Math Club Problem Set #5 Conditional Probability:

1. A pair of dice is rolled. Given that neither shows a "1", what is the probability that the sum of the dice is 7?

2. A fair standard die is tossed three times. Given that the sum of the first two tosses equals the third, what is the probability that at least one "2" is tossed? (AMC)

3. Two fairs coins are simultaneously flipped. This is done repeatedly until at least one of the coins comes up heads, at which point the process stops. What is the probability that the other coin also came up heads on this last flip?

4. Bag "X" has 2 red balls and 3 blue balls. Bag Y has 8 red balls and 2 blue balls. One of the two bags is chosen at random, and then a ball is chosen at random from that bag. If a blue ball is chosen, what is the probability that it came from bag "X"?

5. Suppose there are 9 red balls and 1 white ball in Bag "X" and 2 white balls in Bag Y. A bag is chosen at random, then a ball is selected from the bag. Given that the ball is white, what is the probability that the bag was Bag "x"?

6. The probability that event A occurs is 0.75 and the probability that event B occurs is $0.\overline{6}$
   a. What is the minimum and maximum possible values of $P(A \cap B)$?

   b. What is the minimum and maximum possible values of $P(A \mid B)$?

   c. What is the minimum and maximum possible values of $P(B \mid A)$?

7. 4 cards are drawn at random from a standard 52 card deck. At least 3 of them are hearts. What is the probability that they are all hearts?

8. Let "x" and "y" be drawn (with replacement) from {1,2,3,....99} such that each ordered pair (x,y) is equally likely. Given that "x+y" is even, determine the probability that the sum of the units digits of "x" and "y" is less than 10.

9. There are "m" mean and "n" women in a bowling club. Two members are chosen at random. If atleast one woman is selected, what is the probability that both members selected are women?

10. A new test for HIV is 90% accurate. [10% of the time it gives the wrong result] Suppose that 5% of the general population has the flu. If a person tests positive for the flu, what is the probability that she actually has it?

11. A bag of popcorn has 2/3 white kernels and 1/3 yellow kernels. Only half the white kernels will pop, but 2/3 of the yellow kernels will. If a kernel is taken at random from the bag and is popped, what is the probability that it was a yellow kernel?

12. Two real numbers "r" and "s" are chosen at random between 0 and 1. If we know that $|r - s| < \dfrac{1}{4}$, what is the probability that $r < 0.5 < s$?

13. Larry has a 75% probability of attending a meeting. Tom has an 80% chance of attending is Larry also attends; otherwise he has 50% chance of attending. If we see Tom attending, what is the probability that Larry is also there?

Challenge:

14. The Canucks and Avalanche played a 6 game series. The probability that the Canucks would win each game is 2/3. What is the probability that the Canucks won the series?

15. A coin is flipped 20 times in a row. Given that exactly 14 heads appear, find the probability that no two consecutive coin flips were both tails?

16. A game of craps is played with a set of 5 dice. A player cheats by using a die that rolls a "6" with 50% probability with the other numbers having equal probability. A boss chooses one die randomly and rolls it 10 times to inspect it. How many "6's" would he have to roll in order to be at least 90% sure that the chosen die is the faulty one?

17. 3 points A, B, C are randomly chosen on the circumference of a circle. If A, B, and C all lie on a semicircle, then what is the probability that all of the angles of the triangles are less than 120 degrees?