# Basics of Counting

CS231
Dianna Xu

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## Tossing two coins

- What is the probability of getting two heads? one head? no heads?

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## Terminology

- Experiment
  - A repeatable procedure that yields one of a given set of outcomes
  - Roll a die
- Sample space
  - The range of outcomes possible
  - For a die, that would be values 1 to 6
- Event
  - Subset of the sample space
  - Rolling for 5 or above

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## Probability definition

- The probability of an event occurring is:

$$p(E) = \frac{|E|}{|S|}$$

  - Where E is the set of desired outcomes
  - Where S is the set of all possible outcomes
  - Note that $0 \le |E| \le |S|$
    - Thus, the probability will always between 0 and 1
    - An event that will never happen has probability 0
    - An event that will always happen has probability 1

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## Dice probability

- What is the probability of getting "snake-eyes" (two 1's) on two six-sided dice?
  - Probability of getting a 1 on a 6-sided die is 1/6
  - Only one possible combination (1,1): |E| = 1
  - |S| = ?
  - Thus, it's 1/36
- What is the probability of getting a 7 by rolling two dice?
  - There are six combinations that can yield 7: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1)
  - Thus, |E| = 6, |S| = 36, P(E) = 6/36 = 1/6

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## Deck of cards

- |S| = 52 (no jokers)
- What is the probability of drawing a black face card?

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## What's behind door number 3?

- Three doors A, B and C
- You pick A
- One of the other two is shown empty
- Should you switch to the third?

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## Elements of a list

- Number of integers between m and n, where m ≤ n is n-m+1
- How many 4-digit integers are divisible by 7?
  - 1001 = 7*143
  - 9996 = 7*1428
  - (1428-143)+1 = 1286
- What is the probability that a randomly chosen 4-digit integer is divisible by 7?

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