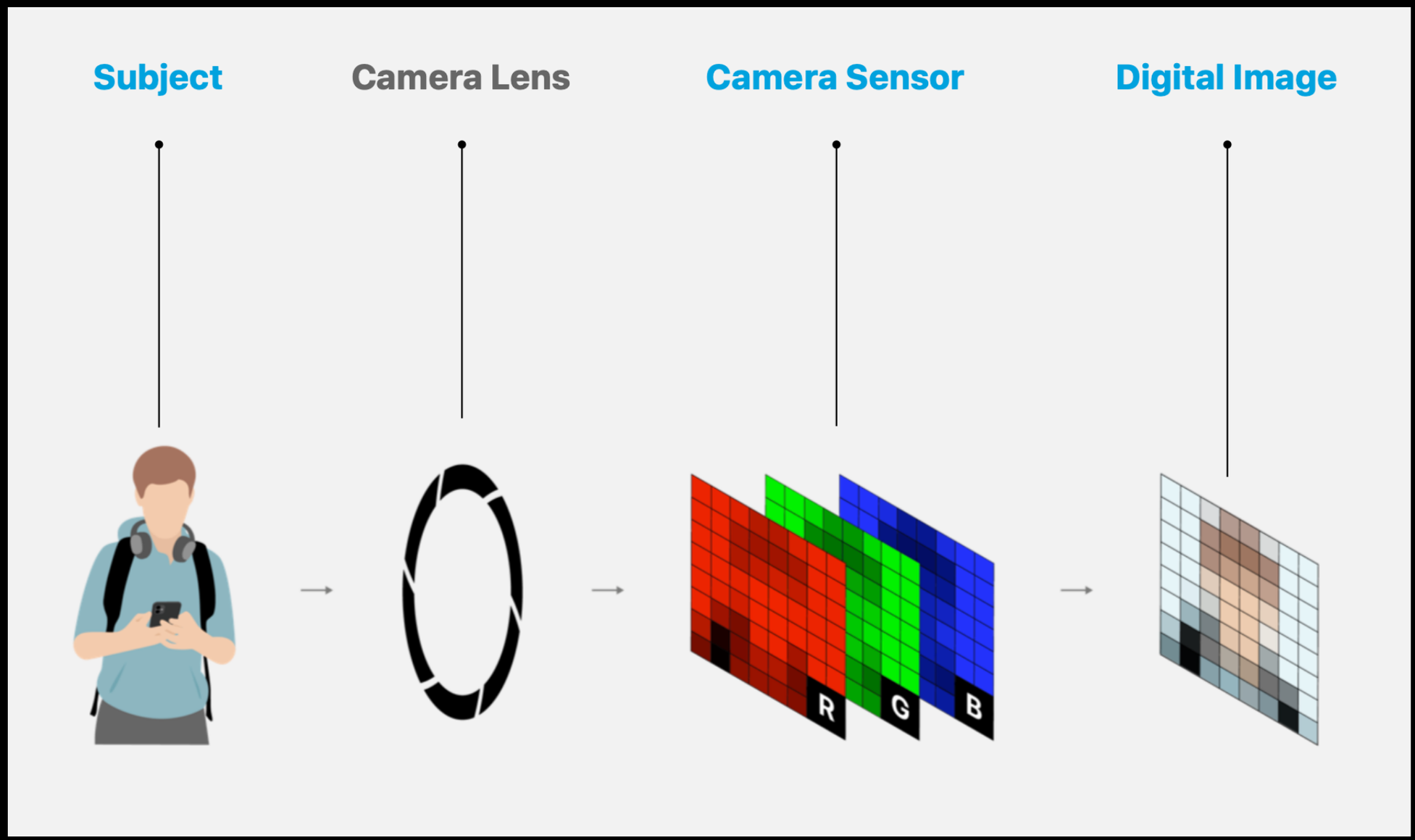
Data

Lossless vs Lossy Compression

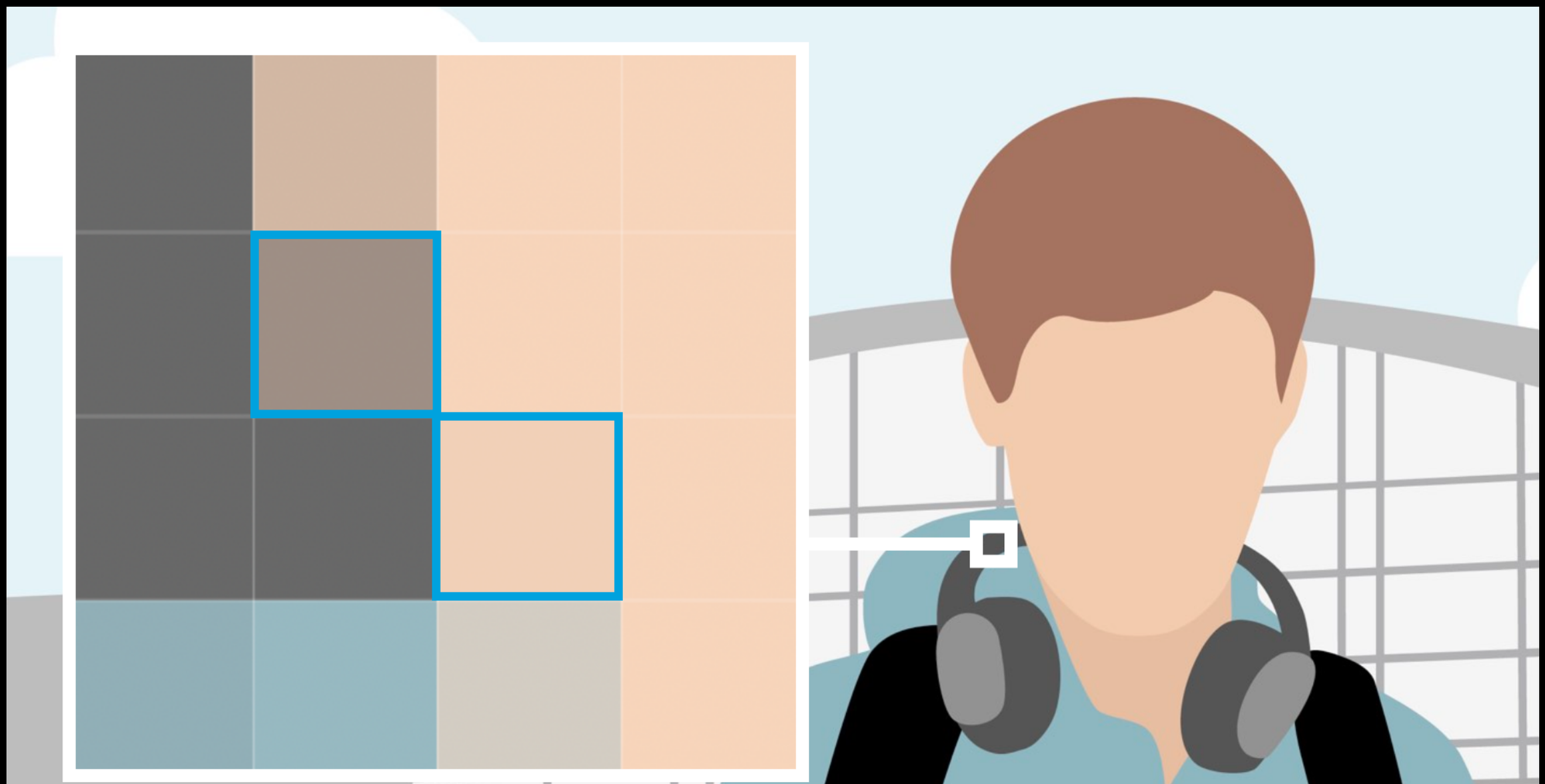
