

DON'T CHASE PEOPLE

CHASE

DREAMS

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AND  STILL

RISE

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Permutations & Combinations

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Permutations & Combinations

1 **Permutation** = is an arrangement where order of objects is important.

Combination = is a selection where order of objects is NOT important.

par, gyp, pre, Apr, rpt, rap are 6 permutations but only one selection.

2 $0! = 1$

$1! = 1$

$2! = 2$

$3! = 6$

$8! = 40320$

$4! = 24$

$5! = 120 = 5 \times 4!$

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

$7! = 5040$

$8! = 40320$

$9! = 362880$

$10! = 3628800$

$11! = 11 \times 10! = 39916800$

$12! = 12 \times 11 \times 10! = 479001600$

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

a. $\frac{19!}{18!} =$

$= \frac{19 \times 18!}{18!} = 19$

b. $\frac{16!}{14!3!} = \frac{16 \times 15 \times 14!}{2! \times 3!} = 105$

c. $\frac{x!}{(x-1)!} = \frac{x(x-1)!}{(x-1)!} = x$

d. $\frac{(x+3)!}{(x+2)!} = \frac{(x+3)(x+2)!}{(x+2)!} = (x+3)$

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

3 In how many ways 3 students can stand in a line for a photograph? (A, B, C)

ABC
ACB
BAC
BCA
CAB
CBA

6 diff photographs

$3P_1 \times 2P_1 \times 1P_1 = 6$ ways

3 students can stand in a line in 3! diff ways = 6

4 In how many ways 4 students can stand in a line for a photograph?

\Rightarrow 4 students can stand in a line in 4! diff ways. $(4P_1 = 4! = 24$ ways)

In how many ways 2 students out of 4 students A, B, C, D can be arranged for a photograph?

My Notes

$4P_2 = \frac{4!}{(4-2)!} = 12$ diff ways

AB, AC, AD, BC, BD, CD
BA, CA, DA, CB, DB, DC

= 12 diff photos

r objects out of n can be arranged in nPr diff ways
 $4P_2 = 4 \times 3 = 12$

5 There are 5 students A, B, C, D, E in how many ways 2 of them can be

Selected = 5C_2 ways
 $= \frac{5!}{2! \times 3!} = \frac{120}{2 \times 6} = 10$

Arranged = 5P_2 ways
 $= \frac{5!}{3!} = \frac{5 \times 4 \times 3!}{3!} = 20$

AD, AE, BE, CE, DE

${}^5C_2 \times 2! = {}^5P_2$

AB, AC, AD, AE, BC, BD, BE, CD, CE, DE

${}^n C_r \times r! = {}^n P_r$

BA, CA, DA, EA, CB, DB, EB, DC, EC, ED

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

6 ${}^n P_r = \frac{n!}{(n-r)!}$ where n = positive integer & $n \geq r \geq 0$

${}^n P_r = n(n-1)(n-2) \dots r$ terms

${}^n P_0 = 1$

${}^{18}P_3 = 18 \times 17 \times 16 = 4896$

${}^n P_1 = n$

${}^{100}P_2 = 100 \times 99 = 9900$

${}^n P_2 = n(n-1)$

${}^{50}P_4 = 50 \times 49 \times 48 \times 47 = 5527200$

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

${}^{25}P_1 = 25$

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

${}^{20}P_5 = 20 \times 19 \times 18 \times 17 \times 16 = 1860480$

${}^n P_5 = n(n-1)(n-2)(n-3)(n-4)$

${}^{24}P_8 = 24 \times 23 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 = 29654190720$

${}^n P_n = n!$

7 $\frac{{}^{18}P_3 \times {}^{16}P_3}{{}^{19}P_4 \times {}^{17}P_2} =$

$= \frac{18 \times 17 \times 16 \times 16 \times 15 \times 14}{19 \times 18 \times 17 \times 16 \times 17 \times 16} = \left(\frac{210}{323} \right)$

8 $\frac{9!}{6!2!} \times {}^5P_2 =$

$= \frac{9 \times 8 \times 7 \times 6 \times 5 \times 4}{6! \times 2} = 5040 = 7!$

9 AND \implies Multiply
 OR \implies Add

10 $n!$ can also be written as $1 \times 2 \times 3 \times \dots \times n$

11 How many different words can be formed by using letters of word :

SQUARE : _____

$= 6! = 720$ diff words

HEXAGON : _____

$= 7! = 5040$ diff words

MISSISSIPPI : _____

$= \frac{11!}{4!4!2!} = 34650$ diff words

Total NO. of letters = 11
 I - 4 times P - 4 times
 S - 4 times

BOSTON : _____

$= \frac{6!}{2!1!1!1!1!1!} = \frac{720}{2} = 360$ diff words

MANAGEMENT _____

$= \frac{10!}{2!1!2!2!1!2!1!} = 326880$ diff words

PERMUTATION _____

$= \frac{11!}{2!} = 1,9958,400$ diff words

BANANA : _____

$= \frac{6!}{3!1!2!} = \frac{720}{6 \times 2} = 60$ diff words

My Notes

In How many diff ways Letters of word

'ACCOUNTING' can be arranged if vowels should be together ?

\Rightarrow A, O, U, I € € N T N G

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

$= 39290$ diff words

$= \frac{7!}{2!1!} \times$ Internal arrangements

12

How many different words can be formed by using letters of word _____ if all vowels should be kept together.

BANANA : A AAA B, N, N = $\frac{4!}{3!} \times \frac{3!}{3!} = 12$ NO. of diff words

PERCEPTION : $\text{E, E, F, O P R E P T N}$ = $\frac{7!}{2!} \times \frac{4!}{4!} = 30,240$ diff words

JAYARAMAN : $\text{A AAAA J, Y, R, M, N}$ = $6! \times \frac{4!}{4!} = 720$ diff words

STATISTICS : $\text{A, T, T S, T, T, S, T, E, S}$ = $\frac{8!}{3!3!} \times \frac{3!}{2!} = 3360$ diff words.

COMPUTER : $\text{O U E C, M, P, T, R}$ = $6! \times 3! = 4,320$ diff words

CALCULATOR : $\text{A U A O E, L, E, L, T, R}$ = $\frac{7!}{2!2!} \times \frac{4!}{2!} = 15,120$ diff words

TATED : A, E T, T, D = $\frac{4!}{2!} \times 2! = 24$ diff words

13 In how many ways 'n' students can stand in a line for a photograph if r of them

Want to be always together?

= $(n - r + 1)! \times r!$

Want to be never together?

= All possible arrangements - Arrangements where they are always together
 = $n! - (n - r + 1)! \times r!$

14 In how many ways 3 letter words can be formed by using letters of the word

SQUARE

$$= {}^6P_3$$

$$= 120$$

diff words

HEXAGON

$$= {}^7P_3$$

$$= 210$$

diff words

COMPUTER

$$= {}^8P_3$$

$$= 336$$

diff words

15 In how many ways 12 students can stand in a line for a photograph if

2 of the want to be always together?

$$= 11! \times 2!$$

$$= 79833600 \text{ ways}$$

2 of them want to be never together?

$$= (\text{All possible arrangements} - \text{Arrangements where those 2 students are always together})$$

$$= 12! - 11! \times 2! = 479001600 - 79833600$$

$$= 399168000 \text{ ways}$$

$$\text{OR } 10! \times {}^{11}P_2 = 399168000 \text{ ways}$$

16 If $6 \times {}^nP_3 = 7 \times {}^{(n-1)}P_3$. Find n.

$$\Rightarrow 6 \times {}^nP_3 = 7 \times {}^{(n-1)}P_3$$

$$6 \times n(n-1)(n-2) = 7 \times (n-1)(n-2)(n-3)$$

$$6n + 7n - 21$$

$$\therefore n = 21$$

$$21 = n$$

17 If ${}^nP_4 = 12 \times {}^nP_2$. then n = ?

$$\Rightarrow {}^nP_4 = 12 \times {}^nP_2$$

$$\frac{n(n-1)(n-2)(n-3)}{4 \times 3 \times 2 \times 1} = 12 \times \frac{n(n-1)}{2 \times 1}$$

$$(n-2)(n-3) = 12$$

$$n = 6$$

My Notes

There are 15 students. How many diff photographs can be taken if 2 of them want to be

