- **Making Predictions + Decisions**

Will be dealing w/ sets.

A set is any collection of objects.
Typical notation A.
If x is in A we say

$$x \in A$$

Given two sets A, B,

$$A \cap B = \{x : x \in A \text{ and } x \in B\}$$

$$A \cup B = \{x : x \in A \text{ or } x \in B\}$$

$A \subset B \Rightarrow \quad x \in A \Rightarrow x \in B$ for all x ← A is a subset of B

Generally, all sets in a given contex will be subsets of a big context-dependent Ω - given $A \subset \Omega$, A^c = complement

$$A^c = \{x \in \Omega : x \notin A\}$$

Sets can be finite or infinite
If infinite, can be
- countable
- uncountable

If finite, $A = \{x_1, x_2, \dots, x_n\}$
or $A = \{\ \} = \emptyset$ (empty set)

Countably infinite means we can put A in one-to-one correspondence w/ natural numbers $\mathbb{N} = \{0, 1, 2, \dots\}$ —

$$A = \{x_0, x_1, x_2, \dots\}$$

Uncountably Infinite: infinite but NOT countable; examples include $A = \mathbb{R}$ = real numbers

$A = [0, 1] \subset \mathbb{R}$, or

$A = [a, b]$ for any $a, b \in \mathbb{R}$ w/ $a \neq b$

Given two sets A, B, $A \times B$, the cartesian porduct of A and B is

$$A \times B = \{(x, y) : x \in A \text{ and } y \in B\}$$

What is a probability model?

-You have an experiment which has a "number" of distinct possible outcomes

Let

$$\Omega = \{\text{all possible outcomes}\}$$

Depending on experiment, Ω could be finite or countably/uncountably infinite

People call Ω the sample space.

① Give someone a coin. They flip it 10 times out of your sight.
They pay you the number of dollars = number of dollars.

Natural choice for Ω is $\Omega = \{0, 1, 2, \ldots, 10\}$
↳ Think of payments as outcomes.

This example is continued and completed in Lecture 2 Notes.