How does a camera work?

KS2 KS3 Ages 7-14 ⏰ 3 min read

You point your phone at something, tap the screen, and a perfect image appears. It all happens so fast it feels instant. But in that tiny fraction of a second, some remarkable physics is taking place.

It all starts with light

A camera is essentially a light-capturing machine. Everything you can see exists because light bounces off it into your eyes (or a camera lens). The camera's job is to collect that reflected light, focus it, and record exactly where the light and colour came from.

The **lens** at the front of a camera is shaped to bend incoming light rays so they converge at exactly the right point — on the sensor (in a digital camera) or on the film (in an old-fashioned camera). Without the lens, the light would just spray everywhere and you'd get a blurry mess.

Imagine light as rain falling from all directions at once. The lens is like a funnel — it collects all that rain and directs it precisely into a bucket. If the funnel is the wrong shape, the water misses the bucket. That's what "being out of focus" means: the light is landing in the wrong place.

The sensor: turning light into numbers

In a digital camera or smartphone, light hits an **image sensor** — a chip covered in millions of tiny light-sensitive cells called **pixels**. Each pixel measures how much light hits it and records that as a number. A 12-megapixel camera has 12 million of these tiny cells, each capturing one tiny piece of the image.

Pixels can't see colour on their own — they only measure brightness. So engineers put a filter over each pixel, allowing only red, green, or blue light through. The camera then combines the readings from neighbouring pixels to work out the actual colour of each point in the image.

The shutter

The **shutter** controls how long the sensor is exposed to light. For a bright sunny day, the shutter might open for only 1/1000th of a second — plenty of light, no need for more. In a dark room, it might stay open for several seconds to gather enough light to make a decent image. Leave it open too long and moving objects (or a shaky hand) will blur.

Processing the image

After the sensor captures the data, a tiny computer inside the camera processes it — sharpening edges, adjusting colour balance, reducing noise. What comes out the other end is the photo you see on your screen. Modern smartphone cameras do extraordinary amounts of this processing, using AI to brighten faces, add blur to backgrounds, and merge several rapid-fire shots into one perfect image. It's far more computing than photography at this point.