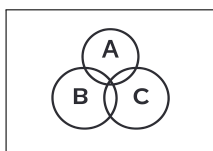
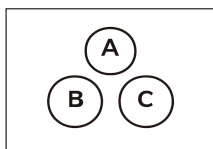


18

Discrete Distribution Uniform Variable

C

$$X = \{2, 4, 6, 8\}$$



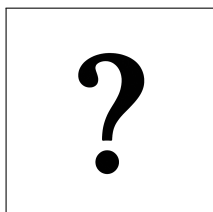
$$P(X = x) = \frac{1}{4}$$

$$E(X) = \sum_x xP(X = x) = \frac{1}{4}(2 + 4 + 6 + 8) = \frac{20}{4} = 5$$

$$E(X^2) = \sum_x x^2P(X = x) = \frac{1}{4}(2^2 + 4^2 + 6^2 + 8^2) = \frac{1}{4}(4 + 16 + 36 + 64) = \frac{120}{4} = 30$$

$$\text{Var}(X) = E(X^2) - [E(X)]^2 = 30 - 25 = 5$$

$$E(3X - 1) = 3E(X) - 1 = 3(5) - 1 = 14$$



$$X = \{3, 4, 5, 6, 7, 8, 9, 10\} = \{a, 4, 5, 6, 7, 8, 9, b\} \rightarrow |X| = 8$$

$$P(X = x) = 1/8$$

$$a = 3$$

$$b = 10$$

$$E[X] = ?$$

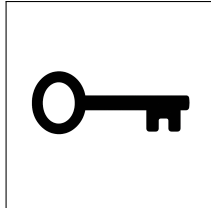
$$E[X^2] = ?$$

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

18

Discrete Distribution Uniform Variable

C



$$X = \{3, 4, 5, 6, 7, 8, 9, 10\} = \{a, 4, 5, 6, 7, 8, 9, b\} \rightarrow |X| = 8$$

$$P(X = x) = 1/8$$

$$a = 3$$

$$b = 10$$

$$E[X] = ?$$

$$E[X^2] = ?$$

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

$$E[X] = \frac{a+b}{2}$$

$$E[X] = \frac{3+10}{2}$$

$$E[X] = 6.5$$

$$E[X] = \frac{1}{8} \sum_{x=3}^{10} x$$

$$E[X] = \frac{1}{8} (3 + 4 + 5 + 6 + 7 + 8 + 9 + 10)$$

$$E[X] = \frac{52}{8}$$

$$E[X] = 6.5$$

$$E[X^2] = \frac{1}{8} \sum_{x=3}^{10} x^2$$

$$E[X^2] = \frac{1}{8} (3^2 + 4^2 + \dots + 10^2)$$

$$E[X^2] = \frac{1}{8} (9 + 16 + 25 + 36 + 49 + 64 + 81 + 100)$$

$$E[X^2] = \frac{380}{8}$$

$$E[X^2] = 47.5$$

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

$$\text{Var}(X) = 47.5 - (6.5)^2$$

$$\text{Var}(X) = 47.5 - 42.25$$

$$\text{Var}(X) = 5.25$$

$$\text{Var}(X) = \frac{(b-a+1)^2 - 1}{12}$$

$$\text{Var}(X) = \frac{8^2 - 1}{12}$$

$$\text{Var}(X) = \frac{63}{12}$$

$$\text{Var}(X) = 5.25$$