

$$\text{Probability} = \frac{\text{number of ways it can happen}}{\text{TOTAL number of outcomes}}$$

Experimental vs. Theoretical Probability

When discussing probability, it is important to know whether or not you are discussing **experimental** probability or **theoretical** probability.

→ past events → future probability

Experimental Probability refers to probability that is based on past events to predict future probability. Past events can help you *extrapolate* information about what might happen in the future. For example, weather people use previous weather data to predict what the weather will be like tomorrow, next week, or even next month.

→ possible outcomes → future probability

Theoretical Probability refers to using possible outcomes to predict future probability. There does not need to be any past events (or experiments) to calculate theoretical probability.

Example 4

Amina has a six-sided cube and each face is labelled with a different number: 1, 2, 3, 4, 5, and 6. She tosses the cube eight times and records the following results: 6, 3, 4, 6, 6, 1, 5, 6.

- a) State the **experimental** probability of tossing the cube and it showing a 6.

$$\begin{aligned} \text{Experimental Probability} &= \frac{\text{number of "successful" outcomes}}{\text{number of attempts}} \\ &= \frac{4}{8} \Rightarrow 50\% \text{ or } 0.5 \end{aligned}$$

- b) State the **theoretical** probability of tossing the cube and it showing a 6.

$$\begin{aligned} \text{Theoretical Prob.} &= \frac{\text{total number of successful outcomes}}{\text{total number of all possible outcomes}} \\ \text{Probability} &= \frac{1}{6} \end{aligned}$$

there are 6 sides, and each side has a different number from 1 to 6.

Example 5

There are 4 red marbles, 3 blue marbles, 2 yellow marbles and 1 green marble. Marcel chooses a marble out of the bag and then replaces it each time. He does this five times. He chose the following colours on his five draws: green, blue, yellow, green, yellow.

- a) Express the **experimental** probability of choosing a green marble.

$$\text{Exp. Probability} = \frac{\text{total green marbles}}{\text{total \# of marbles}} = \frac{2}{5}$$

2 yellows
2 greens
1 blue
5 TOTAL

- b) Express the **theoretical** probability of choosing a green marble.

$$\begin{aligned} \text{Theoretical Probability} &= \frac{\text{total green marbles}}{\text{total all marbles}} \\ &= \frac{1}{10} \end{aligned}$$

4 red
3 blue
2 yellow
1 green
10 marbles