

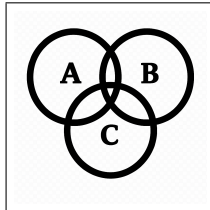
**J**

# Variance / SD

**J**

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

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



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

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

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

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

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



$$F(X < -4) = 0$$

$$F(-4 \leq x < 1) = 0.3$$

$$F(1 \leq x < 4) = 0.7$$

$$F(x \geq 4) = 1$$

$$E(X) = ?$$

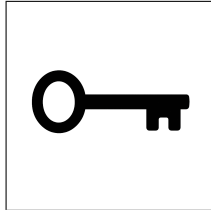
$$E(X^2) = ?$$

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

$$\sigma_X = ?$$



## Variance / SD



$$\begin{aligned}F(X < -4) &= 0 \\F(-4 \leq x < 1) &= 0.3 \\F(1 \leq x < 4) &= 0.7 \\F(x \geq 4) &= 1 \\E(X) &= ? \\E(X^2) &= ? \\\text{Var}(X) &= ? \\\sigma_X &= ?\end{aligned}$$

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$$\begin{aligned}P(X = -4) &= 0.3 \\P(X = 1) &= 0.4 \\P(X = 4) &= 0.3\end{aligned}$$

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$$\begin{aligned}E(X) &= \sum_x x p(x) \\E(X) &= (-4)(0.3) + (1)(0.4) + (4)(0.3) \\E(X) &= -1.2 + 0.4 + 1.2 \\E(X) &= 0.4\end{aligned}$$

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$$\begin{aligned}E(X^2) &= \sum_x x^2 p(x) \\E(X^2) &= (-4)^2(0.3) + 1^2(0.4) + (4)^2(0.3) \\E(X^2) &= 16(0.3) + 1(0.4) + 16(0.3) \\E(X^2) &= 4.8 + 0.4 + 4.8 \\E(X^2) &= 10.0\end{aligned}$$

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$$\begin{aligned}\text{Var}(X) &= E(X^2) - [E(X)]^2 \\\text{Var}(X) &= 10.0 - (0.4)^2 \\\text{Var}(X) &= 10.0 - 0.16 \\\text{Var}(X) &= 9.84\end{aligned}$$

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$$\begin{aligned}\sigma_X &= \sqrt{\text{Var}(X)} \\\sigma_X &= \sqrt{9.84} \\\sigma_X &\approx 3.138\end{aligned}$$