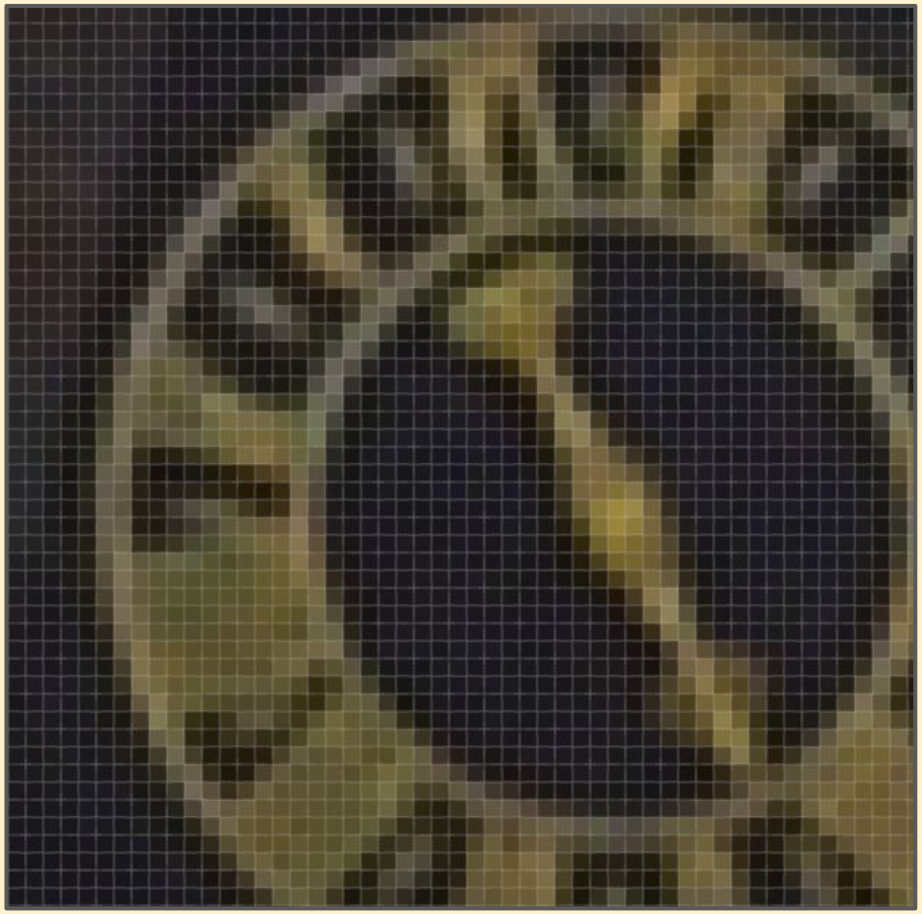
Representing images

All **data** stored in a computer is stored as binary numbers.

This means that images need to be stored as numbers. There needs to be a way to break the image down into small parts and then a way to **represent** each part as a number.

