

9.3 THEORETICAL & EXPERIMENTAL PROBABILITY

Step 1: Roll 2 number cubes 36 times. Record the number of times the sum of the number cubes is 7.

Step 2: Use an addition table from 1 to 6 to help you find the expected number of times the sum 7 should come up after rolling two number cubes 36 times. The top row represents one number cube, and the left column represents the other number cube.

Addition Table

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Results

Sum	Frequency
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

1. How many times did you roll a sum of 7? What is the probability of rolling a sum of 7?
2. What is the expected probability of rolling a sum of 7?
3. How does your result compare to the expected probability of rolling a sum of 7?

In the activity above, you found the experimental probability of rolling a sum of 7 on two number cubes. **Experimental probability** is found using frequencies obtained in an experiment or game.

The expected probability of an event occurring is called **theoretical probability**. This is the probability that you have been using since Lesson 9.1. The theoretical probability of rolling a sum of 7 on two number cubes is $\frac{6}{36}$ or $\frac{1}{6}$.

Example: Experimental Probability

- 1) Two number cubes are rolled 75 times and a sum of 9 is rolled ten times. What is the probability of rolling a sum of 9?

$$P(9) = \frac{\text{number of times a sum of 9 occurs}}{\text{number of possible outcomes}} = \frac{10}{75} \text{ or } \frac{2}{15}$$

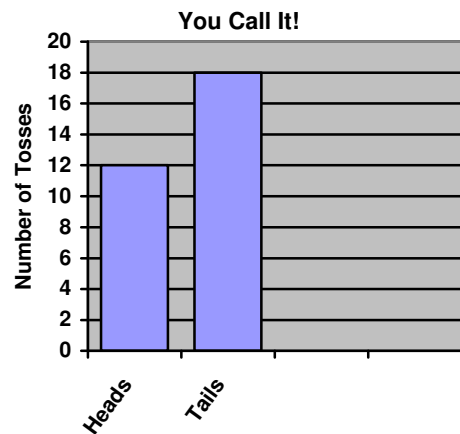
The experimental probability of rolling a sum of 9 is $\frac{2}{15}$.

Examples: Experimental and Theoretical Probability

- 2) The graph shows the results of an experiment in which a coin was tossed 30 times. Find the experimental probability of tossing tails for this experiment.

$$P(\text{tails}) = \frac{\text{number of times tails occurs}}{\text{number of possible outcomes}} = \frac{18}{30} = \frac{3}{5}$$

The experimental probability of tossing tails is $\frac{3}{5}$.



- 3) Compare the experimental probability you found in Example 2 to its theoretical probability.

The theoretical probability of tossing tails on a coin is $\frac{1}{2}$. So, the experimental probability is close to the theoretical probability.

Experimental probability can also be based on past performances and be used to make predictions on future events.

Examples: Predict Future Events

- 4) In a survey, 100 people were asked to name their favorite Independence Day side dishes. What is the experimental probability of macaroni salad being someone's favorite dish?

Side Dish	# of People
Potato Salad	55
Green Salad	25
Macaroni Salad	12
Coleslaw	8

There were 100 people surveyed and 12 chose macaroni salad. So, the experimental probability is $\frac{12}{100}$ or $\frac{3}{25}$.

- 5) Suppose 250 people attend the city's Independence Day barbecue. How many can be expected to choose macaroni salad as their favorite side dish?

$$\frac{3}{25} = \frac{x}{250} \quad \text{Write a proportion.}$$

$$3 \cdot 250 = 25x \quad \text{Find the cross products.}$$

$$30 = x$$

About 30 people will choose macaroni salad.

**** Your Turn**

- a) What is the experimental probability of potato salad being someone's favorite dish?
- b) About how many people can be expected to choose potato salad as their favorite dish if 250 attend the barbecue?