Finite Mathematics (Math 10120) Sec 01, Spring 2014

Quiz 2, Friday February 21

Solutions

Remember that a deck of cards has a total of 52 cards. There are 4 suits (hearts, clubs, diamonds and spades), and in each suit there are 13 denominations (ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, king).

1. I select 5 cards from a well shuffled deck. What is the probability that all five cards I select are spades (order of selection doesn't matter, all selections are equally likely)? (This is called a *flush of spades*.)

   Solution: There are $C(52, 5)$ selections of five cards, so this will be the denominator for this and both of the next two probability calculations. For the numerator, here there are are $C(13, 5)$ selections of five cards that are all spades (there are 13 spades in total). So the probability is $C(13, 5)/C(52, 5) \approx .000495$.

2. I select 5 cards from a well shuffled deck. What is the probability that I select a ten, jack, queen, king and ace, and that all five cards are of the same suit? (This is called a *royal flush*.)

   Solution: There are only 4 successful outcomes here (one for each choice of suit), so the probability is $4/C(52, 13) \approx .00000154$.

3. I select 5 cards from a well shuffled deck. What is the probability that I select a royal flush, that consists entirely of spades?

   Solution: Now there is only 1 successful outcome (the five cards are completely specified in advance), so the probability is $1/C(52, 13) \approx .000000385$.

4. Use the work you've done in the previous parts of this question to calculate the probability that when I select 5 cards from a well shuffled deck, I select *either* a royal flush *or* a flush of spades.

   Solution: Let A be the event of a royal flush, and B the event of flush of spades. We want $\Pr(A \cup B)$, which is $\Pr(A) + \Pr(B) - \Pr(A \cap B)$. Part 1 of the question calculates $\Pr(A)$, part 2 calculates $\Pr(B)$ and part 3 calculates $\Pr(A \cap B)$, so the answer is $C(13, 5)/C(52, 5) + 4/C(52, 5) - 1/C(52, 5) \approx .000494$.