WEEK 9 - Long Answer Question 1

Instructions

From a pack of cards, two cards are drawn at random. What is the probability of getting a King and a Spade card?

Total Cards

- Total cards in a deck: 52

Scenario 1: King first, then Spade

1. Probability of drawing a King first: There are 4 Kings in the deck.

P(King first)=452P(King first)=524

2. Probability of drawing a Spade second: After drawing a King, there are 51 cards left. If the King drawn is not a Spade, there are still 13 Spades left. If the King drawn is the King of Spades, there will be 12 Spades left.

- If the King is not a Spade:

P(Spade second)=1351P(Spade second)=5113

- If the King is the King of Spades:

P(Spade second)=1251P(Spade second)=5112

3. Combined Probability for Scenario 1:

- Probability of drawing a non-Spade King and then a Spade:

P(non Spade King)=352(3 non Spade Kings)P(non Spade King)=523(3 non Spade Kings)

P(Spade second)=1351P(Spade second)=5113

Combined:

P(non Spade King and Spade)=352×1351P(non Spade King and Spade)=523×5113

- Probability of drawing the King of Spades and then another Spade:

P(King of Spades)=152P(King of Spades)=521

P(Spade second)=1251P(Spade second)=5112

Combined:

P(King of Spades and another Spade)=152×1251P(King of Spades and another Spade)=521×5112

Scenario 2: Spade first, then King

1. Probability of drawing a Spade first: There are 13 Spades in the deck.

P(Spade first)=1352P(Spade first)=5213

2. Probability of drawing a King second: After drawing a Spade, there are still 4 Kings in the remaining 51 cards.

P(King second)=451P(King second)=514

Final Calculation

Now we can sum up all the probabilities:

P(King and Spade)=P(non Spade King and Spade)+P(King of Spades and another Spade)+P(Spade and then King)P(King and Spade)=P(non Spade King and Spade)+P(King of Spades and another Spade)+P(Spade and then King)

Calculating each part:

1. Non-Spade King and then Spade:

- 3/52∗13/51=39/26523/52∗13/51=39/2652

2. King of Spades and then another Spade:

- 1/52∗12/51=12/26521/52∗12/51=12/2652

3. Drawing a Spade first and then any King:

- 13/52∗4/51=52/265213/52∗4/51=52/2652

Adding these together gives:

P(King and Spade)=(39+12+52)/2652=103/2652P(King and Spade)=(39+12+52)/2652=103/2652

Simplifying

The final probability can be simplified:

P(King and Spade)=1/26P(King and Spade)=1/26