PERMUTATION AND COMBINATION

Combination

The number of combination of n different things taken r at time is

$$^{n}C_{r} = \frac{^{n}P_{r}}{r!} = \frac{n(n-1)......(n-r+1)}{r!}$$

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

Pg.24 , No.1

In a decagon, there are 10 sides and 10 corners.

The number of triangles can be formed by joining the angular points $= {}^{10}C_3$

The number of straight line can be formed $= {}^{10}C_2$

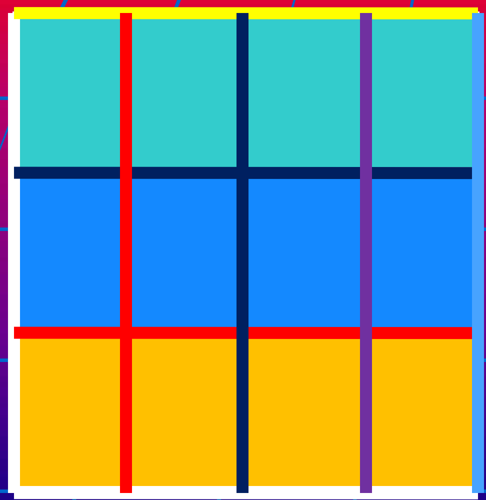
The number of diagonals can be formed by joining the angular points $= {}^{10}C_2 - 10$

The name of diagonals can be formed by joining the angular points

$$= ({}^{10}C_2 - 10) \times 2! \quad or \quad {}^{10}P_2 - 20$$

Above problem consider in Polygon.

Pg. 28 , No.32



The number of all possible rectangles

$$= {}^{4}C_{2} \times {}^{5}C_{2}$$

. The number of monitors in a set = 5

The number of boys = 11

The number of sets eligible for the office

$$= {}^{11}C_5$$

The number of weeks will elapse before the same 5 boys will be in office together again

$$= \frac{{}^{11}C_5}{5}$$

Combination Under Restrictions

The number of combination of n things taken r at time in which p particular things always occur is

$$^{n-p}C_{r-p}$$

The number of combination of n things taken r at time in which p particular things never occur is

$$^{n-p}C_{r}$$

Pg 25 , No.11

The number of boys = 25

The number of selected boys = 11

The number of ways that 6 of then being always exclude

$$= {}^{25-6}C_{11}$$

The number of ways that 5 of then being always include

$$= {}^{25-5}C_{11-5}$$

The number of ways that 6 of then being always exclude and 5 of then always include

$$= {}^{25-6-5}C_{11-5}$$

Pg . 25 , No. 10

A boat's crew consists of 10 men, of whom 2 can row only on one side and 2 only on the other. In how many ways can a selected be made so that 5 men may row each side ?

The number of total ways $= {}^{10}C_5$

The number of required ways $= {}^{6}C_3$

Pg.24 , No.3

The number of persons in a committee = 5

The number of boys = 25

The number of girls = 10

25 boys	10 girls
5	0
4	1
3	2
2	3
1	4
0	5

$$^{35}C_5 = {}^{25}C_5 \times {}^{10}C_0 + {}^{25}C_4 \times {}^{10}C_1 + ------ + {}^{25}C_0 \times {}^{10}C_5$$

Pg 24 , No.3

The number of persons in a committee = 5

The number of boys = 25

The number of girls = 10

The number of committees, so as to include at least one girls

$$= {}^{25}C_4 \times {}^{10}C_1 + {}^{25}C_3 \times {}^{10}C_2 + {}^{25}C_2 \times {}^{10}C_3 + {}^{25}C_1 \times {}^{10}C_4 + {}^{25}C_0 \times {}^{10}C_5$$

$$(\ or\ ) = {}^{35}C_5 - {}^{25}C_5 \times {}^{10}C_0$$

Pg.24 , No.6

The number of persons in a committee = 7

The number of boys = 10

The number of girls = 8

10 boys	8 girls
7	0
6	1
5	2
4	3
3	4
2	5
1	6
0	7

$$^{18}C_7 = {}^{10}C_7 \times {}^{8}C_0 + {}^{10}C_5 \times {}^{8}C_1 + ------ + {}^{10}C_0 \times {}^{8}C_7$$

