

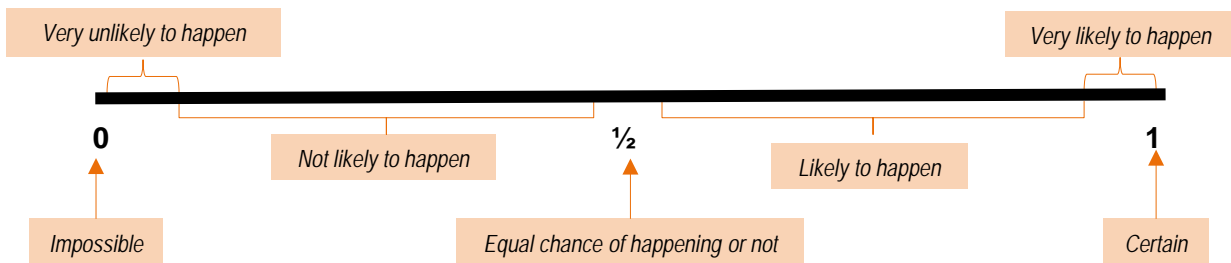
Theoretical Probability: what should occur mathematically in an experiment.

Experimental Probability: what actually occurs when the experiment is carried out.

Probability (p) is the mathematics of chance. Probability tells us the likelihood of an event (E) happening. For any event we can assign a number between **0** and **1** to describe the likelihood that it will occur.

An impossible event has a probability of **0**. A certain event has a probability of **1**. All other events between these extremes can be assigned a probability between **0** and **1**.

A number line can be used to represent different probabilities:



For example, the probability of getting a head if you flip a coin is $\frac{1}{2}$, since only 2 things could happen (a head or a tail) and each one has an equal chance of occurring.

Experimental probabilities are those you calculate by actually carrying out an experiment (like flipping a coin). An example would be to **flip a coin 40 times** and record whether you get a head or a tail. After 40 tosses of the coin calculate the experimental probability of obtaining a head by recording the number of heads that occurred as a fraction of the total number of tosses.



Applying the formula above we get: $p(\text{head}) = \frac{23}{40}$

If we repeated this experiment a very large number of times then the experimental probability of obtaining a head would get very close to the theoretical probability of $\frac{1}{2}$.

The experimental probability of an event occurring is the number of times that it occurred when the experiment was conducted as a fraction of the total number of times the experiment was conducted.

$$p(E) = \frac{\text{no. of times an event occurred during an experiment}}{\text{the total no. of times the experiment was conducted}}$$

EXAMPLE 1

On one day Ben's Bagel Shop sold 15 bagels, of which 6 were raisin bagels. Use experimental probability to predict what fraction of his sales will be raisin bagel the next day. Hint: always write the experimental probability as a fraction in simple form, using the following formula:



$$p(\text{raisin bagel}) = \frac{\text{number of raisin bagels sold}}{\text{total number of bagels sold}} = \frac{6}{15} = \frac{2}{5}$$

EXAMPLE 2

There were dogs of many different breeds at the dog park last Saturday. Use experimental probability to determine that a dog picked at random in the neighborhood will be a German Shepherd.

Yorkshire terriers	3
Springer spaniels	3
Dachshunds	1
German shepherds	6

$$p(\text{german shepherd}) = \frac{\text{number of german shepherds}}{\text{total number of dogs}} = \frac{6}{14} = \frac{3}{7}$$

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