Consider a gray image of size $M \times N$ over gray intensity spectrum $[p, P]$, p, P both nonnegative integers with $p \leq \hat{P}$. Convert it into an image of same size over gray spectrum $[q, Q]$, q, Q both nonnegative integers with $q \leq Q$.

Further, $Q \leq P$ and $q \geq p$.

Given that $\dfrac{Q}{P} = \dfrac{q}{p}$, determine the degree of compression.

[Degree of compression of a transformed image $g(x, y)$ over the original image $f(x, y)$ is

$$\frac{f(x, y) - g(x, y)}{f(x, y)}, \quad \text{taken over the entire image}]$$