Section 11.6: Counting Principles

Key Topics: Fundamental Counting Principles, permutations, combinations

FUNDAMENTAL COUNTING PRINCIPLE

If a _____ can be made in _ different ways, a _____ can be made in _ different ways, a _____ can be made in _ different ways, and so on, then the sequence of choices can be made in _____ different ways.

A restaurant offers 8 appetizers and 16 main courses. How many different meal combinations are possible?

How many license plates are available if they have the format LLLNNN, where L is a capital letter and N is a digit, with no other restrictions?

Permutation

A _____ is an _____ of n distinct objects in a ____ order in which __ object is used more than once. The specific _____: ____ different ordering of the same objects is a _____ permutation.

How many ways can first, second, third, and fourth place prizes be handed out if there are 18 contestants?

NUMBER OF PERMUTATIONS OF n OBJECTS

The number of permutations of n distinct objects is

$$n! = \_\_\_\_\_.$$

That is, n distinct objects can be arranged in $n!$ different ways.

PERMUTATIONS OF *n* OBJECTS TAKEN *r* AT A TIME

The number of permutations of__ _____ objects taken _ at a time is denoted by $P(n, r)$, where

$$P(n, r) = \_\_\_\_\_$$

$$= \_\_\_\_\_.$$

A Combination of *n* Distinct Objects Taken *r* at a Time

When r objects are chosen from n distinct objects _____ to order, we call the set of r objects a _____ **of *n* objects taken *r* at a time**. The symbol $C(n, r)$ denotes the total number of combinations of n objects taken r at a time.

THE NUMBER OF COMBINATIONS OF *n* DISTINCT OBJECTS TAKEN *r* AT A TIME

The number of combinations of n _____ objects taken r at a time is

$$C(n, r) = \_\_\_\_\_.$$

How many different bowls of ice cream can you create if you select 3 scoops from 25 available flavors, without choosing a flavor more than once?

DISTINGUISHABLE PERMUTATIONS

The number of _____ permutations of n objects of which __ are of ___ kind, __ are of a _____ kind, . . . , and __ are of a ___ kind is

$$\_\_\_\_\_$$

where $n_1 + n_2 + \cdots + n_k = n$.

SUMMARY OF **MAIN FACTS**

Permutations

If _____ important, use permutations.

In how many ways can 4 of the 23 students be assigned the available seats in rows 1, 2, 8, and 10?

Answer:

_____

Row 1 Row 2 Row 8 Row 10

Combinations

If _____ important, use combinations.

In how many ways can 5 of the 19 students *not given seats* be chosen to stand in the back?

Answer: _____

Fundamental Counting Principle

Whenever you are making _____choices and the number of choices at each stage is___ affected by the way _____ choices were made, you can use the Fundamental Counting Principle.

In how many ways can students be assigned to the available seats and five students be chosen to stand in the back?

Answer: _____ways

Assign the four seats. Pick five students.

= 2,471,182,560 ways