**Fundamental Counting Principle**: If you have 2 events and one event can occur **m** ways and another event can occur **n** ways, then the number of ways that both can occur is **m\*n** ways.

For example, suppose you are making a sandwich and you have 4 types of meats and 3 types of bread and you want to make a sandwich with one meat and one bread. How many different sandwiches are possible to make?

* Event 1 = 4 types of meats Event 2 = 3 types of bread
* How many diff types of sandwiches can you make? **4\*3 = 12** different sandwiches

What if you had 4 meats, 5 cheeses, and 3 breads to choose from? (and can only use one of each)

 **4\*5\*3 = 60 different sandwiches**

Ex. 2: At a restaurant at Cedar Point, you have the choice of 8 different entrees, 2 different salads, 12 different drinks, & 6 different deserts.

* How many different dinners (one choice of each) can you choose? **8\*2\*12\*6= 1152 different dinners**

Ex. 3: Ohio Licenses plates have 3 #’s followed by 3 letters. How many different licenses plates are possible if digits and letters **can be repeated**? (There are 10 choices for digits and 26 choices for letters)

* + 10\*10\*10\*26\*26\*26= 17,576,000 different plates

b) How many plates are possible if digits and numbers **cannot be repeated**?

* There are still 10 choices for the 1st digit but only 9 choices for the 2nd, and 8 for the 3rd. For the letters, there are 26 for the first, but only 25 for the 2nd and 24 for the 3rd.
	+ 10\*9\*8\*26\*25\*24= 11,232,000 plates

Ex. 4: How many different 7 digit phone numbers are possible if the 1st digit cannot be a 0 or 1?

* 8\*10\*10\*10\*10\*10\*10= 8,000,000 different numbers

Ex. 5: A multiple choice test has 10 questions with 4 answers each. How many ways can you complete the test?

* 4\*4\*4\*4\*4\*4\*4\*4\*4\*4 = 410 = 1,048,576

Ex. 6: 10 people are running a race. How many different results are there? (No repetition is implied by the problem)

* 10 \* 9 \* 8 \* 7 \* 6 \* 5 \* 4 \* 3 \* 2 \* 1 = 3628800 results

Ex 7: 6 boys and 6 girls are lining up for a picture. How many ways can they line up if they have to alternate boy/girl?

* 12\*6\*5\*5\*4\*4\*3\*3\*2\*2\*1\*1 = 1036800 ways

**Classwork (due before you leave class today): SHOW YOUR WORK!!!**

1. An ice cream parlor offers 12 different flavors of ice cream. There are four choices for the container (cup, regular cone, sugar cone, and waffle cone).

2. A computer password consists of four letters followed by a single digit. Assume that the passwords are not case sensitive (i.e., that an uppercase letter is the same as a lower case letter).

 a) How many different passwords are possible?

 b) How many different passwords end in 1?

 c) How many different passwords do not start with Z?

 d) How many different passwords have no Z’s in them?

3. A French restaurant offers a menu consisting of 3 different appetizers, 2 different soups, 4 different salads, 9 different main courses, and 5 different desserts.

 a) A fixed-price lunch meal consists of a choice of appetizer, salad, and main course. How many

 different lunch fixed-price meals are possible?

 b) A fixed-price dinner meal consists of a choice of appetizer, a choice of soup or salad, a main course,

and a dessert. How many different dinner fixed-price meals are possible?

4. A set of reference books consists of 8 volumes numbered 1 through 8. In how many ways can the 8 books be arranged on a shelf?

5. Four women and 4 men line up a checkout stand in a grocery store.

 a) In how many ways can they line up?

 b) In how many ways can they line up if the first person in line must be a woman?

 c) In how many ways can they line up alternately by gender?

6. How many 7-digit numbers (i.e., numbers between 1,000,000 and 9,999,999)

 a) are even?

 b) are divisible by 5?

7. The ski club at East Carolina University has 35 members (15 girls and 20 boys). 3 officers – a President, a Vice-President, and a Treasurer – must be chosen.

 a) How many ways can the officers be chosen?

 b) How many different ways can officers be chosen if the president must be a girl?

 \*c) Bonus: How many different ways can the 3 officers be chosen if they can *not* be all boys or all girls?

***Homework: p932 #1 – 33 odd (show your work)***