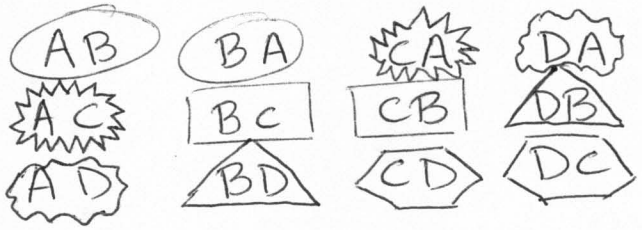
Pg. 696 9.6C Counting Principles

A combination is the number of ways a set of elements can be ordered, where order does NOT matter.

Ex: $\{A, B, C\}$ and $\{B, A, C\}$ are the same set. They both contain the same elements.

Note: Combinations can be applied to card games.

Ex 1:
In how many different ways can two letters be chosen from the letters A, B, C, D? (The order of the letters is not important.)



* Notice every ordering repeats twice. Thus, divide by 2 to account for the repetition.

$$\frac{4 \cdot 3}{2} = \boxed{6}$$

Combinations of n Elements Taken r at a Time

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

Ex 2:
For a certain experiment, four students are randomly selected from a class of 20. How many different groups of four students are possible?

$$_{20}C_4 = \frac{20!}{(20-4)!\,4!} = \frac{\overset{5}{\cancel{20}} \cdot 19 \cdot \overset{6}{\cancel{18}}^{3} \cdot 17 \cdot \cancel{16!}}{\cancel{16!}\,4 \cdot 3 \cdot 2 \cdot 1}$$

$$= \boxed{4,845}$$

Ex 3:

A standard poker hand consists of five cards dealt from a deck of 52. How many different poker hands are possible? (After the cards are dealt, the player may reorder them, and so order is not important.)

$$_{52}C_5 = \frac{52!}{(52-5)!5!} = \boxed{2,598,960}$$

Ex 4:

You are forming a 10-person committee from 9 women and 12 men. The committee must consist of 5 women and 5 men. How many different 10-member committees are possible?

Women | Men

$$\boxed{{}_9C_5 \mid {}_{12}C_5}$$

$$\frac{9!}{(9-5)!5!} \cdot \frac{12!}{(12-5)!5!}$$

$$126 \cdot 792 = \boxed{99,792}$$

Ex 5:

How many different full house poker hands are possible?

3 of a kind | 2 of a kind

$$\boxed{{}_{13}C_1 \, {}_4C_3 \mid {}_{12}C_1 \cdot {}_4C_2}$$

$$= 52 \cdot 72$$

$$= \boxed{3,744}$$

Big Idea:
You first have to choose one rank for the three of a kind and then another rank for the two of a kind.

Assignment 9.6C

Pg. 699 Vocab # 5 Problem Set #'s 47-65 ODD