

# IT2120 - Probability and Statistics

## Lab Sheet 06

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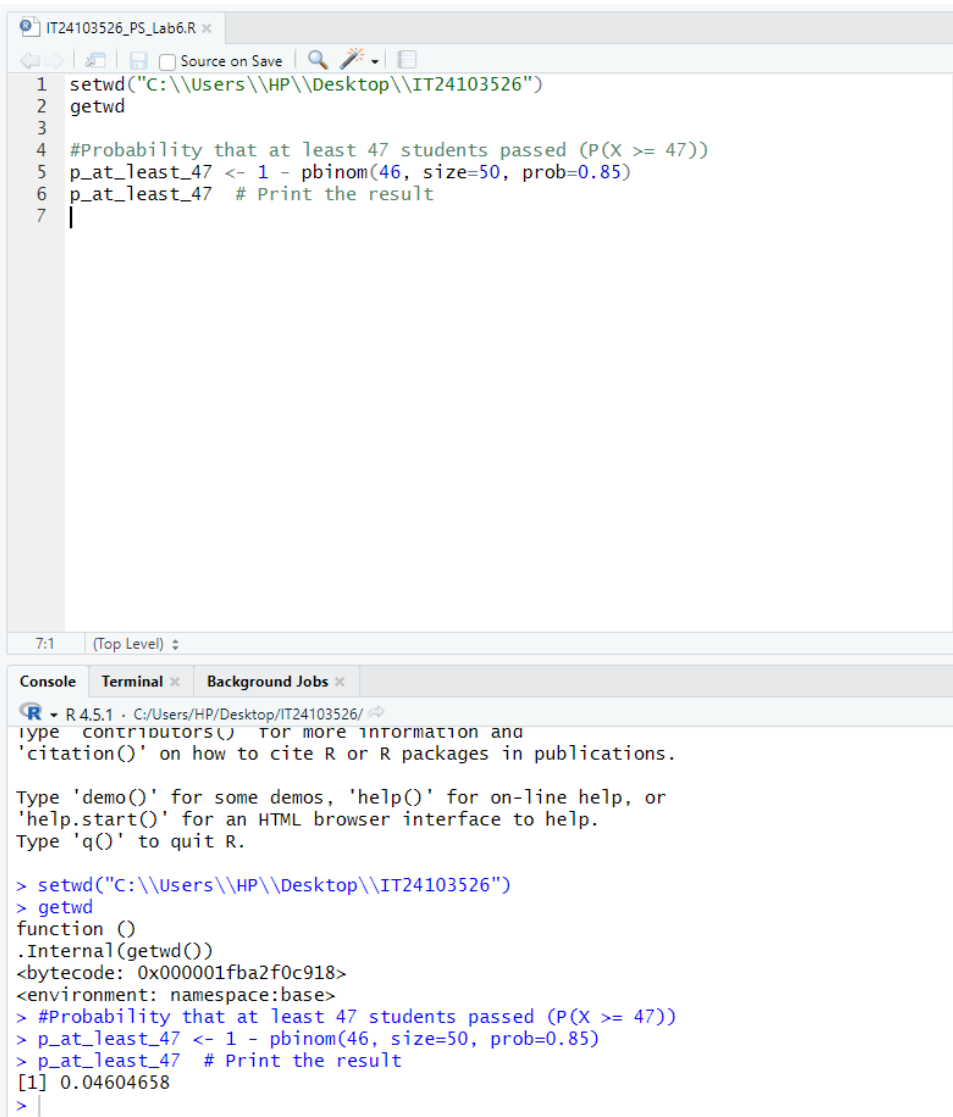
#### Exercise

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  $X$ ?

$X$  follows a Binomial distribution with parameters  $n=50$  (number of trials/students) and  $p=0.85$  (probability of success/passing on each trial). This is appropriate because each student independently passes or fails with constant probability, and we're counting the number of successes in a fixed number of trials.

ii. What is the probability that at least 47 students passed the test?



The screenshot shows an R Studio window with a script editor and a console. The script editor contains the following R code:

```
1 setwd("C:\\Users\\HP\\Desktop\\IT24103526")
2 getwd
3
4 #Probability that at least 47 students passed (P(X >= 47))
5 p_at_least_47 <- 1 - pbinom(46, size=50, prob=0.85)
6 p_at_least_47 # Print the result
7 |
```

The console shows the R version (4.5.1) and the current working directory (C:/Users/HP/Desktop/IT24103526/). It also displays the output of the code executed in the script editor:

```
> setwd("C:\\Users\\HP\\Desktop\\IT24103526")
> getwd
function ()
.Internal(getwd())
<bytecode: 0x000001fba2f0c918>
<environment: namespace:base>
> #Probability that at least 47 students passed (P(X >= 47))
> p_at_least_47 <- 1 - pbinom(46, size=50, prob=0.85)
> p_at_least_47 # Print the result
[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?

X is the number of customer calls received in an hour.

ii. What is the distribution of X?

X follows a Poisson distribution with parameter  $\lambda=12$  (average rate of calls per hour). This is suitable for modeling the number of rare events (calls) occurring in a fixed interval (one hour), assuming calls arrive independently and at a constant average rate.

iii. What is the probability that exactly 15 calls are received in an hour?

The screenshot displays the RStudio interface. The top pane shows an R script with the following code:

```
7  
8 #Probability that exactly 15 calls are received (P(X = 15))  
9 p_exactly_15 <- dpois(15, lambda=12)  
10 p_exactly_15  
11 |
```

The bottom pane is split into two tabs: "Console" and "Terminal". The "Console" tab is active, showing the execution output:

```
>  
>  
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>  
>  
>  
>  
> #Probability that exactly 15 calls are received (P(X = 15))  
> p_exactly_15 <- dpois(15, lambda=12)  
> p_exactly_15  
[1] 0.07239112  
>
```