Permutations and Factorials

- **Permutation** = an arrangements of n distinct items in a definite order ("order matters" when abc ≠bca).
- The number of permutations of n items is the total number of different arrangements of these distinct items. We write is as:

- **A factorial** = a product of sequential natural numbers written in the form:

- **By agreement 0! = 1**

The Number of permutations of r Items out of n Items

Provided that $n \geq r$

- **Formula:**

Example 1:
Forty athletes are entered in a triathlon. Medals are presented to the top three finishers. In how many ways could the gold, silver and bronze medals be awarded?

Example 2:
A half-hour TV show has eight 30-second advertisement time slots. In how many ways could the eight advertisements be assigned a time?

Example 3:
Six team photos are hanging on the wall outside a high school gym. Two of the photos are of the junior and senior football teams. In how many ways could they be arranged in a straight line if the two football photos must be beside each other?

Example 4:
Write in simplest factorial form:
   a) $(n+5)(n+4)(n+3)!$ B) $n(n-1)(n-2)!$

Example 5:
Three players each cut one card from a standard deck. Id order is important, in how many ways could they

a) all be hearts?

b) all aces?

c) all aces or hearts?

Example 6:
In how many ways could the letters in the word FACTOR be arranged so that the vowels are not together?