Day2 Permutation and Combination.

ex.1 Consider the following 8 letters: ABCDWXYZ. How many different ways can these letters be arranged?

$\underline{8}\ \underline{7}\ \underline{6}\ \underline{5}\ \underline{4}\ \underline{3}\ \underline{2}\ \underline{1}$

By Fundamental Counting Principle, : $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

$= 8! = \boxed{40,320}$

The number of permutation for n number of "items" is

$\boxed{n!}$

Ex.2 From the 8 letters in ex.1, how many ways can you arrange 5 of those letters?

$\underline{8}\ \underline{7}\ \underline{6}\ \underline{5}\ \underline{4} = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 = \boxed{6720}$

$= 8 \cdot (8-1) \cdot (8-2)(8-3)(8-4) = 6720$

$\frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

The number of permutation for n number of "items" is

$$n!$$

Ex. 2 From the 8 letters in ev.!, how many ways can you arrange 5 of those letters?

$P(8,5) =$

$\underline{8}\ \underline{7}\ \underline{6}\ \underline{5}\ \underline{4} = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 = 6720$

$= 8 \cdot (8-1) \cdot (8-2)(8-3)(8-4) = 6720$

$P(n,r)$ n, r are numbers, $n > r$.

$$P(n,r) = \underline{n \cdot (n-1) \cdot (n-2) \cdot (n-3) \cdots (n-(r-1))} \cdot \frac{(n-r)(n-r+1) \cdots 3 \cdot 2 \cdot 1}{(n-r)(n-r+1) \cdots 3 \cdot 2 \cdot 1}$$

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

ex.3 A club has 9 members. In how many ways can a president, Vice-president, and secretary be chosen?

$$P(9,3) = \frac{9!}{(9-3)!} = \frac{9!}{6!} = \frac{9 \cdot 8 \cdot 7 \cdot \cancel{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}{\cancel{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}} = 504$$

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ex.4. Out of 31 movie posters, how many different arrangement can you make to display 20 posters?

$$P(31,20) = \frac{31!}{(31-20)!}$$

Combination

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

ex5 Juanya is planning a party. He has 9 friends. Now, due to budget limitations, he can only invite 5 of his 9 friends. Considering the fact that Juanya is a "happy-go-lucky & love-everyone-equally" dude, how many different ways can he invite the 5 friends?

$$C(9,5) = \frac{9!}{5!(9-5)!} = \frac{9!}{5!4!} = \frac{9\times8\times7\times6\times\cancel{5\times4\times3\times2\times1}}{(\cancel{5\times4\times3\times2\times1})(4\times3\times2\times1)}$$

$$= \frac{3024}{24} = \boxed{126}$$