

02 What Python sees

Patch is `pixels[100:104, 100:104]` of `cow-demo.jpg` (R G B in each cell).

113 73 63	123 80 71	136 92 81	141 95 80
125 83 71	139 95 84	150 104 91	147 99 85
132 88 77	140 93 83	145 97 85	142 93 78
125 81 68	130 82 70	138 89 75	144 92 78

- 16 pixels $\times$ 3 numbers = **48** numbers.
- Biggest red number is **150**, at row 1, column 2 (counting from 0, like Python; row 2, column 3 if counting from 1).
- Red total: $113 + 123 + 136 + 141 + 125 + 139 + 150 + 147 + 132 + 140 + 145 + 142 + 125 + 130 + 138 + 144 = \mathbf{2170}$.
- Neighbours are usually **similar** (biggest red step between side-by-side pixels here is 14). Accept any answer backed by the numbers.
- $320 \times 320 \times 3 = \mathbf{307,200}$ numbers.

03 Mix a colour

Part 1:

- `(255, 0, 0)` = red
- `(0, 0, 255)` = blue
- `(255, 255, 0)` = yellow
- `(0, 0, 0)` = black
- `(255, 0, 255)` = magenta (pink-purple)
- `(128, 128, 128)` = mid grey

Part 2 (accept close answers; orange is roughly 255, 128–165, 0):

- Bright green: `(0, 255, 0)`
- White: `(255, 255, 255)`
- Black: `(0, 0, 0)`
- Orange: `(255, 165, 0)`

Part 3 surprise: most pupils expect red to be a duller colour, or are surprised that `(255, 255, 0)` is yellow, not green.

07 Be the computer

C

60	58	146
179	176	119
164	185	85

O

48	212	202
35	126	187
177	61	162

W

44	180	113
178	98	155
165	160	47

image	sum of the 9 reds	total	remainder	letter
C	$60 + 58 + 146 + 179 + 176 + 119 + 164 + 185 + 85$	1172	$1172 - 1170 = 2$	C
O	$48 + 212 + 202 + 35 + 126 + 187 + 177 + 61 + 162$	1210	$1210 - 1196 = 14$	O
W	$44 + 180 + 113 + 178 + 98 + 155 + 165 + 160 + 47$	1140	$1140 - 1118 = 22$	W

Letters read C, O, W: **COW**. Part 2 sample answers: one tiny image takes about 2–5 minutes. A real image has $409,600 \div 9 \approx 45,511$ tiny-image equivalents, so about $45,511 \times 3 \text{ min} \approx 136,000$ minutes (over 2,000 hours) per picture, and $\times 37$ images is roughly 5 million minutes, i.e. years of non-stop work. Computers should do the adding up, the % 26 and the letter lookup, in a loop over all 37 images.