

Probability

Combination Based Examples of Probability

Counting Rules – Multiplication

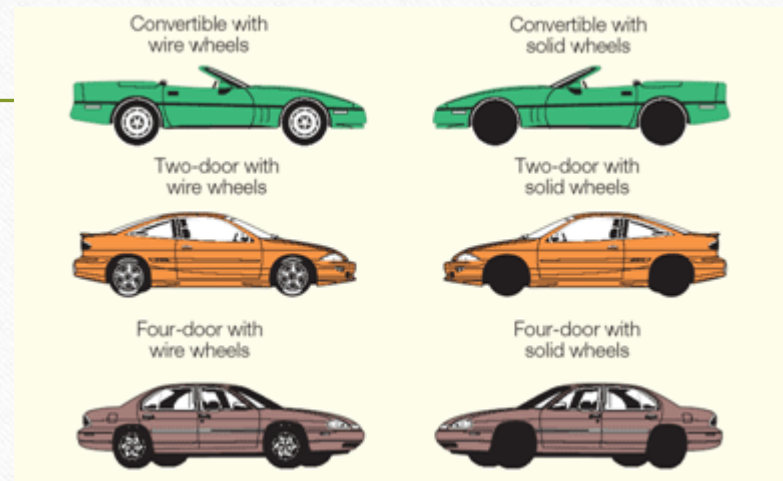
The **multiplication formula** indicates that if there are m ways of doing one thing and n ways of doing another thing, there are $m \times n$ ways of doing both.

Example: Dr. Delong has 10 shirts and 8 ties. How many shirt and tie outfits does he have?

$$(10)(8) = 80$$

Counting Rules – Multiplication: Example

An automobile dealer wants to advertise that for \$29,999 you can buy a convertible, a two-door sedan, or a four-door model with your choice of either wire wheel covers or solid wheel covers. How many different arrangements of models and wheel covers can the dealer offer?



MULTIPLICATION FORMULA

Total number of arrangements = $(m)(n)$

[5–8]

We can employ the multiplication formula as a check (where m is the number of models and n the wheel cover type). From formula (5–8):

$$\text{Total possible arrangements} = (m)(n) = (3)(2) = 6$$

Counting Rules - Permutation

A **permutation** is any arrangement of r objects selected from n possible objects. The order of arrangement is important in permutations.

PERMUTATION FORMULA

$${}_n P_r = \frac{n!}{(n-r)!}$$

[5-9]

where:

n is the total number of objects.

r is the number of objects selected.

Counting - Combination

A **combination** is the number of ways to choose r objects from a group of n objects without regard to order.

COMBINATION FORMULA

$${}^n C_r = \frac{n!}{r!(n-r)!}$$

[5-10]

where:

n is the total number of objects.

r is the number of objects selected.

Combination and Permutation Examples

COMBINATION EXAMPLE

There are 12 players on the Carolina Forest High School basketball team. Coach Thompson must pick five players among the twelve on the team to comprise the starting lineup. How many different groups are possible?

$${}_{12}C_5 = \frac{12!}{5!(12-5)!} = 792$$

PERMUTATION EXAMPLE

Suppose that in addition to selecting the group, he must also rank each of the players in that starting lineup according to their ability.

$${}_{12}P_5 = \frac{12!}{(12-5)!} = 95,040$$