Probability Distribution

November 21, 2022

1.Let X be a random variable such that $X \sim Bin(10, 0.3)$.
Then,
(a) find
(i) $P(X = 5)$
(ii) $P(X \leq 1)$
(iii) $P(X > 4)$
(iv)The median of X

(b) Draw a random sample of size 100 from the distribution of X and obtain the proportion of observations which are ≤ 3.

2.A car hire company has two cars which it hires out a day. The number of demands for a car on each day has a Poisson distribution with mean 1.5. Find the proportion of days on which
a) neither car is used
b) one car remains idle
c) some demands are refused

3.A batch of parts contains 100 parts from a local supplier of tubing and 200 parts from a supplier of the neighbouring state. If four parts are selected randomly and without replacement a) what is the probability that they are all from the local supplier?
b) what is the probability that two or more parts in the sample are from the local supplier?
c) what is the probability that at least one part in the sample is from the local supplier?
4.Suppose a fair coin is tossed until the first head appears.Find the probability that
(i) there will be exactly five tails before the first head appears.
(ii) there will be at most 2 tails before the first head.
(iii) there will be at least 5 tails before the first head appears
(iv) the median number of tails before the first head.

4. When Stéphane plays chess against his favorite computer program, he

wins with probability 0.60. Assuming independence find the probability that Stéphane's fifth win happens when he plays his eighth game.

5.The height of students in a large college is found to have a normal distribution with mean 162.50 cm and standard deviation 6 cm. Find the probability that a student selected at random will have i) height greater than 168 cm ii) height less than or equal to 150 cm iii) height between 150 and 168 cm

6.The marks obtained by candidates in Mathematics (full marks 100) in a certain examination are found to be normally distributed with a certain mean and standard deviation. If 10% of the candidates obtain 60% or more marks, 40% failed to pass (minimum marks for pass is 30), find the mean and standard deviation of the distribution of marks.

7. It is known that the lifetime t of electron tubes is distributed as exponential with mean m. Find the probability that an electron tube chosen at random survives for more than 400 hours when m=200. For what value of m is this probability 0.5?

8.A daily consumption of milk in a city, in excess of 20000 litres, is approximately distributed as a Gamma with shape parameter 0.0001 and scale parameter 2. The city has a daily stock of 30000 litres. What is the probability that the stock is insufficient on a particular day?

9.The percentage of impurities per batch in a certain chemical product is a random variable X following a beta(3,2) distribution. A batch with more than 40% impurities cannot be sold. What is the probability that a randomly selected batch cannot be sold because of excessive impurities?

10.Suppose the lifetime of a motor has a lognormal distribution with shape parameter 11 hours and scale parameter 1.3 hours. What is the probability that the lifetime exceeds 12,000 hours?