(a) always together

$$= 14! \times 2!$$

$$= 174356582400$$

diff. photographs

(b) never together

$$= 15! - 14! \times 2! = 15 \times 14! - 14! \times 2 = 14! \times 13$$

Permutations & Combinations

18 ${}^n P_3 : {}^n P_2 = 3:1$; then $n = ?$

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

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

$$\therefore n-2 = 3 \quad \therefore n = 5$$

19 ${}^5 P_r = 60$; then $r = ?$

$$\Rightarrow {}^5 P_r = 60 = 5 \times 4 \times 3 = {}^5 P_3$$

$${}^5 P_r = {}^5 P_3 \quad \therefore r = 3$$

20 The no. of ways in which letters of word 'TRIANGLE' can be arranged if word 'ANGLE' is always present.

$$\Rightarrow \text{ANGLE T, R, I}$$

$$= 4! = 24 \text{ diff words can be formed}$$

21 In how many ways 5 students can form a

Line	Circle
$= {}^5 P_5$	$= \frac{{}^5 P_5}{5} = 4!$
$= 5! = 120 \text{ ways}$	$= 24 \text{ ways}$

The no. of ways in which letters of word TRIANGLE can be arranged so that letters of word ANGLE are always together?

$$\Rightarrow 4! \times 5! = 2880 \text{ diff words}$$

22 In how many different ways 12 students can form a

Line	Circle
$= {}^{12} P_{12} = 12!$	$= \frac{{}^{12} P_{12}}{12}$
$= 479001600$	$= 11! = 39916800 \text{ ways}$

My Notes

① In How many diff ways 'n' students can form a

① Line = $n!$

② circle = $(n-1)!$

② In How many ways 12 diff diamonds can form a necklace?

$$= \frac{1}{2} \times (11!) = 19958400 \text{ ways}$$

Permutations & Combinations

23 In how many ways _____ of 7 students can be formed out of 12 students

$$\begin{array}{l} \text{Line} \\ = {}_{12}P_7 = 3991680 \text{ ways} \end{array} \qquad \begin{array}{l} \text{Circle} \\ = \binom{{}_{12}P_7}{7} = 570240 \text{ ways} \end{array}$$

In how many ways _____ of r students can be formed out of n students

$$\begin{array}{l} \text{Line} \\ = \frac{n!}{h!r!} \end{array} \qquad \begin{array}{l} \text{Circle} \\ = \binom{{}_n P_r}{r} \end{array}$$

24 The no. of ways in which 'n' diamonds can form a necklace.

$$\Rightarrow \frac{1}{2} \times (n-1)! = \left[\frac{(n-1)!}{2} \right] \text{ ways}$$

25 The number of ways of arranging 'n' persons along a round table so that no person has the same 2 neighbours

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

oo In How many 'n' people can sit along round dining table?

$$\Rightarrow (n-1)!$$

26 No. of different necklaces can be formed with 'n' beads of different colours = ?

$$\Rightarrow \left[\frac{(n-1)!}{2} \right]$$

My Notes

There are 10 students. In how many ways photograph of 4 students can be taken if a particular favourite student should

$$\begin{array}{l} \text{always be there?} \\ = {}_9P_3 \times {}_9P_3 \\ = 2016 \text{ ways} \end{array} \qquad \begin{array}{l} \text{Never be there?} \\ = {}_9P_3 \\ = 3024 \text{ ways} \end{array}$$

27 Permutation of 'n' distinct things taken 'r' at a time when a particular object is

Always there?

$$= {}^n P_1 \times (n-1) P_{(n-1)}$$

$$= n \times (n-1) P_{(n-1)}$$

Never there?

$$= (n-1) P_n$$

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

Allowed

$${}^5 P_1 \times {}^6 P_1 \times {}^6 P_1 \times {}^6 P_1$$

$$= 1080 \text{ Numbers}$$

Not allowed

$${}^5 P_1 \times \frac{{}^5 P_3}{3}$$

$$= 300 \text{ Numbers}$$

29 How many even numbers of 5 digits can be formed by using 2,3,4,5,6,7,8 if repetition of digits is

Not allowed

$${}^6 P_4 \times {}^5 P_1$$

$$= 1,944 \text{ Numbers}$$

Allowed

$${}^7 P_1 \times {}^7 P_1 \times {}^7 P_1 \times {}^7 P_1 \times {}^4 P_1$$

$$= 9,604 \text{ Numbers}$$

30 How many 5 digit numbers greater than 23,000 can be formed by using 1,2,3,5,8,9

If Question is silent about repetition of digits then Repetition of digits is not allowed

starting with 2

$${}^1 P_1 \times {}^4 P_1 \times \frac{{}^4 P_3}{3} = 96$$

OR

starting with 3,5,8,9

$${}^4 P_1 \times {}^5 P_4 = 480$$

$$\underline{\underline{576}}$$

31 How many 4 digit numbers greater than 4700 can be formed by using 2,3,4,5,8 if repetition of digits is

Allowed	Not allowed
<p>① Starting with 5</p> $1P_1 \times 1P_1 \times 3P_1 \times 3P_1 = 25$	<p>① Starting with 5</p> $1P_1 \times 1P_1 \times 3P_2 = 6$
<p>② starting with 5,8</p> $2P_1 \times 3P_1 \times 3P_1 \times 3P_1 = 250$	<p>② starting with 5,8</p> $2P_1 \times 483 = 48$
275	54

32 ${}^nC_r = \left(\begin{matrix} \text{No. of selections of 'r' objects out of 'n'} \end{matrix} \right) \times r! = \left(\begin{matrix} \text{No. of arrangements of 'r' objects out of 'n'} \end{matrix} \right)$

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

i. ${}^nC_r = \frac{n!}{r!(n-r)!}$ where $n \geq r \geq 0$
 $n = \text{positive integer}$

33 Formulae on combinations

${}^nC_r = \frac{n!}{r!(n-r)!}$ where $n \geq r \geq 0$

${}^nC_r = \frac{n!}{r!(n-r)!} = \frac{n(n-1)(n-2)\dots}{r!}$ not

${}^nC_0 = 1$ f

${}^nC_1 = n$ E

${}^nC_2 = \frac{n(n-1)}{2}$ my

${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$ ht's

${}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = (2)^n$

${}^nC_1 + {}^nC_2 + {}^nC_3 + \dots + {}^nC_n = 2^n - 1$

${}^nC_3 = \frac{n(n-1)(n-2)}{3!}$ cans!

