Big Ideas Math: Advanced 2

# Parent Newsletter

## Chapter 15: Probability and Statistics

## Students will...

Identify and count the outcomes of experiments.

Understand the concept of probability and the relationship between probability and likelihood.

Find probabilities of events.

Find relative frequencies.

Use experimental probabilities to make predictions.

Use theoretical probabilities to find quantities.

Compare experimental and theoretical probabilities.

Use tree diagrams, tables, or a formula to find the number of possible outcomes.

Find probabilities of compound events.

Identify independent and dependent events.

Use formulas to find probabilities of independent and dependent events.

Use simulations to find experimental probabilities.

Determine when samples are representative of populations.

Use data from random samples to make predictions about populations.

Use multiple samples to make predictions about populations.

Use measures of center and variation to compare populations.

Use random samples to compare populations.

## Essential Questions

In an experiment, how can you determine the number of possible results?

How can you describe the likelihood of an event?

How can you use relative frequencies to find probabilities?

How can you find the number of possible outcomes of one or more events?

What is the difference between dependent and independent events?

How can you determine whether a sample accurately represents a population?

How can you compare data sets that represent two populations?

## Key Terms

The ***relative frequency*** of an event is the fraction or percent of the time that the event occurs in an experiment.

The set of all possible outcomes of one or more events is called the ***sample space***.

A ***compound event*** consists of two or more events.

Events are ***independent events*** if the occurrence of one event *does not* affect the likelihood that the other event(s) will occur.

Events are ***dependent events*** if the occurrence of one event *does* affect the likelihood that the other event(s) will occur.

A ***simulation*** is an experiment that is designed to reproduce the conditions of a situation or process.

A ***population*** is an entire group of people or objects.

A ***sample*** is a part of the population.

An ***unbiased sample*** is representative of a population because it is selected at random and is large enough to provide accurate data..

A ***biased sample*** is not representative of a population because one or more parts of the population are favored over others..

## Standards

**Common Core:**

**7.SP.1:** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

**7.SP.2:** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

**7.SP.3:** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

**7.SP.4:** Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

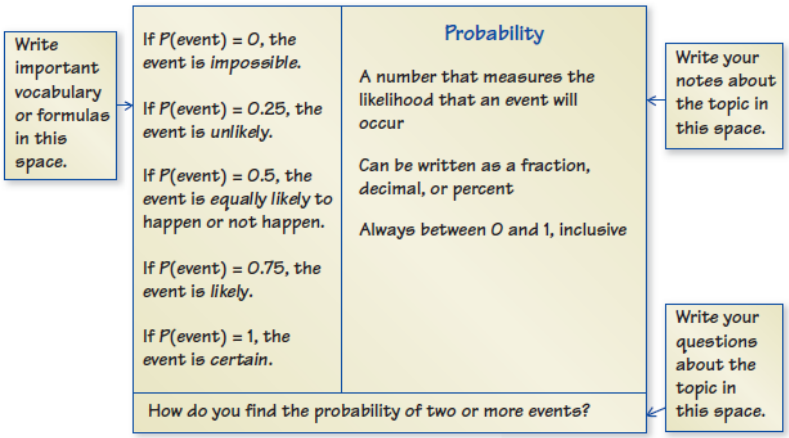
**7.SP.5:** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

**7.SP.6:** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

**7.SP.7:** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.


**7.SP.8:** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

## Reference Tools




A **Notetaking Organizer** can be used to write notes, vocabulary, and questions about a topic. In the space on the left, write important vocabulary or formulas. In the space on the right, write notes about the topic. In the space at the bottom, write questions about the topic.

## Quick Review

- When an experiment is performed *at random* or *randomly*, all of the possible outcomes are equally likely.
- Probabilities can be written as fractions, decimals, or percents.
- You can use tables and tree diagrams to find the sample space of two or more events.
- You can use a sample to make an *inference*, or conclusion, about a population.
- You use the mean and the mean absolute deviation (MAD) to describe symmetric distributions of data.
- You use the median and the interquartile range (IQR) to describe skewed distributions of data.
- You can use random samples to make comparisons about two populations.

## Key Ideas

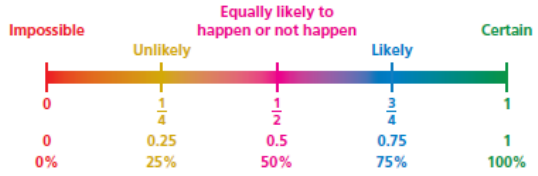
### Outcomes and Events

An **experiment** is an investigation or a procedure that has varying results. The possible results of an experiment are called **outcomes**. A collection of one or more outcomes is an **event**. The outcomes of a specific event are called **favorable outcomes**.

For example, randomly selecting a marble from a group of marbles is an experiment. Each marble in the group is an outcome. Selecting a green marble from the group is an event.

### Probability

The **probability** of an event is a number that measures the likelihood that the event will occur. Probabilities are between 0 and 1, including 0 and 1. The diagram relates likelihoods (above the diagram) and probabilities (below the diagram).




### Probability of Independent Events

The probability of two or more independent events is the product of the probabilities of the events.

$P(A \text{ and } B) = P(A) \cdot P(B)$

$P(A \text{ and } B \text{ and } C) = P(A) \cdot P(B) \cdot P(C)$

### Finding the Probability of an Event

When all possible outcomes are equally likely, the probability of an event is the ratio of the number of favorable outcomes to the number of possible outcomes. The probability of an event is written as $P(\text{event})$.

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

### Experimental Probability

Probability that is based on repeated trials of an experiment is called **experimental probability**.

$$P(\text{event}) = \frac{\text{number of times the event occurs}}{\text{total number of trials}}$$

### Theoretical Probability

When all possible outcomes are equally likely, the **theoretical probability** of an event is the ratio of the number of favorable outcomes to the number of possible outcomes.

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

### Fundamental Counting Principle

An event $M$ has $m$ possible outcomes. An event $N$ has $n$ possible outcomes. The total number of outcomes of event $M$ followed by event $N$ is $m \times n$.

### Probability of Dependent Events

The probability of two dependent events $A$ and $B$ is the probability of $A$ times the probability of $B$ after $A$ occurs.

$P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A)$

## What's the Point?

The ability to use probability and statistics is very useful in real life when you are making important decisions like what your college major should be. Ask your student what they want their career to be. Then have them research job openings to see what type of degrees employers are looking for. Based on this data, what is the probability of finding employment in their fields of interest?

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 15: Massively Multiplayer Rock Paper Scissors STEM Video is available online at www.bigideasmath.com.


## Games

- Anything But Eight
- Take Your Chances

These are available online in the *Game Closet* at www.bigideasmath.com.