

Simple Probability Rules

To find a probability

Make a fraction:

The **bottom** number tells you how many possible **outcomes** there are **in total**

The **top** number tells you the **number of outcomes that fit the question** you have been asked

$$\frac{\text{how many things fit the question}}{\text{total number of outcomes}}$$

Simplify the fraction if you can

You can turn the fraction into a decimal by completing the division
You can turn the decimal into a percentage by multiplying by 100

Example

There is a bag of 5 red balls, 6 yellow balls and 3 blue balls. What is the probability of picking a yellow ball?

$$\frac{\text{yellow balls}}{\text{total number of balls}}$$

$5 + 6 + 3 = 14$ balls in total

6 yellow balls

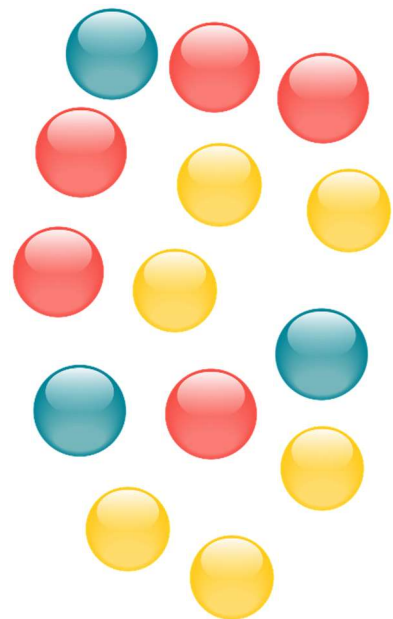
$\frac{6}{14} \rightarrow \frac{3}{7}$ this is our probability

If you want to turn it into a decimal, do $3 \div 7 = \mathbf{0.43}$

To turn this into a percentage $0.43 \times 100 = \mathbf{43\%}$

Try it Out

What is the probability of picking a red ball?



Probability with Two Things

One thing happens **AND** another thing happens

When you see the word **AND** in probability, it tells you to **multiply**.
You create your two fractions then you multiply them together.

Independent or Dependent?

First, check – are they independent events? That means, does the first thing happening change the number of outcomes for the second thing?

Independent

I throw a pair of dice. I want to know the probability of getting a four both times. The two events are **INDEPENDENT** as what I get on the first die doesn't affect what I get on the second die.

$$\begin{array}{ccc} \text{First thing} & & \text{Second thing} \\ \frac{\text{how many thing fit the question}}{\text{total number of outcomes}} & \times & \frac{\text{how many thing fit the question}}{\text{total number of outcomes}} \end{array}$$



Getting a four

$$\frac{1}{6}$$

×

Getting a four

$$\frac{1}{6}$$

=

$$\frac{1}{36}$$

The probability of getting a four both times is $\frac{1}{36}$

If you take something then put it back, it is independent.

Try it Out

What is the probability of tossing two coins and getting a head both times?

Dependent

There are 3 doughnuts and 5 cakes in a box. I pick without looking and then my partner picks without looking. I can choose from 8 options, but he can only choose from 7 options. This is **DEPENDENT**.

What is the probability of me picking a doughnut and my partner also picking a doughnut?



$$\begin{array}{ccc} \text{First thing} & & \text{Second thing} \\ \frac{\text{how many thing fit the question}}{\text{total number of outcomes}} & \times & \frac{\text{how many things fit the question}}{\text{total number of outcomes}} \end{array}$$

Total outcomes at first is 8 (3 doughnuts plus 5 cakes)

Picking a doughnut

$$\frac{3}{8}$$

Picking a doughnut

$$\times \frac{2}{7} = \frac{6}{56} \rightarrow \frac{3}{28}$$

Second time round the total outcomes are 7 because one thing has gone. There are also now only 2 doughnuts because 1 has gone.

The probability of me picking a doughnut and him also picking a doughnut is $\frac{3}{28}$

Try it Out

What is the probability of me picking a doughnut and him picking a cake?

What is the probability of me picking a cake and him also picking a cake?

ANSWERS

What is the probability of picking a red ball?

$$\frac{5}{14} \text{ OR } 0.36 \text{ or } 36\%$$

14 balls in total and 5 red balls $\rightarrow \frac{5}{14}$ This can't be simplified

You could turn it into a decimal $5 \div 14 = 0.36$

You could turn it into a percentage $0.36 \times 100 = 36\%$

What is the probability of tossing two coins and getting a head both times?

$$\frac{1}{4} \text{ or } 0.25 \text{ or } 25\%$$

Getting a head

Getting a head

$$\frac{1}{2} \quad \times \quad \frac{1}{2} \quad = \quad \frac{1}{4}$$

What is the probability of me picking a doughnut and him picking a cake?

$$\frac{15}{56} \text{ or } 0.27 \text{ or } 27\%$$

Total outcomes at first is 8 (3 doughnuts plus 5 cakes)

Picking a doughnut

Picking a cake

$$\frac{3}{8} \quad \times \quad \frac{5}{7} \quad = \quad \frac{15}{56}$$

What is the probability of me picking a cake and him also picking a cake?

$$\frac{5}{14} \text{ or } 0.36 \text{ or } 36\%$$

Picking a cake

Picking a cake

$$\frac{5}{8} \quad \times \quad \frac{4}{7} \quad = \quad \frac{20}{56} \rightarrow \frac{5}{14}$$