How do computers represent + store information?

Binary — base 2

Recall: $435 = 400 + 30 + 5 = 4\times100 + 3\times10 + 5\times1$

$= 4\times10^2 + 3\times10^1 + 5\times10^0$

base 10.

Binary = same, but we (a) use powers of 2 instead of 10
(b) use only 2 digits (0, 1) instead of 10.

8's place, 4's place, 2's place, 1's place

eg. $1101_2 = 1\times8 + 1\times4 + 0\times2 + 1\times1 = 13$

base 2.

- Positive integers are stored in base 2.
- Negative integers? Use a 1 or 0 to indicate positive or negative.

A single 1 or 0 is called a binary digit = bit.

8 bits = byte (1 character)

1 kilobyte = 1024 bytes = 2^{10} bytes. (paragraph)

(1024 bytes = kibibyte = KiB)

1 megabyte (MB) = 1024 kilobytes = 2^{20} (~1 million) (image)

1 gigabyte (GB) = 1024 megabytes = 2^{30} bytes (game, video)

1 terabyte = 2^{40} bytes (hard drive)

1 petabyte 2^{50}

1 exabyte 2^{60} ~ Google

1 zettabytes ~ data on whole internet.

⋮

Text? — every character has a numeric code.

Images? — broken into squares called "picture elements" = "pixels".
each pixel = red + green + blue. (0-255 of each).
hence 1 pixel = 3 bytes.

Audio? — Sequence of numbers — air pressure from 0-255
44,000 times per second.