$\bar{X}$ is an unbiased estimator

$$E[\bar{X}] = E\left[\frac{1}{m}\sum_{i=1}^{m} x_i\right]$$

$$E[\bar{X}] = \frac{1}{m} E\left[\sum_{i=1}^{m} x_i\right]$$

$$E[\bar{X}] = \frac{1}{m}\sum_{i=1}^{m} E[x_i]$$

$$E[\bar{X}] = \frac{1}{m} \cdot m\mu = \mu$$

$$\boxed{E[\bar{X}] = \mu}$$

S^2 is a unbiased estimator

$$E[S^2] = E\left[\frac{1}{m-1}\sum_{i=1}^{m}(x_i - \bar{x})^2\right]$$

$$E[S^2] = \frac{1}{m-1} E\left[\sum_{i=1}^{m}(x_i - \bar{x})^2\right]$$

$$= \frac{1}{m-1} E\left[\sum_{i=1}^{m}(x_i^2 - 2\bar{x}x_i + \bar{x}_i^2)\right]$$

$$= \frac{1}{m-1} E\left[\sum_{i=1}^{m} x_i^2 - 2\bar{x}\cancelto{m\bar{x}}{\sum_{i=1}^{m} x_i} + \cancelto{m\bar{x}^2}{\sum_{i=1}^{m}\bar{x}^2}\right]$$

$$= \frac{1}{m-1} E\left[\sum_{i=1}^{m} x_i^2 - m\bar{x}^2\right]$$

$$= \frac{1}{m-1}\left(\sum \cancelto{\sigma^2+\mu^2}{E[x_i^2]} - E[m\bar{x}^2]\right)$$

$$E\left[\left(\frac{1}{m}\sum_{i=1}^{m} x_i\right)^2\right]$$

$$\frac{1}{m-1}\left(m(\sigma+\mu) - mE[\bar{x}^2]\right)$$

$$\boxed{E[S^2] = \sigma^2}$$