# Math 1501 - Elements of Statistics with Applications

1.1 - Definitions of Statistics, Probability, and Key Terms

# Chapter 1: Sampling and Data



By the end of 1.1 you should be able to answer:

- Who are we studying, and who did we actually measure?
- What is the difference between describing data and concluding from it?
- Which numbers can we compute, and which would be nonsense?

## Let's collect some data — and then let Python draw it

On average, to the nearest half hour, how many hours do you sleep per night?

We will type every answer in the room into a list and get a picture back.

```
sleep = [5, 5.5, 6, 6, 6, 6.5, 6.5, 6.5, 7, 7, 8, 8, 9]
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Google Colab Link

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That is a *list* in Python. It is how data gets typed in and stored.

This is not a coding course. Python is a tool we point at data, the same way we point a calculator at arithmetic. Google Colab Link

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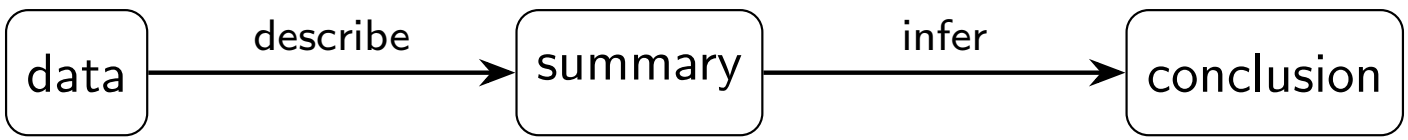

# Why probability shows up in a statistics course

Toss a fair coin 4 times. You may well get 3 heads. Nothing is wrong.

