

Pictures

Storage and Encoding

Multiple Types of Encoding Formats

- BMP (Bitmap)
 - Lossless
 - Uncompressed
- JPEG (Joint Photographic Experts Group)
 - Lossy Compression
 - Data is lost in compression (original can't be recovered)
- PNG (Portable Network Graphics)
 - Lossless Compression
 - Data is not lost in compression (original can be recovered)

Refresher

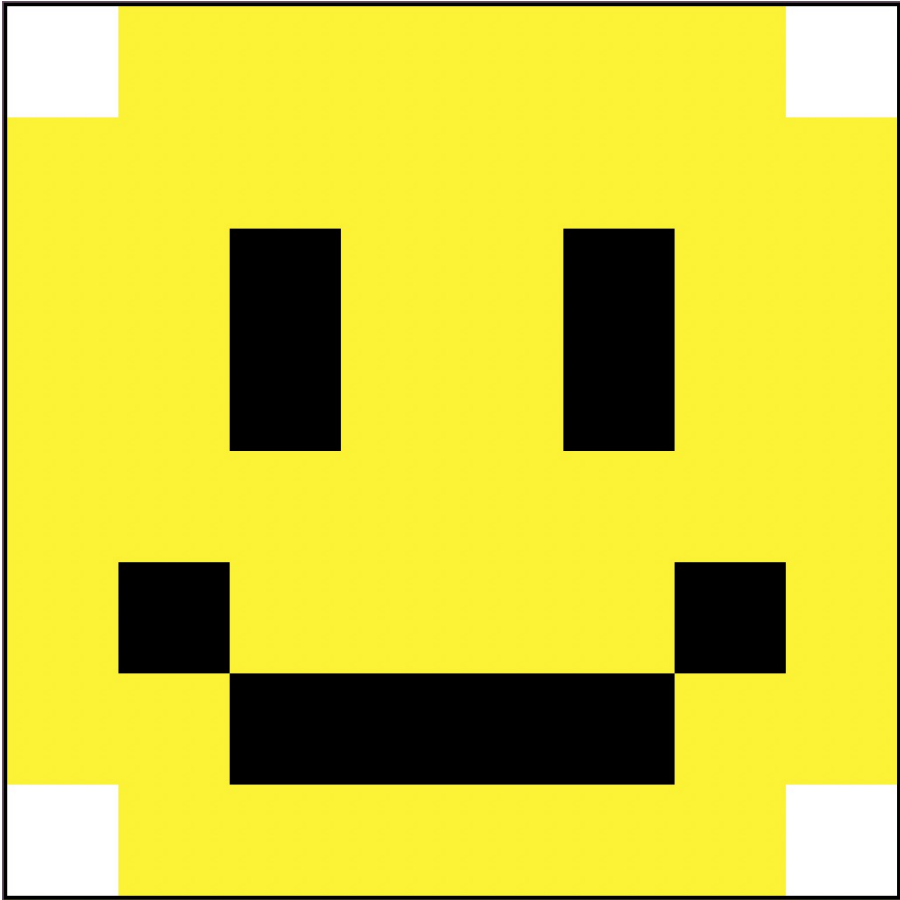
Strings

	0	1	2	3	4
"Hello"	"H"	"e"	"l"	"l"	"o"

