B.Sc. (Hons.) in Information Technology

Year 2 - Semester 2, 2024

Lab Exercise 7 (Probability Distributions)

IT2110 - Probability & Statistics Week 09

Use R to find the probabilities in the following questions.

1) A company claims that their drug treatment cures 92% of cases of hookwarm in children. Suppose that 44 children suffering from hookwarm are to be treated with this drug and that the children are regarded as a simple random sample taken from a large population of children suffering from hookwarm. Let X denote the number of children cured from a sample of 44 children.

   i. What is the distribution of X?

   ii. What is the probability that 40 children are cured?

   iii. What is the probability that less than or equal to 35 children are cured?

   iv. What is the probability that at least 38 children are cured?

   v. What is the probability that between 40 and 42 (both inclusive) children are cured?

2) Data from the maternity ward in a certain hospital shows that there is a historical average of 4.5 babies born in this hospital every day.

   i. What is the probability that 6 babies will be born in this hospital tomorrow?

   ii. What about the probability of more than 6 babies being born?

3) The time (in hours) required to repair a machine is an exponential distributed random variable with parameter $\lambda=1/2$.

   i. Find the probability that a repair time takes at most 3 hours.

   ii. Find the probability that a repair time exceeds 4 hours.

   iii. Find the probability that a repair time takes between 2 to 4 hours

4) Assume that human body temperatures are normally distributed with a mean of 36.8 C^0 and a standard deviation of 0.4 C^0 .

i. A hospital uses 37.9 C^0 as the lowest temperature considered to be a fever. What is the probability that randomly selected person would have a fever?

ii. What is the probability that a random selected person would have a temperature between 36.4 C^0 and 36.9 C^0 ?

iii. Physicians want to select a maximum temperature for requiring further medical tests. What should that temperature be, if want only 1.2% of the people to fall below it?

iv. Physicians want to select a minimum temperature for requiring further medical tests. What should that temperature be, if want only 1.0% of the people to fall above it?