## 12-2 Permutations and Combinations

1. Permutation - when a group of objects or people are arranged in a certain order. The order of the objects is very important.
2. Combination- an arrangement or selection of objects or people in which order is NOT important.
3. Determine if the following are combinations or permutations.
ex) seven shoppers in a line at a checkout counter

> Permutation

ex) the first, second and third place finishers in a race
Permutation
ex) choosing 5 toppings on a pizza
combination
ex) an arrangement of the letters in the word algebra permutation

## 7. ! = Factorial


ex) There are 10 finalists in a figure skating competition. How many ways can gold, silver, and bronze medals be ${ }_{10} P_{3}^{\text {awarded? }}=\frac{10!}{(10-3)!}=\frac{10 \cdot 9 \cdot 8 \cdot \lambda \cdot 6 \cdot x \cdot 4 \cdot 3 \cdot x \cdot X}{7 \cdot 6 \cdot 5 \cdot 4 \cdot 7 \cdot 2 \cdot 1}=10.9 \cdot 8=720$
ex) Five cousins at at family reunion decide that three of them will go to pick up pizza. How many ways can they

$$
\begin{aligned}
& \text { choose three people who will go? } \\
& { }_{5} C_{3}=\frac{5!}{(5-3)!3!}=\frac{5!}{2!3!}=\frac{5 \cdot 4 \cdot 2 \cdot x \cdot 1}{\not 2 \cdot 1 \cdot 3 \cdot x \cdot 1}=10
\end{aligned}
$$

$1=$ FACTORIAL
4. The number of permutations of $n$ distinct objects taken $r$ at a time is given by

5. The number of combinations of $n$ distinct objects taken $r$ at a time is given by

6. The number of permutations of $n$ objects of which $p$ are alike and $q$ are alike is given $\begin{aligned} & \text { by } \\ &n!]=\text { fotal } \\ & \text { p!q! }=\text { Repitilons }\end{aligned}$
ex) How many different ways can the letters of the word $\underline{D E C I D E D}$ be arranged?
ex) A newspaper has nine reporters available to cover four different stories. How many ways can the reporters be assigned to cover the stories?

ex) Find the number of possibilities for choosing two CDs to buy from ten that are on sale.
ex) Find the number of possibilities for seating 5 men and 5 women alternately in a row, beginning with a woman.
***ex) Six cards are drawn from a standard deck of cards. How many hands consist of two hearts and four spades?
***ex) Five cards are drawn from a standard deck of cards. How many hands consist of three clubs and two diamonds?

