

Sheet 08 Model answers

One letter from one picture

1. Open the picture.
2. Take just the red channel.
3. Add up all the red values.
4. Take the total % 26.
5. Look up that number in the alphabet (A is 0).
6. That is the letter.

Boxes and arrows: [for each number 1–37] → box 1 *find the picture: image_path(number)* → [get its letter] → box 2 *letter = letter_for(path)* → [stick it on the message] → box 3 *message += letter*, then back for the next number.

All 37 pictures

1. Start with an empty message.
2. For each picture number, 1 to 37: get its letter (steps above).
3. Stick the letter on the end of the message.
4. After picture 37, the message is finished.

Sheet 09 Completed code (same as image_solution.py)

```
def total_red(path):
    img = Image.open(path)
    pixels = np.array(img)
    red = pixels[:, :, 0]
    total = red.sum()
    return total

def letter_for(path):
    total = total_red(path)
    position = total % 26
    letter = ALPHABET[position]
    return letter
```

```
def decode_message():
    message = ""
    for number in range(1, 38):
        letter = letter_for(image_path(number))
        message += letter
    return message
```

Tests: `total_red("cow-demo.jpg")` gives 10218857 ; `letter_for("cow-demo.jpg")` gives Z . Stretch: change the 0 to 1 (green) or 2 (blue).

Sheet 09 Debugging checklist answers

- **return:** at the very end of each function, indented once. Without it the function gives back `None` .
- **Indent:** the two lines inside the loop must be indented under `for` .
- **Why 38?** `range` stops *before* the end number, so `range(1, 38)` gives 1 to 37.
- **Same folder:** `image_path` looks for `cow_message/` next to the file. In Spyder check the working directory.
- **F5:** run again after every change.
- **% not /:** `%` gives the remainder (0 to 25). `/` gives a decimal that cannot index the alphabet.
- **Channel:** 0 is red, 1 green, 2 blue.

Notes Common mistakes

- Forgetting `return` , or using `print` instead: the next function gets `None` .
- Forgetting `str / int` : string vs number, for example `"5" + 1` errors, or `number` used as the path directly.
- Working directory: Spyder is not in the folder with `cow_message` , so `FileNotFoundError` .
- Not resetting `message = ""` inside the function: run it twice and the message is doubled.
- `range(1, 37)` misses the last picture; `range(37)` starts at 0 and finds no `00.png` .
- Using the wrong channel (`pixels[:, :, 1]`) gives a different, meaningless message.