Representing images

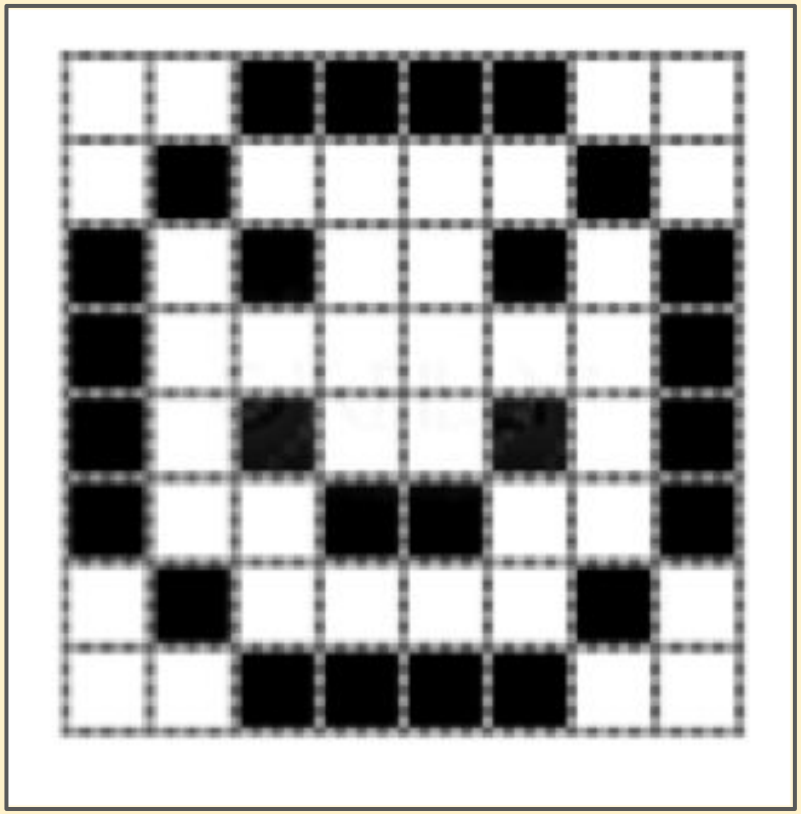


Images are split into a grid of **pixels**

This allows each **pixel** to be given a numerical value to encode it

A **pixel** is a **single point in an image** - a **Picture Element**

Representing images



The grid of pixels is called a **bitmap**

Each pixel in the bitmap can be encoded using binary bits

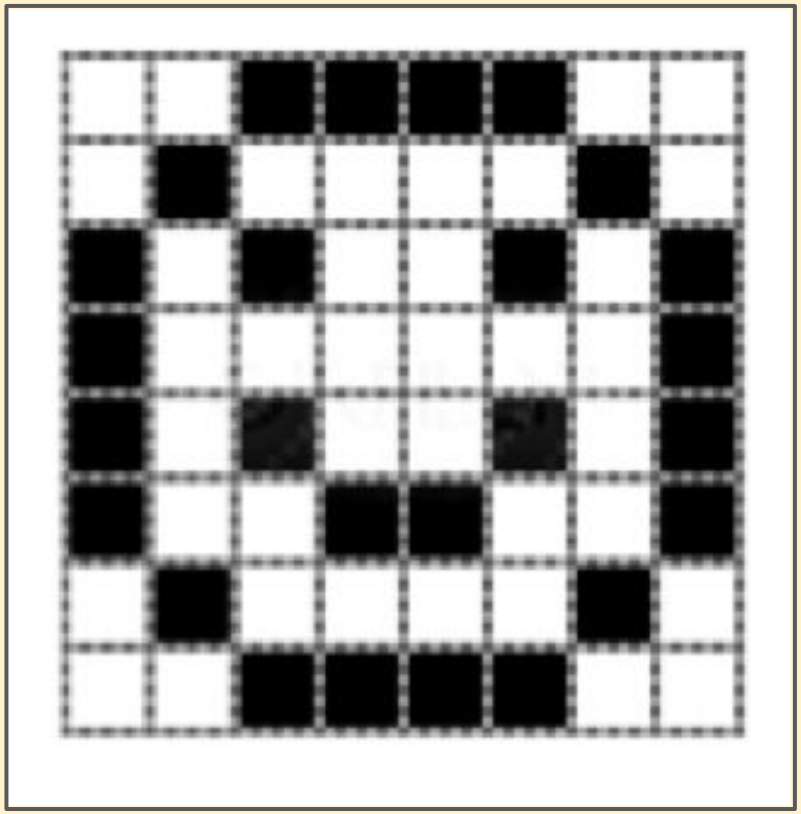
This bitmap is 8 x 8 pixels = 64 pixels

Representing images

The **image size in pixels** is the width times the height

image size = width x height

Representing images



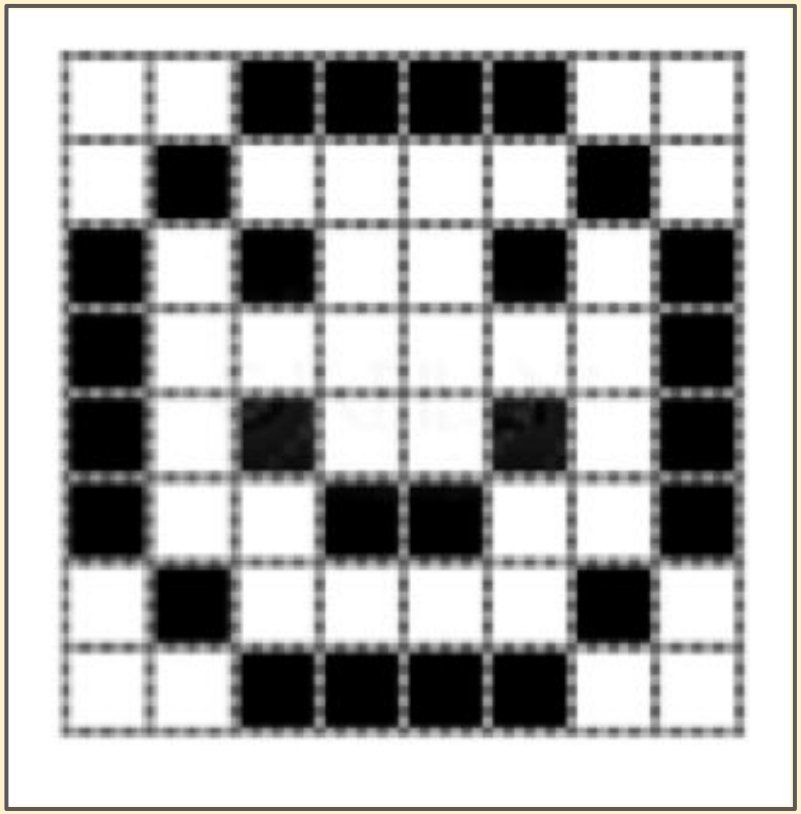
Black and white bitmaps have **two** possible colours per pixel