Pg.24 , No.6

The number of persons in a committee = 7

The number of boys = 10

The number of girls = 8

The number of committees can be chosen

which contain exactly 4 boys $= {}^{10}C_4 \times {}^{8}C_3$

The number of committees can be chosen which contain at least 4 boys

$$= {}^{10}C_4 \times {}^{8}C_3 + {}^{10}C_5 \times {}^{8}C_2 + {}^{10}C_6 \times {}^{8}C_1 + {}^{10}C_7 \times {}^{8}C_0$$

The number of committees can be chosen which contain at most 4 boys

$$= {}^{10}C_4 \times {}^{8}C_3 + {}^{10}C_3 \times {}^{8}C_4 + {}^{10}C_2 \times {}^{8}C_5 + {}^{10}C_1 \times {}^{8}C_6 + {}^{10}C_0 \times {}^{8}C_7$$

From the groups of 8 boys and 4 girls, committees of 7 which particular 2 boys and 1 girl are always include. How many can be chosen which contain (i) at most 3 girls (ii) at most 4 boys ?

6 boys	3 girls
4 3 2 1	0 1 2 3

Pg.24 , No.4

The no. of engineers = 10

The no. of chemists = 5

The no. of mathematics = 7

The no. of committeess to contain 4 engineers ,2 chemists and 2 mathematics

$$= {}^{10}C_4 \times {}^{5}C_2 \times {}^{7}C_2$$

The no. of committeess to contain 4 engineers ,2 chemists and 2 mathematics such that particular 2 engineers, 1 chemists include and 1 mathematics exclude

$$= {}^{8}C_2 \times {}^{4}C_1 \times {}^{6}C_2$$

The no. of doctors = 6

The no. of pharmacists = 3

The no. of nurses = 7

The no. of persons in a committee = 11

The no. of committeess to contain at least 4 doctors and 2 pharmacisrs

$$= {}^{6}C_{4} \times {}^{3}C_{2} \times {}^{7}C_{5} + {}^{6}C_{5} \times {}^{3}C_{2} \times {}^{7}C_{4} + {}^{6}C_{6} \times {}^{3}C_{2} \times {}^{7}C_{3}$$

$$+ {}^{6}C_{4} \times {}^{3}C_{3} \times {}^{7}C_{4} + {}^{6}C_{5} \times {}^{3}C_{3} \times {}^{7}C_{3} + {}^{6}C_{6} \times {}^{3}C_{3} \times {}^{7}C_{2}$$

Pg.24 , No.7

(a) all good units $= {}^{22}C_4 \times {}^{3}C_0$

(b) two good units $= {}^{22}C_2 \times {}^{3}C_2$

(c) at leasttwo good units

$$= {}^{22}C_2 \times {}^{3}C_2 + {}^{22}C_3 \times {}^{3}C_1 + {}^{22}C_4 \times {}^{3}C_0$$

Pg.25 No. 14

Five cards are draw from a pack of 52 well-shuffled cards. Find the number of ways that (i) 4 are ace (ii) 4 are ace and one is king (iii) 3 are tens and 2 are jacks (iv) a 9, 10 , jack , queen , king are obtained in any order (v) 3 are of any one suit and 2 are another (vi) at least one ace is obtain.

Permutation and Combination From two Sets

If m different things of one kind, and n different things of another kind are given the number of permutation which can be formed, containing r of the first and s of the second is

$$^{m}C_{r} \times {}^{n}C_{s} \times (r+s)!$$

How many number can be from the digits 3,4,5 ,6,7,8,9 which the digit 4 , 5 , 6 are always include such that (i) five digits number (ii) between 40000 and 70000 ?

First, we take the digits 4 , 5 , and 6.

