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

SOLUTION:

To find the probability of getting a King and a Spade card, we need to use the concept of probability of dependent even, dependent events are events whose occurrence of one affects the probability of occurrence of the other. The probability of two dependent events can be calculated using the conditional probability formula:

P (A and B) = P (A) x P (B|A)

where P (A) is the probability of event A happening, P (B|A) is the probability of event B happening given that event A has already happened, and P (A and B) is the probability of both events happening together.

In this problem, we have two events:

A: Getting a King card B: Getting a Spade card

We assume that the cards are drawn without replacement, which means that the first card drawn is not put back into the pack before drawing the second card. This makes the events dependent, because the probability of getting a Spade card depends on whether the first card was a Spade or not.

To find P (A and B), we need to find P (A) and P (B|A). We can use the following information:

* There are 52 cards in a pack
* There are 4 suits: Spades, Hearts, Diamonds, and Clubs
* There are 13 cards in each suit
* There are 4 Kings in a pack, one for each suit

P (A) is the probability of getting a King card in the first draw. There are 4 Kings out of 52 cards, so P (A) is:

P (A) = 4/52 = 1/13

P (B|A) is the probability of getting a Spade card in the second draw, given that the first card was a King. There are two possibilities for this:

* The first card was a King of Spades. In this case, there are 12 Spades left out of 51 cards, so P (B|A) is:

P (B|A) = 12/51

* The first card was a King of another suit. In this case, there are 13 Spades left out of 51 cards, so P (B|A) is:

P (B|A) = 13/51

To find the overall P (B|A), we need to use the law of total probability, which states that:

P (B|A) = P (B|A1) x P (A1) + P (B|A2) x P (A2)

where A1 and A2 are mutually exclusive and exhaustive events that make up event A.

In this problem, A1 is getting a King of Spades and A2 is getting a King of another suit. These events are mutually exclusive because they cannot happen at the same time, and they are exhaustive because they cover all possible outcomes for event A.

The probability of getting a King of Spades is 1/52, and the probability of getting a King of another suit is 3/52. Therefore,

P (B|A) = (12/51) x (1/52) + (13/51) x (3/52) P (B|A) = 12/2652 + 39/2652 P (B|A) = 51/2652 P (B|A) = 17/884

Now we can use the conditional probability formula to find P (A and B):

P (A and B) = P (A) x P (B|A) P (A and B) = (1/13) x (17/884) P (A and B) = **17/11492**

Therefore, the probability of getting a King and a Spade card is **17/11492**.