Discrete Probability

1. Consider rolling two fair dice. What is the probability of:

   (a) Rolling a 9?

   (b) Rolling a double?

   (c) Rolling an even value?

   (d) Rolling an even value or a 9?

   (e) Rolling a double or an 8?

   (f) A roll where neither die shows a 1?

   (g) A roll where at least one die shows a 1?

2. Consider drawing 5 cards at random from a standard 52-card deck. What is the probability of a hand containing:

   (a) Only one 10 of any suit?

   (b) A flush (5 cards of the same suit)?

   (c) A hand containing 3-of-a-kind that is neither a full house or 4-of-a-kind?

   (d) A hand containing a straight-flush (5 cards in sequence in the same suit)?

3. A computer generates random bit strings of length 8. What is the probability that a generated bit string contains:

   (a) Exactly five 1's.

   (b) At least one 1.

   (c) An even number of 1's.

   (d) An even number of 1's such that neither the first nor the last position is a 1.

4. A horse race is run with 9 horses. What is the probability that:

   (a) The 4-horse comes in first (win), second (place) or third (show)?

(b) The 4-horse and the 9-horse come in first and second in any order (an exacta)?

(c) The 4-horse, 6-horse, and the 9-horse come in first, second, and third in any order (a trifecta)?

5. Consider the numbers from 1 to 100. If a number is randomly selected, what is the probability that it is:

   (a) The number 61?

   (b) An odd number?

   (c) A number that divisible by 7?

   (d) A number that is divisible by 3 or 7?