- How is light converted into data?



Data

Lossless vs Lossy Compression

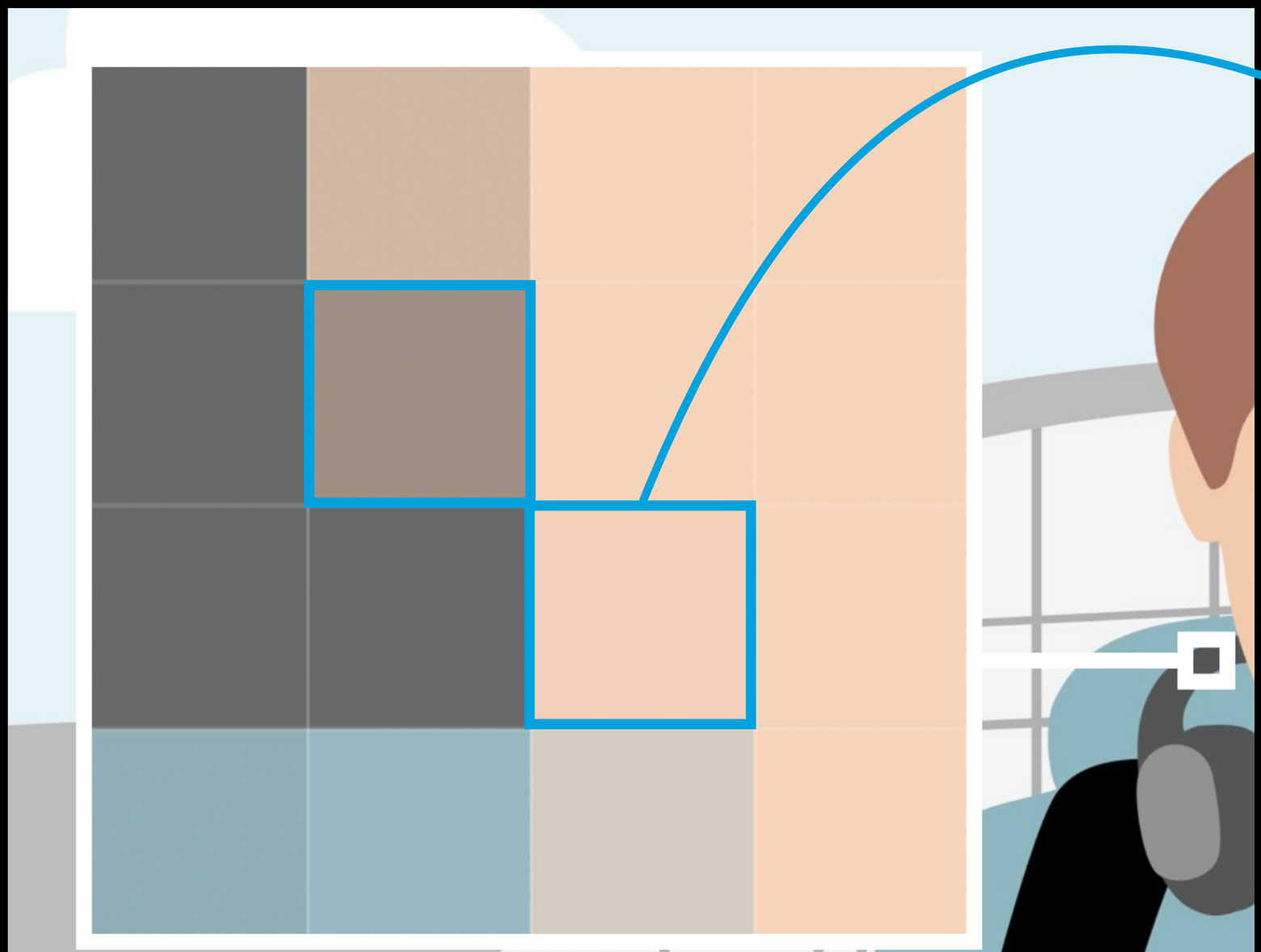
- What colour is that?