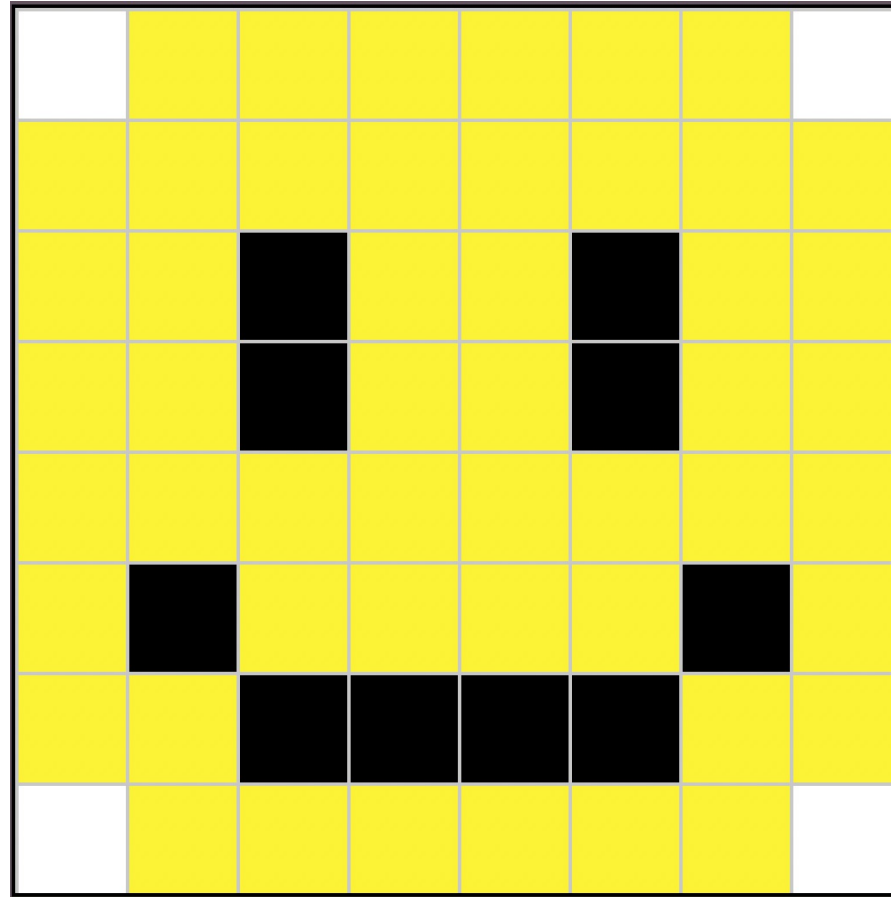
Lists

	0	1	2	3
"Computer Science is Cool".split()	"Computer"	"Science"	"is"	"Cool"

