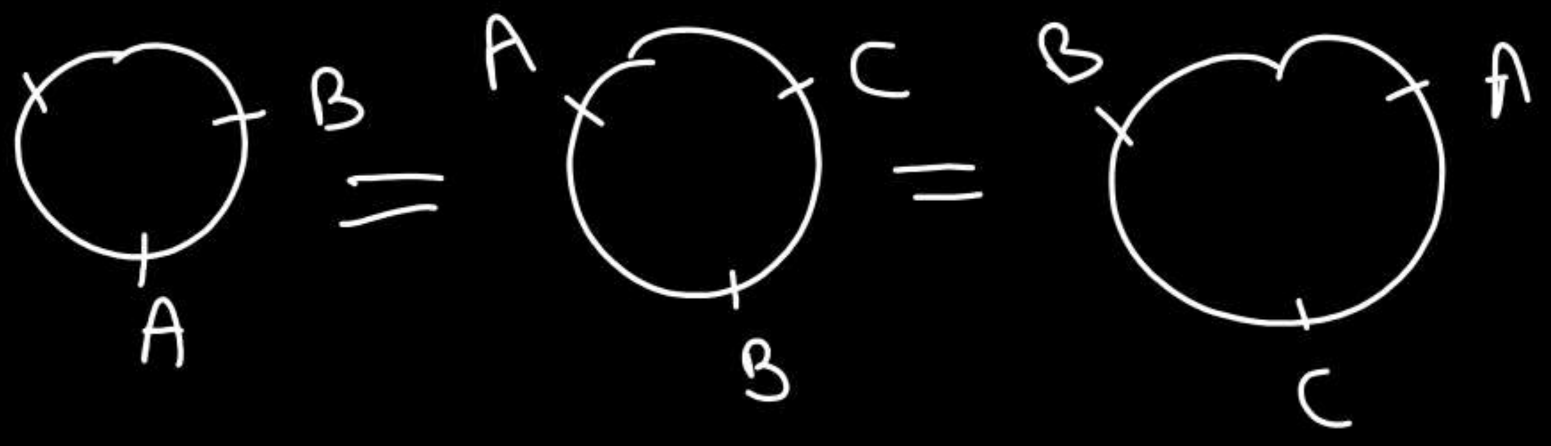
$\_\ \underline{C}\ \_\ \_\ \underline{P} = 3! = 6$

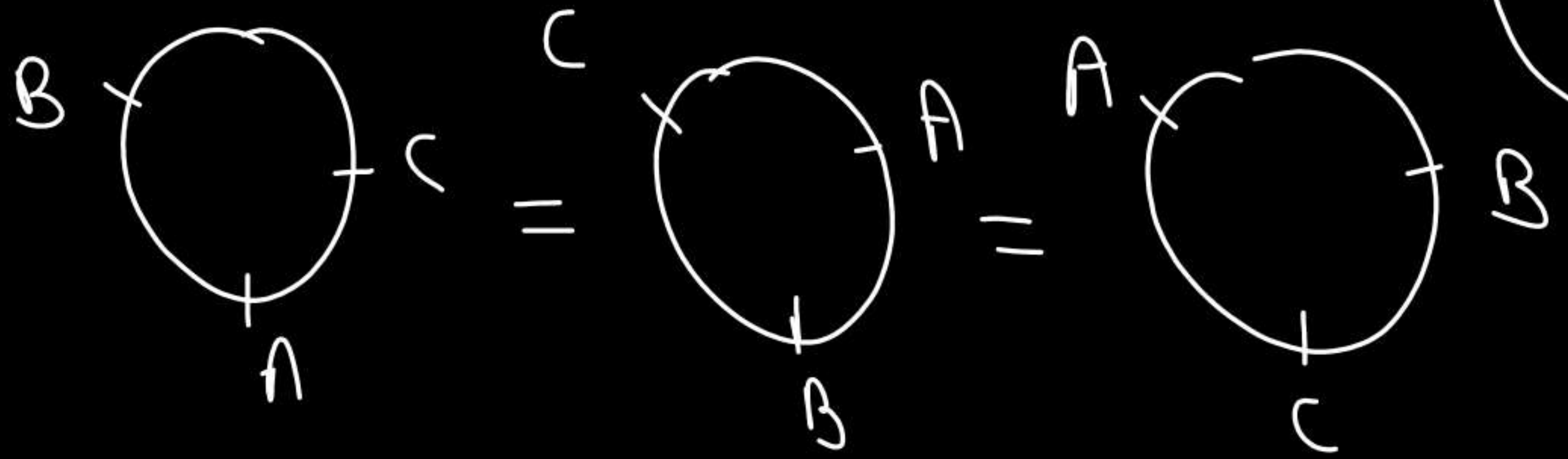
24

Circular Permutations

A , B & C

$\Downarrow$

first =


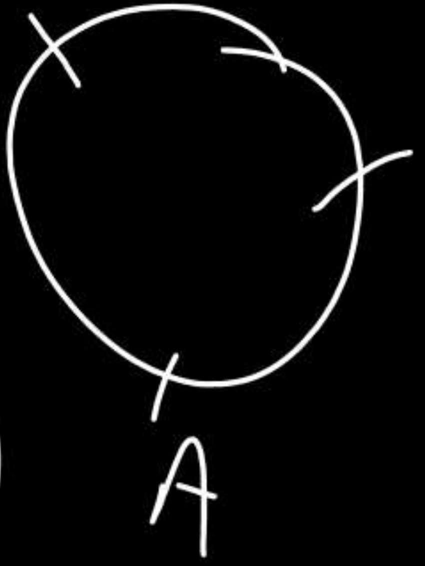
second =


Total circular Perm.

