Lake Wobegon -- "where the women are strong, the men are good-looking, and all the children are above average."

–Garrison Keillor, A Prairie Home Companion

Half the people you know are below average.

– UNKNOWN

Probability

Supplementary Material for CFB3333/PHY3333

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Based on the following information on the web:

http://www.physics.smu.edu/pseudo/experiment.html

Introduction

- Let P(x) denote "the probability of outcome x"
- Consider a fair 6-sided die. We can write down the probabilities of getting any side:
  - P(1) = P(2) = P(3) = P(4) = P(5) = P(6) = 1/6 = 0.1666... = 16.66...%
- We can use some simple rules to combine probabilities
  - what is the probability of rolling three 2's in a row?
  - what is the probability of rolling a 2 or 4 or 6?

Combining Probabilities

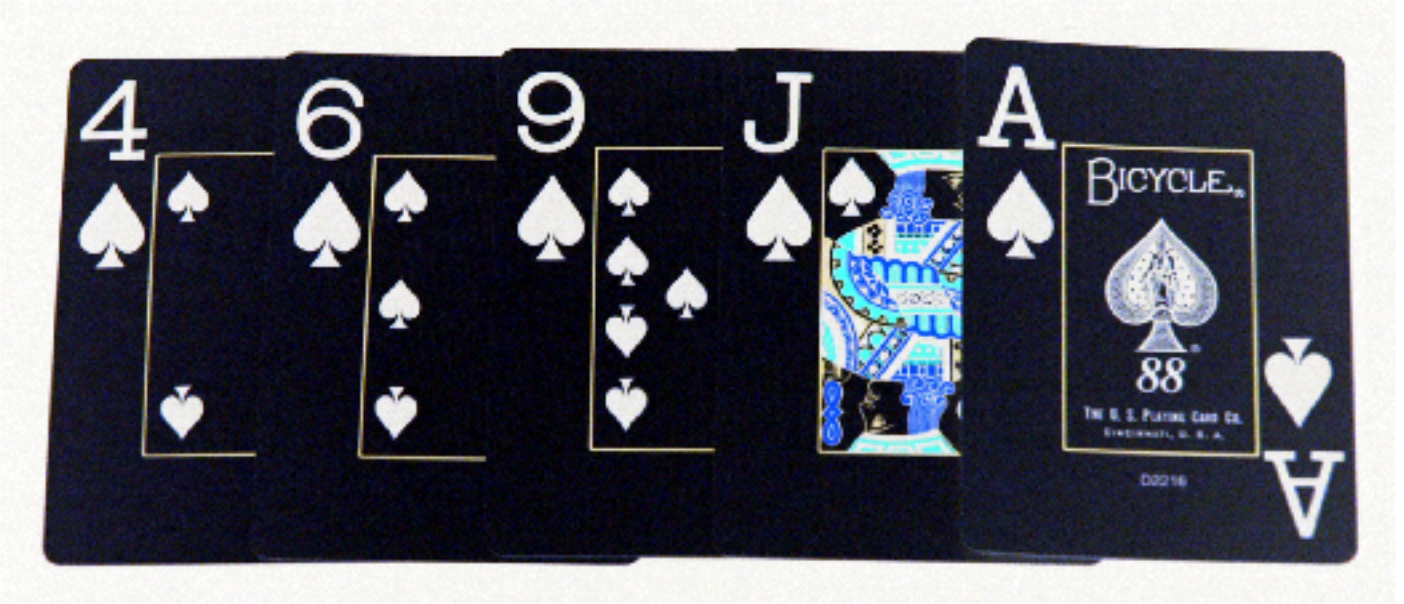
- If one roll of a fair die does not influence the outcome of the next roll, we can answer those questions using the following rules:
  - "What is the probability of rolling a 2, and then another 2, and then another 2?"
    - "AND" means "multiply the probabilities"
    - P = P(2) x P(2) x P(2) = 1/6 x 1/6 x 1/6 = 1/216 = 0.46%
  - "What is the probability of rolling a 2 or a 4 or a 6?"
    - "OR" means "add the probabilities"
    - P = P(2) + P(4) + P(6) = 1/6 + 1/6 + 1/6 = 3/6 = 0.5 = 50%

Determining other probabilities

- The possibility of any outcome is 100% (= 1)
- If we know the possibility of one outcome, x, to be P(x) . . .
  - then we can ask, "What is the probability of x NOT happening?"
    - that is, what is the probability that an outcome other than x will happen?
  - ANSWER: 1 – P(x)

Games of Chance

- Consider poker
  - In poker, the better hands are those with a lower probability of occurring
  - A "full house" beats a "flush" because a full house is LESS likely to occur



The Gambler's Fallacy

- Coins and dice have no memory
  - Let's say you flip a fair coin ten times and get 10 heads in a row
  - What is the chance that on the 11th flip, you'll get heads?
    - The "Gambler's Fallacy" is to assume that all the previous heads mean the next one HAS to come up heads
    - The correct answer is 50%, regardless of any belief that the previous outcomes influence the next one
  - The fallacy also has another form: a streak of losses is interpreted to mean that your luck will turn around and you are "due" for a win.