So each pixel takes **1 binary bit** to represent it

Generally:

- 0 = black
- 1 = white

Representing images



The first row of this bitmap is encoded as:

11000011

The third row is encoded as:

01011010

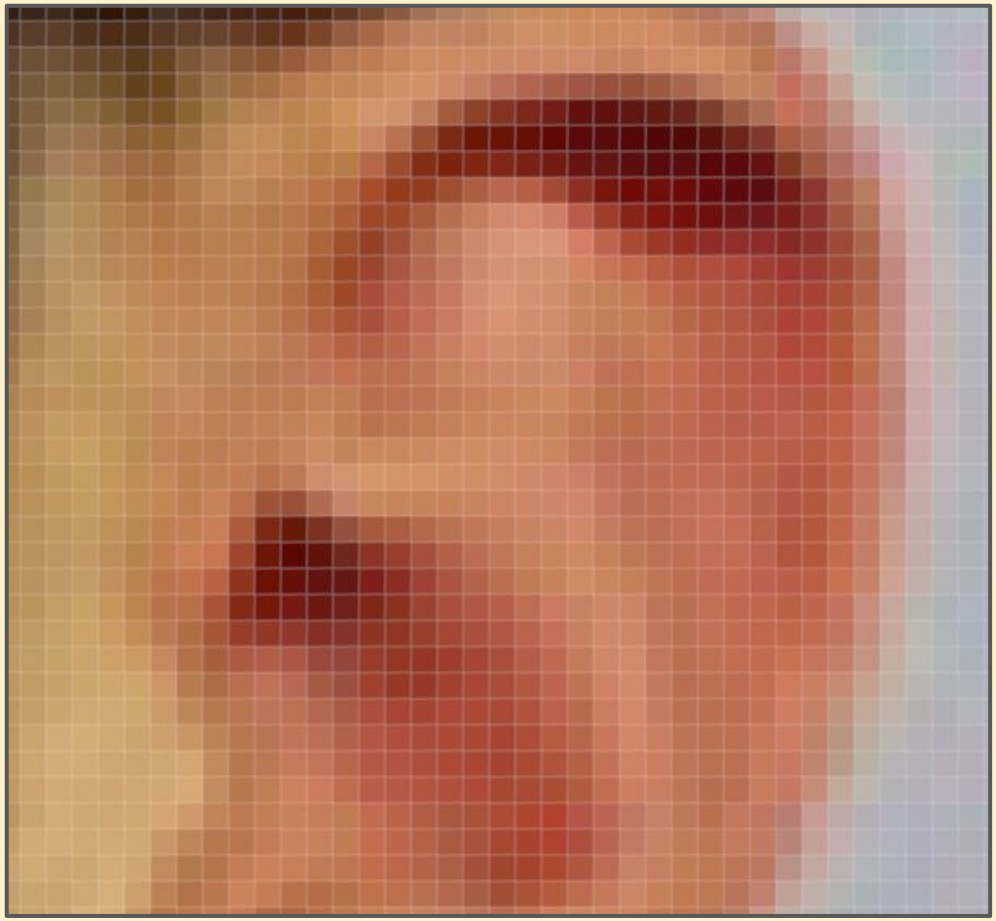
Representing images

When you add **colour** to a bitmap you need more than 1 bit to encode each pixel

For example, if you use 4 bits per pixel, you have 16 different colours (4 bits is 0 to 15 = 16 numbers)

The number of bits used to encode each pixel of a bitmap is called the **colour depth**

Representing images



The more colours you encode the more bits are needed for each pixel and the greater the colour depth

This makes files bigger, but images more realistic

Representing images

Standard JPG images use **24 bit colour depth**:

- 8 bits for red
- 8 bits for green
- 8 bits for blue

Example hex code:

#FF5733 

We use hex codes to write these because they’re easier for humans to use than using binary but clearer (and less prone to error) than using decimal

Representing images

The greater the colour depth the larger the file size.

file size = width x height x colour depth

- 1 bit colour depth = black and white only
- 3 bit colour depth = 8 colours
- 24 bit colour depth = c. 16.7 million colours