Toss it 4,000 times and the fraction of heads sits very close to one half.

Karl Pearson (Mathematician) actually did this. He tossed a coin 24,000 times and got 12,012 heads.

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The two extremes tell you everything:

$$\frac{0}{24{,}000} = 0 \quad \text{never happened}$$

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The part can never exceed the whole. So this number always lands between 0 and 1.

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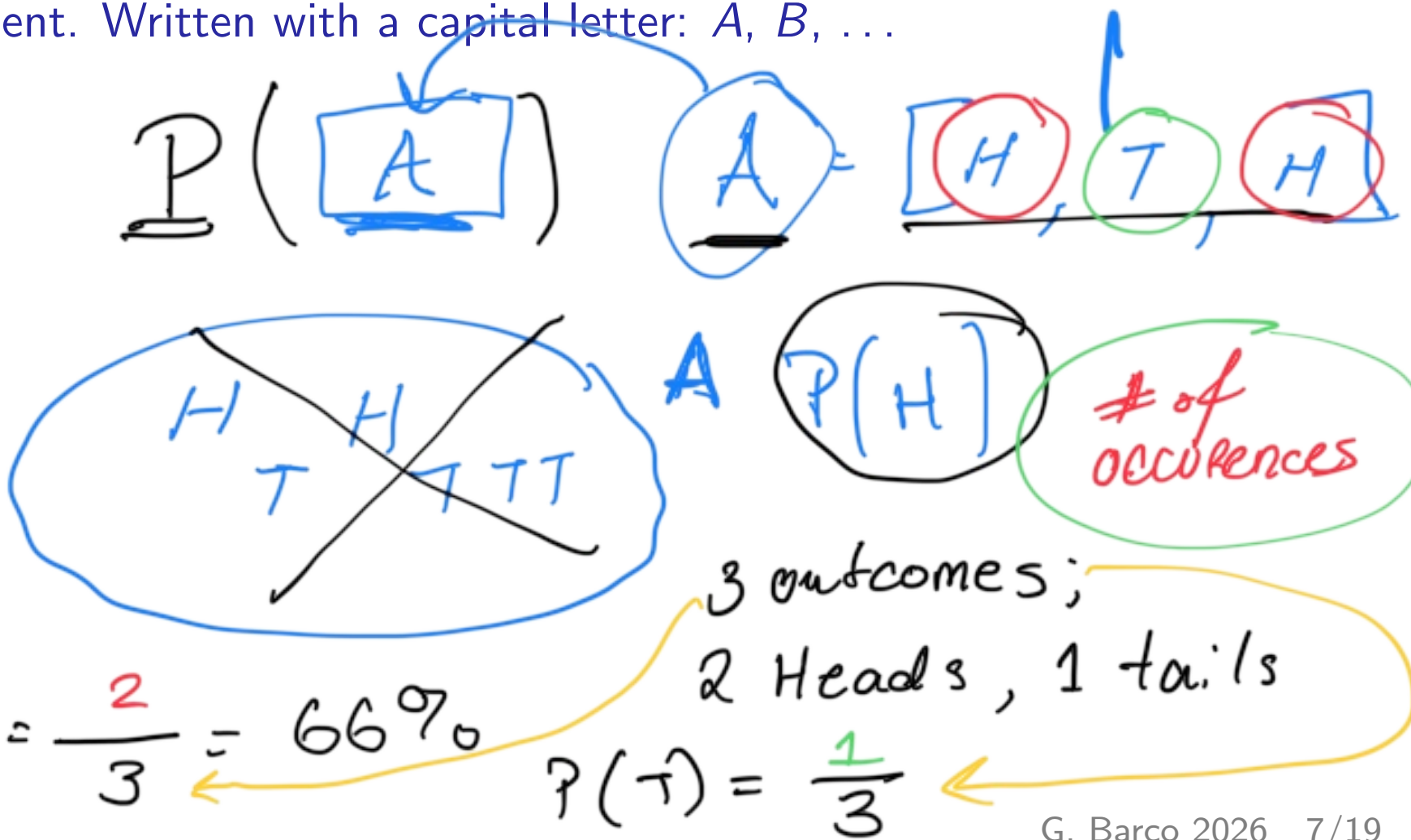
*So far:* statistics, descriptive, inferential

**Event** — one outcome, or a group of outcomes, from a random experiment. Written with a capital letter: $A$, $B$, ...



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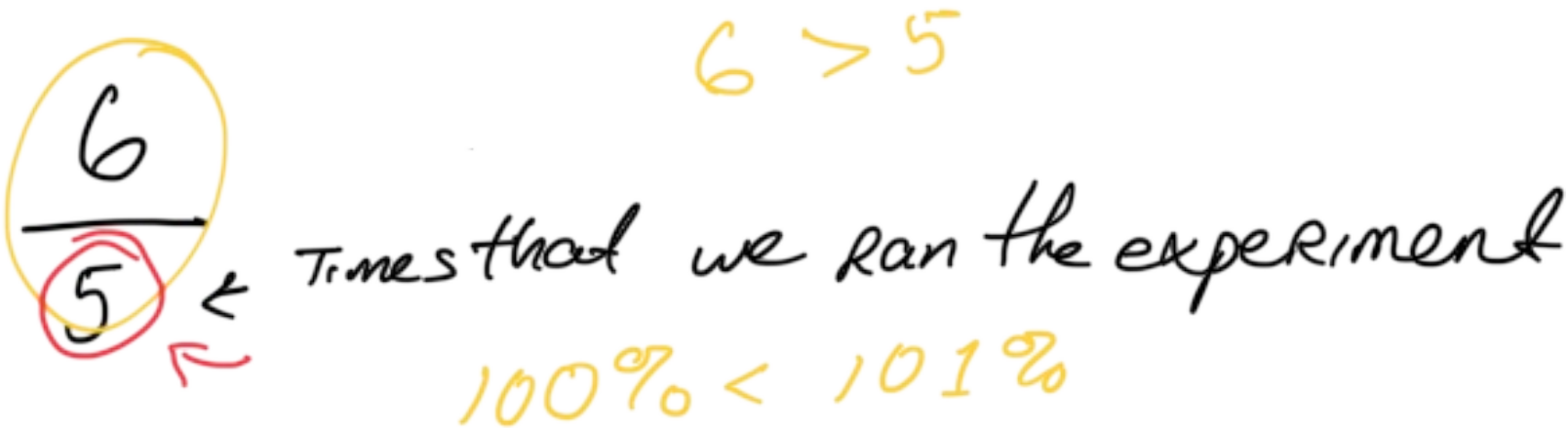

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Roll a die. Let $A =$ "you roll a 2." $S = \{1, 2, 3, 4, 5, 6\}$. $P(A) = \frac{1}{6}$.

$S = \{1, 2, 3, 4, 5, 6\}$

$\frac{2}{6} = \frac{1}{3}$

# Three rules, and that is all

## Definition

**Probability** is a number between 0 and 1, inclusive, that gives the likelihood that a specific event will occur.

$0 \times 100 = 0\%$

$1.00 \times 100 = 100\%$