${}^nC_4 = \frac{n(n-1)(n-2)(n-3)}{4!}$ cen ingen

${}^nC_n = 1$

${}^nC_{n-r} = {}^nC_r$

${}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n - 1 - n$ them

${}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n - 1 - n$ fan

${}^4C_5 = {}^4C_5$ Scans-20

$\frac{4!}{20!25!} = \frac{4!}{25!20!}$

34 ${}^{18}C_r = {}^{18}C_{r+2}$ then $r = ?$

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

$$r = r+2 \quad \text{OR} \quad r + r+2 = 18$$

This is impossible $2r = 16$

$$r = 8$$

Permutations & Combinations

35 ${}^{45}C_x = {}^{45}C_y$, then

${}^{45}C_x = {}^{45}C_y$ then

$x = y$ OR $x + y = 45$
 sety

36 ${}^{15}C_{11} = \frac{15!}{11!(15-11)!} = \frac{15!}{11!4!} = 1365$ ---- ①

${}^{15}C_4 = \frac{15!}{4!(15-4)!} = \frac{15!}{4!11!} = 1365$ ---- ② **Pls. Remember**

say ${}^{15}C_{11} = {}^{15}C_{15-11} = {}^{15}C_4$

${}^n C_r = {}^n C_{n-r}$

37 In how many ways 52 cards can be equally divided in 4 groups?

$= {}^{52}C_13 \times {}^{39}C_{13} \times {}^{26}C_{13} \times {}^{13}C_{13}$

$= \frac{52!}{13!13!13!13!} = \frac{52!}{(13!)^4}$

38 In how many different ways 10 mangoes can be divided among 3 people such that they will get 2,3,5 mangoes

$= {}^{10}C_2 \times {}^8C_3 \times {}^5C_5$

$= 45 \times 56 \times 1 = 2520$ ways

$= \frac{10!}{2!3!5!} = \frac{3628800}{2 \times 6 \times 120} = 2520$ ways

39 $\frac{{}^n P_r}{{}^n C_r} = r!$

$\frac{{}^n C_r}{{}^n P_r} = \frac{1}{r!}$

${}^5 P_r = \frac{5!}{(5-r)!}$

${}^5 C_r = \frac{5!}{(5-r)! r!}$

$\therefore \frac{{}^5 P_r}{{}^5 C_r} = \frac{5! / (5-r)!}{5! / ((5-r)! r!)} = r!$

skis up **ftp.xts 4**

40 $P(8, 3) = {}^8 P_3 = 8 \times 7 \times 6 = 336$

$C(12, 4) = {}^{12} C_4 = \frac{12 \times 11 \times 10 \times 9}{4!} = 495$

${}^4 P_2 = 4 \times 3 = 12$

Permutations & Combinations

41 $\frac{{}^{18}P_3 \times {}^{17}C_2}{{}^{19}P_2 \times {}^{18}C_2} = \frac{18 \times 17 \times 16 \times 17 \times 16 \times 2!}{2! \times 19 \times 18 \times 18 \times 17 \times 1} = \frac{(2176)}{4213,1}$

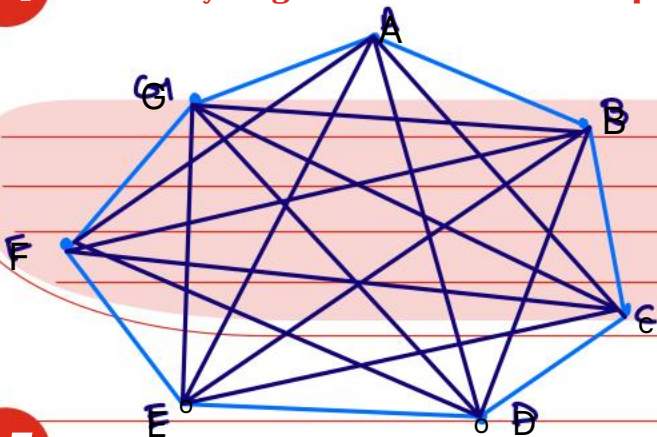
2 $\frac{{}^{20}P_4 \times {}^{25}P_5 \times {}^{20}P_2}{{}^{22}C_3 \times {}^{21}C_3 \times {}^{26}C_3} = \frac{20 \times 19 \times 18 \times 17 \times 25 \times 24 \times 23 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{2! \times 2! \times 2! \times 26 \times 25 \times 24 \times 23 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} = \frac{(220320)}{(230030)}$

42 $\frac{{}^{20}P_3 \times {}^{21}P_4 \times {}^{22}C_4}{{}^{23}C_3 \times {}^{22}P_3 \times {}^{21}P_2} = \frac{20 \times 19 \times 18 \times 21 \times 20 \times 19 \times 18 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{2! \times 2! \times 2! \times 23 \times 22 \times 21 \times 22 \times 21 \times 20 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} = \frac{(1851930)}{(1771)}$

43 In a party of x people if everyone hand shakes with other. How many handshakes will take place

$\Rightarrow {}^x C_2$

44 How many diagonal can be drawn in a polygon having : 7 sides = ${}^7 C_2 - 7 = 14$
 8 sides = ${}^8 C_2 - 8 = 20$
 10 sides = ${}^{10} C_2 - 10 = 35$



$= \left(\frac{\text{no. of sides} \times (\text{no. of sides} - 3)}{2} \right) - (\text{No. of sides})$
 $= {}^7 C_2 - 7 = 14$ diagonals can be drawn in a Heptagon.

45 In a group of 100 people, if everyone sends a greeting to other, How many cards will be used in total?

$\Rightarrow {}^{100} P_2 = 9900$ cards

(OR)

$99 + 98 + 97 + \dots + 100 \text{ people} = 9900$ cards will be used

46 In a plane of 20 non-collinear points

How many different straight lines can be drawn?

$$= {}^{20}C_2 = 202$$

How many different triangles can be obtained?

$$= {}^{20}C_3 = 209$$

If a straight line can pass through all the points, then points are said to be collinear

47 In a plane there are 30 points out of which 8 are collinear

How many different straight lines can be drawn?

$$= ({}^{22}C_2) + (8 \times {}^{22}C_1) + 1$$

$$= 231 + 176 + 1 = 408$$

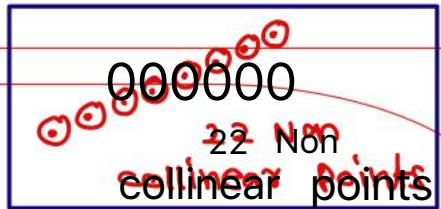
OR ${}^{30}C_2 - 8 \times 8 + 1 = 408$

How many different triangles can be obtained?

$$= {}^{22}C_3 + ({}^{22}C_2 \times 8) + ({}^{22}C_1 \times 8 \times 7)$$

$$= 1540 + 616 + 1848 = 4004$$

OR ${}^{30}C_3 - 8 \times 8 \times 7 = 4004$ diff. triangles

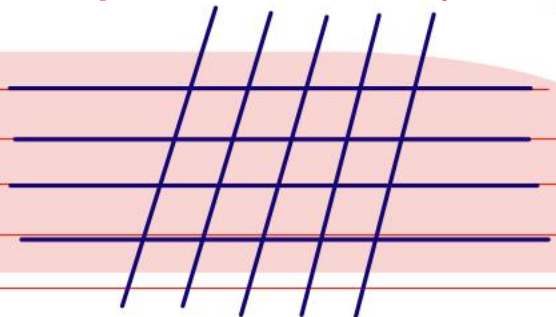


48 There are 4 parallel lines intersecting with another set of 5 parallel lines. How many parallelograms can be drawn?

$$= {}^4C_2 \times {}^5C_2$$

$$= 6 \times 10$$

$$= 60 \text{ diff. parallelograms}$$



49 8 Red; 3 Pink; 6 White Balls -

How many different selections of 3 balls are possible with

All Red balls

$$= {}^8C_3 = 98$$

$$= 56$$

diff ways

2 Red balls

$$= {}^8C_2 \times {}^9C_1 = 90$$

$$= 252$$

diff ways

At least 2 white balls

$$= ({}^6C_2 \times {}^{11}C_1) + ({}^6C_1 \times {}^{11}C_2)$$

$$= 165 + 20$$

$$= 185$$

diff ways

No pink balls

$$= ({}^3C_3 \times {}^{14}C_0) + ({}^3C_2 \times {}^{14}C_1) + ({}^3C_1 \times {}^{14}C_2)$$