The number of 5 digits number so as to contain the digit 4 , 5 , 6

$$= {}^{7-3}C_{5-3} \times 5!$$

The no. of number between 40000 and 70000 so as to contain the digit 4 , 5 , 6

$$= {}^{7-3}C_{5-3} \times {}^{3}P_{1} \times 4!$$

Pg 24, No.13

The named of digits are 0 , 1 , 3 , 4 , 5 , 7 , 9.

The number of 5 digits number so as to contain the digit 0 ,4 , 5

$$= {}^{7-3}C_{5-3} \times {}^{4}P_1 \times 4!$$

The number between 40000 and 60000 digits number so as to contain the digit 0 , 4 , 5

$$= {}^{7-3}C_{5-3} \times {}^{2}P_1 \times 4!$$

The number of 5 digits number so as to contain the digit 0 ,4 , 5 which are divisible by 5 = ?

$$= {}^{7-3}C_{5-3} \times \left(4! + {}^{3}P_{1} \times 3!\right)$$

The number of 6 digits even number so as to contain the digit 0 ,4 , 5 = ?

The number of 6 digits odd number so as to contain the digit 0 ,4 , 5 = ?

Pg .25 , N0.11

There are 7 letters in the word FOMULA

The number of vowels = 3

The number of consonants = 4

4 consonants	3 vowels
3 2 1 0	0 1 2 3

$\times 3!$

$$^7P_3 = {^7C_3} \times 3! = ({^4C_3} \times {^3C_0} + {^4C_2} \times {^3C_1} + {^4C_1} \times {^3C_2} + {^4C_0} \times {^3C_3}) \times 3!$$

Pg 29 , No.39 .

In the word FORMULA, there are 7 letter

The number of consonants = 4

The number of vowels = 3

The number of 3 letter words, so as each words containing one vowel at least

$$= ({}^4C_2 \times {}^3C_1 + {}^4C_1 \times {}^3C_2 + {}^4C_0 \times {}^3C_3) \times 3!$$

The number of 3 letter words, so as each words containing at least one vowel and begin with vowel

$$= ({}^4C_2 \times {}^3C_1 \times {}^1P_1 \times 2! + {}^4C_1 \times {}^3C_2 \times {}^2P_1 \times 2! + {}^4C_0 \times {}^3C_3 \times {}^3P_1 \times 2!)$$

How many three letter words there which can be formed of (i) the seven different letters (ii) the seven letters in which three are the same ?

(i) The many three letter words there which can be formed

of the seven different letters = ?

(ii) The many three letter words there which can be formed

of the seven in which three are same = ?

Pg 25 , No.15

The number of vowels = 5

The number of consonants = 15

The number of letters in a word =5

15 consonants	5 vowels
5	0
4	1
3	2
2	3
1	4
0	5

$\times 5!$

$$^{20}P_5 = {}^{20}C_5 \times 5! = ({}^{15}C_5 \times {}^{5}C_0 + {}^{15}C_4 \times {}^{5}C_1 + --- + {}^{15}C_0 \times {}^{5}C_5) \times 5!$$

pg.25 , No. 15

The number of vowels = 5

The number of consonants = 15

The number of 5 letters words so as to containing the 3 different vowels and 2 different consonants

$$= {}^{5}C_3 \times {}^{15}C_2 \times 5!$$

The number of 5 letters words so as to containing the at most 2 consonant

$$= ({}^{5}C_3 \times {}^{15}C_2 + {}^{5}C_4 \times {}^{15}C_1 + {}^{5}C_5 \times {}^{15}C_0)5!$$

The number of 5 letters words so as to containing the 3 different vowels and 2 different consonants and centlal may be vowel

$$= {}^{5}C_3 \times {}^{15}C_2 \times {}^{3}P_1 \times 4!$$

$\times 4!$

(3 V , 2 C) __ __ $\underline{{}^{3}P_1}$ __ __

The number of 5 letters words so as to containing the at most 2 consonant and begin with vowel

$$= {}^{15}C_2 \times {}^{5}C_3 \times {}^{3}P_1 \times 4! + {}^{15}C_1 \times {}^{5}C_4 \times {}^{4}P_1 \times 4! + {}^{15}C_0 \times {}^{5}C_5 \times {}^{5}P_1 \times 4!$$

