Harvard Statistics 110

Lecture 1: Probability and Counting
Sample space

Homework

words, sentence

be detail as possible

clarity, honesty

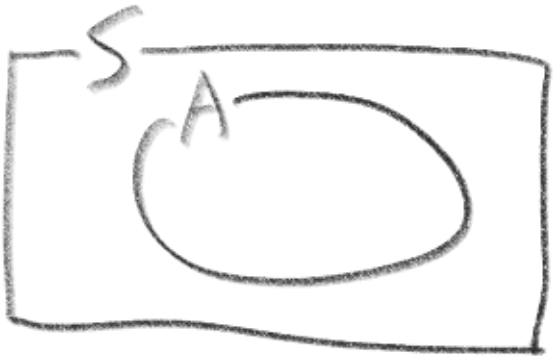
Mosteller - Wallace

Finance STAT 123

A Sample Space

is the set of all possible outcomes of an experiment

An event
is a subset of the sample space



Naive definition of probability

$$P(A) = \frac{\#\text{ favorable outcomes}}{\#\text{ p outcomes}}$$

(A: event)

flip a coin twice

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huge Assumption

all outcomes equally likely

finite Sample Space

Counting

Multiplication Rule:

if have experiment with n_1 possible outcomes, and

for each outcome 1st expt

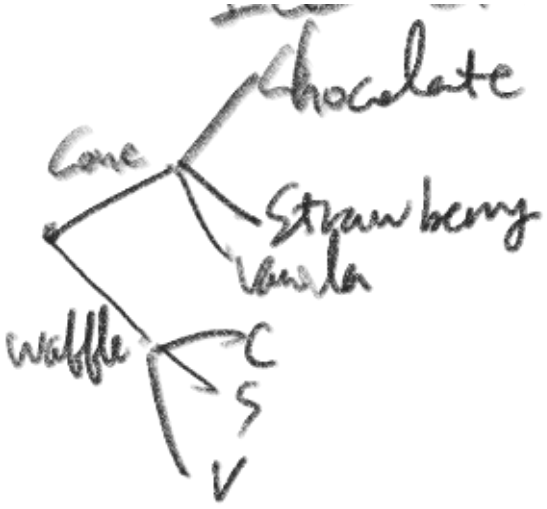
there're outcomes for 2nd, ...

..., for each there're

n_r outcomes for rth expt, then

$n_1, n_2, \ldots n_r$ overall possible outcomes.

Ex. Ice Cream



$6 = 2 \cdot 3$

$= 3 \cdot 2$

Ex. 5 Cards hand of 52 cards
full house

Binomial coefficient

$$\binom{n}{k} = \frac{n!}{(n-k)!\,k!}, \quad 0 \text{ if } n < k$$

subsets of size k, of group of n people

$$n \cdot (n-1)(n-2) \cdots (n-k+1)$$

$k!$

$$= \frac{n!}{(n-k)!\,k!}$$

$$\frac{13 \cdot \binom{4}{3} \cdot 12 \cdot \binom{4}{2}}{\binom{52}{5}}$$

Sampling table:

Choose k objects out of n

	order matters	order doesn't
replace	n^k	$\binom{n+k-1}{k}$
don't replace	$n(n-1)\cdots(n-k+1)$	$\binom{n}{k}$

not easy

pick, put it back