

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  $\text{Var}(X)$ .

---

$$(1) \text{Var}(X) = E(X^2) - (E(X))^2$$
$$= \underline{5} - (2)^2 = 5 - 4 = 1.$$

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

---

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

$$\text{Var}(X) = E((X - \mu_x)^2) = (0-2)^2 \left(\frac{1}{16}\right) \leftarrow X=0$$
$$+ (1-2)^2 \left(\frac{4}{16}\right) \leftarrow X=1$$
$$+ (2-2)^2 \left(\frac{6}{16}\right) \leftarrow X=2$$
$$+ (3-2)^2 \left(\frac{4}{16}\right) \leftarrow X=3$$
$$+ (4-2)^2 \left(\frac{1}{16}\right) \leftarrow X=4$$

$$= \frac{1}{4} + \frac{1}{4} + 0 + \frac{1}{4} + \frac{1}{4}$$

$$= 1 \quad \checkmark$$

Check: Our Probability weights sum to 1.  $\checkmark$