$$= 364$$

diff ways

50 4 CA's; 3 Engineers; 8 Doctors -

How many ways a committee of 4 members can be formed with

Atleast 1 doctor

$$= \binom{8C_1 \times 7C_3}{8C_3} + \binom{8C_2 \times 7C_2}{8C_2} + \binom{8C_3 \times 7C_1}{8C_1} + \binom{8C_4 \times 7C_0}{8C_0}$$

$$= 280 + 588 + 392 + 70$$

$$= 1330 \text{ ways}$$

OR

$$= {}^15C_4 - \binom{8C_4 \times 7C_0}{8C_0}$$

$$= 1365 - 35 = 1,330 \text{ ways}$$

Atleast 1 person of each profession

$$= \binom{4C_1 \times 3C_1 \times 8C_2}{4C_1 \times 3C_1 \times 8C_2} + \binom{4C_1 \times 3C_2 \times 8C_1}{4C_1 \times 3C_2 \times 8C_1} + \binom{4C_2 \times 3C_1 \times 8C_1}{4C_2 \times 3C_1 \times 8C_1}$$

$$= 336 + 96 + 144$$

$$= 576 \text{ ways}$$

51 There are 8 males & 11 females. In how many ways a committee of 5 members can be formed with

No restriction

$$= {}^{19}C_5$$

$$= 11,628 \text{ ways}$$

Atleast 4 Females

$$= \binom{11C_4 \times 8C_1}{11C_4 \times 8C_1} + \binom{11C_3 \times 8C_2}{11C_3 \times 8C_2}$$

$$= 2640 + 462$$

$$= 3102 \text{ ways}$$

Atmost 1 Female

$$= \binom{11C_0 \times 8C_5}{11C_0 \times 8C_5} + \binom{11C_1 \times 8C_4}{11C_1 \times 8C_4}$$

$$= 770 + 56$$

$$= 826 \text{ ways}$$

3 Females

$$= \binom{11C_3 \times 8C_2}{11C_3 \times 8C_2}$$

$$= 4620 \text{ ways}$$

52 ${}^n P_r = {}^{n-1} P_r + r \cdot {}^{n-1} P_{r-1}$

a. True

b. False

Fet's check with numbers : $n = 5, r = 2$

$$L.H.S. = {}^5 P_2 = 20$$

$$R.H.S. = 4 P_2 + 2 \times 4 P_1 = 12 + (2 \times 4) = 12 + 8 = 20$$

53 A supreme court bench consist of 7 judges. In how many ways majority decision can be taken?

$$= {}^7C_4 + {}^7C_5 + {}^7C_6 + {}^7C_7$$

$$= 35 + 21 + 7 + 1 = 64 \text{ ways majority can be formed.}$$

54 A question paper has 8 questions. In how many ways atleast one question can be solved?

$$= (2^8) - 1 = 255 \text{ ways}$$

OR ${}^8C_1 + {}^8C_2 + {}^8C_3 + {}^8C_4 + \dots + {}^8C_8 = 2^8 - 1 = 255$

55 A question paper has 8 questions (each one has alternatives). In how many ways one or more questions can be solved?

$$= (3)^8 - 1$$

$$= 6560 \text{ ways}$$

56 No. of ways in which 9 things can be divided in 3 groups containing 2,3,4 things respectively.



$$= {}^9C_2 \times {}^7C_3 \times {}^4C_4$$

$$= \frac{9!}{2!3!4!} = 1260 \text{ ways}$$

$$= 1260 \text{ ways}$$

57 Number of odd numbers greater than 500 can be formed by using 3, 1, 2, 8

3 digit : $\frac{1P_1 \times 2P_1 \times 2P_1}{1} = 4$

4 digit : $\frac{3P_3}{1} \times 2P_1 = 12$

16 Numbers

58 $\frac{{}^n P_r}{{}^{n-1} P_{r-1}} =$

$$= \frac{n! / (n-r)!}{(n-1)! / (n-1-r+1)!} = \frac{n!}{(n-r)!} \times \frac{(n-r)!}{(n-1)!} = \frac{n(n-1)!}{(n-1)!} = n$$

59 A man has 12 friends in how many ways he can invite _____ for dinner

2 of them

$$= {}^{12}C_2$$

$$= 66$$

ways
ways

Atleast 10 of them

$$= {}^{12}C_1 + {}^{12}C_{11}$$

got

$$+ {}^{12}C_{12}$$

$$= 66 + 12 + 1$$

$$= 79$$

ways
ways

5 of them

$$= {}^{12}C_5$$

$$= 792$$

ways
ways

Atleast one of them

$$= {}^{12}C_1 + {}^{12}C_2 +$$

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

$$\dots + {}^{12}C_{12}$$

$$= 2^{12} - 1$$

$$= 4096 - 1$$

$$= 4095$$

ways
ways

Atmost 10 of them

$$= {}^{12}C_0 + {}^{12}C_1 +$$

$${}^{12}C_2 + \dots +$$

$${}^{12}C_{10}$$

$$= 2^{12} - {}^{12}C_{11} - {}^{12}C_{12}$$

$$= 4096 - 12 - 1$$

$$= 4083$$

ways
ways

So R of them : ${}^{12}C_0 + {}^{12}C_9 = 792 + 220$

$$= 1012$$

ways

60 In a paper there are 2 sections A, B containing 5, 8 questions respectively. In how many ways total 5 questions can be solved with atmost 3 questions of any one of the section.

→	Section A - 5 Questions	Section B - 8 Questions	
	5C_2	\times 8C_3	= 560
	5C_3	\times 8C_2	= 280
			<u>840 ways</u>

61 $\frac{{}^xP_2 \cdot {}^xP_3}{{}^xP_4 \cdot {}^xP_1}$ = $\frac{x(x-1) \cdot x(x-1)(x-2)}{x(x-1)(x-2)(x-3) \cdot x}$

$$= \left(\frac{x-1}{x-3} \right)$$

62 $\frac{{}^{10}P_3 \times {}^2P_1}{{}^{11}P_4}$ = $\frac{10 \times 9 \times 8 \times 2}{11 \times 10 \times 9 \times 8} = \left(\frac{2}{11} \right)$

$\frac{{}^{18}P_5}{{}^{19}P_5}$ = $\frac{18 \times 17 \times 16 \times 15 \times 14}{19 \times 18 \times 17 \times 16 \times 15} = \left(\frac{14}{19} \right)$

tip $\frac{{}^{20}P_3 \times (x-1)P_4}{{}^{(x+1)}P_6 \times (x-3)P_1}$ = $\frac{\cancel{20} \times \cancel{19} \times \cancel{18} \times (x-1)(x-2)(x-3)(x-4)}{(\cancel{x+1}) \times \cancel{x} \times \cancel{(x-1)} \times \cancel{(x-2)} \times \cancel{(x-3)} \times (x-3)}$

$$= \left[\frac{(x-1)(x-2)}{(x+1)(x-3)} \right]$$

Permutations & Combinations

$$63 \quad \frac{{}^{18}P_2 \times {}^{20}P_3}{{}^{21}P_3 \times {}^{19}P_3} = \frac{98 \times 17 \times 26 \times 14 \times 18}{21 \times 20 \times 191 \times 19 \times 18 \times 171} = \left(\frac{6}{133}\right)$$

$$\frac{{}^{16}P_3 \times {}^{18}C_3}{{}^{18}C_7} = \frac{16 \times 15 \times 18 \times 11 \times 16 \times 12}{61 \times 181 \times 11 \times 16 \times 14 \times 147} = \left(\frac{160}{7}\right)$$

64 In how many ways 10 students can be arranged in a line if 4 of them want to be always together?

$$\begin{aligned} \Rightarrow &= (10 - 4 + 1)! \times \text{Internal arrangements} \\ &= 7! \times 4! = 5040 \times 24 = 120,960 \text{ ways} \end{aligned}$$

