Lab 06 – PS

**Lab Exercise 6 (Discrete Probability Distributions)**

1. A company claims that their drug treatment cures 92% of cases of hookworm in children. Suppose that 44 children suffering from hookworm 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 hookworm. Let X denote the number of children cured from a sample of 44 children.

i. What is the distribution of X? Binomial distribution with n=44, p=0.92

ii. What is the probability that 40 children are cured? P(X=40) = 0.19797761097925443

iii. What is the probability that less than or equal to 35 children are cured? P(X<=35) = 0.00725227415994493

iv. What is the probability that at least 38 children are cured? P(X>=38) = 0.9412232785911266

v. What is the probability that between 40 and 42 (both inclusive) children are cured? P(40<=X<=42) = 0.6025555511859888

1. Data from the maternity ward in a certain hospital shows that there is a historical average of 5 babies born in this hospital every day.

i. What is the random variable (X) in the problem? Number of babies born in the hospital tomorrow

ii. What is the distribution of X? Poisson distribution with lambda=5

iii. What is the probability that 6 babies will be born in this hospital tomorrow? P(X=6) = 0.1462228081398754

iv. What about the probability of more than 6 babies be born in this hospital tomorrow? P(X>6) = 0.2378165370270613

**Exercise**

1. An IT company claims that their newly developed learning platform improves student performance in online tests. According to previous data, 85% of students who used the platform passed their online tests. A batch of 50 students is selected at random who have completed the course using this platform. Let X denote the number of students who passed the test out of 50 students.

i. What is the distribution of X? Binomial distribution with n=50, p=0.85

ii. What is the probability that at least 47 students passed the test? P(X>=47) = 0.04604657889230179

1. A call center receives an average of 12 customer calls per hour.

i. What is the random variable (X) for the problem? Number of customer calls received in an hour

ii. What is the distribution of X? Poisson distribution with lambda=12

iii. What is the probability that exactly 15 calls are received in an hour? P(X=15) = 0.07239112014663847

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**Exercise**

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# Setting the directory

setwd("C:\\Users\\YourUsername\\Desktop\\IT2120\_Lab\_06")

# Question 01

# Part 1

# Binomial distribution

# Here, random variable X has binomial distribution with n=44 and p=0.92

p40 <- dbinom(40, 44, 0.92)

p35 <- pbinom(35, 44, 0.92, lower.tail = TRUE)

p38 <- 1 - pbinom(37, 44, 0.92, lower.tail = TRUE)

p40\_42 <- pbinom(42, 44, 0.92, lower.tail = TRUE) - pbinom(39, 44, 0.92, lower.tail = TRUE) + dbinom(40, 44, 0.92)

# Question 02

# Part 1

# Number of babies born in a hospital on a given day

# Part 2

# Poisson distribution

# Here, random variable X has poisson distribution with lambda=5

p6 <- dpois(6, 5)

p\_more\_than\_6 <- 1 - ppois(6, 5, lower.tail = TRUE)

# Exercise

# Question 1

# Part 1

# Binomial distribution

# Here, random variable X has binomial distribution with n=50 and p=0.85

p47 <- 1 - pbinom(46, 50, 0.85, lower.tail = TRUE)

# Question 2

# Part 1

# Number of customer calls received in an hour

# Part 2

# Poisson distribution

# Here, random variable X has poisson distribution with lambda=12

p15 <- dpois(15, 12)

Yes, the provided R code covers all the questions in Lab Sheet 06. Below is the detailed R script that corresponds to the questions from the uploaded document (2025-S2-IT2120-LabSheet-06.pdf). The code includes the necessary commands to compute the probabilities as requested.

```R

# Setting the directory (replace with your actual path)

setwd("C:\\Users\\YourUsername\\Desktop\\IT2120\_Lab\_06")

# Question 01: Drug treatment for hookworm

# Part 1: Distribution of X

# Binomial distribution with n=44 and p=0.92

p40 <- dbinom(40, 44, 0.92)  # P(X=40)

p35 <- pbinom(35, 44, 0.92, lower.tail = TRUE)  # P(X<=35)

p38 <- 1 - pbinom(37, 44, 0.92, lower.tail = TRUE)  # P(X>=38)

p40\_42 <- pbinom(42, 44, 0.92, lower.tail = TRUE) - pbinom(39, 44, 0.92, lower.tail = TRUE) + dbinom(40, 44, 0.92)  # P(40<=X<=42)

# Question 02: Babies born in a hospital

# Part 1: Distribution of X

# Poisson distribution with lambda=5

p6 <- dpois(6, 5)  # P(X=6)

p\_more\_than\_6 <- 1 - ppois(6, 5, lower.tail = TRUE)  # P(X>6)

# Exercise

# Question 1: Learning platform performance

# Part 1: Distribution of X

# Binomial distribution with n=50 and p=0.85

p47 <- 1 - pbinom(46, 50, 0.85, lower.tail = TRUE)  # P(X>=47)

# Question 2: Call center calls

# Part 1: Distribution of X

# Poisson distribution with lambda=12

p15 <- dpois(15, 12)  # P(X=15)

```

**Notes:**

* Replace the setwd() path with the actual path to your folder on your desktop (e.g., "D:\2025 - Sem 2\IT2120\Lab Sessions\Lab 06").
* The code uses dbinom() for exact probabilities (e.g., P(X=k)) and pbinom() for cumulative probabilities (e.g., P(X<=k) or P(X>=k)) for binomial distributions.
* For Poisson distributions, dpois() is used for exact probabilities (e.g., P(X=k)) and ppois() for cumulative probabilities (e.g., P(X>k)).
* Run each line in R to compute the probabilities, and save the output as instructed (e.g., in a Word document with screenshots).

This script addresses all parts of Questions 1, 2, and the Exercise section from the lab sheet.