Math 6 Probability Review

1. Three people have been exposed to a certain illness. Once exposed, a person has a 50-50 chance of actually becoming ill.

   (a) What is the probability that exactly one of the people becomes ill?
   (b) What is the probability that at least two of the people become ill?
   (c) What is the probability that none of the three people becomes ill?

2. One urn contains two black balls (labelled $B1$ and $B2$) and one white ball. A second urn contains one black ball and two white balls (labelled $W1$ and $W2$). Suppose the following experiment is performed: One of the two urns is chosen at random. Next a ball is randomly chosen from the urn. Then a second ball is chosen at random from the same urn without replacing the first ball.

   (a) What is the probability that two black balls are chosen?
   (b) What is the probability that two balls of opposite color are chosen?

3. Ten equally qualified marketing assistants are candidates for promotion to associate buyer; seven are men and three are women. If the company intends to promote four of the ten at random, what is the probability that exactly two of the four are women?

4. An urn contains six chips, numbered 1 through 6. Two are chosen (simultaneously) at random and their numbers are added together. What is the probability that the resulting sum is equal to 5?

5. An urn contains 20 chips, numbered 1 through 20. Two are drawn simultaneously. What is the probability that the numbers on the two chips will differ by more than 2?

6. A bridge hand (13 cards) is dealt from a standard 52-card deck. Let A be the event that the hand contains four aces; let B be the event that the hand contains four kings. Find $\Pr(A \cup B)$.

7. Consider a set of 10 urns, 9 of which each contains three white chips and three red chips. The tenth contains five white chips and one red chip. An urn is picked at random. Then a sample of size 3 is drawn without replacement from that urn. If all three chips drawn are white, what is the probability the urn being sampled is the one with five white chips?

8. A committee of 50 politicians is to be chosen from among our 100 U.S. Senators. If the selection is done at random, what is the probability that each state will be represented?

9. Suppose that n fair dice are rolled. What are the chances that all n faces will be the same?

10. An apartment building has eight floors. If seven people get on the elevator on the first floor, what is the probability they all want to get off on different floors? On the same floor? What assumption are you making? Does it seem reasonable? Explain.

11. Six fair dice are rolled at one time. What is the probability that each of the six faces appears?

12. Suppose that a randomly selected group of k people are brought together. What is the probability that exactly one pair has the same birthday (assume that there are 365 days in a year)?

13. Dana is not the world's best poker player. Dealt a 2 of diamonds, an 8 of diamonds, an ace of hearts, an ace of clubs, and an ace of spades, she discards the three aces. What are her chances of drawing to a flush (five cards of the same suit)?

14. A poker player is dealt a 7 of diamonds, a queen of diamonds, a queen of hearts, a queen of clubs, and an ace of hearts. He discards the 7. What is his probability of drawing to either a full house (three-of-a-kind plus a pair) or a four-of-a-kind?

15. Tim is dealt a 4 of clubs, a 6 of hearts, an 8 of hearts, a 9 of hearts, and a king of diamonds. He discards the 4 and the king. What are his chances of drawing to a straight flush (five cards of the same suit and having consecutive denominations)? to a flush (but *not* a straight flush)?

16. Five cards are dealt from a standard 52-card deck. What is the probability that the sum of the faces on the five cards is 48 or more (assume that the ace has value 1 and each of the face cards has value 10)?

17. Nine cards are dealt from a 52-card deck. What is the probability that three of the five even numerical denominations are represented twice, one of the three face cards appears twice, and a second face card appears once. *Note*: Face cards are the jacks, queens, and kings; 2, 4, 6, 8, and 10 are the even numerical denominations.

18. A coke hand in bridge is one where none of the 13 cards is an ace or is higher than a 9. What are the odds of being dealt such a hand?

19. A pinochle deck has 48 cards, two of each of six denominations (9, 10, J, Q, K, A) and the usual four suits. Among the many hands that count for meld is a *roundhouse*, which occurs when a player has a king and queen of each suit. In a hand of 12 cards, what is the probability of getting a "bare" roundhouse (a king and queen of each suit and no other kings or queens)?