Problem

You draw 2 cards from a standard 52-card deck without replacing them. What is the probability that both cards are of the same suit?

Solution

There are 13 cards of each suit in a deck.

Let's consider events:

- A - first card is of suit X
- B - second card is of suit X

Every suit has an equal number of cards in the deck:

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

There are 12 of the same matching suit remaining in the 51-card deck:

$$P(B|A) = \frac{12}{51}$$

Conditional probability:

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

$$P(A \cap B) = P(B|A) \cdot P(A)$$

For all 4 decks we get:

$$4 \cdot P(A \cap B) = 4 \cdot \frac{12}{51}\frac{1}{4} = \frac{12}{51}$$