# DISCRETE MATHEMATICS

## IN COMPUTER SCIENCE

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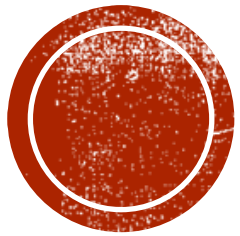
March 2, 2022

# Administrivia

- Final exam
  - Mar 13 (Sun) 8–11AM
  - LSC 100 (this room)
- SAS/Conflict/COVID
  - Come talk to me
- Closed-book written exam
- Scope: Module C on counting
- One-page two-sided cheatsheet
  - Must be hand-written



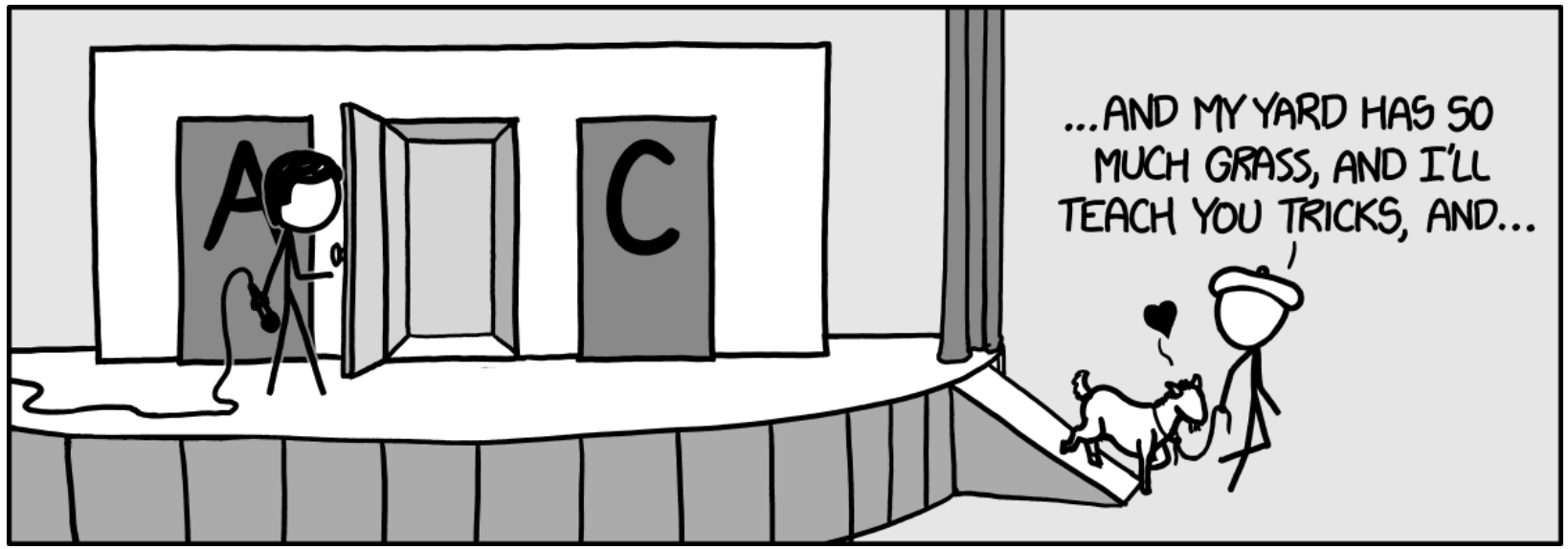