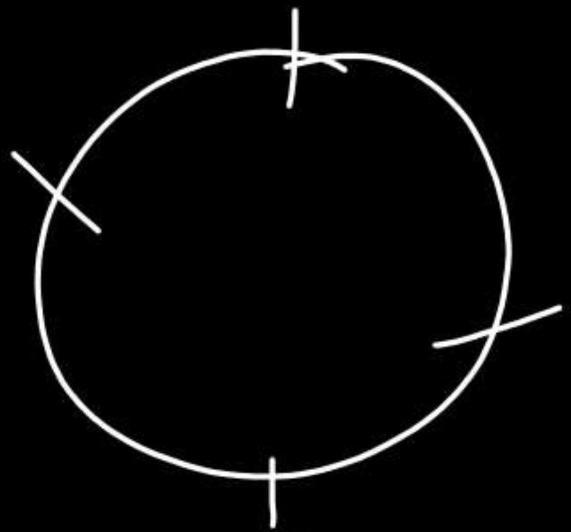
$= 2!$

$= 2 \times 1$

$= 2$



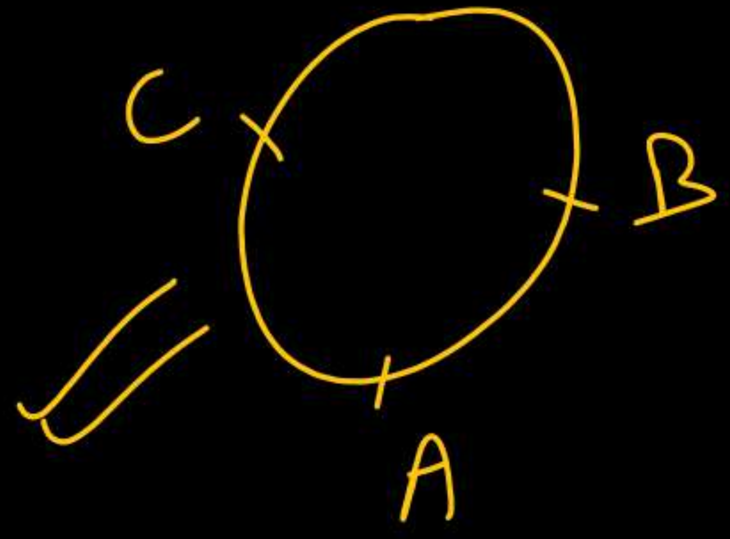
A, B, C, D

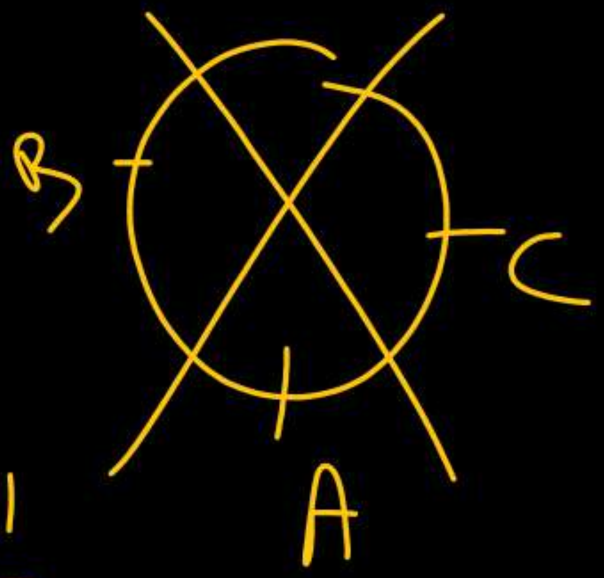


A

$= 3!$

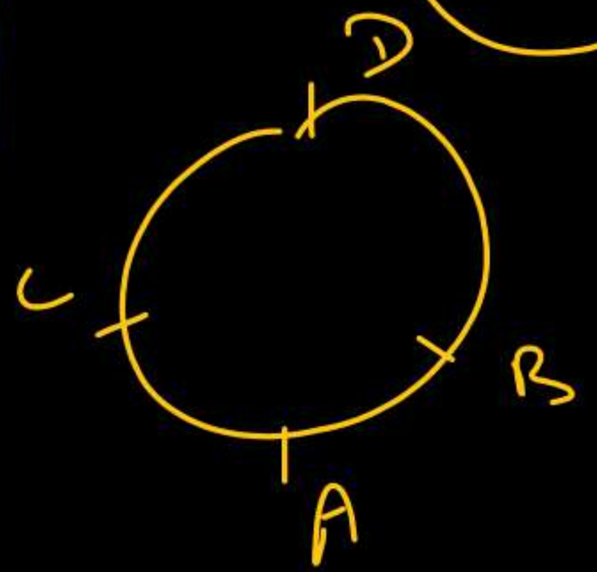
A, B, C

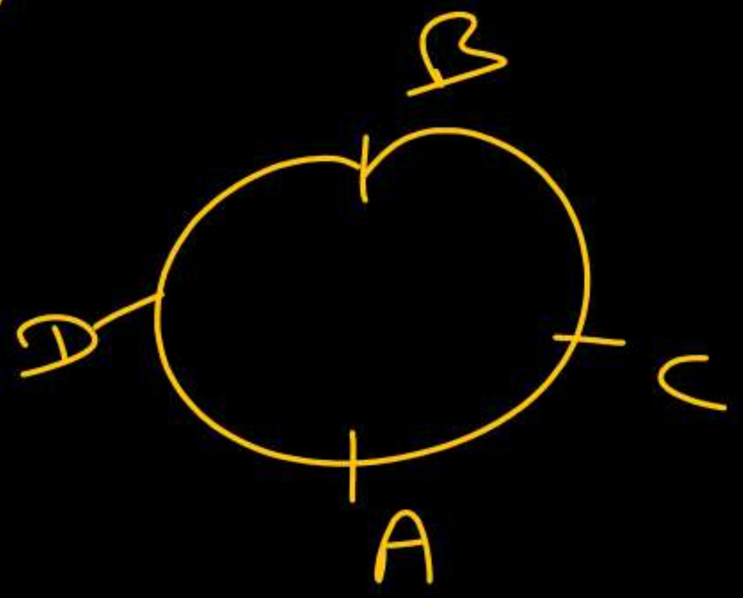


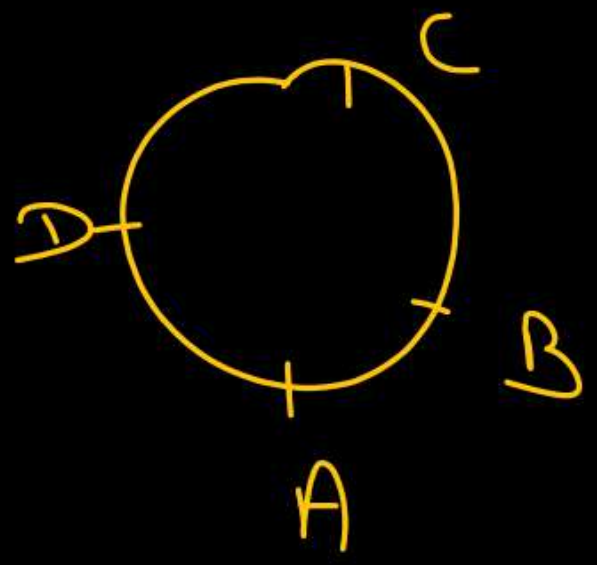


$$\frac{(3-1)!}{2} = \frac{2!}{2} = 1$$

A, B, C, D







$$\frac{(4-1)!}{2} = \frac{3!}{2} = \frac{6}{2} = 3$$

Total no. of circular Perm. of 'n' elements $= (n-1)!$

Total circular Permutation when Different neighbours are Required $= \dfrac{(n-1)!}{2}$

(Necklace)

Q

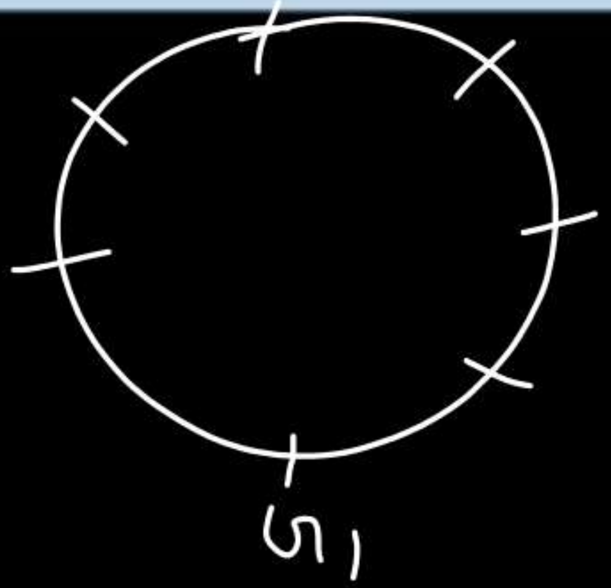
The number of ways in which 7 girls form a ring is

