Pixels

The Computing

One way images are represented and so stored in a computer or digital camera is as a grid of numbers. This way of representing an image is called a **bitmap image** or a **raster image**.

Each image is split in to a grid of squares. Each number gives the color of that square of the image. Each square is called a pixel. The more pixels making up the image the **higher the resolution** it has. Higher-resolution pictures have more detail and in particular lines are smoother. The image is less pixelated – you see the squares less. It also means you can see more fine detail – smaller things may disappear in a **low resolution** image.

Each image has to also come with (or have pre-agreed) a key indicating which number corresponds to which color. The number of colors allowed is called the **color depth**. The more colors, the more bits are needed to store each pixels colors. With two colors you need a single bit for each pixel, with 4 colors you need 2 bits, with 8 colors you need 3 bits, and so on. Each bit pattern represents a different number and so a different color.

Computational Thinking

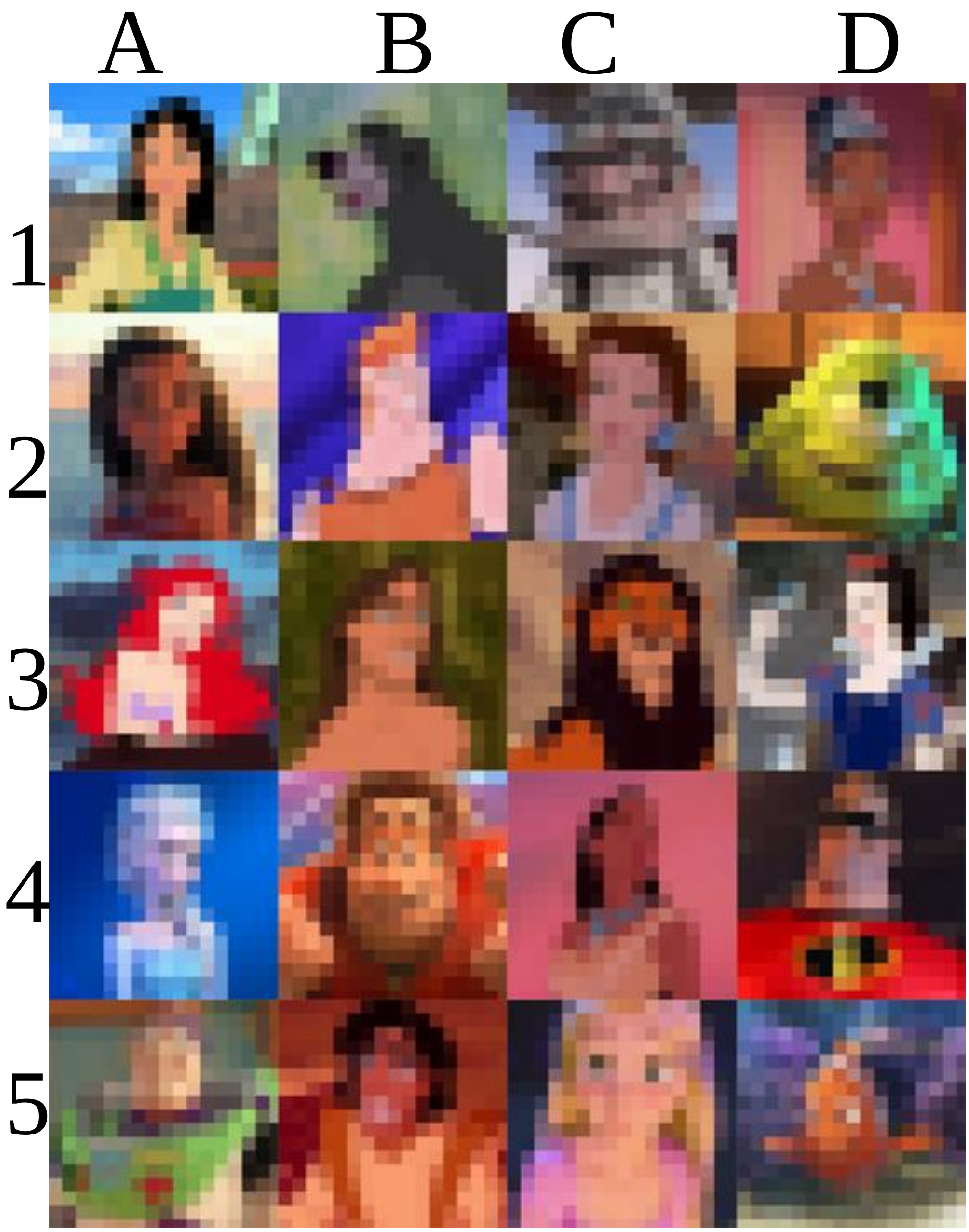
An important part of computational thinking involves being able to choose an appropriate **representation** of data. It is important to know about different representations already used. Choosing representations is a part of **abstraction**: choosing what matters to represent about data and what can be ignored. With bitmap images, part of that is in choosing the resolution. By splitting the image in to small squares and ignoring finer detail, we get an easy way to store, manipulate and transmit images. Once the image is a list of numbers we can explore variations of the representation that allow us to compress the image – store it using fewer numbers.

