

Quiz 9 - Math 374, Frank Thorne (thorne@math.sc.edu)

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You are dealt two cards from a standard 52-card deck. (13 of the cards are spades.)

1. What is the probability that both cards are spades?

Solution 1. The probability the first card is a spade is $\frac{1}{4}$, and the probability the second card is a spade is $\frac{12}{51} = \frac{4}{17}$ if the first card is a spade, so

$$\frac{1}{4} \times \frac{4}{17} = \frac{1}{17}.$$

Solution 2. There are $C(13, 2)$ pairs of spades, and $C(52, 2)$ pairs of cards total, so

$$\frac{C(13, 2)}{C(52, 2)}.$$

If you simplify this you get the same thing.

2. What is the probability that at least one of the two cards is a spade?

Solution 1. If the first card is a spade, the probability that the second is not is $\frac{39}{51} = \frac{13}{17}$. So the probability that the first card is a spade and the second is not is

$$\frac{1}{4} \times \frac{13}{17} = \frac{13}{68}.$$

The probability the second card is a spade and the first is not is the same. We add these two probabilities to the solution to Problem 1 to get

$$\frac{1}{17} + \frac{13}{68} + \frac{13}{68} = \frac{4 + 13 + 13}{68} = \frac{30}{68} = \frac{15}{34}.$$

Solution 2. There are $C(39, 2)$ pairs of cards other than spades, and so the answer is

$$1 - \frac{C(39, 2)}{C(52, 2)},$$

which simplifies to $\frac{15}{34}$.