Quiz 2

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Prove

$$v = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \mu)^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n} x_i^2 - n\mu^2\right] \tag{1}$$

Solution:

$$\begin{aligned}
v &= \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \mu)^2 \\
&= \frac{1}{n-1}(\sum_{i=1}^{n}(x_i^2 - 2x_i\mu + \mu^2)) \\
&= \frac{1}{n-1}(\sum_{i=1}^{n} x_i^2 - 2\mu\sum_{i=1}^{n} x_i + n\mu^2) \\
&= \frac{1}{n-1}(\sum_{i=1}^{n} x_i^2 - 2n\mu^2 + n\mu^2) \\
&= \frac{1}{n-1}(\sum_{i=1}^{n} x_2^i - n\mu^2)
\end{aligned}$$

$$\begin{aligned}
error(va) &: 0.00000000001023181539494544267 7 \\
error(vairiance) &: 0.00000000000000000000000000000
\end{aligned}$$

The better approximation is

$$v = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \mu)^2$$