Drill Quiz Answers for Chapter 12 Section 3

1. (3 points) Suppose E and F are events in a sample space. What does the symbol $P(E|F)$ stand for? Write both a verbal description and a formula.

   $P(E|F)=P(E \cap F)/P(F)$.
   P(E|F) is the probability that the event E occurred given that the event F occurred.

2. Consider the experiment in which you roll a fair die. The next questions are about the following events:

   E = the event that the number you roll is even.
   Note $E=\{2,4,6\}$.
   F = the event that the number you roll is greater than 2 (Note: "greater than 2" means 3 or larger).
   Note $F=\{3,4,5,6\}$.

   a. (2 points) What is the probability that you roll an even number, given that the number you roll is greater than 2? Write the symbol as well as the numerical answer.

      $P(E|F)= n(E \cap F)/n(F)=2/4=1/2$

      Note that $E \cap F$ is the set of rolls that yield a number that is even and greater than 2, so $E \cap F=\{4,6\}$.

   b. (2 points) What is the probability that you roll a number greater than 2, given that the number you roll is even? Write the symbol as well as the numerical answer.

      $P(F|E)= n(E \cap F)/n(E)=2/3$.

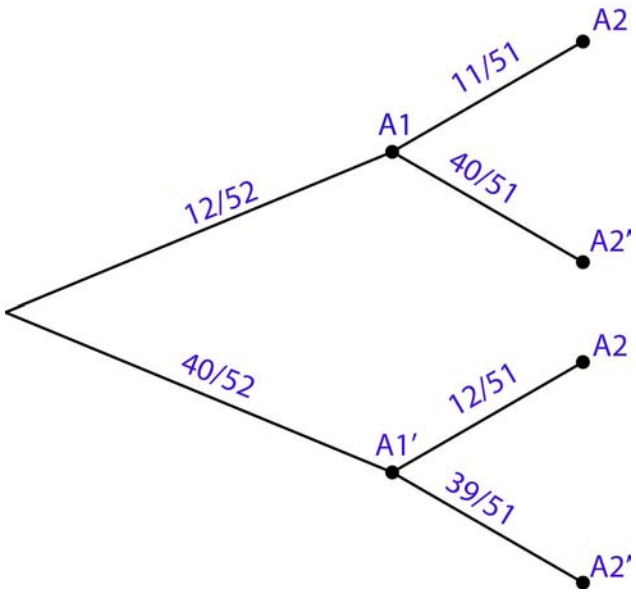
      Note that the numerators when calculating the probabilities $P(E|F)$ and $P(F|E)$ are the same.

3. Consider the experiment in which you choose two cards from a standard deck of playing cards. The next questions are about the following events:

   A_1 = the event that the first card you choose is a 2, 3 or 4.

   A_2 = the event that the second card you choose is a 2, 3 or 4.

   Use the back of this quiz to draw a tree diagram for this experiment. Label the nodes with the appropriate events and the branches (the lines) with the appropriate probabilities.



a. (2 points) What is $P(A_1)$?

$P(A_1)$ is the probability that the first card is a 2, 3 or 4. There are 12 cards numbered either 2, 3 or 4, so $n(A_1) = 12$. Thus $P(A_1) = n(A_1)/\, n(S) = 12/52$.

b. (2 points) What is $P(A_2|A_1)$?

$P(A_2|A_1)$ is the probability that the second card is a 2, 3 or 4, given that the first card is a 2, 3 or 4. If we picked a 2, 3 or 4 for the first cards, then there are 11 cards numbered 2, 3, or 4 left in the deck Thus $P(A_2|A_1) = 11/51$.

c. (2 points) What is the probability that both cards are a 2, 3 or 4?

$P(A_1 \cap A_2) = P(A_2|A_1)P(A_1) = (12/52)\,(11/51) = 0.050$.
You can obtain this answer by multiplying the numbers on the top most branch of the tree.

d. (2 points) What is the probability that the first card is a 2, 3 or 4 but the second card is not a 2, 3 or 4?

$P(A_1 \cap A_2') = P(A_2'|A_1)P(A_1) = (12/52)(40/51) = 0.181$
You can obtain this answer by multiplying the numbers on the second branch of the tree.