

Q Apply Histogram Equalization on image below. Change intensity range 1-20.

3	2	4	5
7	7	8	2
3	1	2	3
5	4	6	7

→ Step 1

Pixel intensities	1	2	3	4	5	6	7	8	9	10
No. of Pixels	1	3	3	2	2	1	3	1	0	0
Probability	0.0625	0.1875	0.1875	0.125	0.125	0.0625	0.1875	0.0625	0	0
Cumulative Probability	0.0625	0.25	0.4375	0.5625	0.6875	0.75	0.9375	1	1	1

→ Probability is no. of pixels divided by total no. of pixels (16)

Cumulative Probability	0.0625	0.25	0.4375	0.5625	0.6875	0.75	0.9375	1	1	1
C.P * 20	1.25	5	8.75	11.25	13.75	15	18.75	20	20	20
Round off	1	5	8	11	13	15	18	20	20	20

Steps

Histogram Equalization

- 1) Count the total number of pixels associated with each pixel intensity.
- 2) Calculate probability of each pixel intensity in the image matrix
- 3) Calculate Cumulative probabilities
- 4) Since we want to change the intensity range to 1-20, we shall multiply Cumulative probabilities by 20.
- 5) Round off to the lower integer value (floor funⁿ).

$$\begin{bmatrix} 3 & 2 & 4 & 5 \\ 7 & 7 & 8 & 2 \\ 3 & 1 & 2 & 3 \\ 5 & 4 & 6 & 7 \end{bmatrix} \Rightarrow \begin{bmatrix} 8 & 5 & 11 & 13 \\ 18 & 18 & 20 & 5 \\ 8 & 1 & 5 & 8 \\ 13 & 11 & 15 & 18 \end{bmatrix}$$