Introduction to Statistics

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Statistics

- Statistics is the mathematics of doing research.
- We will discuss collecting, summarizing, presenting, and analyzing measurements (data).
- There are a wide range of questions you can address using statistics.
  - How long does it take me to commute?
  - How large are iguanas?
  - How many calories do I eat each day?
  - What proportion of people like ice cream?
- Almost all data are generated from **chaotic processes**.
  - Your commute time has variation day to day.
  - Each iguana has a different mass and length.
  - The amount of calories eaten each day is also variable.
  - Some people like ice cream, others do not.

Chaotic processes

- When we do not know what will happen (or did happen), there is uncertainty.
- We often describe uncertainty using **probability**.
  - Tomorrow has a 30% chance of rain.

$$Pr(\text{rain tomorrow}) = 0.3$$

  - The chance of winning the Powerball Lottery is about 1 in 100,000,000.

$$Pr(\text{win powerball}) = \frac{1}{10^8}$$

  - The probability of rolling snake-eyes is $\frac{1}{36}$.

$$Pr(\text{snake eyes}) = 0.02\overline{77}$$

  - The chance a random person likes ice cream is 90%.

$$Pr(\text{yes to ice cream}) = 0.9$$

Generating a sample (getting data)

- In the real world, samples are usually randomly selected from a large population. (Like measuring heights of 30 random BHCC students.)
- In this class, we will often generate samples with:
  - Dice
  - Coins
  - **Spinners**
  - Digital random number generators
- Almost every problem will involve a list of numbers, where each number in that list is generated with the same process. Different problems will use different processes.