A. 5040

B. 720

C. 120

D. None



$6!$

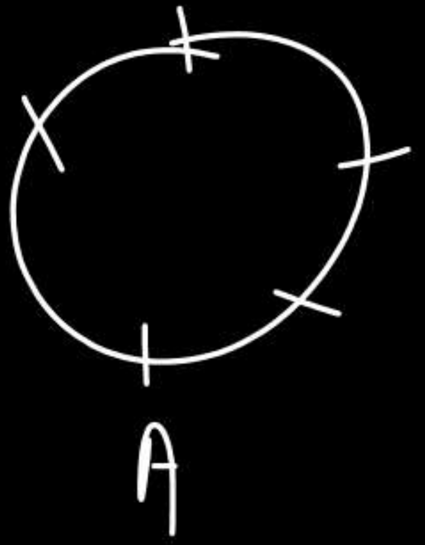
$= 720$

Q. In how many ways A, B, C, D & E sit in a Round table so that D & E are always together? D & E are never together?

Sol: Total ways of arrangement of 5 Person in a Round table

$= 4!$

$= 24$



$\boxed{DE}$, A, B, C

Total arrangement when D & E are together

$= (4-1)! \times 2!$

$= 3! \times 2$

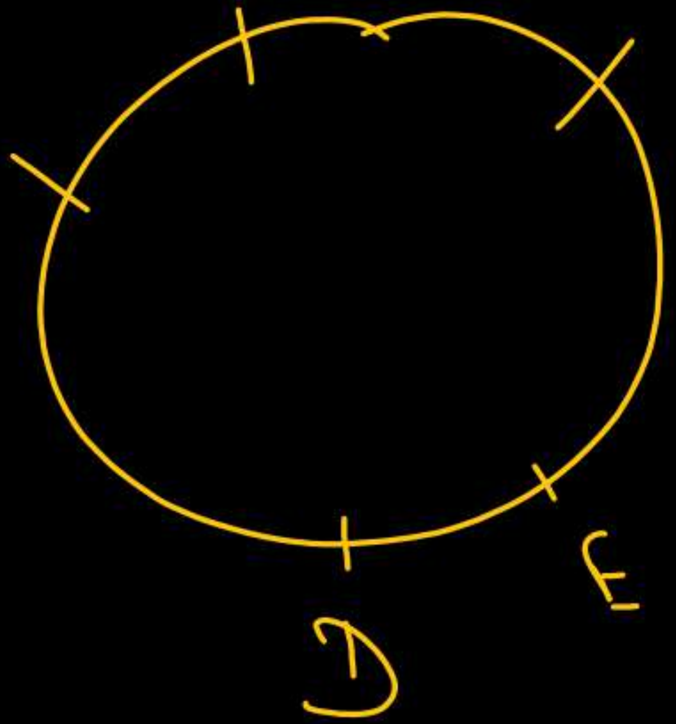
$= 12$

D & E are never together

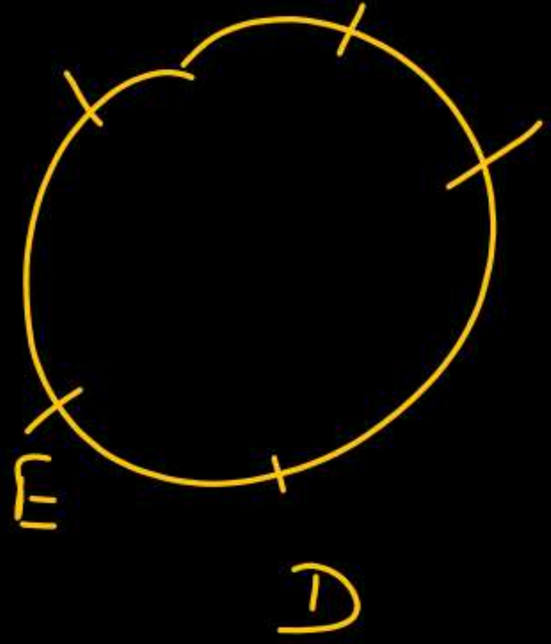
$= 24 - 12$

$= 12$

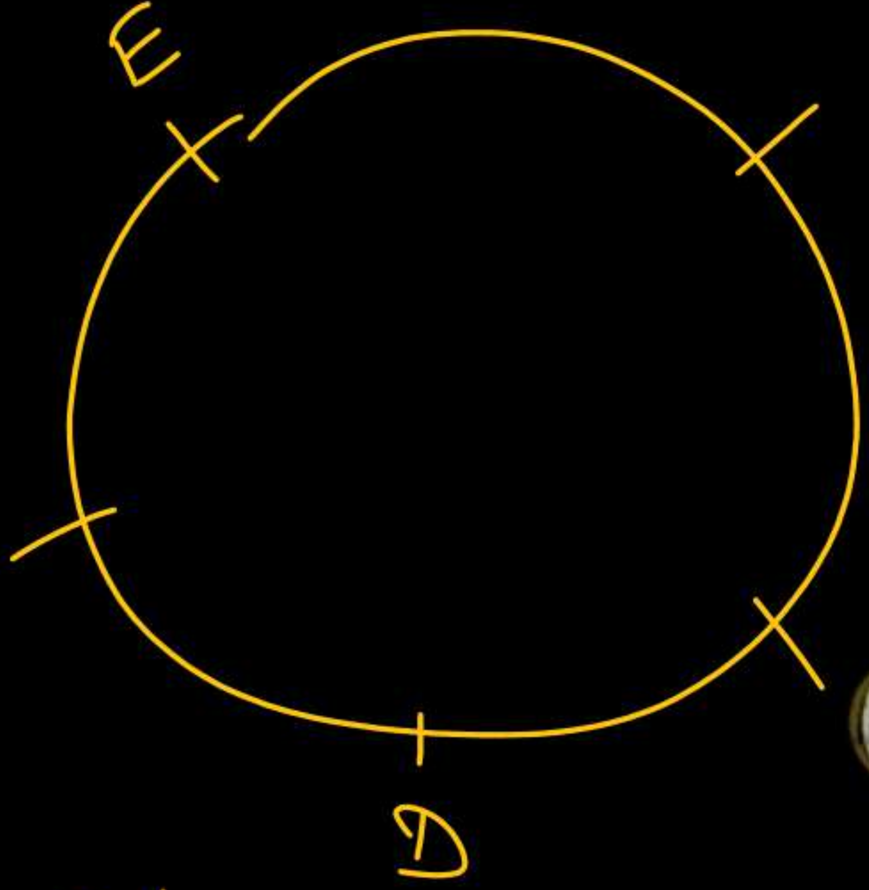
A, B, C, D, E



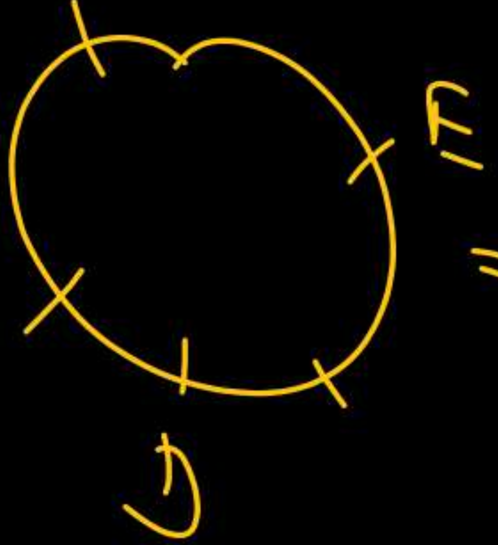
$3! = 6$



$= 3! = 6$



$3! = 6$



$= 3! = 6$

The number of ways in which 7 boys sit in a round table so that two particular boys may sit together is

A. 240

B. 200

C. 220

D. 120

A B C D E $\boxed{f \; g}$

$(6-1)! \times 2!$

$= 5! \times 2$

$= 240$

If 3 sisters and 8 other girls are together playing, Then the numbers of ways all the girls are seated around a circle such that three sisters are never together is

(A.) 11! (8)

(B.) (8!)(504)

(C.) 7!(210)

(D.) 8! (84)

$\underbrace{S_1\ S_2\ S_3}_{3}$ $\underbrace{g_1\ g_2 \ldots g_8}_{8}$

Total student = 3+8 = 11

Total arrangements = $(11-1)! = 10!$

Total arrangement when 3 sister sit together = $(9-1)! \times 3!$

$\boxed{S_1 S_2 S_3}$ $g_1\ g_2\ g_3\ g_4\ g_5\ g_6\ g_7\ g_8$

$= 8! \times 6$

3 sisters never together

$= 10! - 8! \times 6$

$= 10 \times 9 \times 8! - 8! \times 6$

$= 8! \times [90 - 6]$

$= 8! \times 84$

Q

Find the number of ways for 15 people to sit around the table so that no two arrangements have the same neighbors

