Permutations-30

A **permutation** is an arrangement of distinct objects in a **definite order**.

Example 1:

The letters A, B, and C can be arranged in six ways. These are; ABC, ACB, BCA, BAC, CAB, and CBA. The first letter can be chosen in three ways, the second letter can be chosen in two ways, and there is only one letter left, so the number of permutations is 3x2x1 = 3! = 6.

In general, the number of permutations of n distinct objects = n!

Example 2:

Suppose that we have four distinct objects. They are; U, V, W, and X. If we choose two of them, how many permutations are there?

There are four choices for the first object and three choices for the second object. That is 4x3 = 12. These are; UV, UW, UX, VU, VW, VX, WU, WV, WX, XU, XV, and XW.

In general, if we choose r objects from a set of n distinct objects, then the number of permutations (**order important**) is given by the formula:

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

Questions:

1) Evaluate the following:

a) ${}_7P_3$ b) ${}_6P_6$ c) ${}_{10}P_4$

2)a) In how many ways can five students be assigned to five seats?

b) In how many ways can five students be assigned to three seats?

c) In how many ways can the five students be assigned to eight seats? (Hint: assign the eight seats to the five students)

3)a) How many “words” can be made using all of the letters in the word ORANGE?

b) How many four letter “words” can be made?

4) A combination lock requires the selection of three different correct numbers, out of 60, in sequence. How many permutations are there?

Answers: 1)a) 7!/4! = 7x6x5 = 210, b) 6!/0! = 720, c) 10!/6! = 10x9x8x7 = 5040, 2)a) ${}_5P_5$ = 5! = 120, b) ${}_5P_3$ = 5x4x3 = 60, c) ${}_8P_5$ = 8x7x6x5x4 = 6720, 3)a) ${}_6P_6$ = 6! = 720, b) ${}_6P_4$ = 360, 4) ${}_{60}P_3$ = 205,320.