# Discrete Probability

# Two Children Problem

# Three Prisoner's Problem

The Easiest Problem Everyone Gets Wrong - YouTube


# Monty Hall Problem

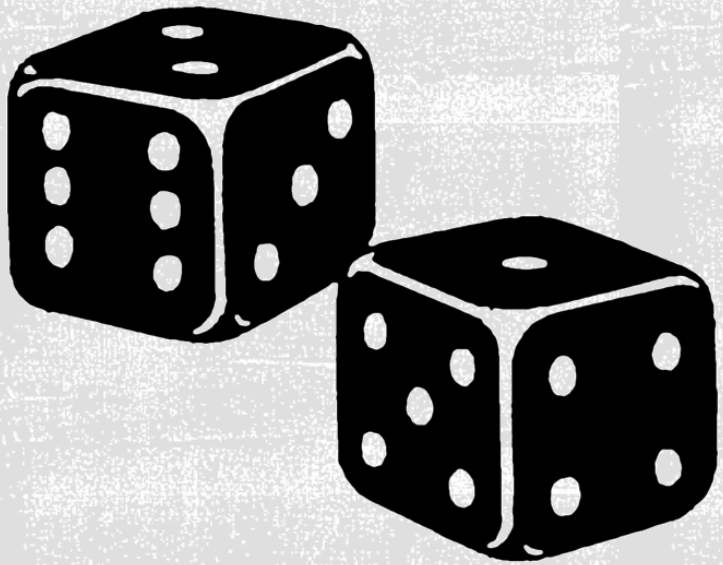



# Monty Hall Problem

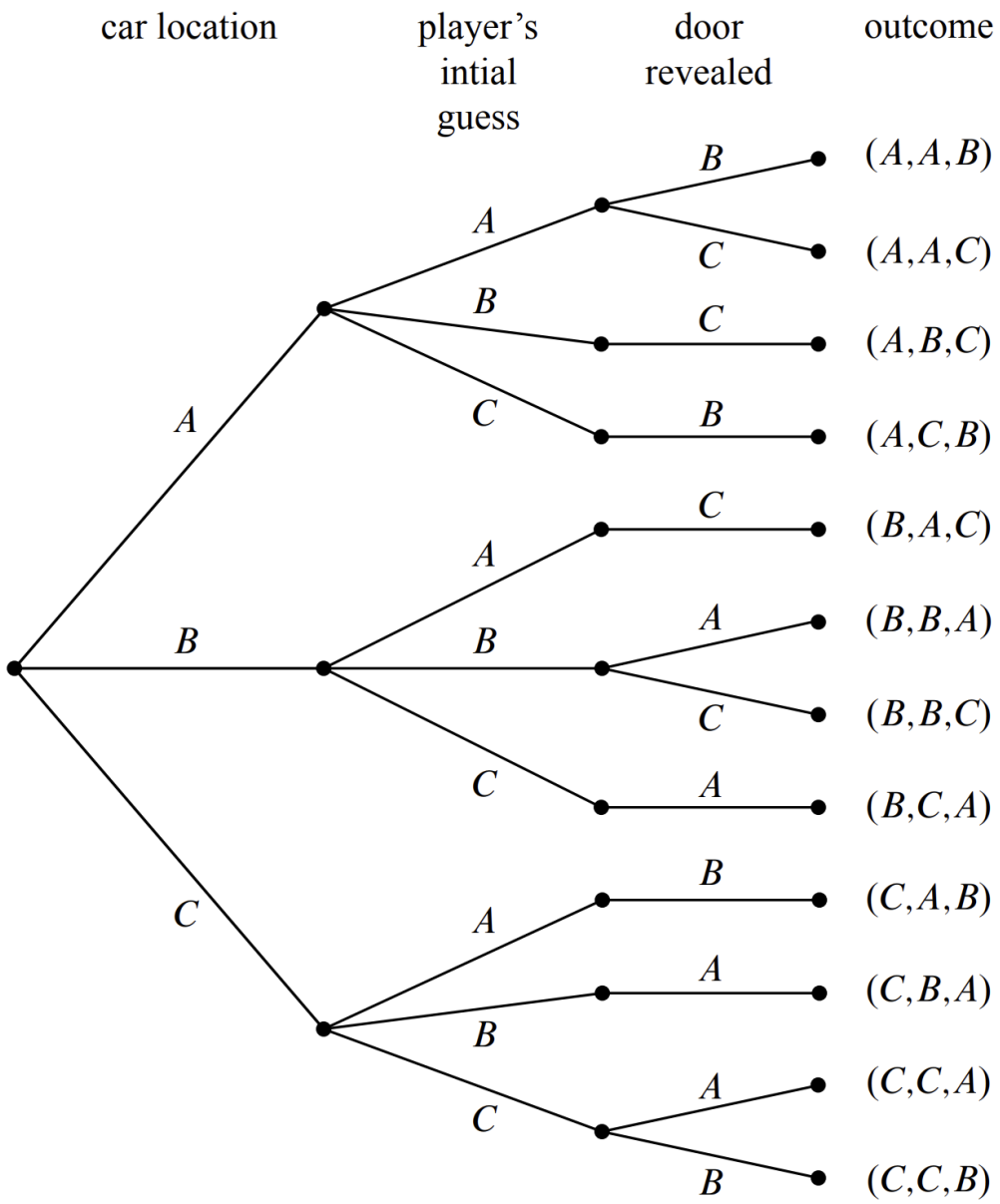
# Probability Jargon

- Sample space S: set of outcomes
- Event E: subset of S
- Probability Pr: $S \rightarrow R$
  - $Pr[\omega] \geq 0$ for every outcome $\omega$
  - $\Sigma_{\omega \in S} Pr[\omega] = 1$