A. 15!

B. 14!

C. 14! / 2

D. 120

$$\frac{(15-1)!}{2}$$

$$= \frac{14!}{2}$$

Q If 50 different jewels can be set to form a necklace then the number of ways is

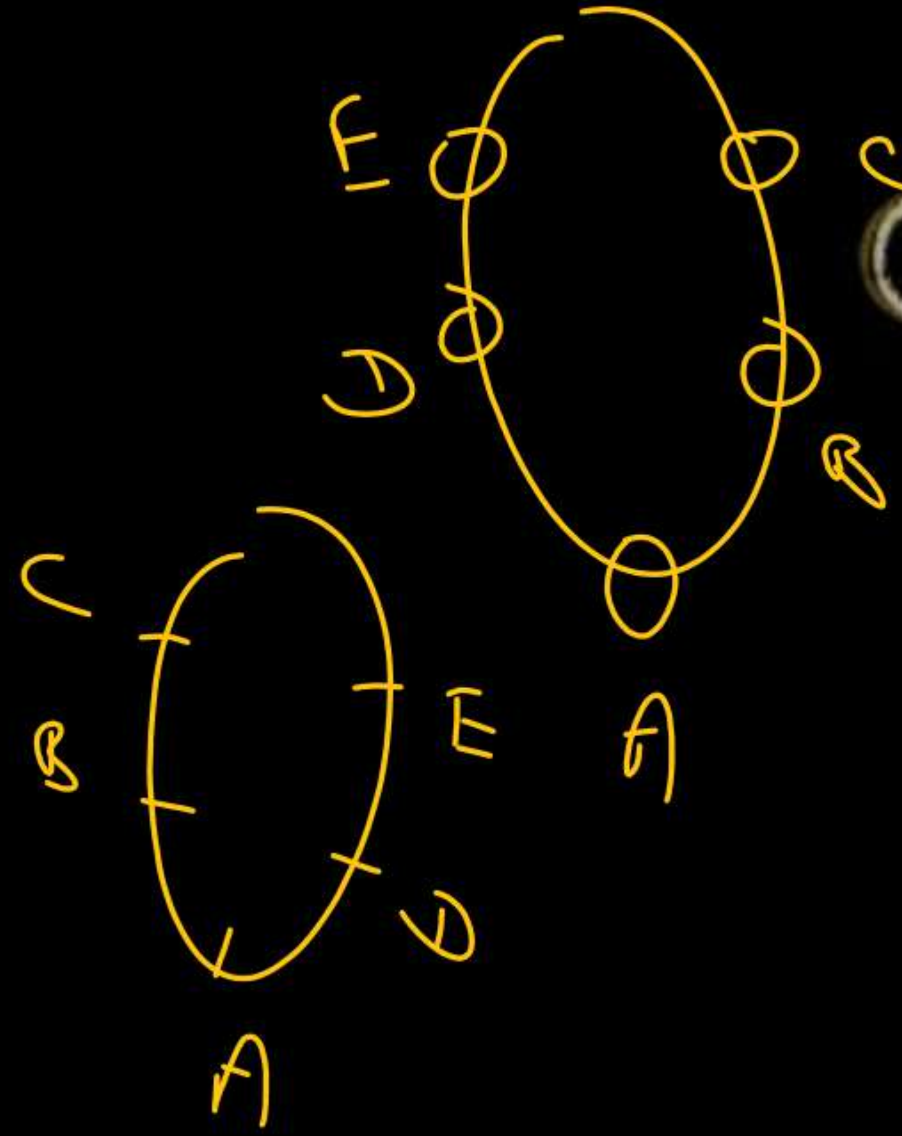
(A) 50! X

(B) 49! X

(C) 50! / 2 X

(D) None

$$\frac{(50-1)!}{2} = \frac{49!}{2}$$



Q The total number of ways in which six '+' and four '–' signs can be arranged in a line such that no two '–' signs occur together is

(A.) 7!/3!

(B.) $6! \times \frac{7!}{3!}$

(C.) 35

(D.) None

$+ \longrightarrow 6$

$- \longrightarrow 4$

$\square + \square + \square + \square + \square + \square + \square$

$$\frac{6!}{6!} \times \frac{{}^7P_4}{4!} = 1 \times \frac{7 \times 6 \times 5 \times 4}{24} = 35$$

AGAIN

$\frac{5!}{2!}$

Concept Of Combination

⇓

Selection of elements where order is not important

Eg: Sonu, man, T, R, P

SM	MT	TR	
ST	MR	TP	
SR	MP		
SP			RP

$$^5C_2 = \frac{5!}{2!\,3!} = \frac{5\times4\times\cancel{3!}}{2\times1\times\cancel{3!}} = 10$$

$$^nC_r = \frac{^nP_r}{r!}$$

n ⇒ Total elements

r ⇒ elements to be selected (elements used at a time)

$$\boxed{r! \times {^nC_r} = {^nP_r}}$$

#
$$\boxed{{}^{n}C_{r} = \frac{n!}{r!\,(n-r)!}}$$

$${}^{8}C_{2} = \frac{8!}{2!\;6!} = \frac{8\times 7\times \cancel{6!}}{2\times 1\times \cancel{6!}} = 28$$

$${}^{7}C_{3} = \frac{7!}{3!\,4!} = \frac{7\times \cancel{6}\times 5\times \cancel{4!}}{\cancel{3}\times \cancel{2}\times 1\times \cancel{4!}} = 35$$

Q $${}^{10}C_{4} = \frac{10!}{4!\,6!}$$

$$= \frac{10\times 9\times 8\times 7\times \cancel{6!}}{24\times \cancel{6!}}$$

Q $${}^{5}C_{0} = \frac{\cancel{5!}}{0!\,\cancel{5!}} = 1$$

Q $${}^{6}C_{6} = \frac{\cancel{6!}}{\cancel{6!}\,0!} = 1$$

$$\# \quad \boxed{{}^{n}C_{0} = 1}$$

$$\# \quad \boxed{{}^{n}C_{n} = 1}$$

$$\# \quad \boxed{{}^{n}C_{1} = n}$$

eg $^{8}C_{1} = 8$

eg $^{10}C_{1} = 10$

$$\# \quad \boxed{{}^{n}C_{2} = \frac{n(n-1)}{2}}$$

eg $$^{10}C_{2} = \frac{10!}{2!\,8!} = \frac{10\times 9\times \cancel{8!}}{2\times 1\times \cancel{8!}} = 45$$

or

$$^{10}C_{2} = \frac{10\times 9}{2} = 45$$

$$^{20}C_{2} = \frac{20\times 19}{2} = 190$$

$$^{6}C_{2} = \frac{6\times 5}{2} = 15$$

If ${}^{n}C_a = {}^{n}C_b$

then $\boxed{a=b}$ or $\boxed{a+b=n}$

eg

$${}^{10}C_2 = \frac{10!}{2!\,8!} = 45$$

$${}^{10}C_8 = \frac{10!}{8!\,2!} = 45$$

$${}^{10}C_2 = {}^{10}C_8$$

$$2+8=10$$

Q: ${}^{20}C_x = {}^{20}C_{2x+2}$

find value of x

Sol:

$$x = 2x + 2$$

$$x - 2x = 2$$

$$-x = 2$$

$$x = -2$$

or

$$(x) + (2x+2) = 20$$

$$3x = 18$$

$$\boxed{x = 6}$$

\# $\boxed{{}^{n}C_{r} = {}^{n}C_{n-r}}$

eg $\;{}^{8}C_{2} = {}^{8}C_{6}$

eg $\;{}^{12}C_{5} = {}^{12}C_{7}$

eg $\;{}^{11}C_{8} = {}^{11}C_{3}$

$\boxed{{}^{n}C_{r} + {}^{n}C_{r+1} = {}^{n+1}C_{r+1}}$

Eg $\quad {}^{6}C_{1} + {}^{6}C_{2} = {}^{7}C_{2}$

$\Downarrow$

$$\frac{6!}{1!\,5!} + \frac{6!}{2!\,4!} \qquad\qquad \frac{7!}{2!\,5!}$$

$$6 + 15 \qquad\qquad = \frac{7\times 6\times \cancel{5!}}{2\times 1\times \cancel{5!}}$$

$$= 21 \qquad\qquad = 21$$

Eg $\quad \underbrace{{}^{10}C_{3} + {}^{10}C_{4}} + {}^{11}C_{5}$

$= {}^{11}C_{4} + {}^{11}C_{5}$

$= {}^{12}C_{5}$

$\boxed{{}^nC_0 + {}^nC_1 + {}^nC_2 + {}^nC_3 + \cdots + {}^nC_n = (2)^n}$

Eg ${}^4C_0 + {}^4C_1 + {}^4C_2 + {}^4C_3 + {}^4C_4$

$= 1 + 4 + 6 + 4 + 1$

$= 16$

$$\boxed{\begin{aligned} &= 2^4 \\ &= 16 \end{aligned}}$$

Eg ${}^{10}C_0 + {}^{10}C_1 + \cdots + {}^{10}C_{10}$

$= (2)^{10}$

$$\# \quad {}^nC_1 + {}^nC_2 + {}^nC_3 + \cdots + {}^nC_n = (2)^n - 1$$

Q $\quad {}^6C_1 + {}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6$

$= 6 + 15 + 20 + 15 + 6 + 1$

$= 63$

$= 2^6 - 1 = 64 - 1 = 63$

Q

(Lines on circle)

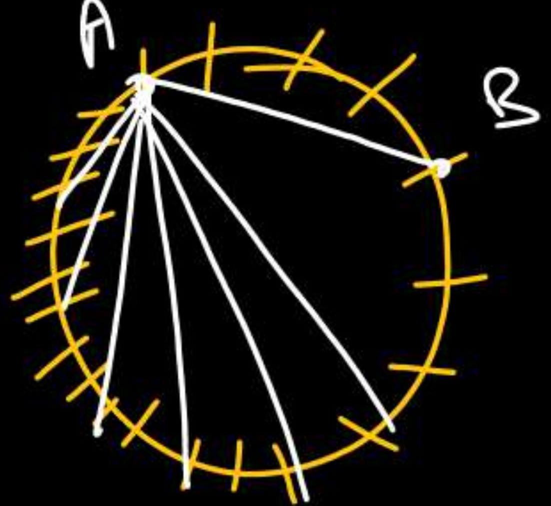
How many chords can be drawn through 21 points on a circle?

A. 420

B. 210

C. 325

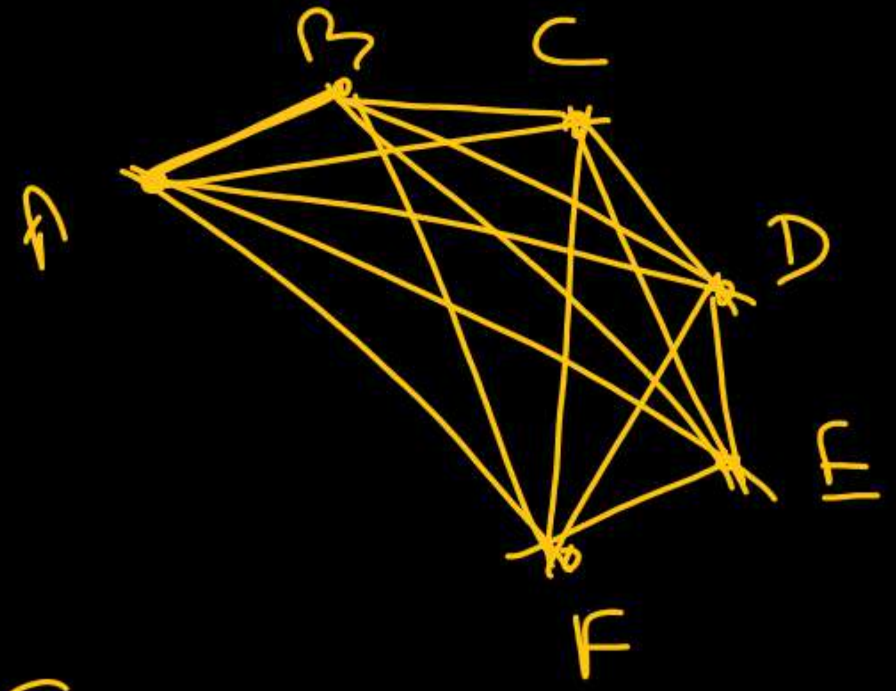
D. None



$$ {}^{21}C_{2} = \frac{21!}{2!\,19!} = 210 $$

Q How many lines can be drawn through 6 non collinear point?

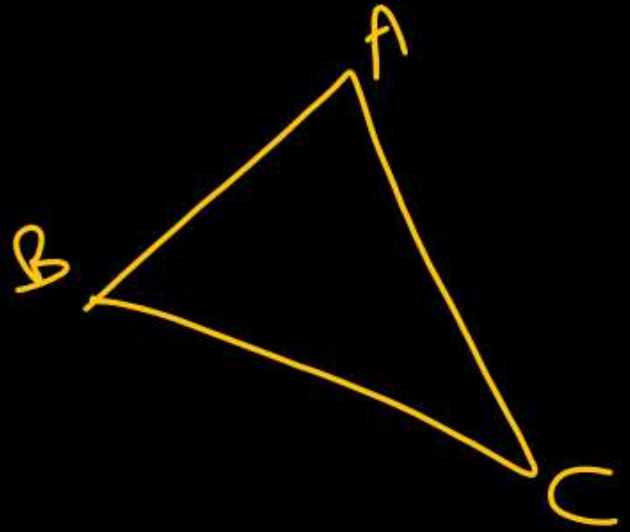
Sol:



$$^{6}C_{2} = \frac{6!}{2!\,4!} = \frac{6\times 5}{2} = 15$$

Q How many Triangles can be made using 8 Non collinear Points

Sol:



$$\text{Total triangles} = {}^{8}C_{3}$$

$$= \frac{8!}{3!\,5!}$$

$$= \frac{8 \times 7 \times \cancel{6} \times \cancel{5!}}{\cancel{3 \times 2} \times 1 \times \cancel{5!}}$$

$$= 56$$

Q How many lines can be drawn using 4 points if 3 of them are collinear.

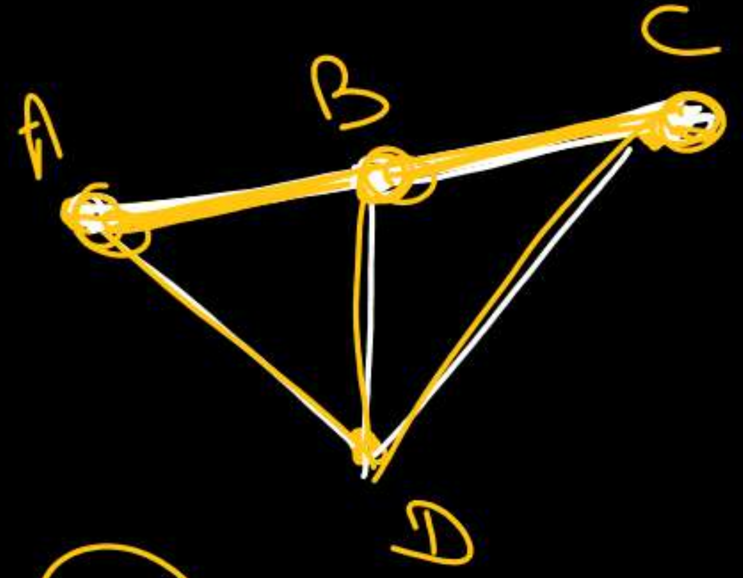
Sol:

Total no of Lines

$$= {}^4C_2 - {}^3C_2 + 1$$

$$= 6 - 3 + 1$$

$$= 4$$



$\cancel{AB}$ | AD
$\cancel{BC}$ | BD
AC | CD

10 points of which 6 are collinear

Total lines $= {}^{10}C_2 - {}^{6}C_2 + 1$

Q How many Triangles can be made using 7 points out of which 4 are collinear.

