



Lecture 12

Chance

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Announcements

Review: Control Statements

Control Statements

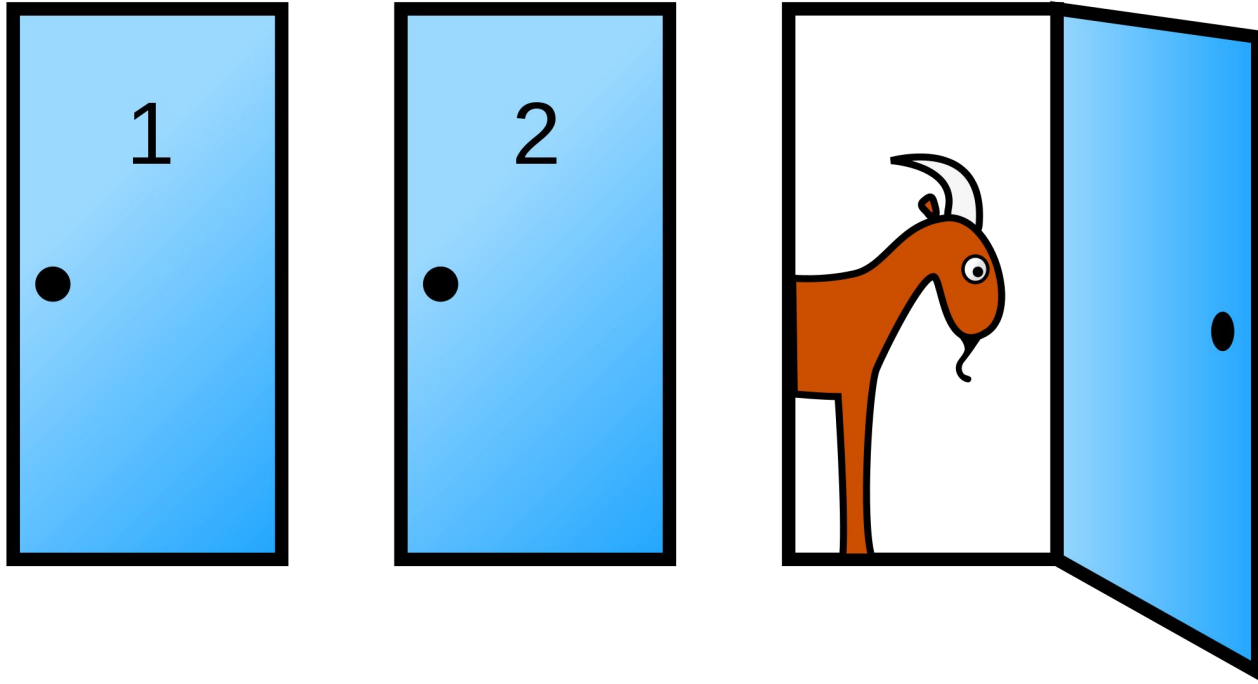
These statements *control* the sequence of computations that are performed in a program

- The keywords **if** and **for** begin control statements
- The purpose of **if** is to define functions that choose different behavior based on their arguments
- The purpose of **for** is to perform a computation for every element in a list or array

(Demo)

The Monty Hall Problem

Monty Hall Problem



Probability

Basics

- Lowest value: 0
 - Chance of event that is impossible
 - Highest value: 1 (or 100%)
 - Chance of event that is certain

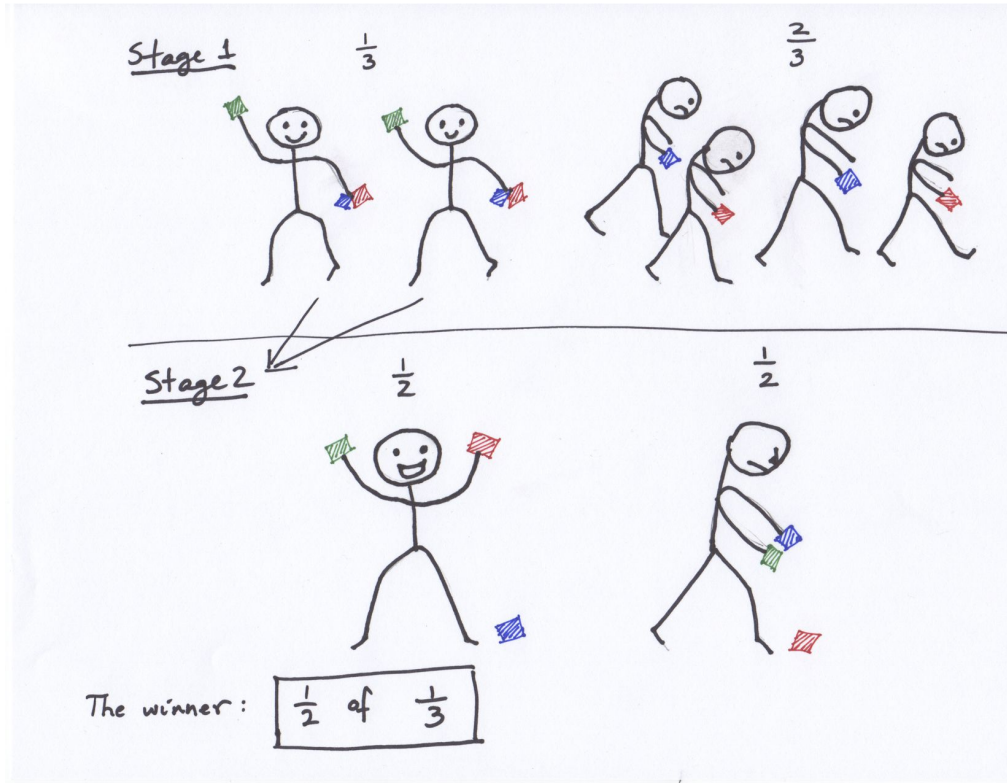
 - If an event has chance 70%, then the chance that it doesn't happen is
 - $100\% - 70\% = 30\%$
 - $1 - 0.7 = 0.3$
-

Equally Likely Outcomes

Assuming all outcomes are equally likely, the chance of an event A is:

$$P(A) = \frac{\text{number of outcomes that make A happen}}{\text{total number of outcomes}}$$

Fraction of a Fraction



(Demo)

Multiplication Rule

Chance that two events A and B both happen

= $P(A \text{ happens}) \times P(B \text{ happens given that } A \text{ has happened})$

- The answer is *less than or equal to* each of the two chances being multiplied
- The more conditions you have to satisfy, the less likely you are to satisfy them all

(Demo)

Addition Rule

If event A can happen in *exactly one* of two ways, then

$$P(A) = P(\text{first way}) + P(\text{second way})$$

- The answer is *greater than or equal to* the chance of each individual way
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Example: At Least One Head

- In 3 tosses:
 - Any outcome *except* TTT
 - $P(\text{TTT}) = (\frac{1}{2}) \times (\frac{1}{2}) \times (\frac{1}{2}) = \frac{1}{8}$
 - $P(\text{at least one head}) = 1 - P(\text{TTT}) = \frac{7}{8} = 87.5\%$

- In 10 tosses:
 - $1 - (\frac{1}{2})^{**10}$
 - 99.9%

(Demo)