Data

Lossless vs Lossy Compression

- What colour is that?



RGB (red green blue)

241 208 183

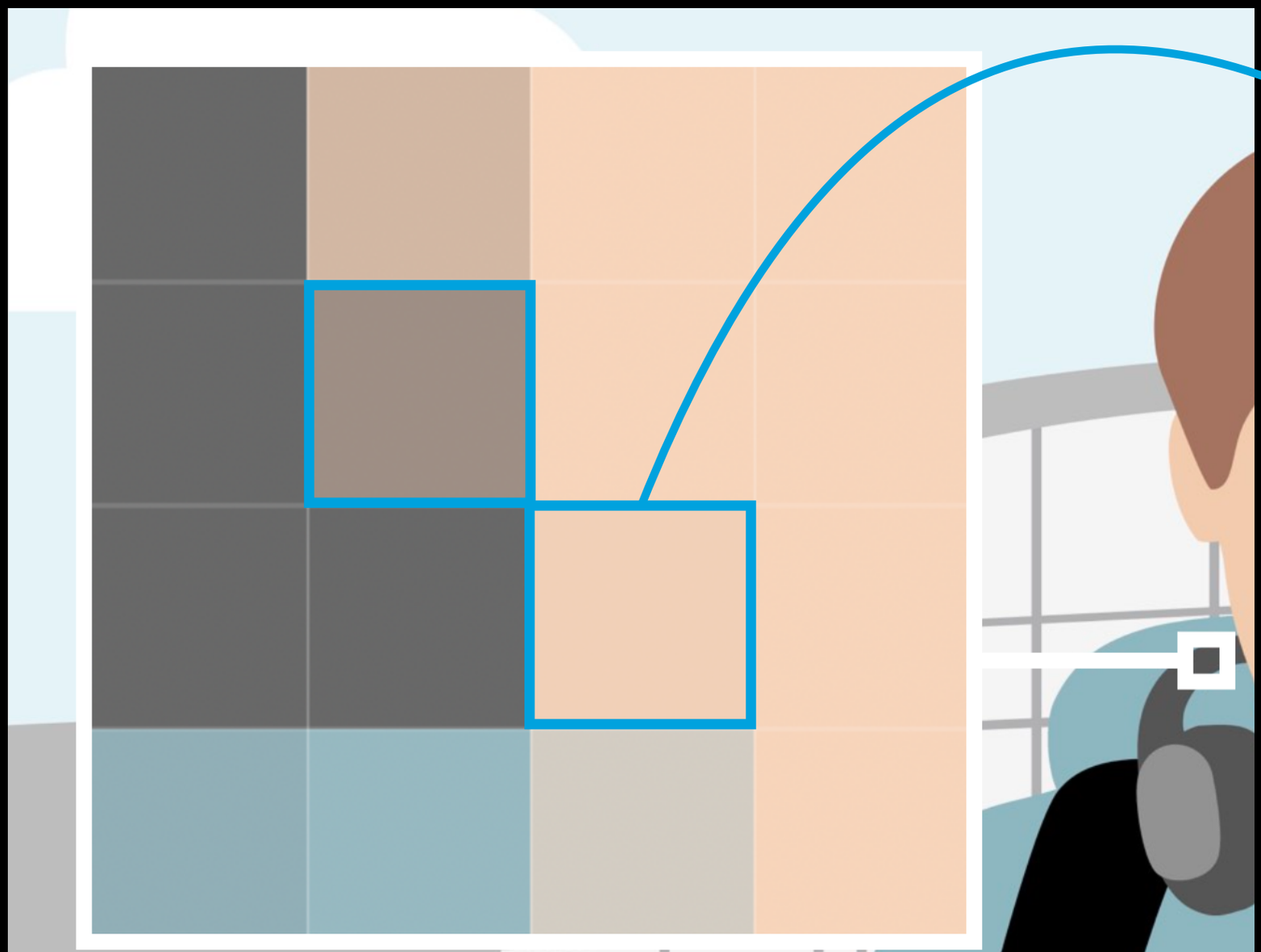
Binary

11110001 ? ?

Data

Lossless vs Lossy Compression

- What colour is that?



RGB (red green blue)