Sol: Total no of triangles

$$= {}^{7}C_{3} - {}^{4}C_{3}$$

In how many way can committee of 3 person be selected from 5 person ?

A. 60

B. 20

C. 10

D. None

$$^{5}C_{3}$$

$$= \frac{5!}{3!\,2!}$$

$=$

Every two persons shakes hands with each other in a party and the total number of guest is 12. The number of handshakes ?

A. 66

B. 55

C. 120

D. None

$$^{12}C_2 = \frac{12 \times 11}{2}$$

$$= 66$$

A, B, C, D

AB
AC
AD
BC
BD
CD

$$^{4}C_2 = 6$$

Every two persons shakes hands with each other in a party and the total number of hand shakes is 15. The number of guests in the party is

A. 4

B. 5

C. 6

D. None

$$^{n}C_2 = 15$$

$$^{4}C_2 = 6$$

$$^{5}C_2 = 10$$

$$^{6}C_2 = 15$$

In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?

A. 180

B. 400

C. 40

D. None

B - 5 & G - 4

$\downarrow$ $\downarrow$

B - 3 & 3 - G

$$^5C_3 \times {}^4C_3$$

$$= 10 \times 4$$

$$= 40$$

& = $\times$

or = +

Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue Balls if each selection consists of 3 balls of each colour

A. 200

B. 2000

C. 20000

D. None

6 - R , 5 - W , 5 - B

$\downarrow$ $\downarrow$ $\downarrow$

3 3 3

$^6C_3 \times {}^5C_3 \times {}^5C_3$

$= 20 \times 10 \times 10$

$=$

In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers?

A. 4850

B. 2672

C. 3960

D. None

17

Bat = 12 | Bowl = 5

7 | 4

$= {}^{12}C_7 \times {}^{5}C_4$

${}^{17}C_{11}$

In how many ways can a student choose a course of 5 subjects if 9 subjects are available and 2 specific subjects are compulsory for every student?

A. 21

B. 28

C. 35

D. None

9

2 - compulsory $\Rightarrow$ 2

7 $\Rightarrow$ non compulsory $\Rightarrow$ 3

$^2C_2 \times {}^7C_3$

Q

How many words, with or without meaning, each of 2 vowels and 3 consonants can be Formed from the letters of the word DAUGHTER?

A. 30

B. 120

C. 3600

D. None

Vowels
⇓
A, U, E
⇓
2 vowels

Consonants
⇓
D, G, H, T, R
⇓
3 consonants

$$^3C_2 \times {}^5C_3 \times 5!$$

$$= 3 \times 10 \times 120 = 3600$$

Q the English alphabet has 5 vowels and 21 consonants. How many words with two Different vowels and 2 different consonants can be formed from the alphabet?

A. 50400

B. 50200

C. 52400

D. None

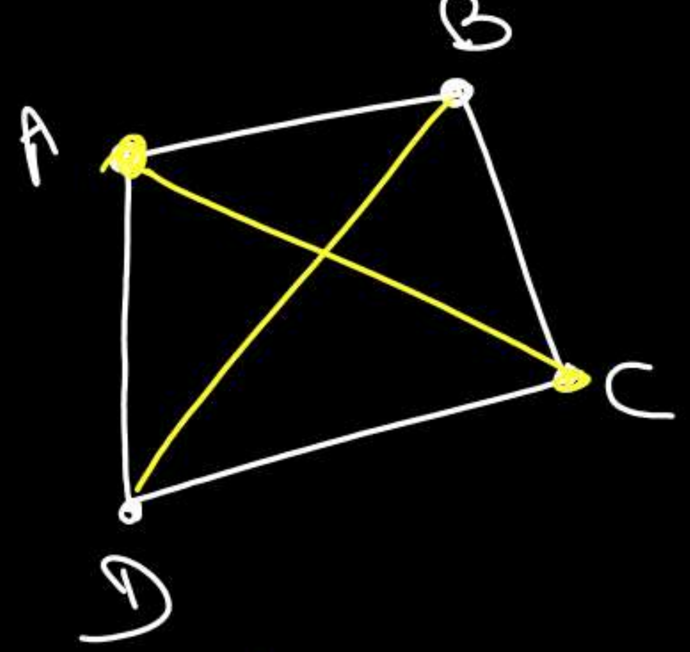
5 - Vowel & 21 - consonants

$\Downarrow$ $\qquad$ $\Downarrow$

2 $\qquad$ 2

$$^5C_2 \times {}^{21}C_2 \times 4!$$

Quadrilateral



~~AB~~, ~~BC~~, ~~CD~~

~~AD~~, AC, BD

$$^4C_2 - 4$$

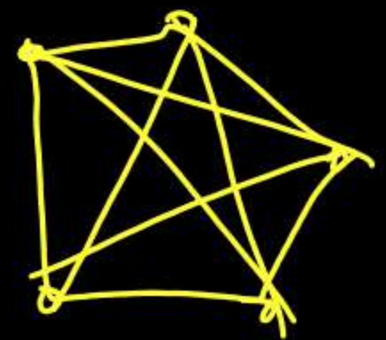
$$= \frac{4!}{2!\,2!} - 4$$

$$= 6 - 4$$

$$= 2$$

No of Diagonals in Pentagon

$$= {}^5C_2 - 5$$



$$= 10 - 5$$

$$= 5$$

No of Diagonals in a polygon with n sides

$$= {}^{n}C_2 - n$$

$$= \frac{n(n-1)}{2} - n$$

$$= n\left[\frac{n-1}{2} - 1\right]$$

$$= n\left[\frac{n-1-2}{2}\right]$$

$$= \frac{n(n-3)}{2}$$

$$\boxed{\text{Total Diagonals} = \frac{n(n-3)}{2}}$$

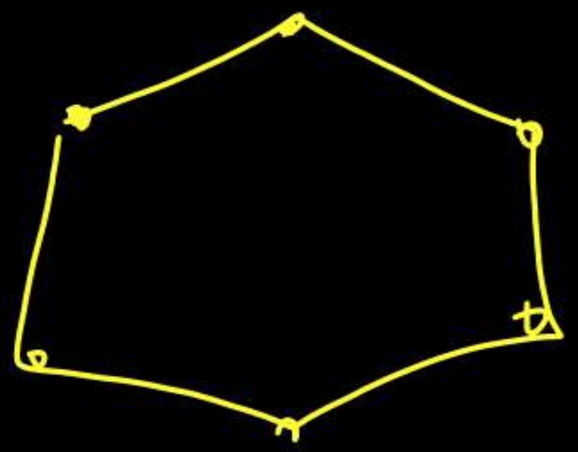
The number of diagonals in a hexagon ?

