135. Let $X_1, ..., X_n$ be a random sample from a population with PMF

$$P_\theta(X = x) = \theta^x(1-\theta)^{1-x}, \quad x = 0 \text{ or } 1, \quad 0 \leq \theta \leq 0.5.$$

In the previous assignment it was shown that the MME ($\tilde{\theta}$) and the MLE ($\hat{\theta}$) are

$$\tilde{\theta} = \bar{X} \quad \text{and} \quad \hat{\theta} = \min\{\bar{X}, 0.5\}.$$

(a) Find the mean squared errors of each of the estimators.

(b) Which estimator is preferred? Justify your choice.