241 208 183

Binary

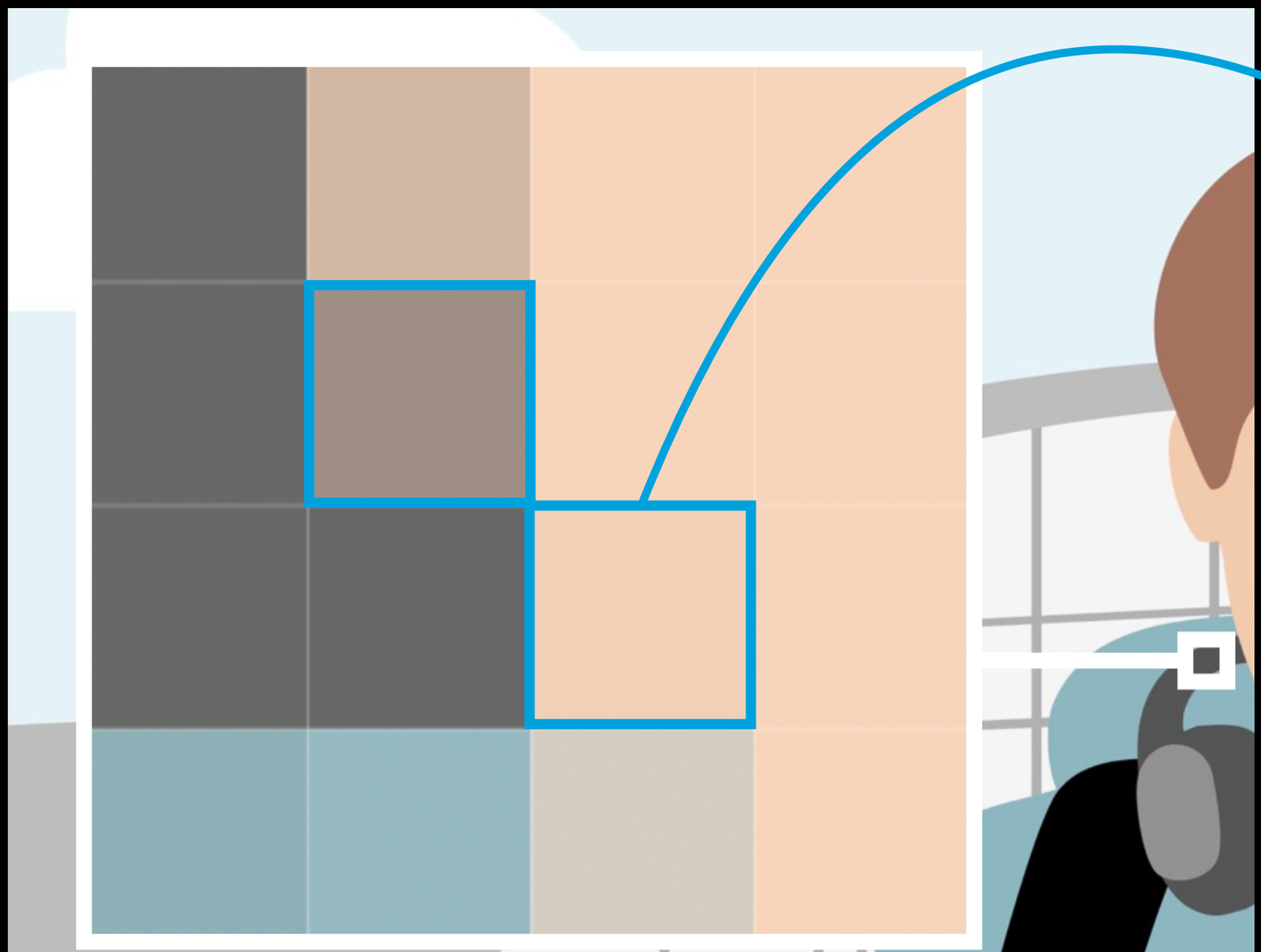
11110001110100010110111

Hex

Data

Lossless vs Lossy Compression

- What colour is that?



RGB (red green blue)

