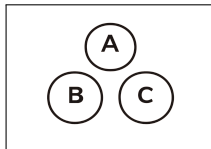


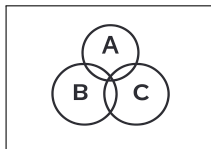
17

Discrete Distribution Standard Deviation



$$X = \{1, 2, 3, 4, 5, 6\}$$

$$P(X = x) = \frac{1}{6}$$



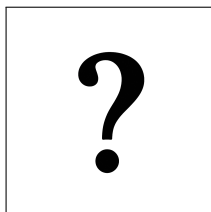
$$E(X) = \sum_{x=1}^6 x \cdot \frac{1}{6} = \frac{1+2+3+4+5+6}{6} = \frac{21}{6} = 3.5$$

$$E(X^2) = \sum_{x=1}^6 x^2 \cdot \frac{1}{6} = \frac{1^2+2^2+3^2+4^2+5^2+6^2}{6} = \frac{91}{6}$$

$$\begin{aligned} \text{Var}(X) &= E(X^2) - [E(X)]^2 = \frac{91}{6} - (3.5)^2 = \frac{91}{6} - \frac{49}{4} = \\ &= \frac{182-147}{12} = \frac{35}{12} = \frac{35}{12} \end{aligned}$$

$$\text{SD}(X) = \sqrt{\text{Var}(X)} = \sqrt{\frac{35}{12}} = \sqrt{\frac{35}{12}} \approx 1.708$$

$$\text{Var}(4X + 2) = 16 \text{Var}(X)$$



$$P(X = 0) = 1 - p$$

$$P(X = 1) = p$$

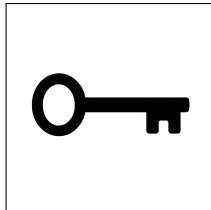
$$E(X) = ?$$

$$E(X^2) = ?$$

$$\text{Var}(X) = ?$$

17

Discrete Distribution Standard Deviation



$$P(X = 0) = 1 - p$$

$$P(X = 1) = p$$

$$E(X) = ?$$

$$E(X^2) = ?$$

$$\text{Var}(X) = ?$$

$$E(X) = 0 \cdot P(X = 0) + 1 \cdot P(X = 1)$$

$$E(X) = (0)(1 - p) + (1)(p)$$

$$E(X) = p$$

$$E(X^2) = \sum_x x^2 \cdot P(X = x)$$

$$E(X^2) = 0^2(1 - p) + 1^2(p) = p$$

$$E(X^2) = p$$

$$\text{Var}(X) = E(X^2) - [E(X)]^2$$

$$\text{Var}(X) = p - p^2$$

$$\text{Var}(X) = p(1 - p)$$