

Lecture 13: Simple Probability

		Example	Enumerate Sets
Sample Space	set of all possible outcomes of a random process	Flipping 2 coins	
Event	a subset of the sample space	Getting exactly 1 tail	

If S is a sample space with all outcomes *equally likely*, define the probability of event E ,

$$P(E) = \frac{\text{the number of outcomes in } E}{\text{the total number of outcomes in } S} = \frac{n(E)}{n(S)}$$

ex. in flipping 2 coins, what's the probability of getting exactly 1 tail?

ex. in flipping a coin what's the probability of getting a head? (What's E ?)



ex. in drawing a card, what's the probability of drawing a face card?

Computing the Number of Possibilities When Order “Counts”

ex. How many ways different 4-letter strings can be formed with the alphabet a, b, c ?

ex. How many 3-letter words can be formed?

ex. How many ways can the Orioles and the Yankees win or lose a 3 game series?

Multiplication Rule: If an operation consists of k steps							
step i		1	2	3	...		k
can be performed		_____	_____	_____	...		_____
in ways							
the entire operation can be performed in							ways

ex: How many user IDs are possible if each must consist of 5 characters and the first character must be an uppercase letter and the other 4 characters must be digits or uppercase letters?

Some problems are not so simple:

ex: How many results are there for the World Series?

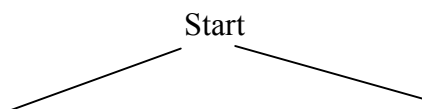
Game 1 2 3 4 5 6 7

When Order Matters.....

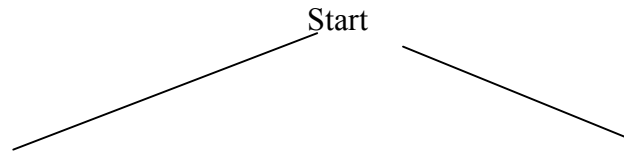
**Using Trees to Determine the Number of Possible Outcomes
(of a sequence of events)**

"Draw the tree and count the leaves"

Example 1. How many sequences of 22 flips of a coin exist?



Example 2: How many ways can you schedule your courses if CS can occur at 11 or 12, English at 10 or 2, and Physics at 10 or 1?



[See the club officer example, pp. 311-312]

Example 3: How many ways can a match in women's tennis proceed to its end?

Permutations

If all n distinct objects are rearranged in a sequence, this is called a **permutation** of the n objects. **The number of permutations of n distinct elements is**

ex. How many ways can the 15 kindergarten children form a line?

If only some, say r , of the n distinct objects are arranged in an ordered sequence, this is called an r -permutation.

The number of r -permutations of a set of n distinct elements is

ex. How many ways can 5 of the 15 kindergarten children be selected to form a line?