6.5 Combinations

In permutations we saw that arranging letters gave us multiple results

3 letters (A, B, C)

ABC
ACB
BAC
BCA
CAB
CBA

order is important

What we are looking at today is where order is not important

A, B, C = C, A, B

Remove Repeats

ABC
ACB
BAC
BCA
CAB
CBA

$_3P_3 = 6$

divide out the repeats

$$_nC_r = \frac{_nP_r}{r!}$$

$$_nC_r = \frac{\frac{n!}{(n-r)!}}{r!} = \frac{n!}{(n-r)!} \cdot \frac{1}{r!}$$

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

5 letters in a bag from a box of 15

$$_{15}C_5 = \frac{15!}{(15-5)!5!} = \frac{15!}{10!5!}$$

$$= \frac{15 \cdot 14 \cdot 13 \cdot 12 \cdot 11}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 3003$$

$$\begin{array}{r} 143 \\ \times\ 3 \\ \hline 429 \\ 7 \\ \hline 3003 \end{array}$$

Combination is always less than Permutation

Determining if Comb of Perm

3 people to be Pres, Vice Pres, Treas
order matters Perm

3 people to student council
order not important comb

4 of a kind in a Poker hand
combination

5 tiles in scrabble on the board
permutation

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

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