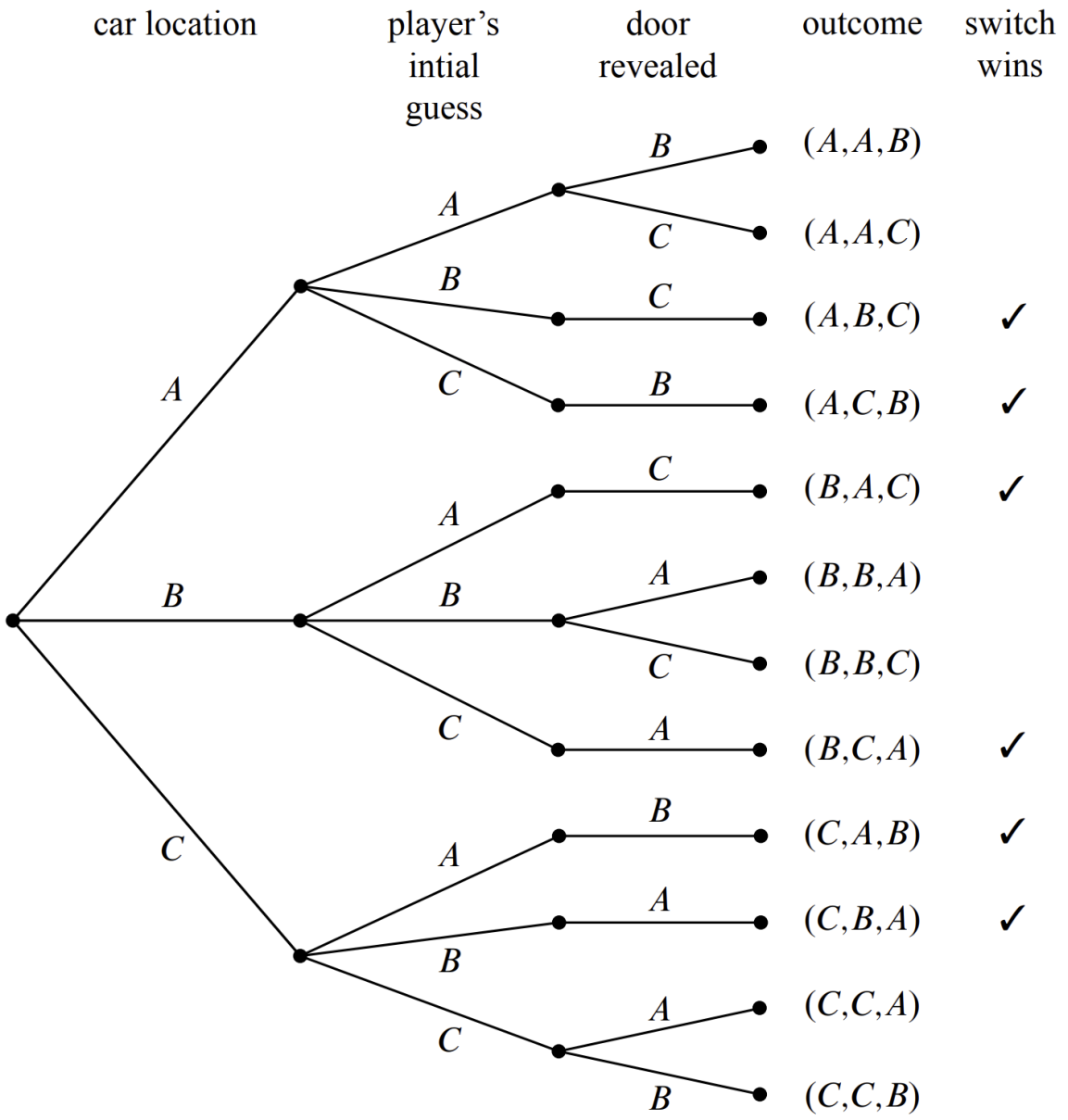
- $Pr[E] = \Sigma_{\omega \in E} Pr[\omega]$