65 There are 9 students, in how many ways they can stand in a line if 2 of them want to be never together?

$$\begin{aligned} &= \left(\begin{array}{l} \text{All possible arrangements} \\ \text{of 9 students} \end{array} \right) - \left(\begin{array}{l} \text{arrangements where 2 of them are} \\ \text{always together} \end{array} \right) \\ &= 9! - (8! \times 2) \\ &= 362880 - 80640 \\ &= 2,82,240 \text{ ways} \end{aligned} \quad \text{OR} \quad = 7! \times 8P_2 = 2,82,240 \text{ ways}$$

66 In how many ways letters of word 'DAUGHTER' can be arranged if all vowels should always be together?

$$\begin{aligned} \Rightarrow & \text{A, V, E, D, G, H, T, R} \\ &= 6! \times \text{Internal arrangements} = 6! \times 3! = 4,320 \text{ ways} \end{aligned}$$

67 In how many ways letters of word 'CALCULATOR' can be arranged if all consonants should always be together?

$$\begin{aligned} \Rightarrow & \text{C, L, C, L, T, R, A, V, A, O} \\ &= \frac{5!}{2!} \times \text{Internal arrangements} \\ &= \frac{5!}{2!} \times \frac{6!}{2! \cdot 2!} \\ &= 10,800 \text{ diff words} \end{aligned}$$

68 How many 3 digit numbers can be formed by using 1,2,3,4,5 if repetition of digits is

Allowed

$$\underline{5P_1} \times \underline{5P_1} \times \underline{5P_1}$$

$$= 125 \text{ Numbers}$$

Not allowed

$$\underline{5P_1} \times \underline{4P_1} \times \underline{3P_1}$$

$$= 60 \text{ Numbers}$$

Please Note

If question is silent about whether repetition of digits is allowed or not then **REPETITION OF DIGITS IS NOT ALLOWED**

69 How many 4 digit numbers greater than 5000 can be formed by using 3,5,8,2,1 if repetition of digits is

Not allowed

$$\underline{2P_1} \times \underline{483}$$

$$= 48 \text{ Numbers}$$

Allowed

$$\underline{2P_1} \times \underline{5P_1} \times \underline{5P_1} \times \underline{5P_1}$$

$$= 250 \text{ Numbers}$$

70 How many numbers greater than 8000 can be formed by using 1,2,7,8,9 if repetition of digits is

Not allowed

4 digit : $\underline{2P_1} \times \underline{MP3}$ = 48

5 digit : $\underline{5P_5}$ = 120

$$\underline{168}$$

Allowed

4 digit : $\underline{2P_1} \times \underline{5P_1} \times \underline{5P_1} \times \underline{5P_1}$ = 350

5 digit : $\underline{5P_1} \times \underline{5P_1} \times \underline{5P_1} \times \underline{5P_1} \times \underline{5P_1}$ = 3125

$$\underline{3375}$$

Note: we have restricted the answer to 5 digit Number.

71 How many 5 digit numbers divisible by 5 can be formed by using 0,2,3,4,5,8,9, if repetition of digits is

Not allowed

Ending with 5 : $\underline{5P_1} \times \underline{5P_3} \times \underline{1P_1}$ = 300

Ending with 0 : $\underline{6P_4} \times \underline{1P_1}$ = 360

$$\underline{660 \text{ Numbers}}$$

Allowed

$$\underline{5P_1} \times \underline{7P_1} \times \underline{7P_1} \times \underline{7P_1} \times \underline{2P_1}$$

$$= 4116 \text{ Numbers}$$

My Notes

How many 4 digit numbers greater than 4000 and divisible by 5 can be formed with 0,2,3,4,5,8 ?

Ending with 0 : $\underline{3P_1} \times \underline{4P_2} \times \underline{1P_1}$ = 36

Ending with 5 : $\underline{2P_1} \times \underline{4P_2} \times \underline{1P_1}$ = 24

$$\underline{60 \text{ Numbers}}$$

OR

start with 4,8 : $\underline{2P_1} \times \underline{4P_1} \times \underline{2P_1}$ = 48

start with 5 : $\underline{1P_1} \times \underline{5P_2} \times \underline{1P_1}$ = 12

$$\underline{60}$$

72 How many 5 digit numbers greater than 34,000 can be formed by using 3,1,2,7,8,0

$$\begin{aligned} \Rightarrow \text{Starting with } 3 &: 1P_1 \times 2P_2 \times 4P_2 = 48 \\ \text{Starting with } 7,8 &: 2P_2 \times 5P_4 = 240 \end{aligned}$$

288 Numbers

73 In how many ways 5 sisters & 6 brothers can stand in a line for a photograph if no 2 sisters or no 2 brothers should stand together?

B S B S B S B S B S B

$$\Rightarrow 6P_6 \times 5P_5 = 86,400 \text{ diff photographs}$$

74 How many 2 digit numbers can be formed with atleast one digit as 7?

starting with 7

$$1P_1 \times 10P_1 = 10$$

Ending with 7

$$9P_1 \times 1P_1 = 8$$

OR

17, 27, 37, 47, 57, 67, 70,

71, 72, 73, 74, 75, 76, 77,

78, 79, 87, 97

18 Numbers

75 In how many ways 11 players out of 16 players can be selected if -

There is No restriction

$$= {}^{16}C_{11}$$

$$= 4368$$

diff selections

2 Particular players must be included?

$$= {}^{14}C_9 \times {}^2C_2$$

$$= 2002$$

diff selections

3 Particular players must be excluded?

$$= {}^{13}C_{11} \times {}^3C_0$$

$$= 78$$

diff selections

2 Particular players must be excluded & 4 particular players must be included?

$$= {}^2C_2 \times {}^4C_4 \times {}^{10}C_5$$

$$= 120$$

diff selections

In How many 5 Brother & 5 sisters can form a line for a photograph If

(a) All Brother should be together

$$= 6! \times 5!$$

$$6!$$

(b) All sisters should be together

$$= 6! \times 5!$$

$$= 86,400$$

(c) All Brothers & All sisters should be together

$$= 2! \times 5! \times 5!$$

$$= 28,800$$

My Notes

$$= 86,400$$

$$= 86,400$$

$$= 2! \times 5! \times 5!$$

$$= 28,800$$

(d) No 2 brother or 2 sisters should be together

$$= (5! \times 5!) + (5! \times 5!)$$

$$= 28,800$$

76 $\frac{{}^{20}P_2 \times {}^{21}C_3}{{}^{18}C_5 \times {}^{21}P_2} = ?$

~~a. $\frac{1805}{12852}$~~

b. $\frac{1826}{18562}$

c. $\frac{1528}{17882}$

d. None of these

~~$= \frac{24 \times 19 \times 21 \times 20 \times 19 \times 120}{6 \times 18 \times 17 \times 46 \times 15 \times 14 \times 211 \times 20}$~~

$= \frac{5 \times 19 \times 19}{18 \times 17 \times 14 \times 14}$
 ~~$= \frac{1805}{12852}$~~
 $= \frac{1805}{12852}$

77 There are 8 men and 7 women, in how many ways a committee of 4 members can be formed :

Without any restriction

$= {}^{15}C_4$
 $= 1365$ ways

With 2 Men

$= {}^8C_2 \times {}^7C_2$
 $= 28 \times 21$
 $= 588$ ways

With Atleast 3 Men

$= ({}^8C_3 \times {}^7C_1) + ({}^8C_4 \times {}^7C_0)$
 $= 392 + 70$
 $= 462$ ways

With Atmost 1 Woman

$= ({}^7C_4 \times {}^8C_0) + ({}^7C_3 \times {}^8C_1)$
 $= 392 + 70$
 $= 462$

78 8 Red, 3 White, 4 Pink Balls - How many different selections of 4 balls are possible with atleast one ball of each colour?