This is also an example of decomposition with respect to data. The image is decomposed in to small squares. A different way to decompose an image, so a different representation is by the lines and shapes within it.
This **decomposition** instead leads instead to **vector images.**

Every image is unique, but by choosing a representation of bitmap images we get a **generalized** way to represent an image. Any image can be represented this way.

Can you guess the pixelated Disney character?

1A ______________________
1B ______________________
1C ______________________
1D ______________________
2A ______________________
2B ______________________
2C ______________________
2D ______________________
3A ______________________
3B ______________________
3C ______________________
3D ______________________
4A ______________________
4B ______________________
4C ______________________
4D ______________________
5A ______________________
5B ______________________
5C ______________________
5D ______________________



1A. Mulan, 1B Baloo, 1C Carl, 1D Princess Tiana, 2A Moana, 2B Hercules, 2C Belle, 2D Mike Wazowski, 3A Ariel, 3B Tarzan, 3C Scar, 3D Snow White, 4A Elsa, 4B Wreck it Ralph, 4C Pocahontas, 4D Robert Parr, 5A Buzz, 5B Aladdin, 5C Rapunzel, 5D Nemo

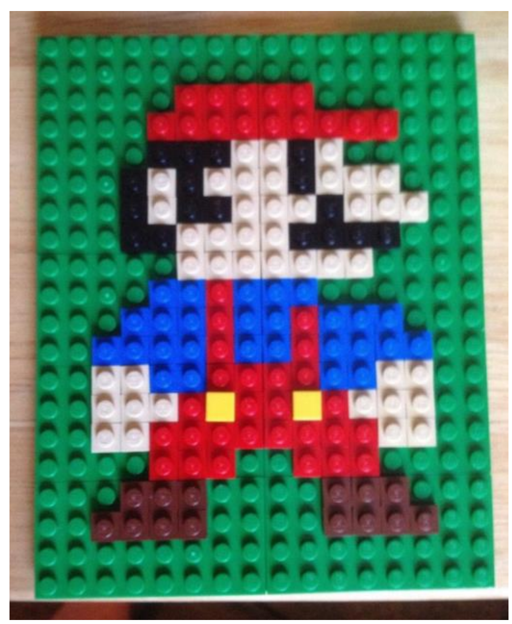
Pixelated Mario

Make your own color by number in reverse!

- Give each color on the lego Mario a number.
- Write that number on the grid where that color should go.
  - How many legos would you need to make Marion?
  - How many: Red? Black? Blue? Peach? Yellow? And Brown?
  - If you have Legos at home try to build the Mario picture. What other characters can you make using pixels?

Give each color a number 1 - 6

___ Red
___ Black
___ Blue
___ Peach
___ Yellow
___ Brown



Pixelate the first letter of your name

Pixelate your favorite cartoon character