



# Binary: How Computers Use Ones and Zeros

KS3 Ages 11-14 ⌚ 3 min read

## What is Binary?

**Binary** is a counting system that uses only **two digits: 0 and 1**. Unlike the system we use every day (which has 10 digits: 0 through 9), computers can only understand these two numbers. Every piece of information stored on a computer—from a photo to a video game, a text message to a song—is represented using long chains of 0s and 1s.

Why do computers use only two digits? Because computers are built from tiny electronic switches called **transistors**. These switches are either ON or OFF—they can't be anything in between. When a switch is ON, we represent it as **1**. When it's OFF, we represent it as **0**.

Think of it like light switches in your home. Each switch is either on (1) or off (0). Computers use millions of these electronic switches working together, just like different combinations of light switches can create different lighting patterns around your house.

## How Does Binary Store Information?

A single **0 or 1 is called a "bit"** (short for binary digit). But one bit alone can't store much information. Eight bits grouped together make one **"byte."** A byte can represent **256 different values**—enough to store a single letter, number, or symbol.

Longer sequences of bytes can represent bigger things. For example, the letter **A** might be stored as **01000001** in binary. A photo is millions of bytes, with each byte describing the colour and brightness of one tiny dot on your screen.

Think of it like LEGO bricks. One brick is just one brick, but when you combine many bricks together in different patterns, you can build anything—a castle, a car, or a spaceship. Binary works the same way: simple 0s and 1s combine to create all the complex information computers handle.

## How Does Binary Help Computers Process Information?

Computers don't actually understand English, pictures, or music. They only understand binary. When you type a message, your **keyboard sends binary codes** to your computer. The computer processes these binary instructions using **logic gates**—special circuits that perform simple yes/no decisions on binary digits.

By performing millions of these tiny binary calculations every second, computers can do everything from running games to running hospitals. **Programming languages** like Python or Java are translated into binary so computers can follow your instructions. Every app you use, every website you visit, and every video you watch is ultimately controlled by chains of 0s and 1s being processed at lightning speed.

Binary is the fundamental language that makes modern computing possible. Without it, we wouldn't have smartphones, internet, or artificial intelligence.