# Monty Hall Problem



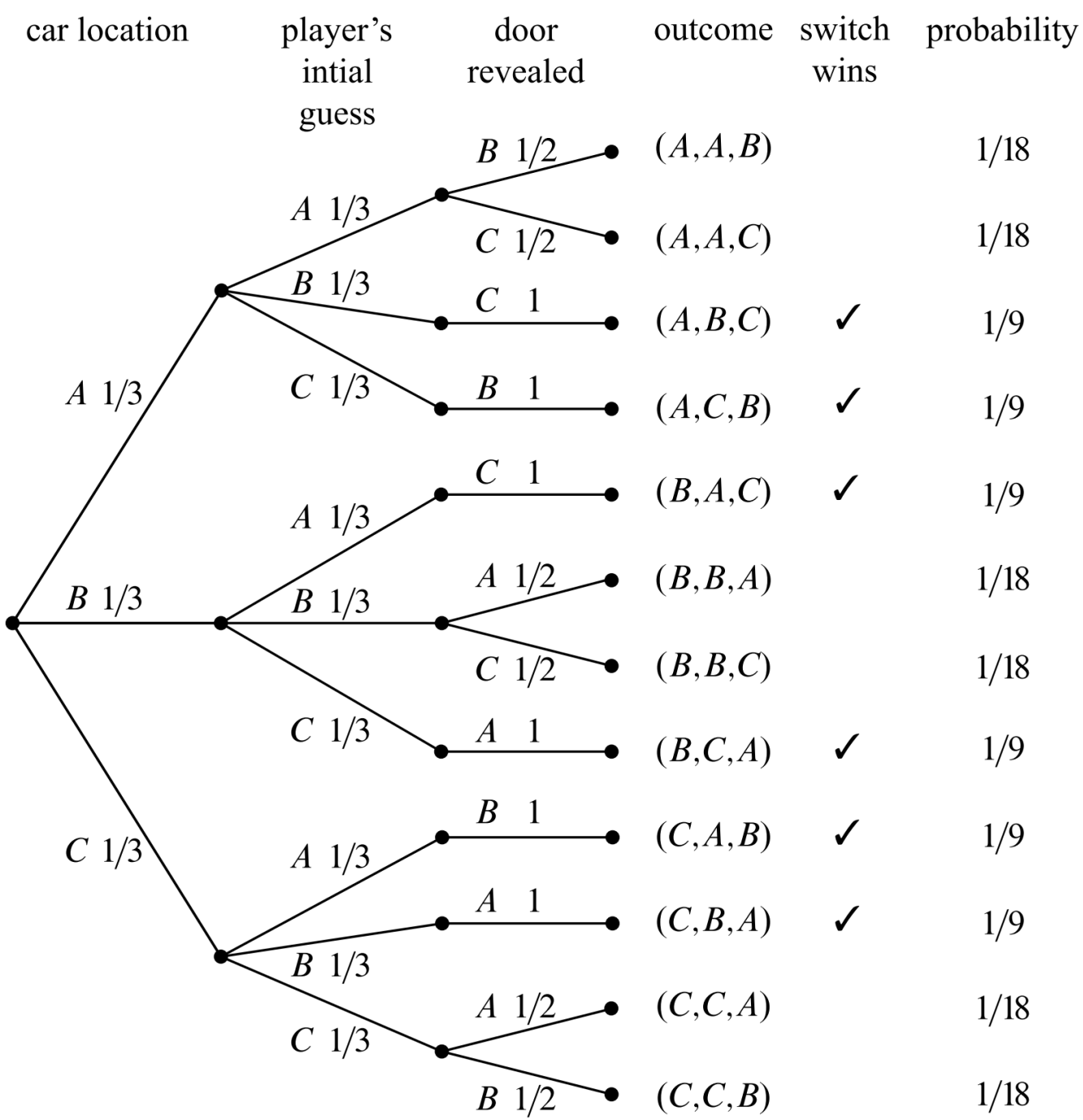

$$\mathcal{S} = \left\{ \begin{array}{l} (A,A,B),\ (A,A,C),\ (A,B,C),\ (A,C,B),\ (B,A,C),\ (B,B,A), \\ (B,B,C),\ (B,C,A),\ (C,A,B),\ (C,B,A),\ (C,C,A),\ (C,C,B) \end{array} \right\}$$




