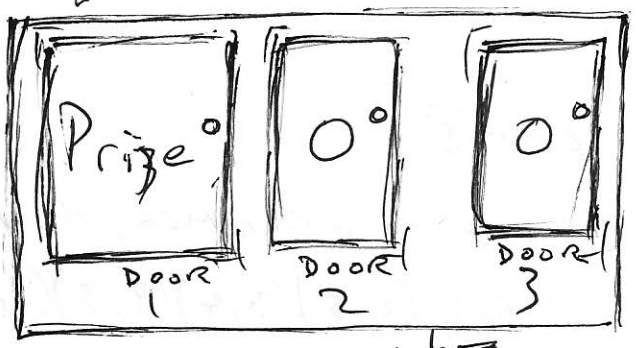
16 Nov 2015 wk 8 lectures 27 + 28

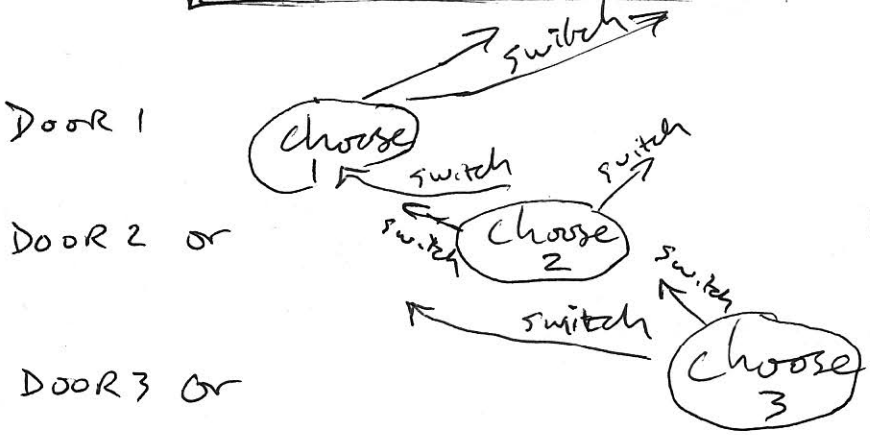
Intro to (discrete) probability

Jed Gibbs
for
Charlton Rodda

Pavel describes gameshow where there are 3 doors: (without opening door to discover whether prize or not.) choose 1, then host opens a door with no prize, then should you switch to third door?



best option always? switch - $\frac{2}{3}$ chance to win, whereas if you stick then only $\frac{1}{3}$ chance.



If you initially choose 1 you would lose, but if you started with 2 or 3 switching will gain, so you double your chance of winning to $\frac{2}{3}$ rather than $\frac{1}{3}$ if switch

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(18th Laplace defined $\frac{\text{number of successful outcomes}}{\text{number of ALL possible outcomes}}$

eg odd number on die : $\frac{1;3;5}{1;2;3;4;5;6} = \frac{3}{6} = \frac{1}{2}$

requires that all possibilities are equally likely - a loaded dice or coin would invalidate the odds.

Glossary:

experiment - procedure that results in one of the possible outcomes

sample space - is the set of ALL possible outcomes

event - subset of the sample space ie odd = 1, 3, 5

probability of event E, which is the subset of a finite sample space S of equally likely outcomes is $P(E) = |E|/|S|$

Example 1

4 blue, 5 green in pocket.

1. what probability a ball chosen is green?

9 possible, 5 of which green, so $\frac{5}{9}$

Example 2

Probability of '7' on 2 dice?

possible total of $6^2 = 36$ possible outcomes, of which 6 pairs add up to seven: (1,6), (2,5)(3,4)(4,3)(5,2)(6,1)

$= \frac{6}{36} = \frac{1}{6}$

Example 3

Probabilities of a hand in cards.

How many different hands of 5 from 52 are there? $\binom{52}{5}$

Probability of 4 cards of one kind in hand of 5?

① Pick 1 kind $\binom{13}{1}\binom{4}{4}\binom{48}{1}$

see slides!

example sequence of random 10 binary bits -

what is probability of at least 1 bit = 0

May be easier to look at negation

let E be event at least 1 is 0

then $\neg E$ is event that all bits are 1.