

Probability



What do you think of when you think of the term **probability**?

Chance
gambling
percent

possibility
Fractions
average

Who uses probability as part of their job?

Construction
Gambling
Weather guessers

Scientist
military

Probability is the measure of how likely an event is to happen.

0% = impossible

1% - 49% = unlikely

50% = likely as not

51% - 99% = likely

100% = Certain

Write impossible, unlikely, as likely as not, likely, or certain to describe each event.

1. Landing on Blue:

$\frac{1}{8} = 12.5\%$ unlikely

2. Landing on Orange:

$\frac{1}{8} = 12.5\%$ unlikely

3. Landing on Red:

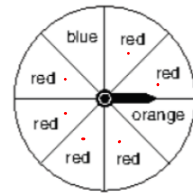
$\frac{6}{8} = 75\%$ likely

4. Landing on Blue, Red, or Orange:

$\frac{8}{8} = 100\% = \text{Certain}$

5. You spin the spinner clockwise:

$\frac{1}{2} = 50\%$ - as likely as not



In my bucket I have 4 white, 3 red, and 1 blue marble.

$$P(\text{red}) = \frac{3}{8} = 37.5\%$$

$$P(\text{white}) = \frac{4}{8} = 50\%$$

$$P(\text{not blue}) = \frac{7}{8} = 87.5\%$$

$$P(\text{red or blue}) = \frac{4}{8} = 50\%$$

$$P(\text{purple}) = \frac{0}{8} = 0\%$$

$$P(\text{red, white, or blue}) = \frac{8}{8} = 100\%$$

There are **TWO** types of probability!

Theoretical Probability

- Uses mathematics to find the answer
- Tells what is supposed to happen "in theory"

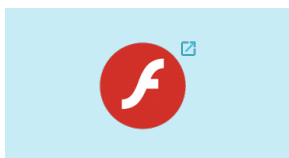
What is the **theoretical** probability of flipping a coin and getting tails? $\frac{1}{2} = 50\%$

What is the **theoretical** probability of flipping a coin and getting heads? $\frac{1}{2} = 50\%$

What is the **experimental** probability of flipping a coin 20 times and getting heads?

$\frac{6}{20} = 30\%$ $\frac{14}{20} = 70\%$

| Heads | Tails |
|-------|-------|
| 6 | 14 |



What is the **theoretical** probability of rolling a number cube and getting a 5?

$\frac{1}{6} = 16.67\%$

What is the **experimental** probability of rolling a number cube and getting a 5?

$\frac{1}{14} = 7.17\%$

| Number of Rolls | 5's |
|-----------------|-----|
| | |



Experimental Probability

- probability based on data collected
- you actually perform "an experiment"
- it doesn't always match the **theoretical** probability **BUT**
- if you perform the experiment many times (**billions!**) you should get very close or achieve the theoretical probability.

Theoretical VS Experimental Probability

Theoretical: What could happen

Experimental: What does happen

$\frac{30}{50}$ $\frac{27}{50}$ $\frac{35}{50}$ $\frac{23}{50}$ $\frac{21}{50}$ $\frac{17}{50}$ $\frac{22}{50}$
 $\frac{21}{50}$ $\frac{28}{50}$ $\frac{25}{50}$ $\frac{25}{50}$ $\frac{28}{50}$
 - $\frac{25.2}{50}$

$$\frac{24}{50} \quad \frac{19}{50} \quad \frac{30}{50} \quad \frac{23}{50} \quad \frac{15}{50} \quad \frac{25}{50}$$

$$\frac{27}{50} \quad \frac{24}{50} \quad \frac{33}{50} \quad \frac{22}{50} \quad \frac{36}{50} \quad \frac{23}{50}$$

$$\frac{28}{50} \quad \frac{26}{50} \quad \textcircled{14} \quad \frac{25.4}{50}$$