241 208 183

Binary

11110001110100010110111

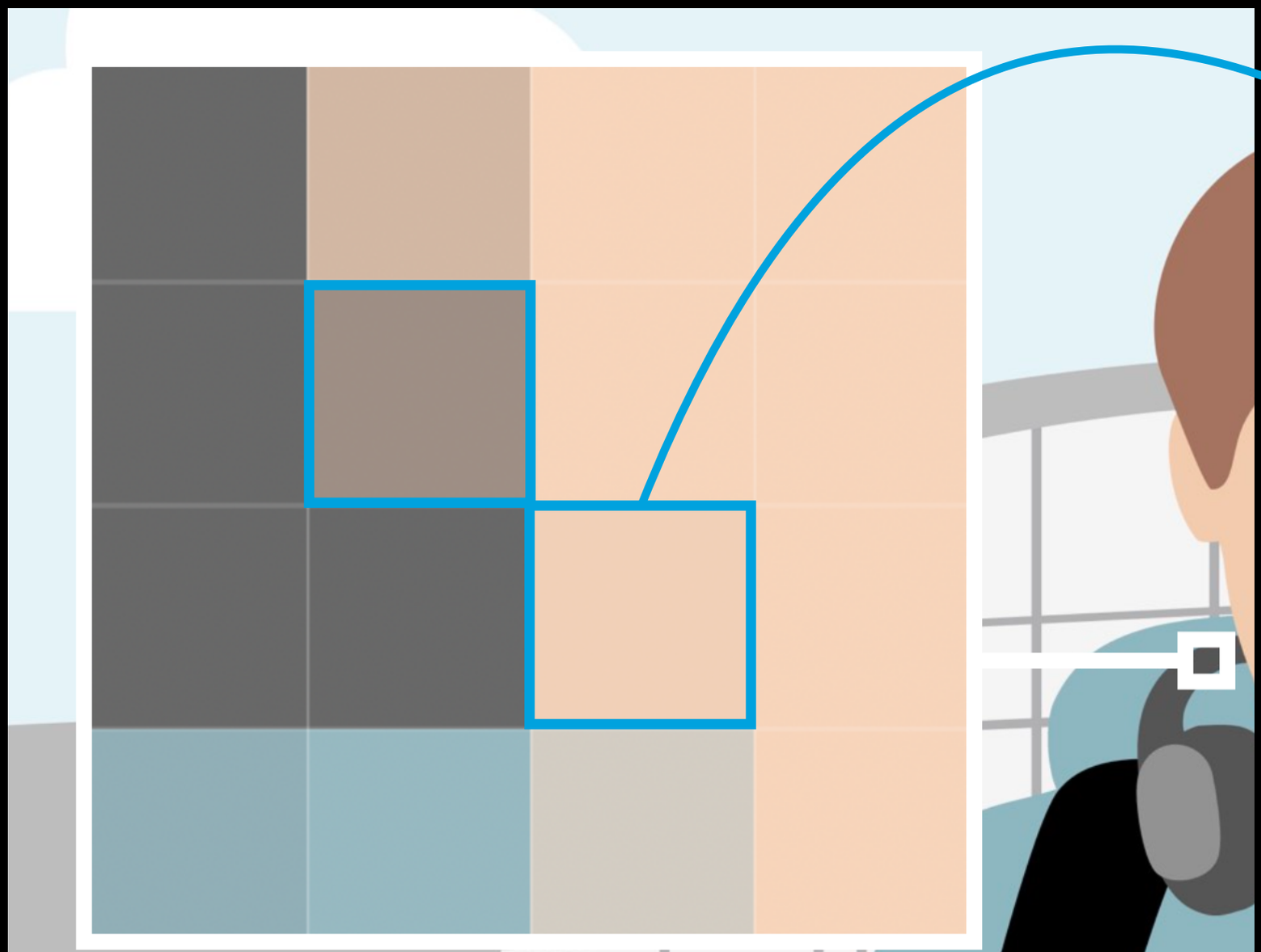
Hex

#F1 ? ?

Data

Lossless vs Lossy Compression

- What colour is that?



RGB (red green blue)

241 208 183

Binary

11110001110100010110111

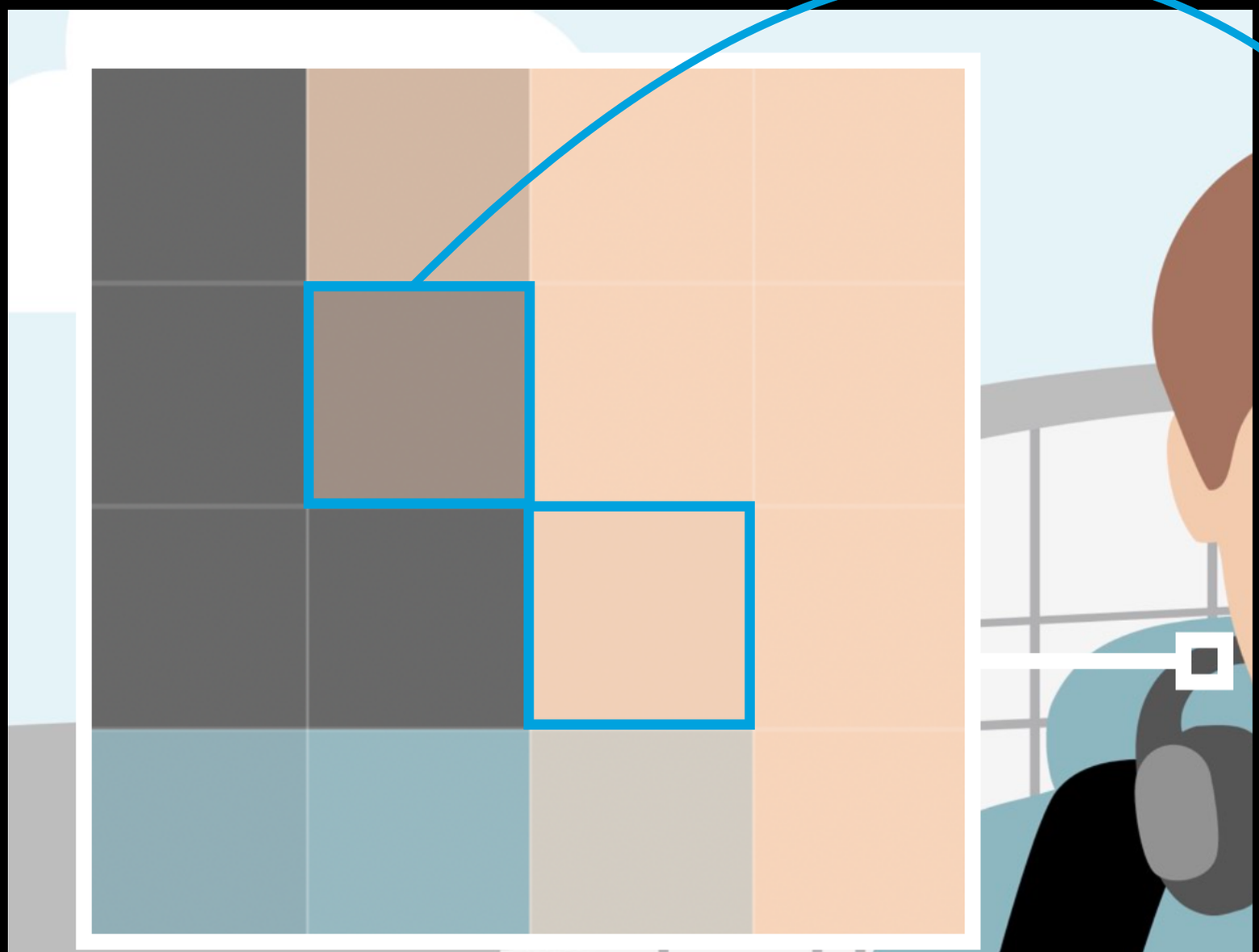
Hex

#F1D0B7

Data

Lossless vs Lossy Compression

- What colour is that?



RGB (red green blue)

158 143 132

Binary

? ? ?

