

# IT2120 - Probability and Statistics

## Lab Sheet - 06

IT24103153

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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.

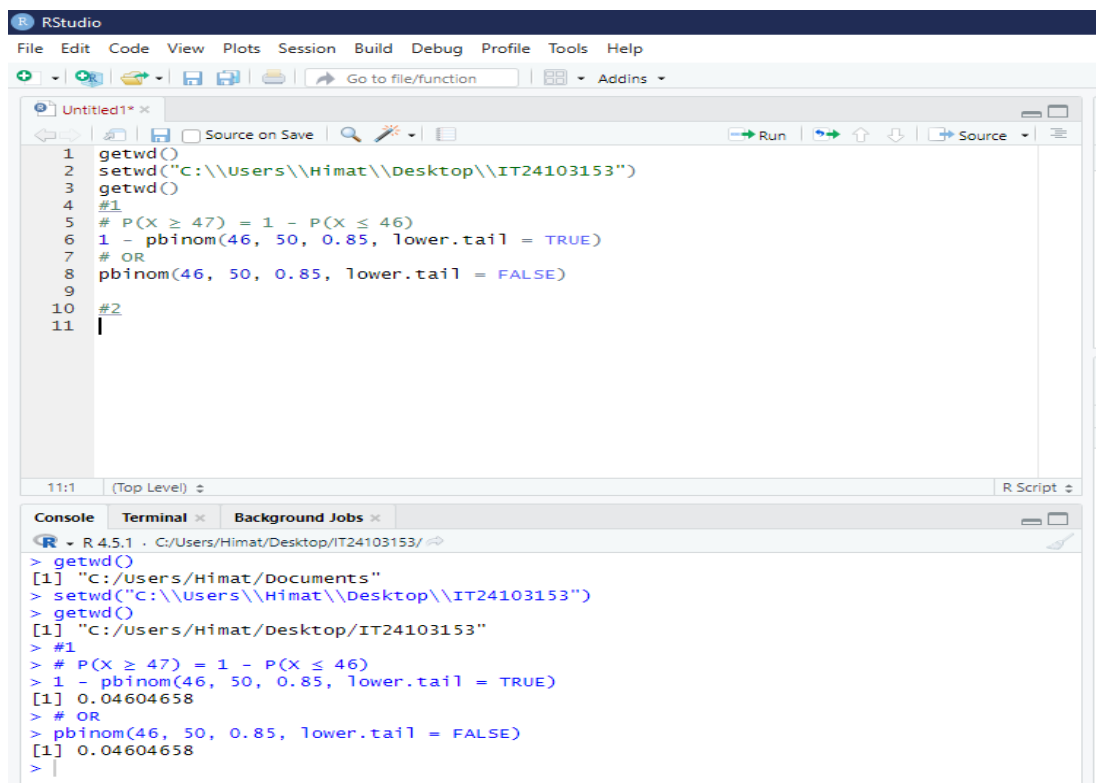
- i. What is the distribution of  $X$ ?
- ii. What is the probability that at least 47 students passed the test?

(i)  $X$  follows a **binomial distribution** with parameters

$n = 50$  (number of trials/students)

$p = 0.85$  (probability of success/passing the test)

(ii)



```
1 getwd()
2 setwd("C:\\Users\\Himat\\Desktop\\IT24103153")
3 getwd()
4 #1
5 # P(X ≥ 47) = 1 - P(X ≤ 46)
6 1 - pbinom(46, 50, 0.85, lower.tail = TRUE)
7 # OR
8 pbinom(46, 50, 0.85, lower.tail = FALSE)
9
10 #2
11 |
```

```
> getwd()
[1] "C:/Users/Himat/Documents"
> setwd("C:\\Users\\Himat\\Desktop\\IT24103153")
> getwd()
[1] "C:/Users/Himat/Desktop/IT24103153"
> #1
> # P(X ≥ 47) = 1 - P(X ≤ 46)
> 1 - pbinom(46, 50, 0.85, lower.tail = TRUE)
[1] 0.04604658
> # OR
> pbinom(46, 50, 0.85, lower.tail = FALSE)
[1] 0.04604658
> |
```

