



Binary code Pixel challenge

Teacher sheet

Please read this sheet before setting the challenge for the pupils as some of this information is not to be shared with them but is for your knowledge only.

Computers and electrical devices store and communicate digital information as binary code. Images are also stored in the same way but are represented as pixels on an output display.

Bits and Bytes

The zero or one (on/off) is called a **bit** and is the smallest unit of digital storage.
Eight **bits** = one **byte**

Pixels

A pixel, or picture element, is the smallest unit of data displayed on an output device. Digital images are usually made up of thousands of pixels. Computer monitors can usually display hundreds of thousands of pixels.

RGB colours

A single pixel in an image has only three colour group options, for example, a gradient of Red, Green or Blue. In order to make other colours, a mixture of these three options is used. Pixels are stored as three bytes (24bits), that is, three groups of eight bits. The reason for this is as follows:

Pixel value in binary	128	64	32	16	8	4	2	1	Total value
Red									255
Green									255
Blue									255

The table above shows the three gradients of red, green and blue as mentioned earlier. The gradients fall within their binary value which has a maximum of 255. When thinking of colour storage on a computer, think of it as either the presence or absence of light. Where no light is present the value is zero and therefore the colour displayed as a pixel is black.

The binary value for red is 255, which means all of the positions for each bit are turned on. The same can be said for green and blue.

The other colours can be achieved by mixing the values of each of these colours.

The presence of all colours displayed at 255 each gives the maximum presence of light which is white. The visual output display (device screen or computer monitor) will display colours according to its **RGB** value ranging from 0-255 for Red, Green and Blue.

The challenge:

To work out the binary value for the colours of the rainbow or flags. Using an RGB app or its equivalent, pupils are to record the RGB values next to each colour on the grid.

Things to know:

Pupils should develop a method of working systematically in order to know they have explored all options.