**OBJECTIVE:**

Today you will learn about various methods of counting!

---

**Fundamental Counting Principle**

The fundamental counting principle can be used to determine the number of possible outcomes when there are two or more characteristics.

---

1. For Christmas you want to get your parents a framed family picture. At the framing store, there are 4 different styles each available in 5 different colors. You decide to use a blue mat board and there are 3 different shades of blue to choose from. How many different frames can you create?

2. In one Austrian province, a vehicular plate number consists of 4 letters and 3 numbers. (example: BACK_301) Using the fundamental principle of counting (one more time!), how many plate numbers are available?
**Permutation: (Picky about order)**
The ordering of n objects

**Permutation of n Objects taken r at a time:**
The number of permutations of r objects taken from a group of n distinct objects is denoted

**EXAMPLE ONE** ➔ There are eight teams competing in a bobsleigh skeleton race.

A) How many different ways can each team finish?

B) How many ways can teams be awarded the gold, silver, and bronze medals?

**EXAMPLE TWO** ➔ You are burning a CD demo for your band. Your band has 12 songs stored on your computer, but room enough on the demo for only 4 songs. How many different orders can you burn the 4 songs onto the demo?

**Combination: (don't Care about order)**
The combination of n objects taken r at a time is denoted

\[ nC_r = \frac{n!}{(n-r)!r!} \]

**EXAMPLE THREE** ➔ There are eight teams competing in the bobsleigh skeleton race. Only 6 teams make it to the next round.

A) How many different COMBINATIONS of teams can make it to the next round?

B) How many ways can the top three be chosen?

**EXAMPLE FOUR** ➔ You are burning a CD demo for your band. Your band has 12 songs stored on your computer, but room enough on the demo for only 4 songs. How many different combinations of songs can you put on the demo?
DIRECTIONS:
✓ Indicate whether this problem is an example of permutations or combinations.
✓ Justify this answer.
✓ Solve the problem.

2. In a race in which six automobiles are entered and there are no ties, in how many ways can the first three finishers come in?

3. A book club offers a choice of 8 books from a list of 40. In how many ways can a member make a selection?

4. A medical researcher needs 6 people to test the effectiveness of an experimental drug. If 13 people have volunteered for the test, in how many ways can 6 people be selected?

5. From a club of 20 people, in how many ways can a group of three members be selected to attend a conference?

6. How many different four-letter passwords can be formed from the letters A, B, C, D, E, F, and G if no repetition of letters is allowed?

7. For Christmas you want to get your parents a framed family picture. At the framing store, there are 4 different styles each available in 5 different colors. You decide to use a blue mat board and there are 3 different shades of blue to choose from. How many different frames can you create?
DIRECTIONS: Solve each of the following applications. Show the formula used.

8. An election ballot asks voters to select three city commissioners from a group of six candidates. In how many ways can this be done?

9. A four-person committee is to be elected from an organizations’ membership of 11 people. How many different committees are possible?

10. Of 12 possible books, you plan to take 4 with you on vacation. How many different collections of 4 books can you take?

11. Of the 100 people in the U.S. Senate, 18 serve on the Foreign Relations Committee. How many ways are there to select Senate members for this committee (assuming party affiliation is not a factor in selection)?

12. A mathematics exam consists of 10 multiple-choice questions and 5 open-ended problems in which all work must be shown. If an examinee must answer 8 of the multiple-choice questions and 3 of the open-ended problems, in how many ways can the questions and problems be chosen?

13. How many different six-letter arrangements can be made from the letters in the word HOCKEY.

14. Your local ice cream store has 5 flavors, 2 types of cones, and 10 toppings. How many different cones are possible?

15. Write a word problem that can be solved by evaluating $21C_3$. Now solve it!
HOMEWORK: COUNTING PRINCIPLES

NAME: ______________________________________________  DAY 3 DUE: _______

Compute the following with a calculator.

1. \( 5P_3 \)
2. \( 4P_1 \)
3. \( 6P_6 \)
4. \( 5C_3 \)
5. \( 4C_1 \)
6. \( 4C_4 \)
7. \( 6! \)
8. \( 5! \)

License Plate Configurations: Determine how many possible ways the a license plate can be made meeting the requirements if letter and digits CANNOT be repeated.

9. 4 letters, and 3 digits

10. 3 letters, and 4 digits

11. 7 digits

Use either permutations or combinations to answer the following questions.

12. The Spanish Club is electing a president, vice president, and secretary from the 8 eligible members. How many different ways can the three offices be filled?

13. Five representatives from the class of 32 students are being chosen to a committee. How many different ways can those 5 students be chosen?

14. The school newspaper has an editor in chief and an assistant editor. The staff of the newspaper has 12 students. How many ways can students be elected to the two positions?
15. In a race, the top five finishers are awarded points for their team. There are 12 people running in a particular race. In how many ways can the people finish 1st, 2nd, 3rd, 4th, and 5th?

16. In a race, the top five finishers are awarded points for their team. There are 12 people running in a particular race. In how many ways can the people finish in the top 5?

17. In how many ways can 8 people be seated in a row of 5 chairs?

18. The starting lineup for a baseball team consists of 9 players. Assuming that each member of a team with 25 players can play each position, in how many different ways can the starting lineup be filled?

19. From a group of 40 people, a jury of 12 people is selected. In how many different ways can a jury of 12 people be selected?

20. In a local restaurant, there are 3 choices for appetizer, 7 choices for entrée, 4 items for dessert, and 5 choices for drinks. In how many ways can a customer order a full meal?

21. In order to conduct an experiment, 4 subjects are randomly selected from a group of 20 subjects. How many different groups of four subjects are possible?