# Year 9 Topic 6 – Going Audiovisual

| Lesson | Can you? |
|---|---|
| 1 Binary mosaic | Describe how digital images are composed<br>Recall that the colour of each picture element is represented using a sequence of binary digits<br>Define key terms such as ‘pixels’, ‘resolution’, and ‘colour depth’ |
| 2 A splash of colour | Describe how colour can be represented as a mixture of red, green, and blue, with a sequence of bits<br>Compute the size of a digital image, by multiplying resolution (number of pixels) with colour depth<br>Describe the trade-off between size and quality |
| 3 Collage | Perform basic image editing tasks<br>Explain how the manipulation of digital images amounts to arithmetic operations on their digital representation |
| 4 Good vibrations | Explain the function of microphones and speakers as components that capture and generate sound<br>Define key terms such as ‘sample’, ‘sampling frequency/rate’, ‘sample size’ |
| 5 Sonic playground | Calculate file size for a given digital sound<br>Explain how attributes such as sampling frequency and sample size affect quality, and the trade-offs involved<br>Perform basic sound editing tasks |
| 6 Always another way | Recall that bitmap images and pulse code sound are not the only binary representations of images and sound available<br>Define ‘compression’, and describe why it is necessary |

## Useful websites

- www.curriculum.code.org
- www.csfieldguide.org.nz
- www.cs4fn.org
- www.youtube.com/watch?v=7Jr0SFMQ4Rs
- www.pippin.gimp.org/image_processing/chap_dir.html
- www.projects.raspberrypi.org
- www.trinket.io/sense-hat
- www.pythonhosted.org/sense-hat/api/#led-matrix
- www.scratch.mit.edu
- www.sonic-pi.net
- www.soundcloud.com/the-british-library/first-recording-of-computer-music-1951-Copeland@long-restoration
- www.commons.wikimedia.org/wiki/File:Chopin_-_Nocturne_in_F_Minor_variation.mid
- www.vintagecomputermusic.com/mp3/s2t9_Computer_Speech_Demonstration.mp3
- www.web.archive.org/web/20000407081031/http://www.bell-labs.com/news/1997/march/5/2.html
- www.en.wikipedia.org/wiki/MIDI
- www.parametric.press/issue-01/unraveling-the-jpeg
- www.classic.csunplugged.org
- www.bbc.co.uk/bitesize/clips/zc2svcw
- www.teachinglondoncomputing.org/compression-code-puzzles

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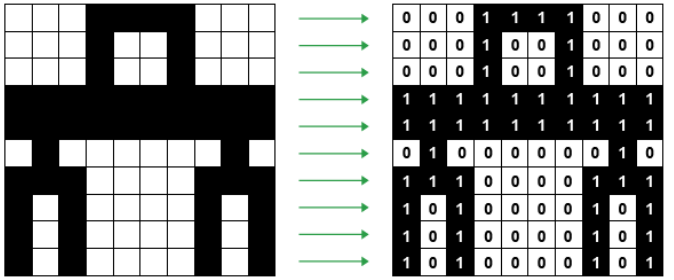
**Key Stage 3 - COMPUTING**

Each colour of an image is stored as a **binary** number. In the black-and-white image below, each pixel is either black or white. You need a binary value for each different colour. As each pixel is either black or white, this image can be encoded with a value of 0 for white and 1 for black.





Bitmap images are organised as a grid of coloured squares called pixels (short for 'picture elements'). When zooming in or enlarging a bitmap image, the pixels are stretched and made into larger blocks. This is why bitmap images appear as poor quality when enlarged too much.

Most computer systems and digital cameras use 24-bit images. 24 in binary is 1111 1111 1111 1111 1111 1111. This means there are over 16 million possible colours per pixel.

**Resolution** is a measure of **pixel density**, usually measured in **pixels per inch (ppi)**. Images on websites usually have a resolution of 72 ppi. This means that a 1-inch square contains a grid of pixels that is 72 pixels wide by 72 pixels high. 72 x 72 = 5184 pixels per square inch.

The colour depth of an image is measured in **bits**. The number of bits indicates how many colours are available for each pixel. In the black and white image, only two colours are needed. This means it has a colour depth of 1 bit.

A 2-bit colour depth would allow four different values: 00, 01, 10, 11. This would allow for a range of colours such as:

Compression can be **lossy** or **lossless**. Lossless compression means that as the file size is compressed, the picture quality remains the same - it does not get worse. Also, the file can be decompressed to its original quality. Lossy compression permanently removes data.

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