Binomial Problems

1. A coin is to be tossed 12 times. Let X count the number of heads tossed. Determine the following:

a. $P(X = 3)$

b. $P(X < 12)$

c. $P(X \geq 7)$

2. A coin is to be tossed 15 times. Let X count the number of heads tossed. Determine the following:

a. $P(X \leq 2)$

b. $P(9 < X < 11)$

c. $P(6 \leq X < 10)$

3. We have an unfair coin which give us tails 70% of the time. The coin is to be tossed 15 times. The Let X count the number of heads tossed. Determine the following:

d. $P(X \leq 9)$

e. $P(9 < X < 11)$

f. $P(2 \leq X < 15)$

4. Consider a binomial experiment with n = 14 and p = 0.2. Let X count the number of successes. Determine the following:

a. P (10 ≤ X ≤ 13)

b. P (7 < X)

Poisson Distribution Problems

1. The number of customers entering a building over a 12-minute period is assumed to follow a Poisson distribution with a mean of 7. Let X count the number of individuals in the next 12 minutes. Determine the following:

a. P (X = 9)

b. P (X > 13)

c. P (12 < X ≤ 15)

d. P (7 ≤ X ≤ 10)

Scenario 1: Hospital Emergency Room

The number of patients arriving at an emergency room over a 30-minute period follows a Poisson distribution with a mean of 5. Let X be the number of patients arriving in the next 30 minutes. Determine the following:

a. $P(X=3)$

b. $P(X>7)$

c. $P(4<X\leq 8)$

d. $P(2\leq X\leq 6)$

Let X count the number of people arriving at the bus stop in the next 20 minutes. Determine the following:

a. What is the new value of λnew for a 20-minute period?

b. $P(X<12)P(X<12)$

c. $P(X\leq 9)P(X\leq 9)$

d. $P(8\leq X<11)$

e. $P(10<X<14)$

Scenario 2: Traffic Through a Toll Booth

The number of cars passing through a toll booth in a 10-minute interval follows a Poisson distribution with a mean of 4 cars. Let X represent the number of cars passing in the next 10 minutes. Determine the following:

a. $P(X=6)$

b. $P(X>9)$

c. $P(3<X\leq 7)$

d. $P(1\leq X\leq 5)$

Scenario 2: Orders in an Online Store

The number of orders placed in an online store follows a Poisson distribution with a mean of 6 orders per hour. Let Y count the number of orders placed in the next 30 minutes. Determine the following:

a. What is the new value of λnew for a 30-minute period?

b. $P(X<5)$

c. $P(X\leq 3)$

d. $P(2\leq X<6)$