

Grade 7 - Probability and Probability Models - Lesson

Common Core 7.SP.C.5, 7.SP.C.6, 7.SP.C.7 · maths-pdf.fr/en/

Probability is a number from 0 to 1 that measures how likely an event is. When outcomes are equally likely, the theoretical probability is the number of favorable outcomes divided by the total number of outcomes. The relative frequency from many trials approximates the probability. The probabilities in a model always add up to 1.

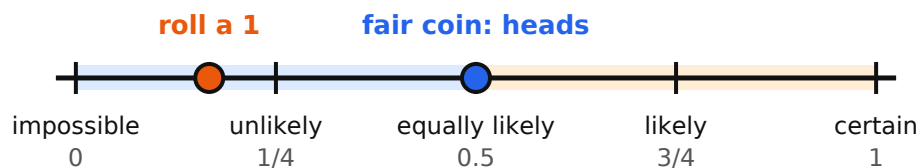
Grade 7 · Common Core State Standards: **7.SP.C.5, 7.SP.C.6, 7.SP.C.7**

Key facts

- Probability is between 0 (impossible) and 1 (certain).
- Equally likely outcomes: $P = \text{favorable} \div \text{total}$.
- Relative frequency = number of times the outcome happens $\div$ number of trials.
- The probabilities of all outcomes in a model add up to 1.
- $P(\text{not } A) = 1 - P(A)$.

What is probability?

The **probability** of an event is a number between 0 and 1 that tells how likely the event is. A probability near 0 means unlikely, near $\frac{1}{2}$ means about as likely as not, and near 1 means likely.



Probability is a number from 0 (impossible) to 1 (certain). Landing heads on a fair coin has probability $\frac{1}{2}$.

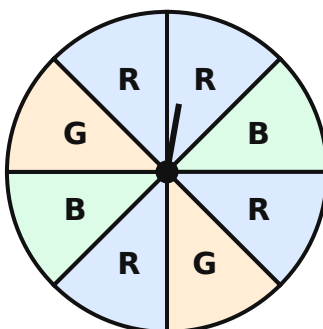
An event with probability 0 is impossible, such as rolling a 7 on a standard die. An event with probability 1 is certain, such as rolling a number less than 7.

How do you find theoretical probability?

Theoretical probability

When all outcomes are **equally likely**:

$P(\text{event}) = \text{number of favorable outcomes} \div \text{total number of outcomes}$. This is called a **uniform** probability model.

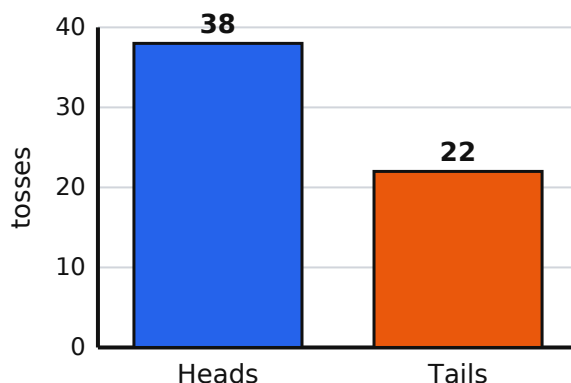


This spinner has 8 equal sections: 4 red, 2 blue, 2 green. $P(\text{red}) = 4/8 = 1/2$.

On the spinner, 4 of the 8 sections are red, so $P(\text{red}) = \frac{4}{8} = \frac{1}{2}$. The probability of an event that does not happen is $1 - P(\text{event})$, so $P(\text{not red}) = \frac{1}{2}$.

What is relative frequency?

If you repeat an experiment many times, the **relative frequency** of an outcome is the number of times it happens divided by the total number of trials. It is an approximation of the probability, and it gets closer to the theoretical value as the number of trials grows.



In 60 tosses, 38 heads gives a relative frequency of $38/60$, about 0.63.

Heads came up 38 times in 60 tosses, so the relative frequency is $\frac{38}{60} \approx 0.63$, while the theoretical probability is 0.5. With only 60 trials, some difference is expected.

What is a probability model?

A probability model lists all outcomes with their probabilities. In a uniform model each outcome has the same probability. In a **non-uniform** model the probabilities differ, but they always add up to 1.

Outcome	Red	Blue	Green	Total
Probability	1/2	1/4	1/4	1

The probabilities in a model add up to 1.

You can use a probability to predict. If the chance of rain is 0.35, you expect rain on about $0.35 \times 20 = 7$ of the next 20 days.

Questions about probability and probability models

What does a probability of 0.5 mean?

It means the event is as likely to happen as not to happen, like heads on a fair coin.

What is the difference between theoretical and experimental probability?

Theoretical probability is found by reasoning about equally likely outcomes. Experimental probability, or relative frequency, comes from repeating an experiment and counting.

Why do relative frequencies differ from theoretical probabilities?

Chance causes variation in small numbers of trials. With many more trials, the relative frequency usually gets closer to the theoretical probability.

What is a uniform probability model?

A model where every outcome has the same probability, like rolling a fair die where each face is $\frac{1}{6}$.

How do I find the probability of an event not happening?

Subtract the probability of the event from 1. If $P(\text{rain}) = 0.35$, then $P(\text{no rain}) = 0.65$.