$\implies ({}^8C_1 \times {}^3C_1 \times {}^4C_2) + ({}^8C_1 \times {}^3C_2 \times {}^4C_1) + ({}^8C_2 \times {}^3C_1 \times {}^4C_1)$
 $= 144 + 96 + 336$
 $= 576$ diff selections

79 There are 'm' points in a plane out of which 'k' are collinear

How many different straight lines can be drawn by joining them?

$= \binom{m}{2} - \binom{k}{2} + 1$

How many different triangles can be obtained by joining them?

$= \binom{m}{3} - \binom{k}{3}$

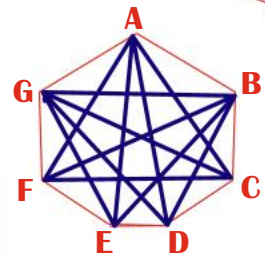
My Notes

There are 50 points in a plane out of which 18 are collinear. How many lines can be formed by joining them?

Lines
 $= \binom{50}{2} - \binom{18}{2} + 1$
 $= 1073$

Triangles
 $= \binom{50}{3} - \binom{18}{3} = 18784$

80 How many diagonals can be drawn in a Heptagon?
(Heptagon = A polygon having 7 sides)



No. of diagonals that can be drawn in a heptagon

$$= \binom{7}{2} - 7$$

$$= \frac{7 \times 6}{2} - 7$$

$$= 21 - 7 = 14 \text{ diagonals}$$

81 A man has 13 friends. In how many ways he can invite _____ for dinner

Atleast one of them

$$= {}^{13}C_1 + {}^{13}C_2 + \dots + {}^{13}C_{13}$$

$$= 2^{13} - 1$$

$$= 8192 - 1$$

$$= 8191 \text{ ways}$$

4 of them

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

$$= 715 \text{ ways}$$

4 or 7 of them

$$= {}^{13}C_4 + {}^{13}C_7$$

$$= 715 + 1716$$

$$= 2431 \text{ ways}$$

Atmost 11 of them

$$= {}^{13}C_3 + {}^{13}C_4 + \dots + {}^{13}C_{11}$$

$$= 2^{13} - ({}^{13}C_0 + {}^{13}C_1)$$

$$= 8192 - (1 + 13)$$

$$= 8178 \text{ ways}$$

82 There are 4 papers in an exam. in how many ways student can pass the exam if passing in all papers is compulsory to pass the exam?

a. 1 b. 15 c. 16 d. None of these

\Rightarrow $pppp = {}^4C_4 = 1$

83 There are 5 papers in an exam. in how many ways a student can pass the exam if student passes the exam if he passes in atleast one paper?

a. 32 ~~b. 31~~ c. 1 d. None of these

$$= {}^5C_1 + {}^5C_2 + {}^5C_3 + {}^5C_4 + {}^5C_5$$

$$= 2^5 - 1 = 32 - 1 = 31$$

My Notes

How many 4 digit even numbers greater than 4000 can be formed with 0, 2, 5, 3, 6, 8, 4

\Rightarrow

starting with 4, 6, 8 : $\frac{3P_1 \times 5P_2 \times 4P_1}{1} = 240$

starting with 5 : $\frac{1P_1 \times 5P_2 \times 5P_1}{1} = 100$

84 There are 5 multiple choice questions with 4 options each. How many different sequences of answer are possible?

$$\Rightarrow 4P_1 \times 4P_1 \times 4P_1 \times 4P_1 \times 4P_1$$

$$= 1024 \text{ diff sequences}$$

85 There are 6 multiple choice questions. First 4 questions have 4 options each and last two questions have 5 options each. How many different sequences of answer are possible?

$$\Rightarrow 4P_1 \times 4P_1 \times 4P_1 \times 4P_1 \times 5P_1 \times 5P_1$$

$$= 6400 \text{ diff sequences}$$

86 There are 8 males and 5 females. In how many ways a committee of 5 members can be formed so that males are in majority?

$$\Rightarrow \binom{8}{3} \times \binom{5}{2} + \binom{8}{4} \times \binom{5}{1} + \binom{8}{5} \times \binom{5}{0}$$

$$= 560 + 350 + 56 = 966 \text{ ways}$$

87 ① No. of arrangements of 'n' different things taken 'r' at a time in which a particular thing

Always there	Never there
$= rP_1 \times {}^{n-1}P_{r-1}$	$= (n-1)P_r$

② No. of selections of 'n' different things taken 'r' at a time in which a particular thing is

always there	Never there
$= {}^{n-1}C_{r-1} \times {}^1C_1$	$= {}^{n-1}C_r \times {}^1C_0$

My Notes

How many 5 digit odd numbers greater than 50,000 can be formed with 0, 1, 2, 3, 4, 6, 8, 9 if repetition of digits is allowed?

$$\Rightarrow 3P_1 \times 8P_1 \times 8P_1 \times 8P_1 \times 3P_1$$

$$= 4608 \text{ Numbers}$$

88 No. of selections of 'n' different things taken 'r' at a time in which a particular thing

↓ Is always there $= (n-1)C_{(r-1)} \times {}^1C_1$ $= (n-1)C_{(r-1)}$	↓ Is never there $= {}^{n-1}C_r \times {}^1C_0$ $= (n-1)C_r$
--	--

89 Find sum of all 4 digit numbers formed by using 1,3,5,7

a. 1,06,656 b. 1,78,252 c. 1,78,282 d. None

$$= \frac{24}{4} (1111 + 3333 + 5555 + 7777)$$

$$= 1,06,656$$

1357	3157	5137	7135
1375	3175	5173	7153
1537	3517	5317	7315
1573	3571	5371	7351
1735	3715	5713	7513
1753	3751	5731	7531

90 ${}^n P_r$ can also be written as :

- a. $\frac{n!}{r!}$ b. $\frac{n}{(n-r)}$ c. $\frac{n}{r(n-r)}$ d. None

$${}^n P_r = \frac{n!}{(n-r)!}, \quad {}^n C_r = \frac{n!}{r!(n-r)!}$$

where $n \geq r \geq 0$
 $n =$ positive integer

91 There are 6 Books on Eco, 3 on Maths, 2 on stats. In how many ways all books can be placed on a shelf if books on same subject are to be always together?

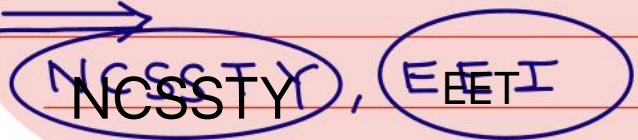
- a. 1,06,656 b. 1,78,252 c. 1,78,282 d. None



$$= 3! \times (\text{Internal Arrangements}) = 3! \times (6! \times 3! \times 2!) = 51,840 \text{ ways}$$

My Notes

In How many ways letters of word 'NECESSITY' can be arranged if all the consonants & all the vowels should be together?



