Example of the variance of a random variable.

Let $X$ be the number of births of girls within 4 births altogether.

Know $E(X) = \mu_x = 2$.

Find $\text{Var}(X)$.

\[ (1) \quad \text{Var}(X) = E(X^2) - (E(X))^2 \]
\[ = 5 - (2)^2 = 5 - 4 = 1. \]

Also std. dev. of $X$, $\sigma_X = \sqrt{\text{Var}(X)} = \sqrt{1} = 1$.

\[ (2) \quad \text{Compute } \text{Var}(X) \text{ from definition. } \text{Know } \mu_x = E(X) = 2. \]

\[ \text{Var}(X) = E((X-\mu_X)^2) = (0-2)^2 \left( \frac{1}{16} \right) \iff X = 0 \]
\[ + (1-2)^2 \left( \frac{4}{16} \right) \iff X = 1 \]
\[ + (2-2)^2 \left( \frac{4}{16} \right) \iff X = 2 \]
\[ + (3-2)^2 \left( \frac{4}{16} \right) \iff X = 3 \]
\[ + (4-2)^2 \left( \frac{1}{16} \right) \iff X = 4 \]
\[ = \frac{1}{4} + \frac{1}{4} + 0 + \frac{1}{4} + \frac{1}{4} \]
\[ = 1 \quad \checkmark \]

Check: Our Probability weights sum to 1. \( \checkmark \)