Memoryless property of geometric random variables.

Note: these are the only discrete random variable to have such a property. Say $X$ is Geometric($p$) random variable,

\[ P(X > 8 \mid X > 3) = \frac{P(X > 8 \text{ and } X > 3)}{P(X > 3)} = \frac{P(X > 8)}{P(X > 3)} = \frac{\frac{1}{3}^8}{\frac{1}{3}^3} = 2 \]

\[ = P(X > 5) \]

\[ P(X > i+j \mid X > i) = \frac{P(X > i+j \text{ and } X > i)}{P(X > i)} = \frac{P(X > i+j)}{P(X > i)} = \frac{\frac{1}{q^i}^{i+j}}{\frac{1}{q^i}^i} = q^{j} = P(X > j) \]