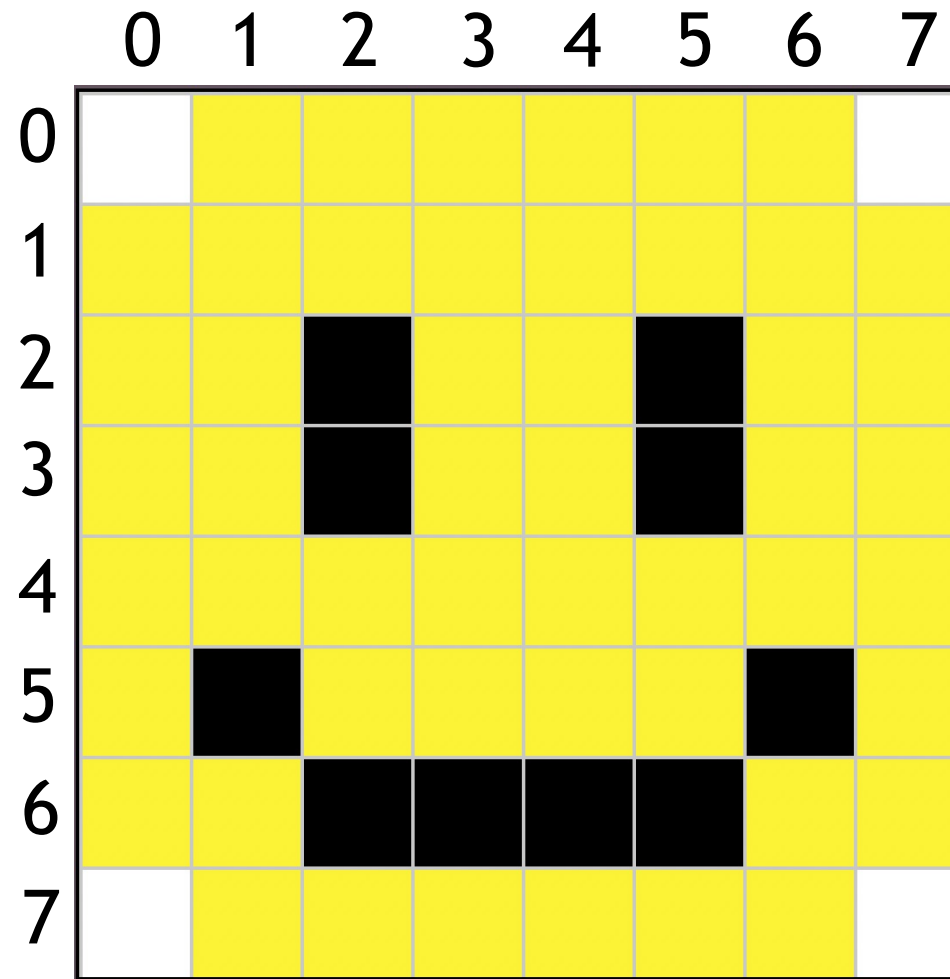
Storing Pictures



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Storing Pictures

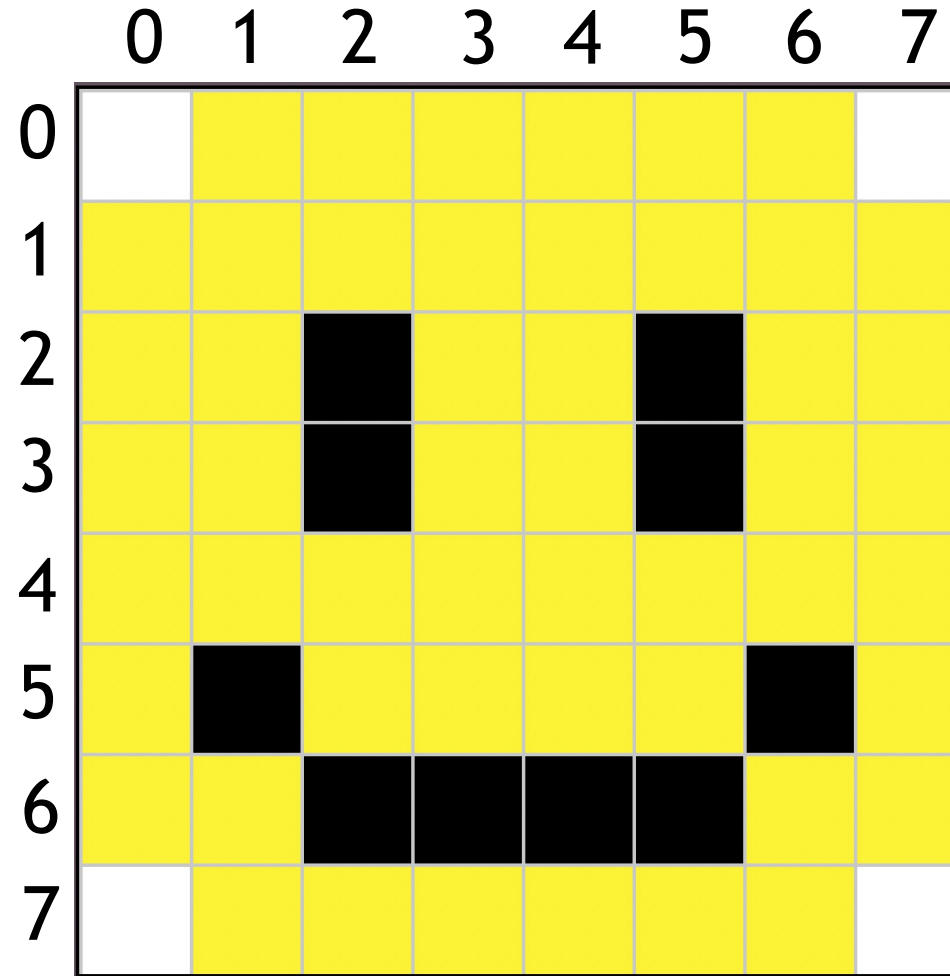
Can access via:

- (x, y)
- (column, row)

(0, 0) 

(3, 2) 


(5, 2) 





