LAB. METEOROLOGICAL STATISTICS ..... FOURTH STAGE

(The second Semester)

Department of Atmospheric Sciences

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Permutation and Combination:

Permutation:

A permutation is an arrangement in a definite order of a number of objects taken some or all at a time. With permutations, every little detail matters. It means the order in which elements are arranged is very important.

There are two types of permutations:

1-Repetition is Allowed:

n × n × n *(*n multiplied 3 times)
n × n × ... *(*r times***)***

n × n × ... (r times) = nr
Example: in the lock above, there are 10 numbers to choose from (0,1,2,3,4,5,6,7,8,9) and we choose 3 of them:
10 × 10 × ... (3 times) = 10^3 = 1,000 permutations

> where ***n*** is the number of things to choose from, and we choose ***r*** of them, repetition is allowed, and order matters.

2-No Repetition Allowed :

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

$$P(n,r) = {}^{n}P_r = {}_{n}P_r = \frac{n!}{(n-r)!}$$

where ***n*** is the number of things to choose from, and we choose ***r*** of them, no repetitions, order matters.

Example: How many ways can first and second place be awarded to 10 people?

$$\mathbf{P} = {}^{10}\mathbf{P}_2 = {}_{10}\mathbf{P}_2 = \frac{10!}{(10-2)!} >>> = \frac{10!}{8!} >>>>> = \frac{3{,}628{,}800}{40{,}320} >>>> = \mathbf{90}$$

Combination:

The combination is a way of selecting elements from a set in a manner that order of selection doesn't matter. With combination, only choosing elements matter. It means the order in which elements are chosen is not important.

There are two types of combinations:

1-Repetition is Allowed:

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

where ***n*** is the number of things to choose from, and we choose ***r*** of them, repetitions allowed , order doesn't matter.

2. ***No Repetition Allowed*** *:*

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

$$C(n,r) = {}^nC_r = {}_nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

where ***n*** is the number of things to choose from, and we choose ***r*** of them, no repetitions , order doesn't matter.

For example **: Find the number of permutations and combinations, if n = 15 and r = 3.**

Solue:

permutations : P = n!/(n – r)! >>>> = 15!/(15 – 3)! = 15!/12! = (15 x 14 x 13 x 12!)/12! = 15 x 14 x 13 **= 2730**

Combination: C = n!/(n – r)!r! >>> = 15!/(15 – 3)!3! = 15!/12!3!
= (15 x 14 x 13 x 12!)/12!3! = 15 x 14 x 13/6 = 2730/6 **= 455**

H.W(1) \\ **Find the number of permutations and combinations, if , n = 7 and r = 4.**

H.W(2)\\ Calculate the following [$_{12}C_3$, $_{10}P_3$].