A. 4

B. 7

C. 8

D. 9



$$^6C_2 - 6$$
$$= 15 - 6$$
$$= 9$$

$$\frac{n(n-3)}{2} = \frac{6 \times 3}{2} = 9$$

Q The number of sides in a polygon if it has 35 diagonals

A. 8 ✗

B. 9 ✗

C. 10

D. 11

Let there are 'n' sides

$^{n}C_2 - n = 35$

$\frac{n(n-3)}{2} = 35$

$n(n-3) = 70$

$\frac{9 \times 8}{2}$ $\quad \frac{10 \times 9}{2} - 10$

If nC10 = nC14, then 25Cn is

A. 24

B. 25

C. 1

D. None

$^nC_{10} = {}^nC_{14}$

$10 + 14 = n$

$\boxed{n = 24}$

$\boxed{\begin{array}{l} {}^nC_a = {}^nC_b \\ \text{then } a = b \text{ or } a + b = n \end{array}}$

$^{25}C_n$

$= {}^{25}C_{24}$

$= \dfrac{25!}{24!\,1!}$

$= \dfrac{25 \times \cancel{24!}}{\cancel{24!}} = 25$

There are 12 points in a plane of which 5 are collinear. The number of triangles is

A. 210

B. 211

C. 212

D. None

12 points & 5 are collinear

Triangles $= {}^{12}C_3 - {}^{5}C_3 = \frac{12!}{3!\,9!} - \frac{5!}{3!\,2!}$

$= 220 - 10 = 210$

Lines $= {}^{12}C_2 - {}^{5}C_2 + 1$

There are 12 points in a plane of which 5 are collinear. The number of lines ?

A. 56

B. 57

C. 212

D. None

$$^{12}C_2 - {}^{5}C_2 + 1$$

$$= \frac{12\times 11}{2} - \frac{5\times 4}{2} + 1$$

$$= 66 - 10 + 1$$

$$= 57$$

Q

The number of ways in which 15 mangoes can be equally divided among 3 students is

R P C

A. 15!

B. 15!/(5!)

C. $15!/(5!)^2$

D. None

15 mangoes

$R \to 5$

$P \to 5$

$C \to 5$

$^{15}C_5 \times {}^{10}C_5 \times {}^{5}C_5$

$= \frac{15!}{5! \times \cancel{10!}} \times \frac{\cancel{10!}}{5!\,5!} \times 1$

$= \frac{15!}{5! \times 5! \times 5!}$

$= \frac{15!}{(5!)^3}$

If $a + b + c = n$

Total elements

'n' elements has to be divided b/w A, B & C

$$\text{Total ways} = \frac{n!}{a!\, b!\, c!}$$

Q 15 mangoes are given to A, B & C. If A gets 7, B gets 5 & C gets 3 mangoes.

Sol:

$${}^{15}C_7 \times {}^{8}C_5 \times {}^{3}C_3$$

$$= \frac{15!}{7!\,\cancel{8!}} \times \frac{\cancel{8!}}{5!\,3!} \times \frac{\cancel{3!}}{\cancel{3!} \times 0!}$$

$$= \frac{15!}{7! \times 5! \times 3!}$$

$$\frac{15!}{7!\,5!\,3!}$$

R, P, C, T

1> R P & C T

2> R C & P T

3> R T P C

4> P C R T

5> P T R C

6> C T R P

$${}^4C_2 \times {}^2C_2 \times \frac{1}{2!}$$

$$= 6 \times 1 \times \frac{1}{2}$$

$$= 6 \times \frac{1}{2}$$

$$= 3$$

R P C T

	Sec A	Sec B
→ 1	R P	C T
→ 2	C T	R P

$$\frac{4!}{2!\,2!} = 6$$

15

8 4 3

Unequal group

$$\frac{15!}{8!\,4!\,3!}$$

or

$$^{15}C_8 \times {}^{7}C_4 \times {}^{3}C_3$$

$$\frac{15!}{8!\,\cancel{7!}} \times \frac{\cancel{7!}}{4! \times 3!} \times 1$$

15

5 5 5

Equal group with name

$$\frac{15!}{5! \times 5! \times 5!}$$

$$\frac{15!}{(5!)^3}$$

15

5 5 5

Equal group with no name

$$\frac{15!}{5! \times 5! \times 5!} \times \frac{1}{3!}$$

Q

The number of ways in which 12 students can be equally divided into three groups is

A. 5775

B. 7575

C. 7755

D. None

12

4 4 4

$$ {}^{12}C_4 \times {}^{8}C_4 \times {}^{4}C_4 \times \frac{1}{3!} $$

$$ = \frac{12!}{4!\,\cancel{8!}} \times \frac{\cancel{8!}}{4! \times 4!} \times 1 \times \frac{1}{6} $$

$$ = \frac{12!}{4!\,4!\,4!} \times \frac{1}{6} $$

$$ = 34650 \times \frac{1}{6} $$

$$ = 5775 $$

Eg 12 Students

3 section are to be formed.

4 students in sec-A, 4 in sec B

& 4 in sec. C are to be selected.

<u>Sol</u>:

$$^{12}C_4 \times {}^{8}C_4 \times {}^{4}C_4$$

$$= \frac{12!}{4!\,\cancel{8!}} \times \frac{\cancel{8!}}{4!\,4!} \times 1$$

$$= \frac{12!}{4!\,4!\,4!}$$

Q

The value of 12C4 + 12C3 is

A. 715

B. 710

C. 716

D. None

$${}^{12}C_4 + {}^{12}C_3$$

$$= \frac{12!}{4!\,8!} + \frac{12!}{3!\,9!}$$

$$= 495 + 220$$

$$= 715$$

$${}^{n}C_r + {}^{n}C_{r+1} = {}^{n+1}C_{r+1}$$

$${}^{12}C_4 + {}^{12}C_3$$

$$= {}^{13}C_4$$

$$= \frac{13!}{4!\,9!} = 715$$

If $500_{C_{92}} = 499_{C_{92}} + n_{C_{91}}$ then n is

A. 499

B. 500

C. 501

D. None

$$^{500}C_{92} = {}^{499}C_{92} + {}^{n}C_{91}$$

$$\boxed{n = 499}$$

$$^{n}C_{r} + {}^{n}C_{r+1} = {}^{n+1}C_{r+1}$$

If $^{18}C_r = {}^{18}C_{r+2}$, the value of $^{r}C_5$ is

A. 55

B. 50

C. 56

D. None

$^{18}C_r = {}^{18}C_{r+2}$

$r = r+2$

$0 = 2$

$\times$

$r + (r+2) = 18$

$2r = 16$

$\boxed{r = 8}$

$^{r}C_5$

$= {}^{8}C_5$

$= \frac{8!}{5!\,3!} = 56$

$^{n}C_a = {}^{n}C_b$

$a = b$ or $a + b = n$

Q

The Supreme Court has given a 6 to 3 decision upholding a lower court; the number of ways it can give a majority decision reversing the lower court is

A. 255

B. 256

C. 276

D. 226

Total Judges = 3 + 6 = 9

Decision of lowest court will be reverse

$= {}^9C_5 + {}^9C_6 + {}^9C_7 + {}^9C_8 + {}^9C_9$

$= \frac{9!}{5!4!} + \frac{9!}{6!3!} + \frac{9!}{2!7!} + 9 + 1$

$= 126 + 84 + 36 + 9 + 1 = 256$

Q

3 ladies and 3 gents can be seated at a round table so that any two and only two of the ladies sit together. The number of ways is

