

# What is the difference between Probability and Proportion?

Authored by  
**stats writer**

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Probability and proportion are two mathematical concepts that are often confused with each other. While they both involve the likelihood of an event occurring, they are not the same.

Probability refers to the measure of how likely an event is to occur, expressed as a number between 0 and 1. It is based on the total number of possible outcomes and the number of desired outcomes. For example, if you flip a coin, the probability of getting a heads is 0.5 or 50%.

On the other hand, proportion refers to the relative size or amount of one part compared to the whole. It is expressed as a fraction or percentage. For example, if a class has 20 students and 12 of them are girls, the proportion of girls in the class is 12/20 or 60%.

In summary, the main difference between probability and proportion is that probability deals with the likelihood of an event occurring, while proportion deals with the relative size or amount of one part compared to the whole.

## Probability vs. Proportion: What's the Difference?

Two terms that students often get confused in statistics are probability and proportion.

Here's the difference:

**Probability** represents the chances of some event happening. It is *theoretical*. **Proportion** summarizes how frequently some event actually happened. It is *empirical*.

|               | Probability                                     | Proportion                                              |
|---------------|-------------------------------------------------|---------------------------------------------------------|
| Description   | Represents the chances of some event happening. | Summarizes how frequently some event actually happened. |
| Type of Value | Theoretical                                     | Empirical                                               |

**We often use probability when talking about the chances of some event happening in the future.**

**By contrast, we often use proportion when describing how often some event actually happened in the past.**

**The following examples illustrate the differences between probabilities and proportions in different scenarios.**

#### **Example 1: Probability vs. Proportion in Coin Flips**

**If we flip a fair coin, the probability that it will land on heads is 0.5 or 50%.**

**However, if we flip a fair coin 20 times then we can actually count the proportion of times it landed on heads. For example, perhaps it landed on heads in 60% of the flips.**

The probability of landing on heads is theoretical, but the proportion of times the coin landed on heads is empirical - we could actually count the proportion.

#### Example 2: Probability vs. Proportion in Die Rolls

If we roll a six-sided die, the probability that it will land on the number "4" is  $1/6$  or about 16.67%.

However, if we roll the die 10 times then we can actually count the proportion of times it landed on 4. For example, perhaps it landed on "4" in 20% of the rolls.

The probability of rolling a "4" is theoretical, but the proportion of times the die landed on "4" is empirical - we could actually count the proportion.

#### Example 3: Probability vs. Proportion in Spinners

If we spin a spinner split into four equal parts - red, blue, green, purple - the probability that it will land on purple on any given spin is 25%.

The probability of the spinner landing on purple is theoretical, but the proportion of times it landed on purple is empirical - we could actually count the proportion.

#### Example 4: Probability vs. Proportion in Card Decks

In a standard deck of 52 cards, there are 4 Queens. Thus, the probability of choosing a Queen on any random draw is  $4/52 = 7.69\%$ .

However, if we take a random draw (and replace the card we draw) 50 times, we can actually count the proportion of times we draw a Queen. For example, perhaps we draw a Queen in 10% of the draws.

The probability of the choosing a Queen is theoretical, but the proportion of times we actually choose a Queen is empirical - we could actually count the proportion.