The number of 5 letters words so as to containing the at most 2 consonant and begin with vowel

$$= {}^{15}C_2 \times {}^{5}C_3 \times {}^{3}P_1 \times 4! + {}^{15}C_1 \times {}^{5}C_3 \times {}^{4}P_1 \times 4! + {}^{15}C_5 \times {}^{5}C_0 \times {}^{5}P_1 \times 4!$$

$(2\,C, 3V)$ $\quad$ $(1\,C, 4V)$ $\quad$ $(\,, 5V)$

$\underline{V}\ \_\ \_\ \_\ \_$ $\quad$ $\underline{V}\ \_\ \_\ \_\ \_$ $\quad$ $\underline{V}\ \_\ \_\ \_\ \_$

pg 25 , No. 16

The number of vowels = 5

The number of consonants = 10

First, we take the the vowel " a "

10 consonants	4 Vowels + a
4 3 2 1 0	0 1 2 3 4

$\times 5!$

$$= ({}^{10}C_4 \times {}^4C_0 + {}^{10}C_3 \times {}^4C_1 + - - - - - + {}^{15}C_0 \times {}^4C_4) \times 5!$$

Pg25 , No. 16

The number of consonants = 10

The number of vowels = 5

The number of 5 letters words so as ' a ' is always include and the words is to contain at least 2 consonants

$$= ({}^{10}C_2 \times {}^{4}C_2 + {}^{10}C_3 \times {}^{4}C_1 + {}^{10}C_4 \times {}^{4}C_0) \times 5!$$

The number of 5 letters words so as ' a ' is always include and the words is to contain at least 2 consonants and begin with "a"

$$= ({}^{10}C_2 \times {}^{4}C_2 + {}^{10}C_3 \times {}^{4}C_1 + {}^{10}C_4 \times {}^{4}C_0) \times 4!$$

The number of 5 letters words so as ' a ' is always include and the words is to contain at least 2 consonants and begin with vowel

$$= ({}^{10}C_2 \times {}^{4}C_2 \times {}^{3}P_1 \times 4! + {}^{10}C_3 \times {}^{4}C_1 \times {}^{2}P_1 \times 4!$$

$$+ {}^{10}C_4 \times {}^{4}C_0 \times {}^{1}P_1 \times 4!)$$

The number of 5 letters words so as ' a ' is always include and the words is to contain at least 3 consonants and vowels are separated

$$= {}^{10}C_3 \times {}^{4}C_1 \times 3! \times {}^{4}P_2 + {}^{10}C_4 \times {}^{4}C_0 \times 4! \times {}^{5}P_1$$

$(3\,C, 2V)$ $\qquad$ $(4\,C, 1V)$

$\_\ \underline{C}\ \_\ \underline{C}\ \_\ \underline{C}\ \_$ $\qquad$ $\_\ \underline{C}\ \_\ \underline{C}\ \_\ \underline{C}\ \_\ \underline{C}\ \_$

The number of 5 letters words so as the letters ' a and b ' are always include and the words is to contain at least 2 consonants and begin a and end with b =

. The number of consonants = 10

The number of vowels = 5

The number of 5 letters words so as ‘ A ’ and ‘E ’ is always include the words is to contain at least 2 consonants and begin “A” and end “E” =

$$= ({}^{10}C_2 \times {}^{3}C_1 + {}^{10}C_3 \times {}^{3}C_0) \ 3!$$

$\underline{A}$ ___ $\underline{3\,!}$ ___ $\underline{E}$

Pg25 , No.17

The number of people = 6

The no. of ways = $^{6}C_3 \times {}^{3}P_3 \times {}^{3}P_3$

The no. of ways that 2 people must be sit together

$$= {}^{4}C_1 \times \left({}^{2}P_2 \times {}^{2}P_2 \times {}^{3}P_3 + {}^{3}P_3 \times {}^{2}P_2 \times {}^{2}P_2 \right)$$

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

A B C D E F