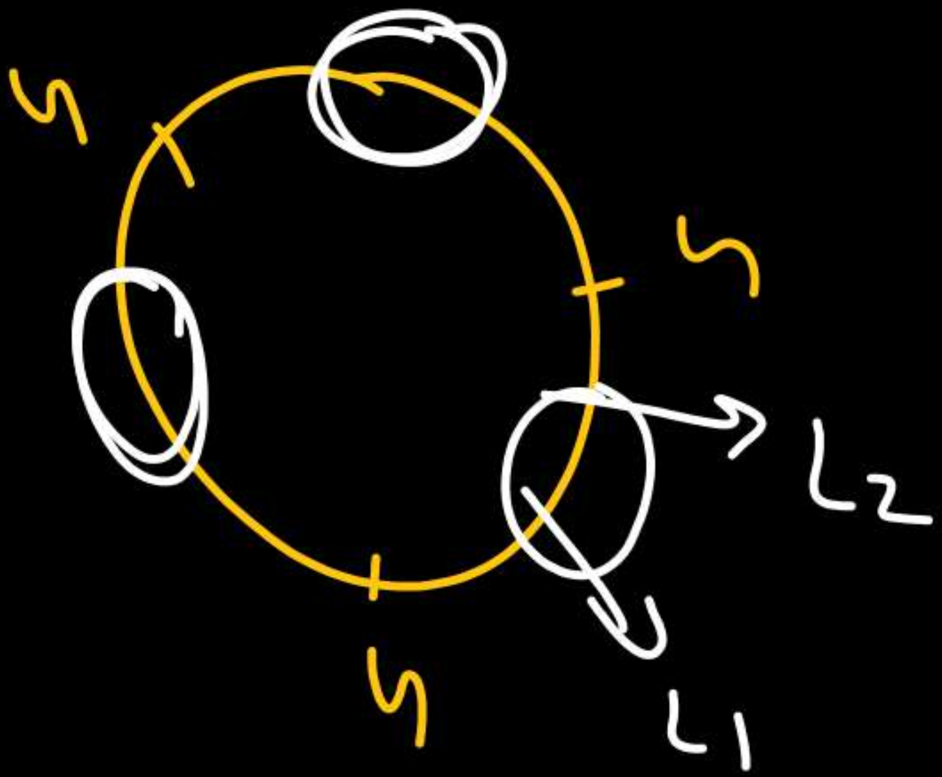
A. 24

B. 48

C. 72

D. None

3-L & 3-G



$(3-1)! \times {}^3C_1 \times {}^3C_2 \times 2! \times 2$

$(3-1)!$: three gents

${}^3C_1$: selection of one place from 3 for 2 ladies

${}^3C_2$: selection of 2 ladies out of 3

$2!$: Arranging 2 ladies

2: third lady can sit in any two places

$= 2 \times 3 \times 3 \times 2 \times 2 = 72$

Q

The results of 8 matches (Win, Loss or Draw) are to be predicted. The number of different forecasts containing exactly 6 correct results is

A. 316

B. 214

C. 112

D. None

1	2	3	4	5	6	7	8
✓	✓	✓	✓	✓	✓	×	×
×	×	✓	✓	✓	✓	✓	✓
×	✓	✓	✓	✓	✓	✓	×

8

6-Correct 2-Incorrect

$$^{8}C_{6} \times (1)(1)(1)(1)(1)(1)(2)(2)$$

$$= \frac{8!}{6!\,2!} \times 4 = 28 \times 4$$

$$= 112$$

10 match (loss, win, Draw)

7 corre 3 Incorre.

$${}^{8}C_{7} \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 2 \times 2 \times 2$$

A person has 8 friends. The number of ways in which he may invite one or more of them to a dinner is.

A. 254

B. 255

C. 256

D. None

$${}^8C_1 + {}^8C_2 + {}^8C_3 \dots + {}^8C_8$$

$$= 2^8 - 1 = 256 - 1 = 255$$

$${}^nC_0 + {}^nC_1 + \dots + {}^nC_n = 2^n$$

$${}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n - 1$$

'MAN'

2 1 3

$3! = 6$

1) AMN

2) ANM

3) MAN

4) MNA

5) NAM

6) NMA

3	1	2
N	A	M
2	0	0
×	×	×
2!	1!	0!

$4 + 0 + 0 = 4$

Rank of 'NAM' $= 4 + 1 = 5$

If all the permutations of the letters of the word 'CHALK' are written in a dictionary the rank of this word will be___?

$5! = 120$

A. 30

B. 31

C. 32

D. None

$$\begin{array}{ccccc} 2 & 3 & 1 & 5 & 4 \\ C & H & A & L & K \\ \Downarrow & \Downarrow & \Downarrow & \Downarrow & \Downarrow \\ 1 & 1 & 0 & 1 & 0 \\ \times & \times & \times & \times & \times \\ 4! & 3! & 2! & 1! & 0! \end{array}$$

$24 + 6 + 0 + 1 + 0 = 31$

$\text{Rank} = 31 + 1 = 32$

what is the rank or order of the word `ZENITH' in the dictionary

(A.) 613

(B.) 615

(C.) 616

(D.) None

$$\begin{array}{cccccc} 6 & 1 & 4 & 3 & 5 & 2 \\ Z & E & N & I & T & H \\ \Downarrow & \Downarrow & \Downarrow & \Downarrow & \Downarrow & \Downarrow \\ 5 & 0 & 2 & 1 & 1 & 0 \\ \times & \times & \times & \times & \times & \times \\ 5! & 4! & 3! & 2! & 1! & 0! \end{array}$$

$$600 + 0 + 12 + 2 + 1 + 0 = 615$$

$$\text{Rank} = 615 + 1 = 616$$

$\underbrace{\text{RANDOM}}$

$\Downarrow$

Common

Q

In an examination, a question paper consists of 12 questions divided into two parts i.e., Part I and Part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can a student select the questions?

A. 400

B. 410

C. 420

D. 450

12

I → 5, II → 7

$(I-3, II-5) + (I-4, II-4) + (I-5, II-3)$

$= ({}^5C_3 \times {}^7C_5) + ({}^5C_4 \times {}^7C_4) + ({}^5C_5 \times {}^7C_3)$

$= 10 \times 21 + 5 \times 35 + 1 \times 35 = 420$

An examination paper with 10 questions consists of 6 questions in Algebra and 4 questions in Geometry. At least one question from each section is to be attempted. In how many ways can this be done?

(A.) 940

(B.) 915

(C.) 948

(D.) None

10 Q.

I – 6   II – 4

Atleast one from section I & Atleast one from section II

$$\left({}^6C_1 + {}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6\right) \times \left({}^4C_1 + {}^4C_2 + {}^4C_3 + {}^4C_4\right)$$

$$= \left(2^6 - 1\right) \times \left(2^4 - 1\right)$$

$$= 63 \times 15 = 945$$

Q

Find the number of ways in which a selection of 4 letters can be made from the word `MATHEMATICS'

A. 130

B. 132

C. 134

D. 136

$\boxed{MM}$, $\boxed{TT}$, $\boxed{AA}$, H, E, I, C, S

$\boxed{\text{Case-1}}$ When 2 letters are same & other two letters are same

$= {}^3C_2 = 3$

$\boxed{\text{Case-2}}$ When 2 letters are same & other two letters are different

$= {}^3C_1 \times {}^7C_2 = 3 \times 21 = 63$

$\boxed{\text{Case-3}}$ When all 4 letters are different

$= {}^8C_4 = \frac{8!}{4!4!} = 70$

Total selections

$= 3 + 63 + 70$

$= 136$

Find the number of ways in which an arrangement of 4 letters can be made from the word `MATHEMATICS'.

A. 1680

B. 756

C. 18

D. 2454

MM TT AA H, E, I, C, S

Case-1 when 2 letters are same & other two letters are same

$= {}^3C_2 \times \frac{4!}{2!2!} = 3 \times 6 = 18$

Case-2 When 2 letters are same & other two letters are Different

$= {}^3C_1 \times {}^7C_2 \times \frac{4!}{2!} = 3 \times 21 \times 12$

$= 756$

Case-3 When all 4 letters are different

$= {}^8C_4 \times 4!$

$= 70 \times 24$

$= 1680$

Total words

$= 18 + 756 + 1680$

$= 2454$

Find the number of ways in which a selection of 4 letters can be made from the word `EXAMINATION'

A. 130

B. 132

C. 134

D. 136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&
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