

Key

Theoretical vs. Experimental Probability

Theoretical Probability is what is supposed to happen when you conduct an experiment.

Ex. You toss a coin 10 times. You should get 5 heads and 5 tails.

Experimental Probability is what actually happens when you conduct an experiment. Note: Experimental probability is also called empirical probability.

Ex. You toss a coin 10 times. You get 7 heads and 3 tails.

Let's conduct an experiment using a coin. The outcomes are heads or tails. The theoretical probability of heads is $\frac{1}{2}$ and for tails is $\frac{1}{2}$. Now, toss a coin 20 times. Record your results here: $P(H) = 12$ and $P(T) = 8$. Based on your results, complete the sentence below.

* example...answers may vary! *

The actual number of heads was more than the expected number of heads.

Here's another example.

Harold performs an experiment by spinning the arrow on a spinner. The spinner has five equal sections. The results of his experiment are shown in the table below.

| Outcome | Frequency |
|---------|-----------|
| Blue | 9 |
| Green | 11 |
| Orange | 14 |
| Red | 7 |
| Purple | 9 |

Handwritten notes: Blue and Green are grouped with a bracket labeled 20. Orange, Red, and Purple are grouped with a bracket labeled 21. A large bracket on the right groups all frequencies and is labeled 50.

- What is the experimental probability of landing on purple? $\frac{9}{50}$
- What is the theoretical probability of landing on purple? $\frac{1}{5}$ or $\frac{10}{50}$
- Based on Harold's experiment, how many times should the spinner land on purple in 1000 tries?
 $\frac{9}{50} \cdot 1000 = 180 \text{ times}$
- In theory, how many times should the spinner land on purple in 1000 tries?
 $\frac{1}{5} (1000) = 200 \text{ times}$

Create a table for all the sums for rolling two dice.

SUMS

| | 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 |

1. What is the theoretical probability of obtaining a sum of 7 based on the table above?

$$\frac{6}{36} \text{ or } \frac{1}{6}$$

2. Now, you conduct an experiment with two different colored dice. Record your results in the table below. Roll both dice at the same time 36 times. Find the sum each time. Place a tally mark in the correct section.

Experimental SUMS

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |

answers may vary

COLOR 1

second color

3. How did your results compare with the theoretical probabilities?

sum of 7 → $\frac{8}{36}$ vs. $\frac{6}{36}$
actual expected

actual > expected