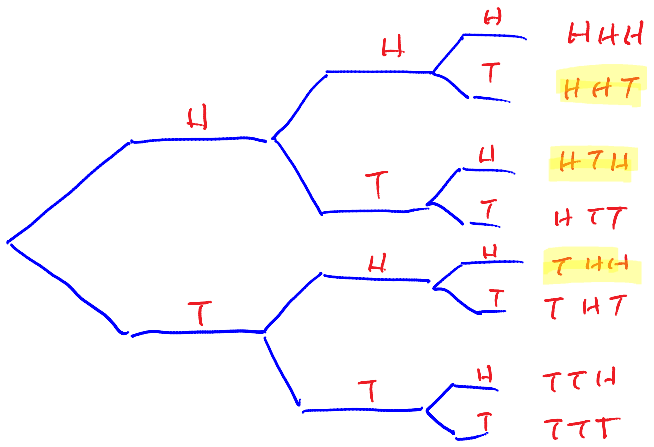
Section 4.1: cont'd

Wednesday, May 20, 2015
1:34 PM

if you are having trouble generating the sample space, can always consider a tree diagram

example: write all the sample space for flipping a coin 3 times and recording the result for each flip



8 outcomes are the sample space

note: how many ways of getting exactly one tail? 3

if the coin is fair then the odds of getting exactly one tail in 3 flips = $\frac{3}{8}$

---

classical probability: the probability of an event happening is equal to the sum of the probabilities of all of the simple events in that event

P(A) - the probability of event A happening

from our previous example

$$P(\text{exactly one tail}) = P(HHT) + P(HTH) + P(THH)$$
$$= 1/8 + 1/8 + 1/8$$
$$= 3/8$$

if all simple events are equally likely then

$$P(A) = \frac{n(A)}{n_{TOT}}$$

where $n(A)$ is the number of ways A can happen

n_{TOT} is the total number of outcomes

two properties of probability:

$$0 \leq P(A) \leq 1$$

$0 \leq P(A)$: never happens

$P(A) \leq 1$: always happens

$$\sum_i P(A_i) = 1$$

the sum of all probabilities for a sample space

Complement: the complement of event A is the set of simple events in which A does not occur

notation: $\overline{A}$ pronounced "not A"

other notations:

$\sim A$

A^c

$\neg A$

property of complement:

$$P(\bar{A}) = 1 - P(A)$$

$$P(A) + P(\bar{A}) = 1$$

example from laziness:

If you flip a coin 3 times and the coin is fair what is the probability of getting at least one head?

sample space: $\{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

$$P(\text{at least 1 head}) = 1 - P(\text{no heads})$$

$$= 1 - 1/8$$

$$= 7/8$$