Accel Precalc Notes: Counting Principles Name _____
Unit #1: Probability and Statistics
Lesson #1

EQ:

- Do p. 671 #5

Example 1 Selecting Pairs of Numbers at Random

Eight pieces of paper are numbered from 1 to 8 and placed in a box. One piece of paper is drawn from the box, its number is written down, and the piece of paper ***is replaced in the box***. Then, a second piece of paper is drawn from the box, and its number is written down. Finally, the two numbers are added together. How many different ways can a sum of 12 be obtained?

To solve this problem, list the different ways that a sum of 12 can be obtained using two numbers from 1 to 8.

First number _____
Second number _____

From this list, you can see that a sum of 12 can occur in _____ different ways.

Example 2 Selecting Pairs of Numbers at Random

Eight pieces of paper are numbered from 1 to 8 and placed in a box. Two pieces of paper are drawn from the box ***at the same time***, and the numbers on the pieces of paper are written down and totaled. How many different ways can a sum of 12 be obtained?

To solve this problem, count the different ways that a sum of 12 can be obtained *using two different numbers* from 1 to 8.

First number _____
Second number _____

From this list, you can see that a sum of 12 can occur in _____ different ways.

Do: Using the same scenario, find two *distinct* numbers whose sum is 9

❖ <u>The Fundamental Counting Principle</u> - Let E_1 and E_2 be two events. The first event E_1 can occur in _____ different ways. After E_1 has occurred, E_2 can occur in _____ different ways. The number of ways that the two events can occur is _____.

Example 3 **Using the Fundamental Counting Principle**

How many different ***pairs*** of letters from the English alphabet are possible?

- Do p. 671 #14

Example 4 **Using the Fundamental Counting Principle**

Telephone numbers in the United States currently have 10 digits. The first three are the *area code* and the next seven are the *local telephone number*. How many different telephone numbers are possible within each area code? (Note that at this time, a local telephone number cannot begin with 0 or 1.)

- Do p. 671 #21

- **Tree Diagrams** --- used to determine the _____ and the _____of the _____ _____ for an event that is a combination of 2 or more events

Ex. A café's lunch special is a hamburger meal. It comes with a choice of beverage (soda or tea) and a choice of salad (garden, potato, or bean). Create a tree diagram to determine how many choices are available for this lunch special.

❖ What are some "numbers" that define you as a person?

1. _____ 2. _____ 3. _____

In the above examples, does the order of the digits matter?

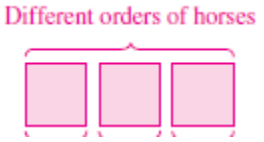
❖ Permutation – of ___ different elements is an _____ of the elements such that one element is _____, one is _____, one is _____, and so on.

Example 5 **Finding the Number of Permutations of *n* Elements**

How many permutations are possible for the letters A, B, C, D, E, and F?

- Do p. 672 #39

Example 6 **Counting Horse Race Finishes**



Eight horses are running in a race. In how many different ways can these horses come in first, second, and third? (Assume that there are no ties.)

Do: From a pool of 12 candidates, the offices of president, vice-president, secretary, and treasurer will be filled. In how many different ways can the offices be filled?

❖ Permutations of ___ objects taken ___ at the time: ${}_nP_r$ = _____

Ex. ${}_8P_3$ = _____

❖ Distinguishable Permutations --- a set of _____ objects has _____of one kind of object, _____ of a second kind, _____ of a third kind, and so on with

n = _____

Then the number of **Distinguishable Permutations** of the *n* objects is _____

Example 7 **Distinguishable Permutations**

In how many distinguishable ways can the letters in BANANA be written?

This word has _____ letters, of which three are ___'s, two are _____'s, and one is a ___. So, the number of distinguishable ways the letters can be written is

- Do p. 672 #43

Combination --- subsets of a larger set in which _____ is not important.

Example 8 **Combinations of *n* Elements Taken *r* at a Time**

In how many different ways can three letters be chosen from the letters A, B, C, D, and E? (***The order of the three letters is not important.***)

From this list, you can conclude that there are _____ different ways that three letters can be chosen from five letters.

Combinations of ___ objects taken ___ at the time: ${}_nC_r$ = _____

Ex. ${}_5C_3$ = _____

Example 9 **Counting Card Hands**

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

- Do p. 672 #49

Example 10 Forming a Team

You are forming a 12-member swim team from 10 girls and 15 boys. The team must consist of five girls and seven boys. How many different 12-member teams are possible?

There are _____ ways of choosing five girls. There are _____ways of choosing seven boys. By the Fundamental Counting Principal, there are _____ways of choosing five girls and seven boys.

Do: A six-member research committee at a local college is to be formed having one administrator, three faculty members, and two students. There are seven administrators, 12 faculty members, and 20 students in contention for the committee. How many six-member committees are possible?

- Assignment: p. 671 – 673 #9, 11, 16, 17, 19, 24, 33, 37, 46, 52, 58, 59