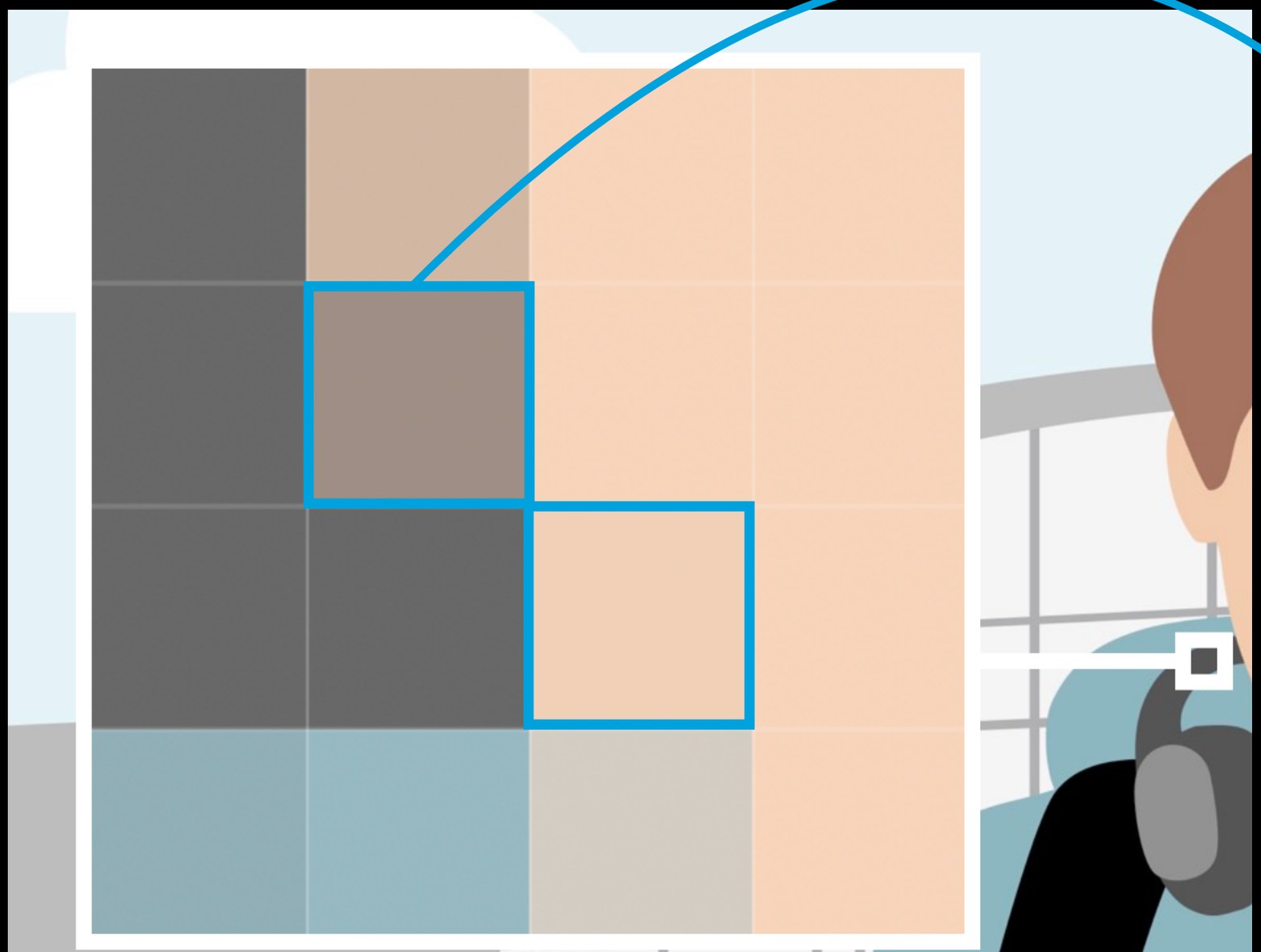
Hex

? ? ?

Data

Lossless vs Lossy Compression

- What colour is that?



RGB (red green blue)

