Experimental and Theoretical Probability

Today I Can

1. Calculate experimental and theoretical probability.

Outcome

The possible result of a situation or experiment.

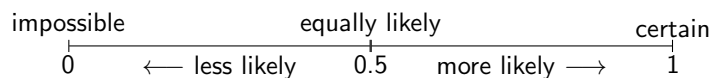**Event**

A single outcome or a group of outcomes.

Sample Space

The set of all possible outcomes.

Probability

The **probability** of an event, denoted $P(\text{event})$, is a numerical value from 0 to 1 that measures the likelihood of the event.

- $P(\text{event}) = \dfrac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$

impossible   equally likely   certain

0    $\longleftarrow$ less likely   0.5   more likely $\longrightarrow$ 1

Experimental Probability

The measure of the likelihood that the event occurs based on the *actual results* of an experiment.

- $P(\text{event}) = \dfrac{\text{number of times the event occurs}}{\text{number of times the experiment is done}} = \dfrac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$

Example 1. A quality control inspector samples 500 LCD monitors and finds defects in three of them.

(a) What is the experimental probability that a monitor selected at random will have a defect?

(b) If the company manufactures 15,240 monitors in a month, how many are likely to have a defect based on the quality inspector's results?

Example 2. You roll two standard six-sided dice. The outcomes of which are shown in the table below.

Dice	1	2	3	4	5	6
1	1,1	1,2	1,3	1,4	1,5	1,6
2	2,1	2,2	2,3	2,4	2,5	2,6
3	3,1	3,2	3,3	3,4	3,5	3,6
4	4,1	4,2	4,3	4,4	4,5	4,6
5	5,1	5,2	5,3	5,4	5,5	5,6
6	6,1	6,2	6,3	6,4	6,5	6,6

What is the probability of getting each sum when rolling two standard dice?

(a) 7   (b) 9   (c) 2   (d) 13

Complement of an Event

All possible outcomes of the sample space that are **not** part of the event.

- The sum of the probability of an event and the probability of its complement is 1.
- $P(\text{event}) + P(\text{not event}) = 1$
- $P(\text{not event}) = 1 - P(\text{event})$

Example 3. A jar contains 10 red marbles, 8 green marbles, 5 blue marbles, and 6 white marbles. A marble is chosen at random. Find each probability.

(a) Probability the marble is not green.   (b) Probability the marble is not red.