Texture Filtering

1. Magnification
Suppose we have the following 2x2 texture of greyscale values.

<table>
<thead>
<tr>
<th>T(0,1)</th>
<th>0.36</th>
</tr>
</thead>
<tbody>
<tr>
<td>T(1,1)</td>
<td>0.64</td>
</tr>
<tr>
<td>T(0,0)</td>
<td>0.16</td>
</tr>
<tr>
<td>T(1,0)</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Suppose a fragment has texture coordinates of (0.75, 0.25).

a. What fragment color is generated using nearest neighbor?

b. What fragment color is generated using bilinear filtering.

\[
\text{Interp in } T_{\text{top}} = 0.25 (T(0,1)) + 0.75 (T(1,1)) = 0.57
\]

\[
\text{Interp in } T_{\text{bottom}} = 0.25 (T(0,0)) + 0.75 (T(1,0)) = 0.39
\]

\[
0.57 + 0.39 = 0.96
\]
2. Minification

a. Create a mipmap for the greyscale texture shown below

b. How much space does the mipmapped version of a texture take up in comparison to the original?

\[
\sum_{i=0}^{\infty} \frac{A}{4^i} = A \left(\frac{4}{3}\right)
\]

\[A = \text{original texture size}\]

So, for non-infinite textures we have

\[
\sum_{i=0}^{K} \frac{4^k}{4^i} \approx 2^k \left(\frac{4}{3}\right) \text{ texels}
\]