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

$$= 2160 \text{ diff words}$$

Permutations & Combinations

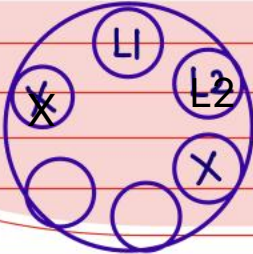
92 The number of ways in which 7 girls can form a ring is :

- a. 700 b. 710 ~~c. 720~~ d. 360

⇒ $\frac{7!}{7} = 6! = 720$ ways

93 3 Ladies and 3 gents are to be seated on a round table so that 2 and only 2 ladies should sit together. The number of arrangements are :

- a. 70 b. 27 ~~c. 72~~ d. None of these



= $(2! \times 3! \times 3!) \times 3 = 14,12$
 = 72 diff arrangements

$(14,12)$
 $(14,4)$
 $(4,4)$

94 In a group of boys the no. of arrangements of 4 boys is 12 times the number of arrangements of 2 boys. The no. of boys in the group is

- a. 10 b. 8 ~~c. 6~~ d. None of these

no. of Boys = n
 $n P_4 = 12 \times n P_2$
 $n(n-1)(n-2)(n-3) = 12 \times n(n-1)$
 $(n-2)(n-3) = 12$

95 $\sum_{r=1}^{10} r P_r = ?$

$\sum_{r=1}^{10} r \cdot r P_r$

$n = 6$

- a. ${}^{11}P_{11}$ ~~b. ${}^{11}P_{11} - 1$~~ c. ${}^{11}P_{11} + 1$ d. None of these

⇒ $(1 \times 1 P_1) + (2 \times 2!) + (3 \times 3!) + \dots + (10 \times 10!)$
 = 39916799
 ${}^{11}P_{11} - 1 = 39916800 - 1$
 = 39916799

My Notes

In How many ways 20 objects can be Equally divided among 4 people?

⇒ $20 C_5 \times 15 C_5 \times 10 C_5 \times 5 C_5$ (OR) $\frac{20!}{5! 5! 5! 5!}$
 = $15504 \times 3003 \times 252 \times 1$ = 11732745024
 = 11732745024

Permutations & Combinations

96 There are 10 trains plying between Latur and Pune, The no. of ways in which a man can go from Latur to Pune and return by different train is

a. 99

~~b. 90~~

c. 80

d. 100



$${}^{10}C_1 \times {}^9C_1$$

$$= 90$$

97 The number of ways in which six '+' and four '-' signs can be arranged in a line such that no '-' signs occur together is

a. $7!/3!$

b. $(6! \times 7!) / 3!$

~~c. 35~~

d. None of these

$$0 + 0 + 0 + 0 + 0 + 0 + 0$$

$$= \frac{6! \times {}^7P_4}{6! \cdot 4!} = 35$$

98 The number of ways in which letters of word 'MOBILE' be arranged so that consonants always occupy the odd places is :

~~a. 36~~

b. 63

c. 30

d. None of these



1st

3rd

5th

M, B, L

$$= 3! \times 3! = 36 \text{ diff words}$$

99 5 persons are sitting along a round table in such a way that tallest person is always to the immediate right of shortest person. The no. of such arrangements are :

~~a. 6~~

b. 8

c. 24

d. None of these



$$= 3! = 6 \text{ ways}$$

100 In how many ways 17 balls can be arranged in a line if 7 of them are Black, 6 are Red and 4 are White?



$$\frac{17!}{7! \cdot 6! \cdot 4!} = 4084080$$

My Notes

How many words can be formed by using B, B, B, B, B, B, K, K, K, K if no 2 K's should occur together?



$$\frac{6! \times {}^7P_4}{6! \cdot 4!} = 35 \text{ diff words}$$

Permutations & Combinations

101 The number of different words that can be formed with 12 consonants and 5 vowels by taking 4 consonants and 3 vowels in each word are

- a. ${}^{12}C_4 \times {}^5C_3$ b. ${}^{17}C_7$ c. $4950 \times 7!$ d. None of these

$$= ({}^{12}C_4 \times {}^5C_3) \times 7!$$

102 How many different words can be formed by using all letters of word 'ASSASSINATION' if all vowels should be together?

⇒ AATAIO SSSSNTN

$$= \frac{8!}{4!2!} \times \frac{6!}{3!2!} = 50,400 \text{ diff words}$$

103 How many numbers greater than a million can be formed with the digits 0,4,4,5,5,5,3?

- a. 420 b. 360 c. 7! d. None of these

⇒ GP x ||| GP

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

$$= 360$$

104 $4 \times {}^nP_3 = 5 \times {}^{(n-1)}P_3$; then value of 'n' is

- a. 12 b. 13 c. 14 d. 15

$$4 \times n \times (n-1) \times (n-2) = 5 \times (n-1) \times (n-2) \times (n-3)$$

$$4n = 5n - 15$$

$$15 = n$$

105 The number of ways in which 8 examination papers can be arranged so that best and worst paper never come together are :

- a. $8! - 2!7!$ b. $8! - 7!$ c. $8!$ d. None of these

⇒ [All possible arrangements - arrangements where best & worst are always together]

$$= 8! - (7!2!)$$

$$= 8! - 2!7!$$

My Notes

In how many ways 7 Brothers & 11 sisters can form a line so that all brothers are together?

$$\Rightarrow 12! \times 7!$$

$$= 12 \times 11 \times 36288 \times 100 \times 504 \times 10$$

$$= 2414168064000$$

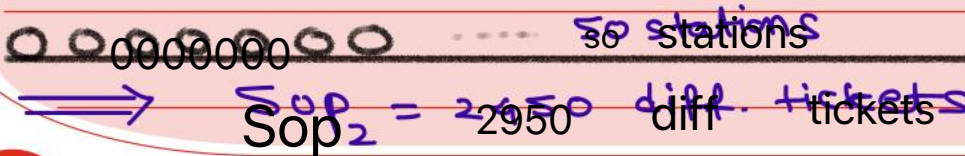
Permutations & Combinations

106 How many 6 digit numbers can be formed out of 4,5,6,7,8,9 if no digit being repeated?

- a. $6! \cdot 5!$ ~~b. $6!$~~ c. $6! + 5!$ d. None of these

107 There are 50 stations on a railway line, How many different kinds of tickets to be printed to enable a passenger to travel from one station to another station?

- a. 2500 ~~b. 2450~~ c. 2400 d. None of these

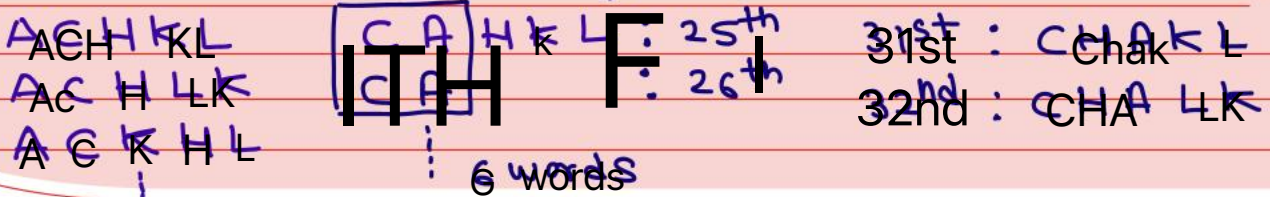


108 In "P," "C," n is always

- ~~a. positive integer~~ b. an integer c. zero d. None of these

109 If all permutations of word 'CHALK' are written in a dictionary sequence. the rank of word 'CHALK' is

- a. 30 b. 31 ~~c. 32~~ d. None of these



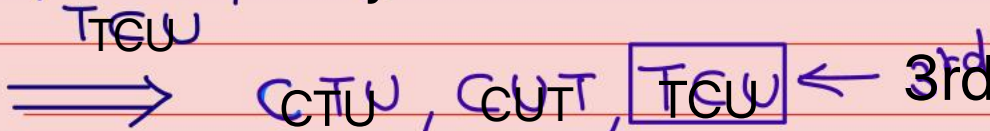
110 How many words can be formed by using letter A thrice, letter B twice. letter C once.

- ~~a. 60~~ b. 120 c. 90 d. 6

$$\frac{6!}{3!2!1!} = 60 \text{ diff words}$$

My Notes

If all permutations of word 'CUT' are written in dictionary sequence. what is rank of word



Permutations & Combinations

111 If different permutations of the word 'EXAMINATION' are listed in a dictionary, How many items are there in the list before the first word starting with E?

