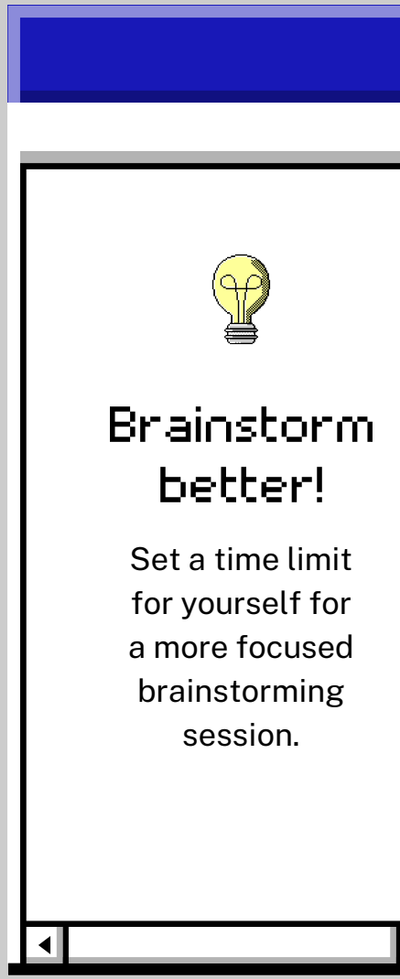
SIMPLE PREDICTIONS OF EVENTS WITH PROBLEM SOLVING

Add a short description

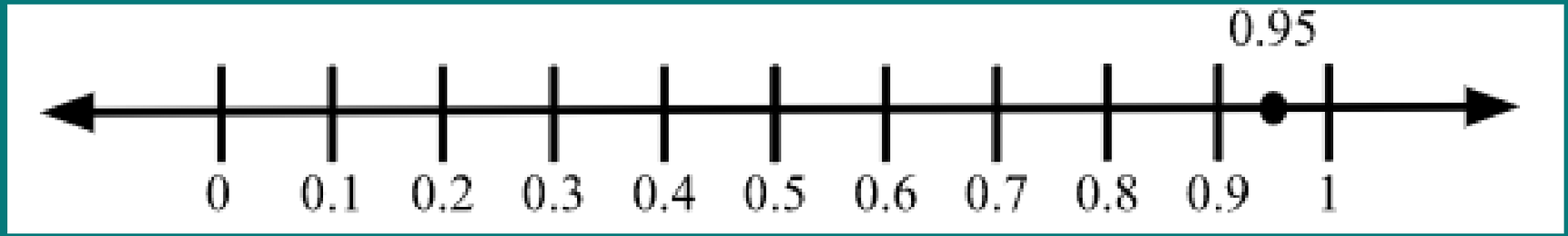
11:11PM

When the pandemic began, our country quickly started implementing the **COVID-19 vaccination program.** Do you know how effective the COVID vaccines are?

According to the **World Health Organization (WHO),** the Pfizer-BioNTech vaccine has an efficacy of **95%** against symptomatic SARS-CoV-2 infection.



Does this mean that getting vaccinated will completely protect you? To answer this question, we need to understand the concept of probability. Based on the data, the effectiveness of the Pfizer-BioNTech vaccine is **95%.** On a number line from 0 to 1, we can locate 95%.



Based on the number line, we can say that if a person is vaccinated with the Pfizer-BioNTech vaccine, they are **highly protected from severe COVID-19**, as the effectiveness is closer to 1 or 100%.

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Probability is the likelihood that an event will occur. It is used to describe how likely or unlikely something is to happen.

Probability can be expressed as a **fraction, decimal, or percentage.** The value of probability ranges from **0 to 1,** where **0** indicates that the **event is impossible** and **1** means the **event is certain to happen.**

Events with a probability **closer to 0 are unlikely to occur,** such as winning a jackpot in a lottery, where the chance is one in a million.

Events with a probability **closer to 1 are most likely to happen.**

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Example 1:

There are colored balls inside a roulette wheel: 4 pink, 2 yellow, 3 violet, and 1 green. What is the likelihood of picking a yellow ball? Since there are 10 balls in total and 2 of them are yellow, the chance of picking a yellow ball is 2 out of 10, or 20%. Therefore, it is unlikely to pick a yellow ball from the roulette wheel.

