Notes Chapter 11.1

Combinations: an arrangement of object in which order is ***NOT*** important.

For example: in choosing a clean up committee of 5 students from this class, ***the order*** you are chosen ***is not important***, what matters is that you were chosen to clean up.

B G Y P R

Ex. 1: You have a blue, green, yellow, purple and red cell phone. How many ways can you select 2 phones to take to class? Write out your possibilities.

BG GY YP PR 10 ways
BY GP YR
BP GR
BR

Is taking a red and a yellow cell phone to class the same as taking a yellow and a red cell phone to class? yes

Combinations of n objects taken r at a time:

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

n choose r

Ex. 2 Find the number of ways to buy 4 fruits out of a selection of 9 different fruits.

$${}_9C_4 = \frac{9!}{(9-4)!\,4!} = \frac{9!}{5!\,4!} = \boxed{126}$$

Ex. 3: Find the number of ways to rent 6 dramas from a collection of 19 dramas at the video store.

order doesn't matter (watching-order matters)

$${}_{19}C_6 = \frac{19!}{13!\,6!} = \boxed{27,132}$$

So how do you know when you should use permutations or combinations?
The question you should ask yourself every time is **"Does the order of how I choose them matter?"** If order matters, use permutations. If not, use combinations.

Ex. 4: How many ways are there to choose a committee of 4 people from 7 people is each person must hold an office (president, vice president, secretary, and treasurer)?

ORDER matters!

$${}_7P_4 = \frac{7!}{3!} = \boxed{840 \text{ ways}}$$

Ex. 5: How many ways are there to choose a committee of 4 people from a group of 7 people?

ORDER DOES NOT MATTER!

$${}_7C_4 = \frac{7!}{3!\,4!} = \boxed{35 \text{ ways}}$$

Ex. 6: How many ways are there to purchase 3 cars, 2 dolls and 4 animals if there are 7 cars, 5 dolls and 6 animals from which to choose?

#ways cars · #ways dolls · #ways animals

$${}_7C_3 \cdot {}_5C_2 \cdot {}_6C_4$$

$$35 \cdot 10 \cdot 15 = \boxed{5{,}250 \text{ ways}}$$

Ex. 7: In a recent survey of 40 students, 27 favor having an outside dance, and 13 oppose it. Find the PROBABILITY that in a random sample of 24 of these students, exactly 15 favor the dance and 9 oppose it.

$$\frac{{}_{27}C_{15} \cdot {}_{13}C_9}{{}_{40}C_{24}}$$

← # ways of getting outcome

← total # possibilities.

Round to nearest tenth of percent

$= .19775 \ldots$

$\approx 19.8\%$