- a. 9,06,200 ~~b. 9,07,200~~ c. 9,08,200 d. 9,05,200

NO. of words starting with 'A' = $\frac{10!}{2! \cdot 2!} = 9,07,200$ words

E EXAMINATION N

112 A letter lock consist of 3 rings marked with 5 different letters. Number of maximum unsuccessful attempts to open the lock is :

- ~~a. 124~~ b. 125 c. 120 d. 75

Total No. of passwords possible = $5P_1 \times 5P_1 \times 5P_1 = 125$

Max. no. of unsuccessful attempts = $125 - 1 = 124$

ab'd, aped

113 The number of 5 letter words that can be formed using letters of word 'DELHI' which begin and end with vowel, when repetitions are allowed is

- a. 125 b. 625 ~~c. 500~~ d. 1350

$2P_1 \times 5P_1 \times 5P_1 \times 5P_1 \times 2P_1 = 500$ diff words

114 The number of ways in which 20 persons be seated along a round table if there are 7 seats is :

- a. ${}^{20}P_7$ b. ${}^{20}P_7 / 7!$ c. ${}^{20}C_7$ ~~d. ${}^{20}P_7 / 7$~~

$\Rightarrow \frac{{}^{20}P_7}{7}$

115 ${}^nP_r = 120 \times {}^nC_r$, then n = ?

- ~~a. 5~~ b. 120 c. 24 d. 4

${}^nP_r = 120 \times {}^nC_r$ $2! = 5!$

${}^nP_r = 120$ $2 = 5$

IPF

My Notes

If ${}^{45}C_m = {}^{45}C_n$ then $n = ?$

- (a) 190 (b) 300 ~~(c) a or b~~ (d) None of these

$\Rightarrow {}^{45}C_m = {}^{45}C_n \therefore n = 20, n = 25$ $20C_2$ OR $25C_2 = 190$ OR 300

116 In how many ways letters of the word 'BALLOON' be arranged so that 2 L's do not come together is :

LL B A O O N

- a. 900 b. 1200 c. 800 d. 600

= All possible arrangements - Arrangements where 2 L's are always together

$$= \binom{7!}{2!2!} - \binom{6!}{4!} \times 2! = 1260 - 360 = 900 \text{ words}$$

117 ${}^{15}C_{11} / {}^{15}C_{10} = ?$

- a. 15/11 b. 15/10 c. 5/10 d. None of these

\Rightarrow $\frac{{}^{15}C_{11}}{{}^{15}C_{10}} = \frac{15!}{11!4!} \times \frac{10!}{15!} = \frac{10! \times 5 \times 4!}{11!} = \frac{5}{11}$

YE.filij loxax filij

118 How many even numbers greater than 300 can be formed with digits 1,2,3,4,5. No repetition being allowed

- a. 112 ~~b. 111~~ c. 113 d. 121

\Rightarrow

3 digit : Ending with 2 : $\frac{3P_1 \times 3P_1 \times 1P_1}{\text{fix}} = 9$
 Ending with 4 : $\frac{2P_1 \times 3P_1 \times 1P_1}{\text{fix}} = 6$

4 digit : $\frac{4P_1}{\text{fix}} \times 2P_1 = 48$

5 digit : $\frac{4P_1}{\text{fix}} \times 2P_1 = 48$

It

119 ${}^{43}C_{(r-6)} = {}^{43}C_{(3r+1)}$, then r = ?

- a. 12 b. 8 c. 6 d. 10

$$\begin{aligned} r-6 + 3r+1 &= 43 \\ 4r-5 &= 43 \\ 4r &= 48 \\ r &= 12 \end{aligned}$$

OR

$$\begin{aligned} r-6 &= 3r+1 \\ -5 &= 2r \end{aligned}$$

This is impossible

My Notes

If $nCr = nCy$ then they

Either $x=y$ or $x+y=n$
 y sety

120 A committee of 3 ladies and 4 gents to be formed out of 8 ladies and 7 gents. Mrs. X refuses to serve in a committee if Mr. Y is there. Number of such committees are :

- a. 1530 b. 1500 c. 1520 d. 1540

$$\Rightarrow \binom{8}{3} \times \binom{7}{4} - \binom{1}{1} \times \binom{1}{1} \times \binom{7}{3} \times \binom{6}{4}$$

$$= 1960 - 420 = 1540 \text{ ways}$$

121 What is rank of word 'TALK' if all words by using letters of word are arranged in a dictionary sequence ?

- a. 20 b. 18 c. 19 d. None of these

\Rightarrow A K L T T - 6 words starting with A
 - 6 words starting with K
 - 6 words starting with L
 19th T A K L 20th : T A L K

122 How many 3 digit odd numbers can be formed by using 1,3,5, if repetition of digits is allowed?

- a. 3^3 b. $3!$ c. $(3 \times 3 \times 4)$ d. None of these

$$\Rightarrow \underline{3P_1} \times \underline{3P_1} \times \underline{3P_1} = 3^3$$

123 ${}^{56}P_{(r+6)} : {}^{54}P_{(r+3)} = 30,800 : 1$; then $r = ?$

- a. 42 b. 41 c. 45 d. None of these

$$\frac{{}^{56}P_{r+6}}{{}^{54}P_{r+3}} = \frac{56 \times 55 \times 54 \times 53 \times 52 \times 51 \times 50 \times 49 \times 48 \times 47 \times 46 \times 45 \times 44 \times 43 \times 42 \times 41 \times 40 \times 39 \times 38 \times 37 \times 36 \times 35 \times 34 \times 33 \times 32 \times 31 \times 30 \times 29 \times 28 \times 27 \times 26 \times 25 \times 24 \times 23 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{54 \times 53 \times 52 \times 51 \times 50 \times 49 \times 48 \times 47 \times 46 \times 45 \times 44 \times 43 \times 42 \times 41 \times 40 \times 39 \times 38 \times 37 \times 36 \times 35 \times 34 \times 33 \times 32 \times 31 \times 30 \times 29 \times 28 \times 27 \times 26 \times 25 \times 24 \times 23 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} = 30,800$$

$\frac{56 \times 55 \times 54 \times 53 \times 52 \times 51 \times 50 \times 49 \times 48 \times 47 \times 46 \times 45 \times 44 \times 43 \times 42 \times 41 \times 40 \times 39 \times 38 \times 37 \times 36 \times 35 \times 34 \times 33 \times 32 \times 31 \times 30 \times 29 \times 28 \times 27 \times 26 \times 25 \times 24 \times 23 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{54 \times 53 \times 52 \times 51 \times 50 \times 49 \times 48 \times 47 \times 46 \times 45 \times 44 \times 43 \times 42 \times 41 \times 40 \times 39 \times 38 \times 37 \times 36 \times 35 \times 34 \times 33 \times 32 \times 31 \times 30 \times 29 \times 28 \times 27 \times 26 \times 25 \times 24 \times 23 \times 22 \times 21 \times 20 \times 19 \times 18 \times 17 \times 16 \times 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} = 30,800$

$(56 - r) = 54 - r + 3$
 $56 - r = 57 - r$
 $r = 41$

124 There are 6 questions in section A and 7 in section B. In how many ways 8 questions can be attempted with atmost 6 questions from any section are :

- a. 360 b. 1281 c. 6 d. 42

A - 6 Questions	B - 7 Questions
$\binom{6}{0} \times \binom{7}{8} = 105$	
$\binom{6}{1} \times \binom{7}{7} = 420$	
$\binom{6}{2} \times \binom{7}{6} = 525$	
$\binom{6}{3} \times \binom{7}{5} = 210$	
$\binom{6}{4} \times \binom{7}{4} = 21$	
$\binom{6}{5} \times \binom{7}{3} = 21$	
$\binom{6}{6} \times \binom{7}{2} = 21$	
	<u>1281</u>

My Notes