When we use a formula to calculate the probability of an event, we are determining the **theoretical probability.**

The **theoretical probability** of an event is the ratio of the number of ways the event can occur to the total number of possible outcomes.

$$\text{Theoretical Probability} = \frac{\textit{number of favorable outcomes}}{\textit{number of possible outcomes}}$$

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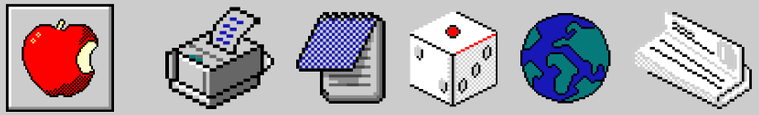
In this example, the number of **favorable outcomes is 2** because there are 2 yellow balls, and the total number of **possible outcomes is 10** because there are 10 balls in the roulette wheel.

$$\textbf{Theoretical Probability} = \frac{2}{10} or \frac{1}{5}$$

Therefore the theoretical probability of getting **yellow ball** is $\frac{1}{5}$



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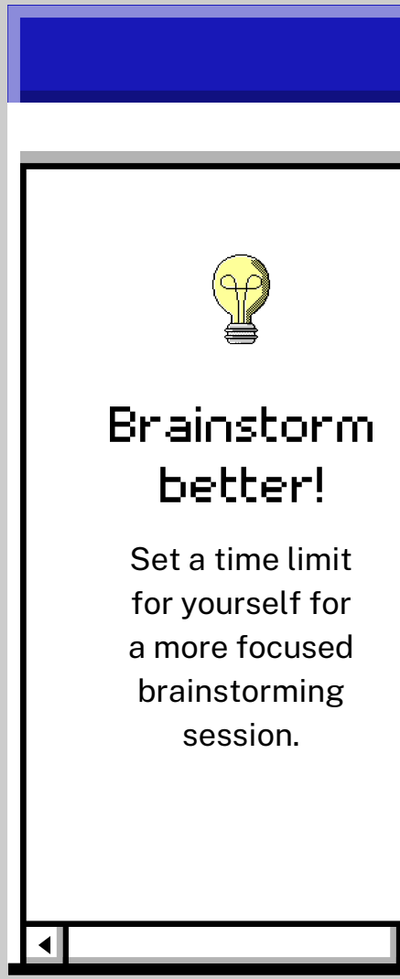
We can also determine the probability of an event by conducting an **experiment.**

This is called **experimental probability.**

The experimental probability of an event is the **ratio of the number of times the event occurs to the total number of trials or repetitions of the activity.**

$$\textbf{Experimental Probability} = \frac{number\ of\ times\ favorable\ outcomes\ occur}{number\ of\ trials\ in\ the\ experiment}$$



Let's use Example 1 to explore experimental probability:

1. Draw a ball from the roulette wheel.
2. Record its color, then return the ball to the box.
3. Repeat this process at least 10 times.
4. Count how many times a yellow ball is picked (e.g., suppose it is picked 4 times).

Using the formula, we have:

$$\textbf{Experimental Probability} = \frac{number\ of\ times\ favorable\ outcomes\ occur}{number\ of\ trials\ in\ the\ experiment}$$

$$\text{Experimental Probability} = \frac{4}{10}$$

$$\text{Experimental Probability} = \frac{2}{5}$$

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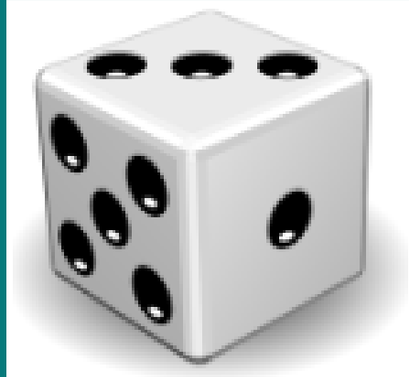
Example 2: What is the probability of rolling a die and getting a face with 1 dot, 3 dots, or 5 dots?



A die has 6 faces, numbered 1 to 6, and each number has an equal chance of appearing.

$$\textbf{Theoretical Probability} = \frac{number\ of\ favorable\ outcomes}{number\ of\ possible\ outcomes}$$

Theoretical Probability (getting a face with 1 dot) $= \frac{1}{6}$

Theoretical Probability (getting a face with 3 dot) $= \frac{1}{6}$

Theoretical Probability (getting a face with 5 dot) $= \frac{1}{6}$

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Example 3:

Arkin tossed a coin 50 times, and it landed on tails 38 times. To find the probability of landing on heads:

Since the total number of tosses is 50 and tails landed 38 times, heads must have landed 12 times.

$$\textbf{Experimental Probability} = \frac{\textit{number of times favorable outcomes occur}}{\textit{number of trials in the experiment}}$$

$$\text{Experimental Probability} = \frac{12}{50} \text{ or } \frac{6}{25}$$

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Example 4:

A clinical trial tested a new medication on 6,000 patients. The medication was successful for 5,100 patients. Calculate the experimental probability of the medication's success.

$$\text{Experimental Probability} = \frac{5100}{6000} \text{ or } \frac{17}{20} \text{ or } 85\%$$

The experimental probability that the vaccine is **effective is** $\frac{17}{20}$ **or 85%.**

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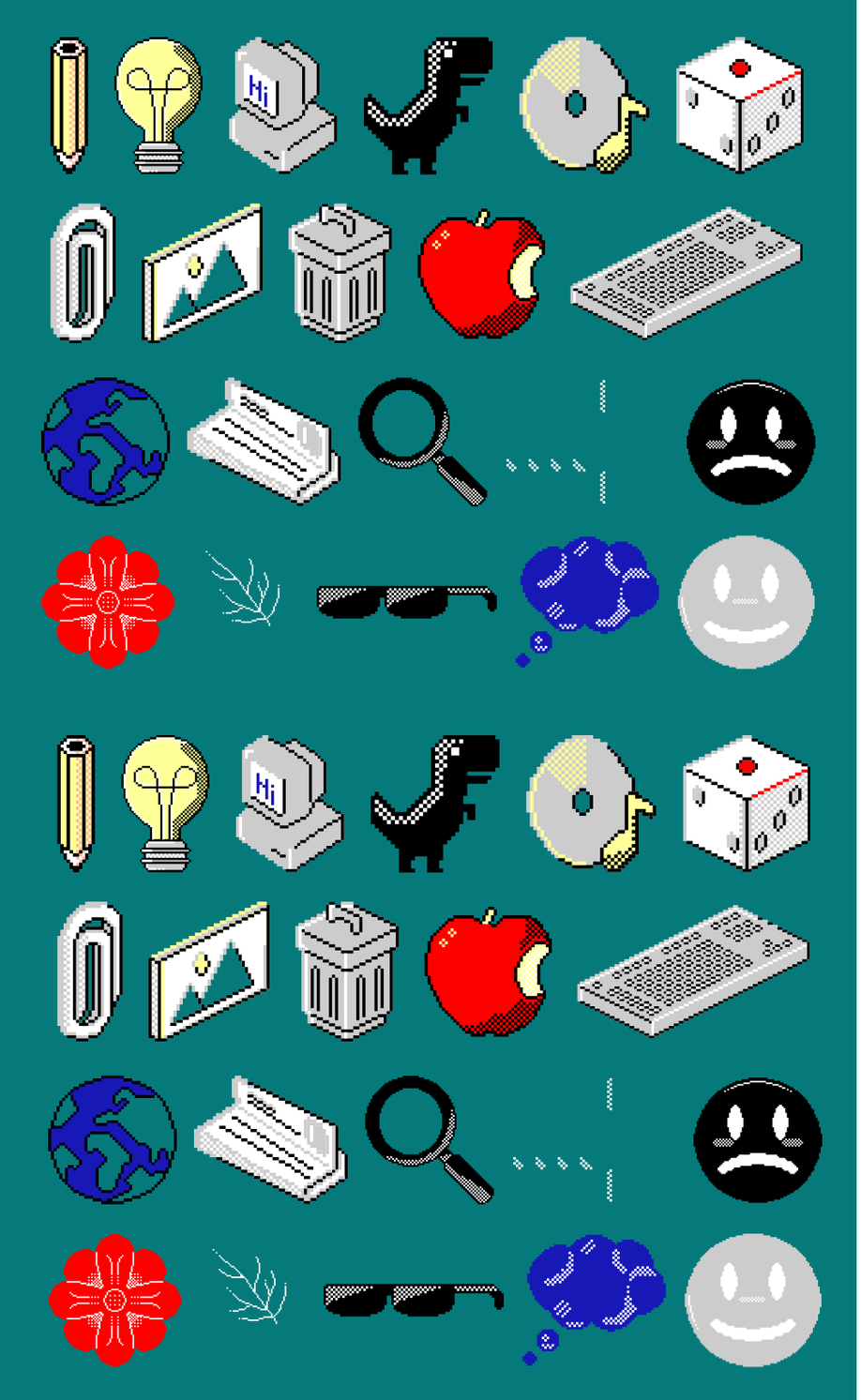

Take note:

Theoretical probability represents what we expect to happen, while **experimental probability** reflects what actually occurs during trials. As the number of trials increases, the experimental probability tends to approach the theoretical probability.