158 143 132

Binary

10011110100011110000100

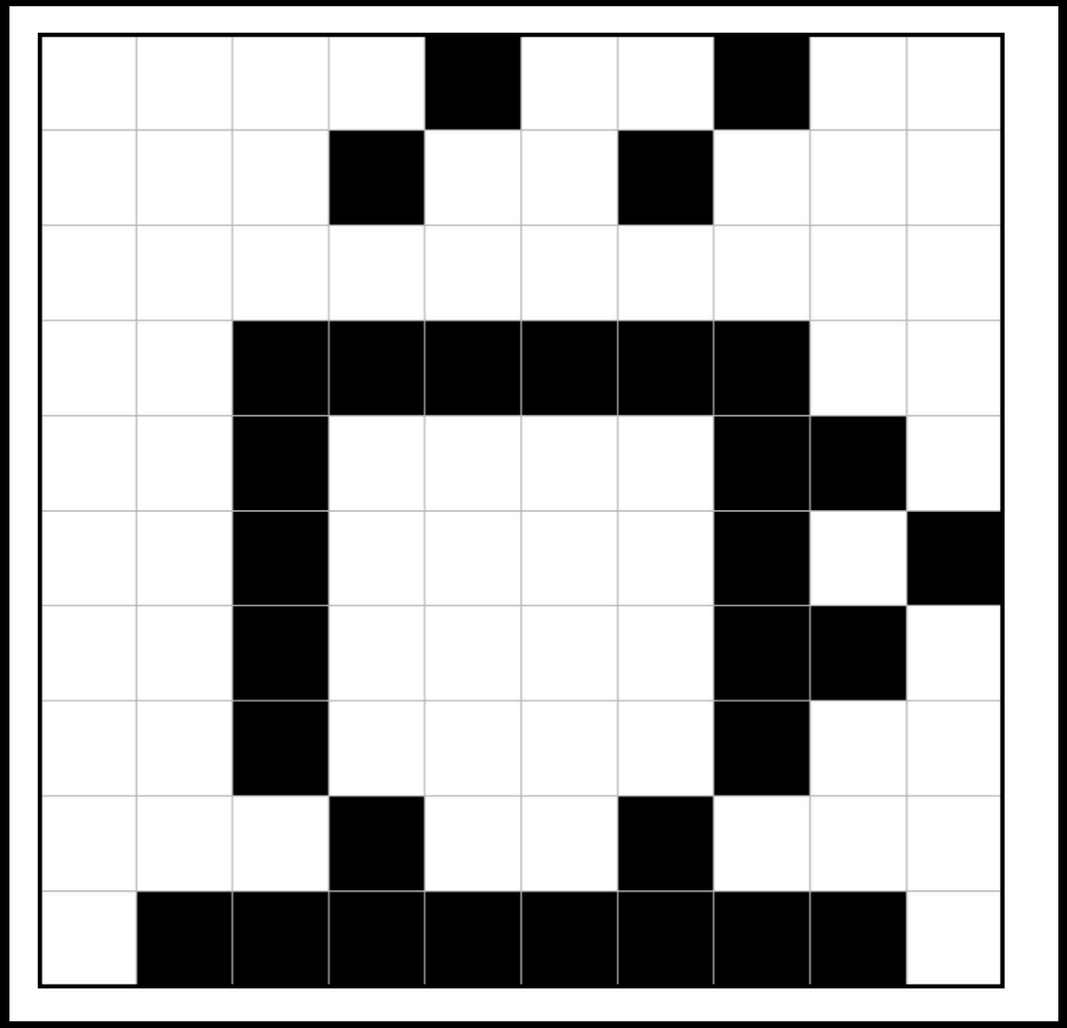
Hex

#9E8F84

Data

Lossless vs Lossy Compression

- How could this image be encoded digitally?

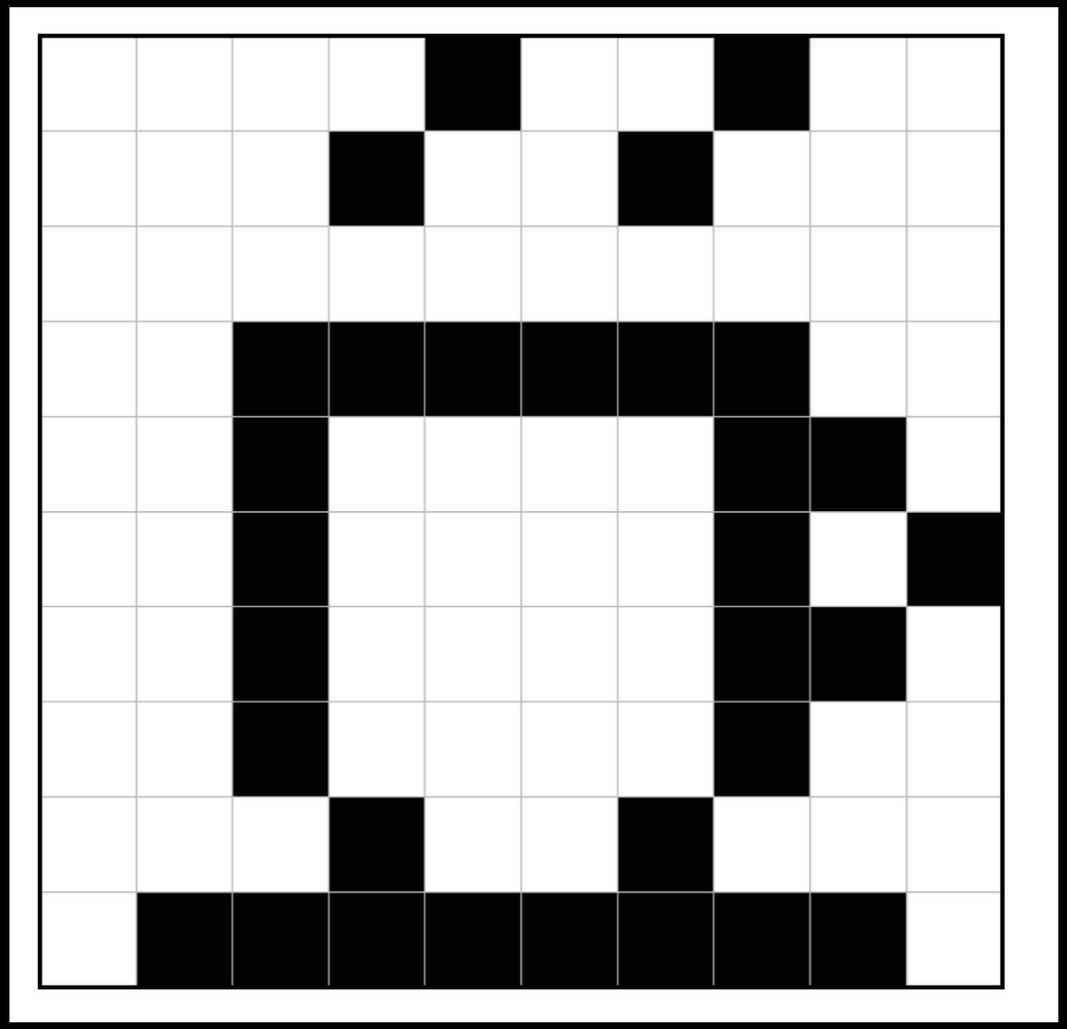


- One possibility...
  - 4 bits to indicate width (10 pixels).
  - 4 bits to indicate height (10 pixels)
  - Remaining bits represent each individual pixel. 0 for white. 1 for black. 100 bits.
  - Total length of file: 108 bits.

Data

Lossless vs Lossy Compression

- How could this image be compressed?



- One possibility...
  - 4 bits to indicate width (10 pixels).
  - 4 bits to indicate height (10 pixels)
  - Encode "runs" of the same pixel.
    - e.g.: White pixel, four times, encodes as:

      0 0100 (5 bits)

    - Original was: 0000 (4 bits)
  - This encoding method works best with long runs of the same pixel.

