

# Probability in Society

# Learning Targets:

1. Identify and explain **assumptions** linked to probability.
2. Apply **experimental** probability ideas to survey results.
3. Make **decisions** based on probabilities.

When a survey is performed using a sample, the goal is to have a random sample that is **truly representative** of the entire population so that the survey results can be generalized to **make predictions** about the **entire population**.

The results of a survey can be treated like the results of an experimental probability activity. If the sample used for the survey was **large enough** and was **unbiased**, we can assume that the sample is truly representative of the population.

It is then reasonable to use the survey results to answer questions about the **entire population**.

**Probability** is the likelihood of something happening and can be expressed as a **fraction**, **decimal**, or **percent**.

Probabilities range from **0%** (impossible) to **100%** (certainty).

## Example:

### Using a sample to make a prediction about a population

A school with 5400 students is electing a student council president. A reporter for the student newspaper polled 100 people. The table shows that 45% chose candidate A, 15% chose candidate B, and the rest chose candidate C.

Candidate A	Candidate B	Candidate C	Total
45%	15%	40%	100%
2430	810	2160	5400

According to the poll, how many students will choose each candidate?

$$A: 0.45(5400) = 2430$$

$$B: 0.15(5400) = 810$$

$$C: 0.4(5400) = 2160$$

# Example:

## Avoid making a false prediction

Cody records the scores from his ten most recent golf games.

Game	Score
1	70
2	69
3	71
4	73
5	74
6	72
7	73
8	75
9	78
10	74

Use the first three game scores as a sample. Calculate the mean.

$$\text{mean} = \frac{70 + 69 + 71}{3} = \frac{210}{3} = 70$$

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4	73
5	74
6	72
7	73
8	75
9	78
10	74

Use the last three game scores as a sample. Calculate the mean to the nearest hundredth.

$$\text{mean} = \frac{75 + 78 + 74}{3} = \frac{227}{3} = 75.\bar{6}$$

# Example:

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8	75
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728

Calculate Cody's mean score based on all ten games.

$$\text{mean} = \frac{728}{10} = 72.8$$



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Are the samples a good predictor for Cody's overall score? Explain.

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Are the samples a good predictor for Cody's overall score? Explain.

The first sample contained Cody's **three lowest scores** and the second sample contained Cody's **three highest scores**. Neither sample was a good predictor of his actual overall score.

# Example:

## Making decisions based on probability

A youth association surveys its 400 members about their preferred activity. There are 100 members in each of four groups. The activities were chosen from a youth activities resource. The table displays the survey results.

Group	Swimming	Rock Climbing	Watching Movies	Bowling	Total
Red	14	9	40	37	100
Blue	11	19	59	11	100
Green	27	12	57	4	100
Yellow	13	24	44	19	100

What is the **theoretical** probability of a member choosing swimming? What about choosing bowling? Watching movies? Rock climbing?

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What is the **theoretical** probability of a member choosing swimming? What about choosing bowling? Watching movies? Rock climbing?

The **theoretical** probability of each of the four activities is the same, assuming each activity is equally likely to be chosen:

$$\frac{1}{4} = 0.25 = 25\%$$

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65

$$\rightarrow \frac{65}{400} = 0.1625 = 16.25\%$$

Based on the survey results, what is the **experimental** probability of a member choosing swimming?

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Yellow	13	24	44	19	100

Calculate the **experimental** probabilities for the remaining three activities.

$$\begin{array}{l} 64 \\ \hookrightarrow \frac{64}{400} = 0.16 = 16\% \end{array}$$

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200

$$\rightarrow \frac{200}{400} = 0.5 = 50\%$$

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Yellow	13	24	44	19	100

Calculate the **experimental** probabilities for the remaining three activities.

$$\frac{71}{400} = 0.1775 = 17.75\%$$



# Example:

## Making decisions based on probability

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Which probability should the camp organizers use to make their decisions about activities? Explain.

# Example:

## Making decisions based on probability

A youth association surveys its 400 members about their preferred activity. There are 100 members in each of four groups. The activities were chosen from a youth activities resource. The table displays the survey results.

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The camp organizers should make their decisions about activities based on the **survey results probabilities**. Since they **surveyed the entire population** of members, the survey results are the most **accurate representation of the preferences of the members**.

# Check your understanding:

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