

Question #186

Key: D

$$\text{bias} = E(\hat{\theta}) - \theta = \frac{k}{k+1}\theta - \theta = -\frac{\theta}{k+1},$$

$$\text{Var}(\hat{\theta}) = \text{Var}\left(\frac{k\theta}{k+1}\right) = \frac{k^2\theta^2}{25(k+1)^2},$$

$$\text{MSE} = \text{Var}(\hat{\theta}) + \text{bias}^2 = \frac{k^2\theta^2}{25(k+1)^2} + \frac{\theta^2}{(k+1)^2},$$

$$\text{MSE} = 2\text{bias}^2 = \frac{2\theta^2}{(k+1)^2}.$$

Setting the last two equal and canceling the common terms gives

$$\frac{k^2}{25} + 1 = 2 \text{ for } k = 5.$$