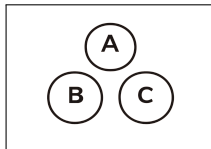


11

Discrete Distribution Independant Events

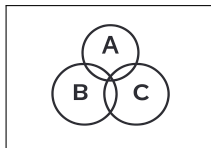


$$S = \{1, 2, 3, 4\}$$

$$A = \{1, 2\}$$

$$B = \{1, 3\}$$

$$C = \{1, 4\}$$



$$P(1) = P(2) = P(3) = P(4) = \frac{1}{4}$$

$$P(A) = P(B) = P(C) = \frac{1}{2}$$

$$A \cap B = \{1\} \rightarrow P(A \cap B) = \frac{1}{4}$$

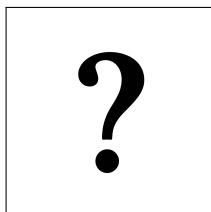
$$A \cap C = \{1\} \rightarrow P(A \cap C) = \frac{1}{4}$$

$$B \cap C = \{1\} \rightarrow P(B \cap C) = \frac{1}{4}$$

$$\frac{1}{4} = P(A \cap B) = P(A) \times P(B) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \rightarrow A \perp\!\!\!\perp B = \text{thumbs up}$$

$$\frac{1}{4} = P(A \cap C) = P(A) \times P(C) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \rightarrow A \perp\!\!\!\perp C = \text{thumbs up}$$

$$\frac{1}{4} = P(B \cap C) = P(B) \times P(C) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \rightarrow B \perp\!\!\!\perp C = \text{thumbs up}$$



$$S = \{(i, j) \mid i, j \in \{1, 2, 3, 4, 5, 6\}\}, \quad |S| = 36$$

$$A = \{(1, j), (2, j), (3, j) \mid j = 1 \text{ to } 6\} \Rightarrow |A| = 18 \Rightarrow P(A) = \frac{18}{36} = \frac{1}{2}$$

$$B = \{(3, j), (4, j), (5, j) \mid j = 1 \text{ to } 6\} \Rightarrow |B| = 18 \Rightarrow P(B) = \frac{18}{36} = \frac{1}{2}$$

$$C = \{(3, 6), (4, 5), (5, 4), (6, 3)\} \Rightarrow |C| = 4 \Rightarrow P(C) = \frac{4}{36} = \frac{1}{9}$$

11

Discrete Distribution Independant Events



$$A \cap B = \{(3, j) \mid j = 1 \text{ to } 6\} \Rightarrow |A \cap B| = 6P(A \cap B) = \frac{6}{36} = \frac{1}{6}$$

$$P(A) \cdot P(B) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

$$\frac{1}{4} \neq \frac{1}{6} \rightarrow A \perp\!\!\!\perp B = \text{✗}$$