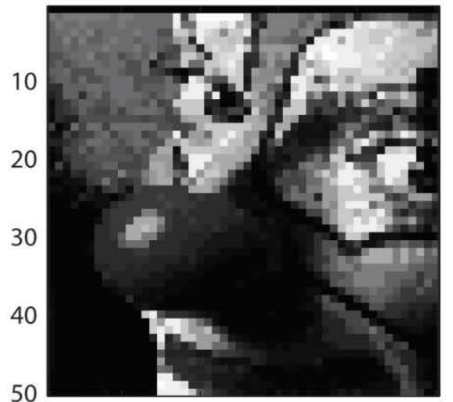
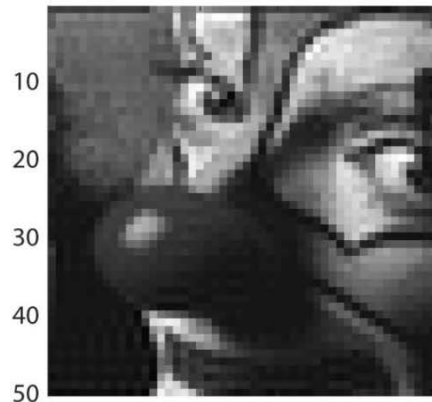


**Concept Question 10-5:** Why is lowpass filtering before downsampling needed to produce a thumbnail image?

If the image is not lowpass filtered, which acts as an antialias filter, the downsampled image will be aliased:



(b)  $x_d[m,n]$ : a downsampled version of  $x[m,n]$



(c)  $\tilde{x}_d[m,n]$ :  $x[m,n]$  was lowpass filtered first and then downsampled