Storing Pictures

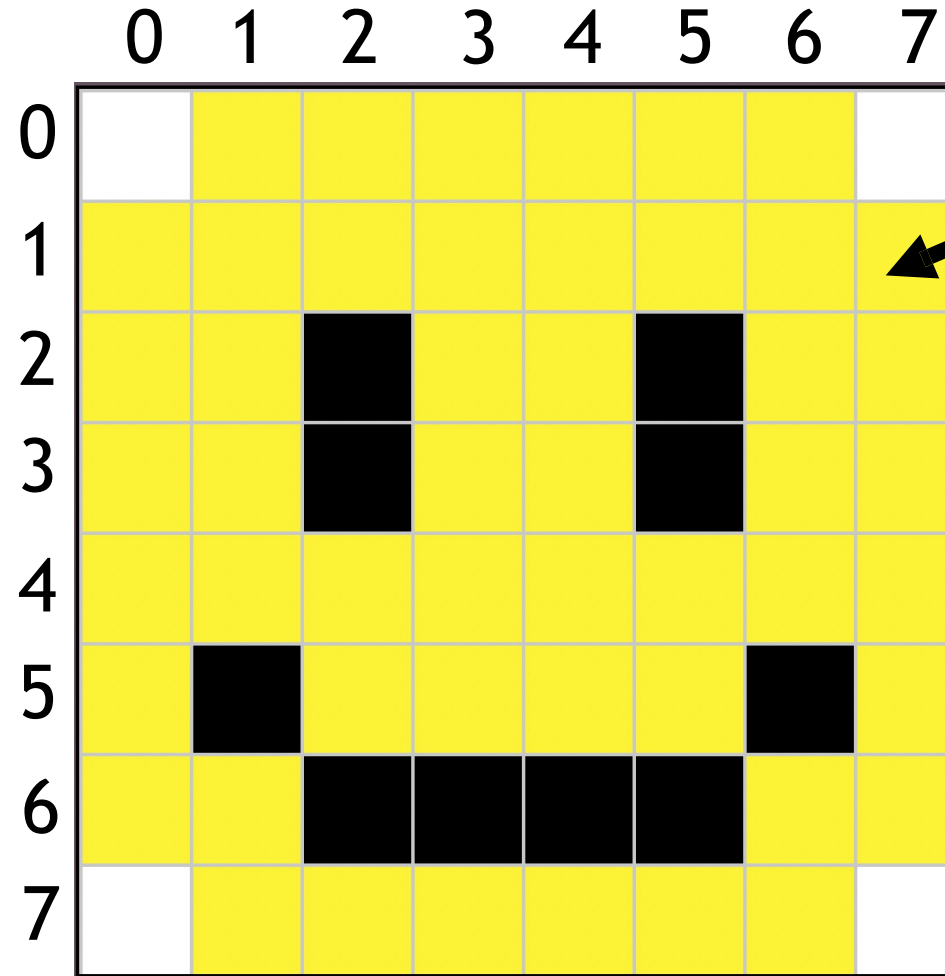
Can access via:

- (x, y)
- (column, row)

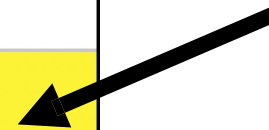
(0, 0) 

(3, 2) 

(5, 2) 