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

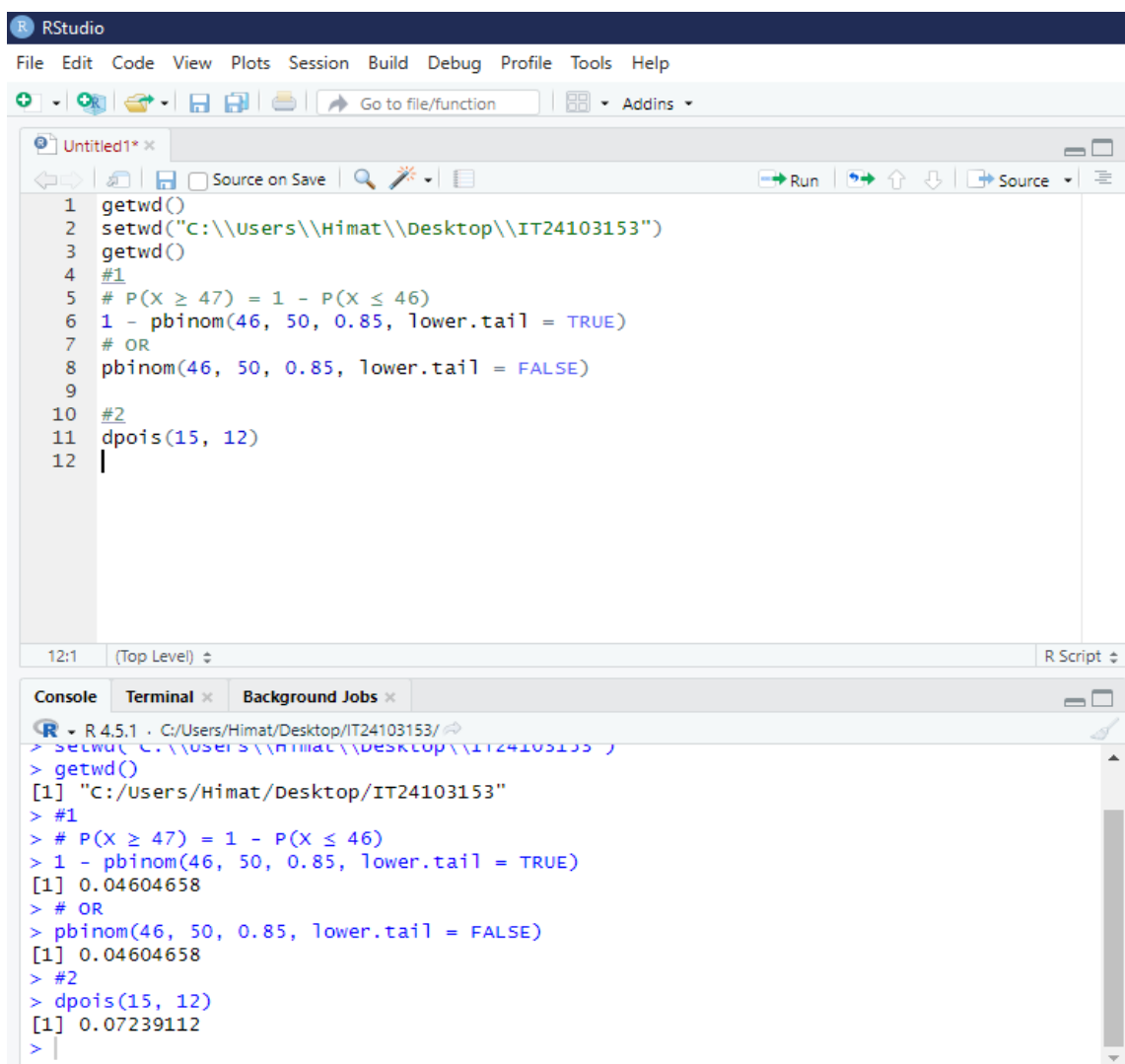
- i. What is the random variable (X) for the problem?
- ii. What is the distribution of X?
- iii. What is the probability that exactly 15 calls are received in an hour?

(i) X = Number of customer calls received in an hour.

(ii) X follows a **Poisson distribution** with parameter:

$\lambda = 12$  (average rate of calls per hour)

(iii)



The screenshot shows the RStudio interface. The script editor contains the following R code:

```
1 getwd()
2 setwd("C:\\Users\\Himat\\Desktop\\IT24103153")
3 getwd()
4 #1
5 # P(X ≥ 47) = 1 - P(X ≤ 46)
6 1 - pbinom(46, 50, 0.85, lower.tail = TRUE)
7 # OR
8 pbinom(46, 50, 0.85, lower.tail = FALSE)
9
10 #2
11 dpois(15, 12)
12 |
```

The console output shows the execution of the code:

```
R > R 4.5.1 - C:/Users/Himat/Desktop/IT24103153/
> setwd("C:\\Users\\Himat\\Desktop\\IT24103153")
> getwd()
[1] "C:/Users/Himat/Desktop/IT24103153"
> #1
> # P(X ≥ 47) = 1 - P(X ≤ 46)
> 1 - pbinom(46, 50, 0.85, lower.tail = TRUE)
[1] 0.04604658
> # OR
> pbinom(46, 50, 0.85, lower.tail = FALSE)
[1] 0.04604658
> #2
> dpois(15, 12)
[1] 0.07239112
> |
```