

## Work Sheet- Array 2D

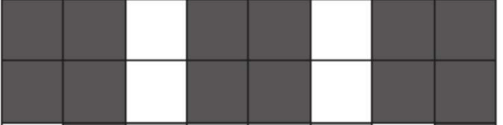
20190709

You will need to complete tasks 1-3. Write **structured English**, **flow chart**, **pseudocode** and **programming code**.

You will need to design a mini project based on manipulating image with **Pillow** in Task 4.

A 2D array, Picture, contains data representing a bitmap image. Each element of the array represents one pixel of the image. The image is grey-scale encoded where the value of each pixel ranges from 0 (representing black) to 255 (representing white) with intermediate values representing different levels of grey.

The following is an example of an image and the corresponding data values for the Picture array.

Bitmap image								Values																																															
								<table><tr><td>80</td><td>80</td><td>255</td><td>80</td><td>80</td><td>255</td><td>80</td><td>80</td></tr><tr><td>80</td><td>80</td><td>255</td><td>80</td><td>80</td><td>255</td><td>80</td><td>80</td></tr><tr><td>255</td><td>80</td><td>120</td><td>120</td><td>120</td><td>120</td><td>255</td><td>80</td></tr><tr><td>255</td><td>80</td><td>255</td><td>255</td><td>255</td><td>255</td><td>80</td><td>80</td></tr><tr><td>255</td><td>80</td><td>120</td><td>120</td><td>120</td><td>120</td><td>80</td><td>80</td></tr></table>								80	80	255	80	80	255	80	80	80	80	255	80	80	255	80	80	255	80	120	120	120	120	255	80	255	80	255	255	255	255	80	80	255	80	120	120	120	120	80	80
80	80	255	80	80	255	80	80																																																
80	80	255	80	80	255	80	80																																																
255	80	120	120	120	120	255	80																																																
255	80	255	255	255	255	80	80																																																
255	80	120	120	120	120	80	80																																																

### Task1 - Lighten the image

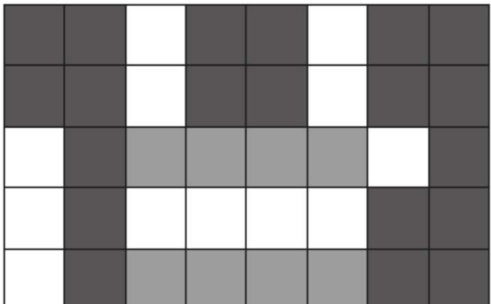
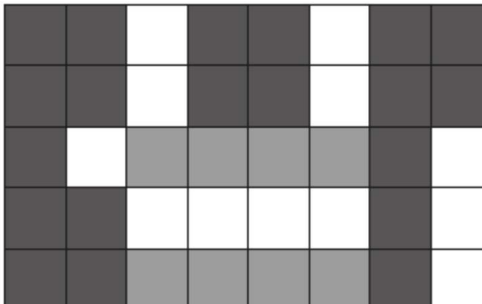
A program is required to lighten the image. Lightening an image may cause it to 'burn out'. An image is said to be 'burnt out' if any pixel is set to the maximum value of 255.

The program will:

1. Increase the value of each pixel by 10%
2. Return TRUE if the resultant image is 'burnt out'.

### Task2 - Flip (reflect) the image

An example of an image before and after the function is:

Before flip	After flip
	

### Task3 - Clip the image

- Take an integer parameter, MaxVal, to represent the maximum allowed value for each pixel.
- Limit each pixel value to the maximum allowed value.
- Pixels with a value not greater than MaxVal will remain unchanged.

### Task4 – Use the Python Imaging Library **Pillow** to do manipulating images, and build a project.

- <https://pillow.readthedocs.io/en/stable/>