1. An ID includes 9 digits selected uniformly random in range from integral number 0-9. Each number can be selected multiple times. What is the probability that none of the digit can be 0 or 3 if the first digit is not 0?

2. A standard 52-card deck includes thirteen ranks, A-K-Q-J-10-9-8-7-6-5-4-3-2, of each of the four suits: clubs (♣), diamonds (♦), hearts (♥) and spades (♠). Randomly select five cards without replacement. What is probability for selecting:
   (a) Straight Flush? (Five cards of the same suit in sequence. For example: ♦J-♦10-♦9-♦8-♦7. In this game, 5-4-3-2-A is not allowed)
   (b) Full House? (Three cards of one rank and two cards of another rank. For example: ♦7-♦7-♥7-♥9-♣9)
   (c) Flush? (Five cards of the same suit. For example: ♦K-♦J-♦9-♦3-♦2. Flush is not including Straight Flush)

3. Refer to the first problem in HW1.
   (a) In a general case, for n distinguishable particles and r possible cells, there are how many possible outcomes?
   (b) What is the probability for event A, B and C as we defined in HW1. Assume r ≥ n.

4. Refer to the fourth problem in HW2.
   Consider a large communication channel which is composed by N identical independent binary channel sections as shown in below:

   ![Diagram](image)

   Each binary channel has the same channel transition probabilities $p_0, p_1, q_0$ and $q_1$ as defined in HW2.

   **Assume $p_0 = p_1$ and $q_0 = q_1$**

   (a) Assuming 0 and 1 at input of the 1st channel section occurs with same probability 0.5, what is the error rate at the output of the 4th channel section, $P(X_1 \neq Y_4)$?

   (b) Under the same assumption, what is the error rate for the whole communication channel, $P(X_1 \neq Y_N)$?