1. Each sample of water has a 10% chance of containing a particular organic pollutant. Assume that the samples are independent with regard to the presence of the pollutant. Find the probability that in the next 18 samples, exactly 2 contain the pollutant.

   A) 0.098 B) 0.265 C) 0.284 D) 0.137

2. A factory produced the screws and it is known that the probability of defective is 0.01 independently of each other. The factor sells the screws in packages of 10 and offers a money-back guarantee that at most 1 of the 10 screws is defective. What proportion of packages sold must the factory replace?

   A) 9.1% B) 0.4% C) 9.6% D) 90.4%

3. In a chuck-a-luck gambling game, a player bets on one of the number 1 through 6. Three dice are then rolled, and if the number bet by the player appears x times, $x = 1, 2, 3$, then the player wins x units; on the other hand, if the number bet by player does not appear on any of the dice, then the player loses 1 unit. Find the probability that the player wins at least 1 unit in the game.

   A) 0.069 B) 0.347 C) 0.579 D) 0.421

4. The probability that a wafer contains a large particle of contamination is 0.01. If it is assumed that the wafers are independent, what is the probability that exactly 120 wafers need to be analyzed before a large particle is detected?

   A) 0.299 B) 0.001 C) 0.003 D) 0.701

5. A communication system consists of n components, each of which will independently function with probability p. The total system will be able to operate effectively if at least one-half of its components function. For what values of p is a 5-component system more likely to operate effectively than a 3-component system?

   A) $p = \frac{1}{2}$ B) $p > \frac{1}{2}$ C) $p < \frac{1}{2}$ D) $p < \frac{1}{3}$

6. Suppose that the number of typographical errors on a single page of the book has a Poisson distribution with parameter $\lambda = \frac{1}{2}$. Calculate the probability that there is at least one error on this page.

   A) 0.393 B) 0.607 C) 0.303 D) 0.910

7. Suppose that the probability of an item produced by a machine will be defective is 0.1. What is the Poisson approximation to the probability that a sample of 10 items will contain at most 1 defective item.

   A) 0.7811 B) 0.7732 C) 0.7358 D) 0.7937

8. Flaws occurs at random along the length of a thin wire. Let X denote the random variable that counts the number of flaws in a length of l millimeters of wire and let λ be the average number of flaws per millimeters. Suppose that the number of flaws follows a Poisson distribution with a mean of 2.3 flaws per millimeter.

   i) Determine the probability of exactly 2 flaws in 1 millimeter of wire.

      A) 0.265 B) 0.165 C) 0.372 D) 0.465

   ii) Determine the probability of 10 flaws in 5 millimeter of wire.

      A) 0.211 B) 0.168 C) 0.193 D) 0.113

   iii) Determine the probability of at least 1 flaw in 2 millimeters of wire.

A) 0.2439 B) 0.0101 C) 0.9899 D) 0.7561