





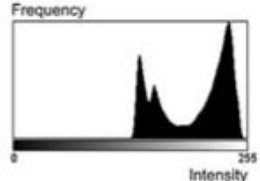
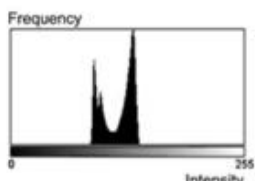
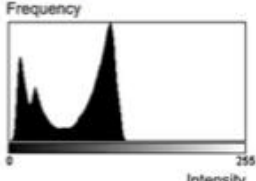
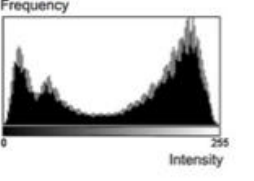
Assignment 1

| | |
|----------------|----------------|
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Exercise 1

Match the Images (1-4) below to their corresponding pixel histogram (A-D).

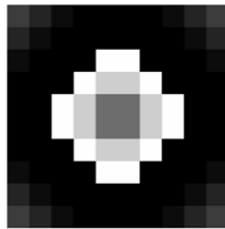
| | | | |
|--|--|---|--|
| Dark image | High contrast image | Bright image | Low contrast image |
|  |  |  |  |
| Image 1 | Image 2 | Image 3 | Image 4 |

| | | | |
|---|---|--|---|
|  |  |  |  |
| histogram A | histogram B | histogram C | histogram D |

| Image | Corresponding histogram |
|---------|-------------------------|
| Image 1 | Dark image |
| Image 2 | High contrast image |
| Image 3 | Bright image |

| | |
|---------|--------------------|
| Image 4 | Low contrast image |
|---------|--------------------|

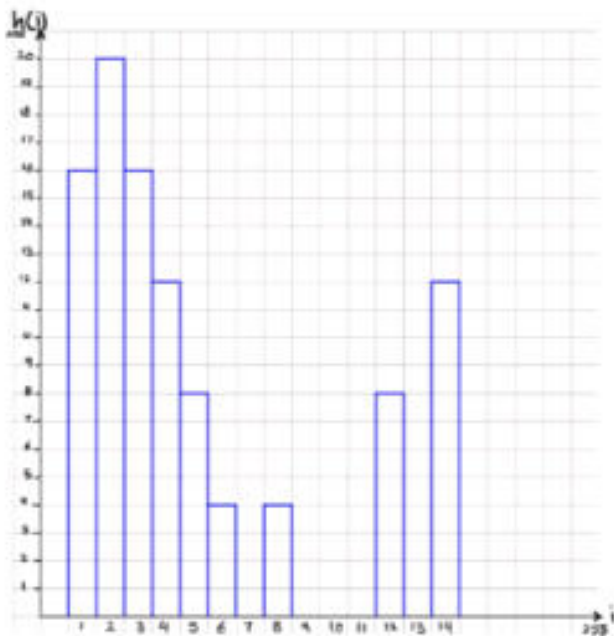
Exercise 2



| | | | | | | | | | |
|---|---|----|----|----|----|----|----|---|---|
| 6 | 5 | 4 | 3 | 2 | 2 | 3 | 4 | 5 | 6 |
| 5 | 4 | 3 | 2 | 1 | 1 | 2 | 3 | 4 | 5 |
| 4 | 3 | 2 | 1 | 14 | 14 | 1 | 2 | 3 | 4 |
| 3 | 2 | 1 | 14 | 12 | 12 | 14 | 1 | 2 | 3 |
| 2 | 1 | 14 | 12 | 8 | 8 | 12 | 14 | 1 | 2 |
| 2 | 1 | 14 | 12 | 8 | 8 | 12 | 14 | 1 | 2 |
| 3 | 2 | 1 | 14 | 12 | 12 | 14 | 1 | 2 | 3 |
| 4 | 3 | 2 | 1 | 14 | 14 | 1 | 2 | 3 | 4 |
| 5 | 4 | 3 | 2 | 1 | 1 | 2 | 3 | 4 | 5 |
| 6 | 5 | 4 | 3 | 2 | 2 | 3 | 4 | 5 | 6 |

Draw the histogram corresponding to this image i

| | | | | | | | | | |
|--------|----|----|----|----|---|---|---|----|----|
| i | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 12 | 14 |
| $h(i)$ | 16 | 20 | 16 | 12 | 8 | 4 | 4 | 8 | 12 |



$$\begin{aligned}
 h(50) &= 150 \\
 h(100) &= 100 \\
 h(130) &= 50 \\
 N &= 150 + 100 + 50 = 300
 \end{aligned}$$

Exercise 3

Consider the following image and its corresponding histogram.



What is the number N of pixels of the image and its dynamic ?

Exercise 4

Apply histogram stretching for the following image and draw the resulting image

$$\text{Stretch}(I(r,c)) = \frac{I(r,c) - I(r,c)_{\min}}{I(r,c)_{\max} - I(r,c)_{\min}} (MAX - MIN) + MIN$$

$$\begin{pmatrix} 7 & 12 & 8 \\ 20 & 9 & 6 \\ 10 & 15 & 1 \end{pmatrix}$$

$$I(r,c)_{\min} = 1 ; I(r,c)_{\max} = 20 ; MAX = 255 ; MIN = 0$$

$$\begin{aligned}
 I(0,0) &= [7 - 1 / 20 - 1] * [255 - 0] + 0 = 80.5 \\
 I(0,1) &= [12 - 1 / 20 - 1] * [255 - 0] + 0 = 147.6 \\
 I(0,2) &= [8 - 1 / 20 - 1] * [255 - 0] + 0 = 93.9 \\
 I(1,0) &= [20 - 1 / 20 - 1] * [255 - 0] + 0 = 255 \\
 I(1,1) &= [9 - 1 / 20 - 1] * [255 - 0] + 0 = 107.3 \\
 I(1,2) &= [6 - 1 / 20 - 1] * [255 - 0] + 0 = 67.1 \\
 I(2,0) &= [10 - 1 / 20 - 1] * [255 - 0] + 0 = 120.7 \\
 I(2,1) &= [15 - 1 / 20 - 1] * [255 - 0] + 0 = 187.8 \\
 I(2,2) &= [1 - 1 / 20 - 1] * [255 - 0] + 0 = 0
 \end{aligned}$$