***Question1 : Discrete Random Variables***

Consider a binomial experiment where the number of independent trials is 10, and the probability of success is 0.25. Let X denote the number of successes in the 10 trials.

1. Write out the sample space of X.
2. For the each of the following events, write out the sample points:
   1. the number of successes is less than or equal to 3,
   2. the number of successes is greater than 4,
   3. the number of successes is greater than 8,
   4. the number of successes is between 4 and 7.

***Question 2:*** ***Discrete Random Variables***

By considering the relevant sample points from the sample space in question 1, show that

1. P(4 ***≤***X ***≤***8) = P(X ***≤***4) – P(X ***≤***9 )
2. P(X=4) = P(X ***≥***4) – P(X ***≥***5 )
3. P(X***≤***7) = 1- P(X ***≥***8)

***Question 3: Poisson Distribution***

Cars enter a car wash at an average rate of 4 per half hour.

1. Compute the probability that the 3 cars arrive in a half hour period.
2. Compute the probability that the 6 cars arrive in a one hour period.

***Question 4 : Binomial Distribution***

Let X denote the number of bits received in error in a digital communication channel, and assume that X is a binomial random variable with p=0.10. If 100 bits are transmitted, use the binomial tables to determine the following

1. P(X=1)
2. P(X *≥*1)
3. P(X *≤*2)

***Question 5 : Binomial Distribution***

In a test of a printed circuits board using a random test pattern, an array of 10 bits is equally likely to be “zero” or “one”. Assume that the bits are independent.

What is the probability that all bits are “ones”? (Answer : 0.0010)

***Question 6 : Binomial Distribution***

An examination contains 20 multiple choice questions with four choices per questions. A pass is obtained by answering 10 questions correctly. Calculate the probability that a student who chooses the answer to each question at random will pass the examination. ( Answer : 0.0139 )

***Question 7 : Binomial Distribution***

An electronics product contains 20 integrated circuits. The probability that any integrated circuit is defective is 0.20. The ICs operate independently of each other. The product operates only if there are no defective ICs. What is the probability that the product operates?

It is not economically viable to repair the product if there are more than 3 ICs are defective. What is the probability that it will not be repaired if broken.

***Question 8 : Poisson Distribution***

Phone calls arrive at a help desk at the rate of 48 per hour.

1. Find the probability of receiving three calls in a five minute period of time.
2. What is the probability of receiving 5 or fewer calls in a 15 minute interval of time.

***Question 9: Poisson Distribution***

The number of particles emitted by a radioactive source in 1 minute has a Poisson distribution with parameter m=1.2, called the emission rate. Calculate the probability that

1. No particle is emitted
2. At least 4 particles are emitted

***Question 10 : Poisson Approximation of Binomial distribution***

A particular electronic component is produced by a manufacturing process for which 0.1% of components are produced are defective. Consider a consignment of 5,000 of these times.

Let X denote the number of defective components in the consignment.

Use the Poisson Approximation of the binomial distribution to calculate P(X ≤25)

***Question 7 :***

***Question 8 :***

***Question 9 :***

***Question 10 : Exponential Distribution***

The time between arrivals at a particular intersection

During the day, cars pass along a point on a remote road at an average rate of one per 20 minutes. Calculate the probability that

1. in the course of an hour no car passes.
2. in the course of 30 minutes exactly 4 cars pass
3. in the course of 30 minutes at least two cars pass

In a newspaper on average 1 in 10 000 characters is incorrectly printed. Suppose the paper contains 50 000 characters. Calculate the exact probability that

* 1. no printing errors are made
  2. at least 3 errors are made