The moments of order i,j of the function f(x,y) are defined as:

 $m_{i,j} = \sum_{x} \sum_{y} x^{i} y^{j} f(x, y)$

a) Define the central moments $\mu_{i,j}$

b) Why are they more useful?

c) Determine numerically the central moment $\mu_{2,2}$ for object 1 specified below and for the same object but shifted one pixel in the x and y directions respectively:



d) Also compute moment $\mu_{2,2}$ for object 2 which is a rotated version of object 1. Notice that in object 2, in order to keep the distance between object points identical, the pixel with value 2 has x-coordinate $2 + \sqrt{2}$:

e) Explain the results you get in c) and d)