

• 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 ,

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

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

$$A \subset B \Rightarrow x \in A \Rightarrow x \in B \text{ for all } x$$

\swarrow A is a subset of B

Generally, all sets in a given context 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

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

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

Given two sets A, B , $A \times B$, the cartesian product 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 $\Omega = \{0, 1, 2, \dots, 10\}$

↳ Think of payments as outcomes.

This example is continued and completed in
Lecture 2 Notes.