$$\{(A, B, C), (A, C, B), (B, A, C), (B, C, A), (C, A, B), (C, B, A)\}$$

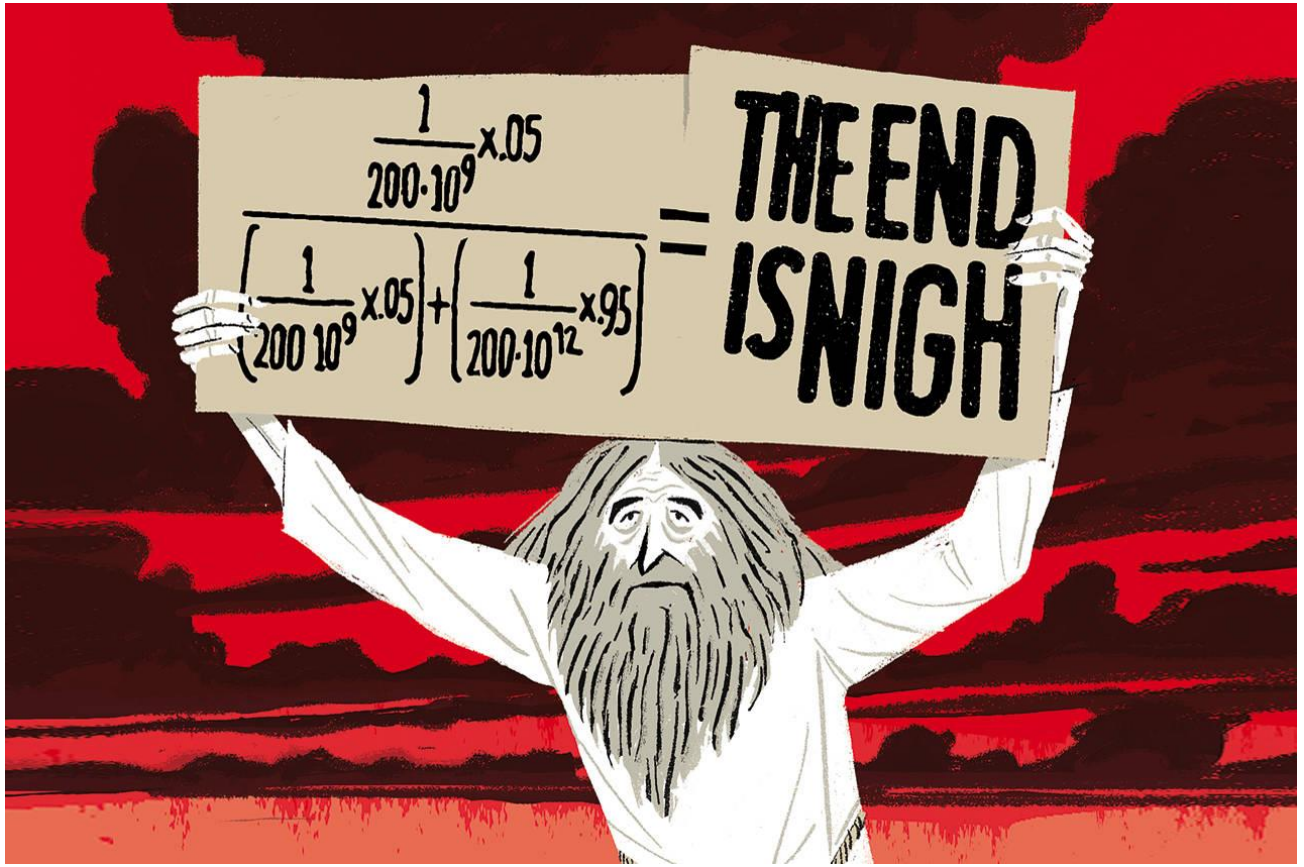
# Monty Hall Problem

# Monty Hall Problem




# The Birthday Paradox

The Birthday Paradox Experiment (pudding.cool)




# Anthropic Principle and Doomsday Argument

# Humans have amazingly BAD intuition about probability.

## Next time.
Random variable and Expectation. Almost there!