

# THEORETICAL PROBABILITY

## Probability

### Key Concepts

**Probabilities** can be described using **words** and **numerically**.

We can use **fractions, decimals or percentages** to represent a probability.

**Theoretical probability** is what should happen if all variables were fair.

All probabilities must **add to 1**.

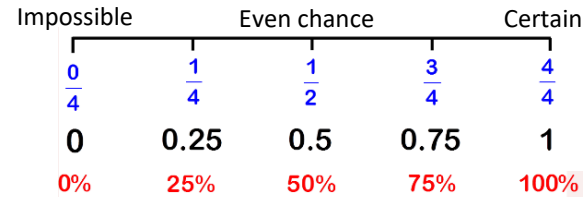
The probability of something **NOT** happening equals:

$$1 - (\text{probability of it happening})$$



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### Probability scale:



There are only red counters, blue counters, white counters and black counters in a bag.

Colour	Red	Blue	Black	White
No. of counters	9	3	5	2

- What is the probability that a blue counter is chosen?  $\frac{3}{19} = \frac{\text{number of blue}}{\text{total number of counters}}$
- What is the probability that red is **not** chosen?  $\frac{10}{19} = \frac{\text{number of all other colours}}{\text{total number of counters}}$

### Examples

There are only red counters, blue counters, white counters and black counters in a bag.

Colour	Red	Blue	Black	White
No. of counters	9	3x	x-5	2x

A counter is chosen at random, the probability it is red is  $\frac{9}{100}$ . Work out the probability it is black.

$$\begin{aligned} 9 + 3x + x - 5 + 2x &= 100 \\ 6x + 4 &= 100 \\ x &= 16 \end{aligned}$$

$$\begin{aligned} \text{Number of black counters} &= 16 - 5 \\ &= 11 \end{aligned}$$

$$\text{Probability of choosing black} = \frac{11}{100}$$

### Key Words

Theoretical  
Probability  
Fraction  
Decimal  
Percentage  
Certain  
Impossible  
Even chance

	1	2	3
Prob	5	4	9

- Calculate the probability of choosing a 2.
- Calculate the probability of not choosing a 3.

	1	2	3
Prob	0.37	2x	x

- Calculate the probability of choosing a 2 or a 3.