Friday, August 26, 2011
10:43 AM

Introduction to Probability

independent events: where one outcome does not affect the other

dependent events: events that affect each other

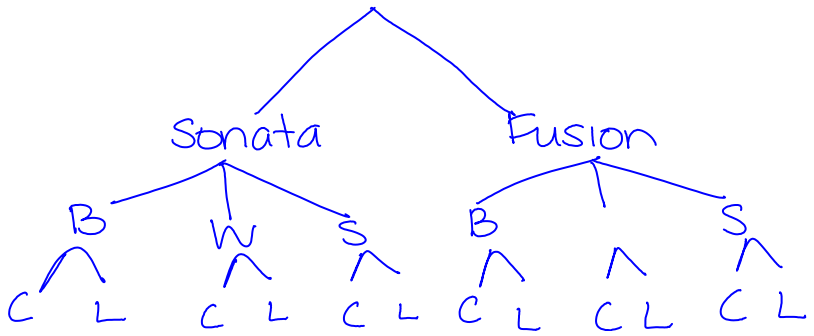
Basic Counting Principle

Suppose one event can be chosen in p different ways, and another independent event can be chosen q different ways. Then the two events can be chosen successively $p \cdot q$ ways.

Formula: $p \cdot q \cdot r \ldots$
Illustration: tree diagram

Example 1: Kinkaid had to buy a new car. She had chose between a Hyundai Sonata and a Ford Fusion. She then chose between black, white and silver. Finally, she chose between cloth and leather seats.

$$\underset{\text{make}}{2} \cdot \underset{\text{color}}{3} \cdot \underset{\text{seats}}{2} = 12 \text{ options}$$



Example 2: How many combinations of 7-digit phone numbers are there?

$9 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$

$= 9{,}000{,}000$

How many combinations of 7-digit numbers can you make if the first 3 must be 856?

$1 \cdot 1 \cdot 1 \cdot 10 \cdot 10 \cdot 10 \cdot 10$

$= 10{,}000$

Permutations

an arrangement of objects in a certain order

$P(n,n)$ or ${}_nP_n = n!$

n objects taken n at a time
choose to arrange all of the objects available
Example: how many ways can you arrange 5 picture frames on a shelf?
$P(5,5)$ or ${}_5P_5 = 5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$

$P(n,r)$ or ${}_nP_r = \frac{n!}{(n-r)!}$

n objects chosen r at a time
you choosing a certain number of objects(r) out of a larger group (n)
Example: how many different ways can

you seat students in a row of 4 if there are 30 students in the class?

$P(30,4)$ or ${}_{30}P_4 = \frac{30!}{(30-4)!} = \frac{30!}{26!}$ $\frac{30 \cdot 29 \cdot 28 \cdot 27 \cdot 26 \cdot 25 \cdots}{26 \cdot 25 \cdots}$

$= 657,720$

Example 2: 6 people want to run the 4x100. How many different arrangements can be made to form the relay team?

$P(6,4)$ OR ${}_6P_4 = \frac{6!}{(6-4)!} = \frac{6!}{2!}$ $\frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1}$

$= 360$