Data

Lossless vs Lossy Compression

- What is data compression?
  - Digital information is stored as 1's and 0's.
  - Compression refers to using *fewer bits* to represent the same data.
  - A set of rules – an encoding and decoding algorithm – is required.

Data

Lossless vs Lossy Compression

- *Run length encoding* is a compression method for black and white images similar to what was just described.
  - Used by fax machines
  - Simple algorithm – again, performs best with long runs of the same pixel color.
  - *Lossless* – the original image can be re-created in its full fidelity.

Data

Lossless vs Lossy Compression

- *Lossy* compression methods use more complex algorithms to radically reduce the number of bits required to represent an image.
- The compressed image is an approximation of the original.
- Depending on the compression settings, it may be hard to tell the difference.

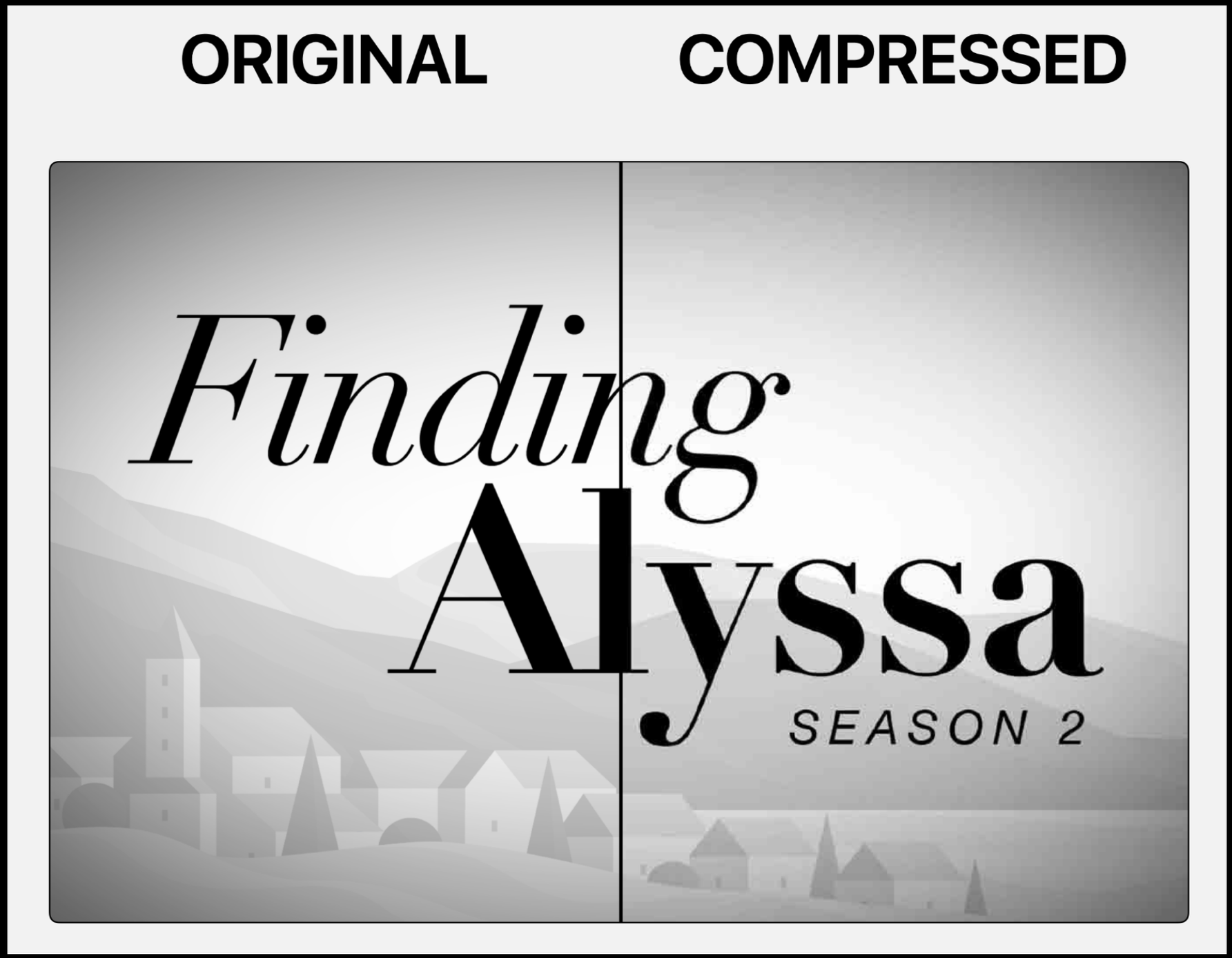
Data

Lossless vs Lossy Compression

ORIGINAL	COMPRESSED
FILE TYPE	FILE TYPE
.TIF .RAW	.JPG .PNG .HEIC
FILE SIZE	FILE SIZE
32MB	**2MB**
USE	USE
Suitable for large format printing, high-definition viewing	Suitable for email, text messaging, easy file uploading and downloading

Data

Lossless vs Lossy Compression



Data

Lossless vs Lossy Compression

Data

Lossless vs Lossy Compression

- *Loss/ess* compressions techniques allow the original to be restored.
    - No data is lost, but the file size cannot be compressed as much.
- *Lossy* compression techniques lose some data in the process of compression. The original can never be restored, but the compression is greater with lossless techniques.

Data

Lossless vs Lossy Compression

- To learn about these topics in greater detail:
  - From Khan Academy...
    - complete the section on data compression and the related quizzes and self-checks
  - Note that the KA tutorials go into a bit more detail than you can likely expect on the AP CSP exam, but, if you can ace their their tutorials, you should do very well on the actual exam.