ENGR 0021 Recitation 2

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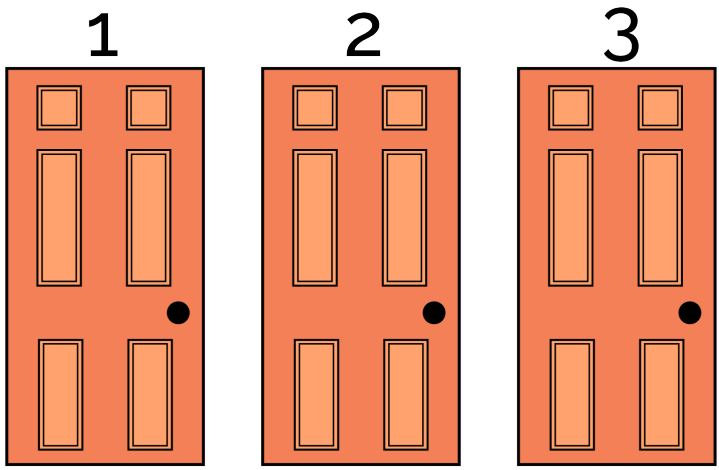
Let's Play a Game



The Monty Hall Problem: The Math

Let C_i be the event that the car is behind Door i ($P(C_i) = 1/3,\ \forall i$). Let M_j be the event that Monty opens Door j ($i \neq j$). Suppose you pick Door 1, after which Monty opens Door 3. We want to calculate $P(C_2|M_3)$.

Likelihoods $P(M_3|C_i)$:

If C_1, Monty can open 2 or 3 $\rightarrow$ $P(M_3|C_1) = 1/2$

If C_2, Monty can only open 3 $\rightarrow$ $P(M_3|C_2) = 1$

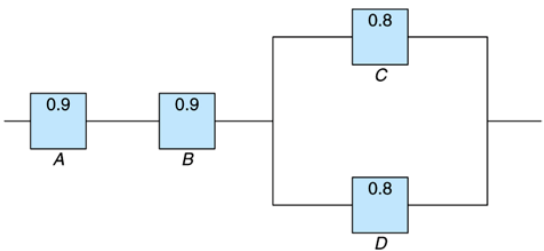
If C_3, Monty cannot open 3 $\rightarrow$ $P(M_3|C_3) = 0$

Chapter 2, Slide 80 (Example 2.39)

An electrical system consists of four components (illustrated below). The system works is components A and B work and if either of components C or D work. The probability each component works (the reliability) is pictured in the figure.

(a) Find the probability that the entire system works.

(b) Find the probability that component C does not work given the entire system works. Assume components function independently.



Chapter 2, Slide 81 (Example 2.39)

Chapter 2, Slide 82 (Example 2.39)

Chapter 2, Slide 82 (Example 2.39) Continued

Homework 2, Question 2: The Problem

Four married couples have bought 8 seats in the same row for a concert.

(a) How many different ways can they be seated with no restrictions?

(b) How many different ways can they be seated if each couple is to sit together?

(c) How many different ways can they be seated if all the men sit in the right four seats and all the women sit in the left four seats?

Homework 2, Question 2: The Solution

Question 1

DNA is made of sequences of the following nucleotides: A, C, G, T. How many sequences of length 3 are there? How many sequences of length 3 with no repeats are there? How many unique sets of length 3 are there?

Question 2

Suppose we flip a coin 5 times. How many ways can we get exactly 3 heads in 5 coin flips? What is the probability of getting exactly 3 heads in 5 coin flips?

Question 3

Suppose we have three mutually exclusive events A, B, and C. The probabilities of events A and B are 0.2 and 0.3 respectively ($P(A) = 0.2, P(B) = 0.3$). Can the probability of event C be 0.1? Can it be 0.7? What must the probability of event C be if events A, B, and C partition their sample space?

Question 4

Ashley is a soccer player, and she has a lucky pair of socks. When Ashley wears the socks, her team wins 85% of their matches. Ashley is quite forgetful, however, and only remembers to bring the socks to 40% of matches. What is the probability Ashley remembers her socks and her team wins the match?

Question 5

In response to a zombie outbreak, your town installs a zombie detector. If someone is a zombie, it beeps 90% of the time; if they aren't, it stays silent 95% of the time). In your town, only 1 in 10 people are actually zombies. The detector beeps at your friend Matt. What is the probability that Matt is actually a zombie?