Pixels

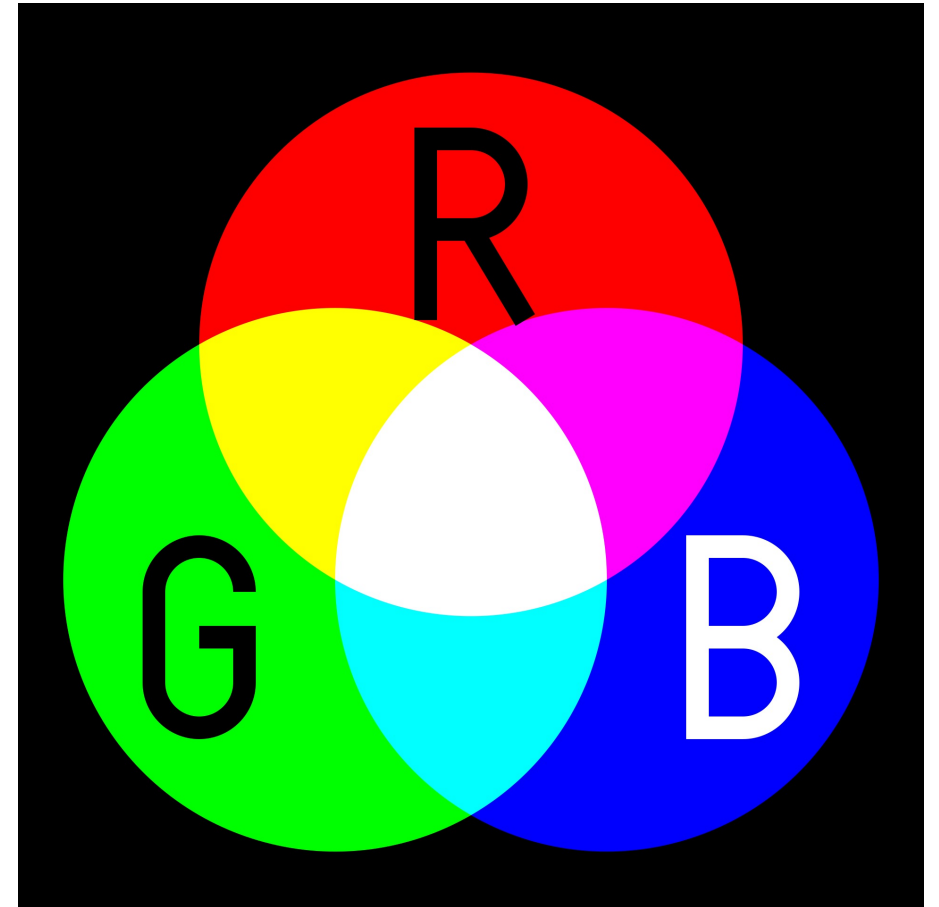


What's a Pixel?

- Short for Picture Element
- Tiny dots that make up your computer screens
 - 1080P = $1920 \times 1080 = 2,073,600$ pixels!
- Basically imperceptible
- All the dots together make up the images you see!

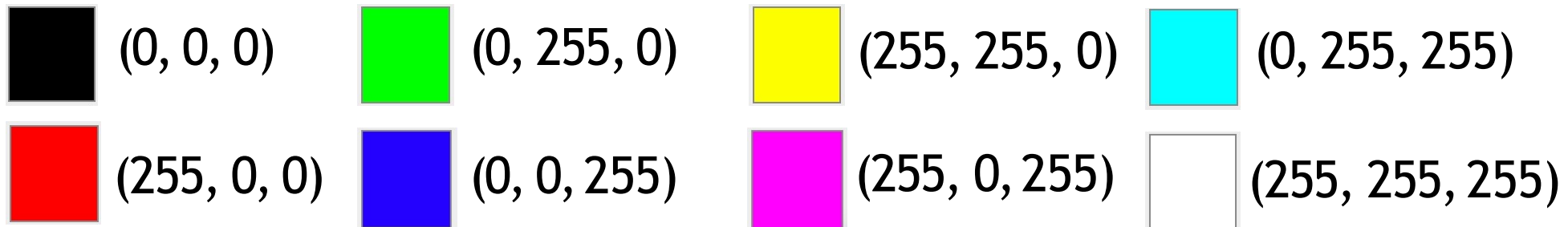
How?

- The RGB Color Model
- Pixels are made up of combinations of red, green, and blue light
- Each color is represented by a number to determine that color's intensity



Determining Color

- Each color value or **channel** is stored as a number in triplet
 - (R, G, B)
- Each possible value ranges from 0 - 255
 - Each color value is made up of 8 bits (0000 0000 - 1111 1111)
 - 24-bits total
 - Can go up to 32-bits to encode an **alpha channel** (transparency)



The Binary Encoding

- Color Values



(113, 220, 185)



Binary: (0111 0001, 1101 1100, 1011 1001)

- Picture Sizes

- A picture that is 800 x 600
 - 480,000 pixels * 24-bits per pixel
 - 1,440,000 bytes (1.44 megabytes)
- A 4K image is 24,883,200 bytes (24.88 megabytes)

Kilobyte = 1,000 bytes
Megabyte = 1,000,000 bytes

Let's try it out!