

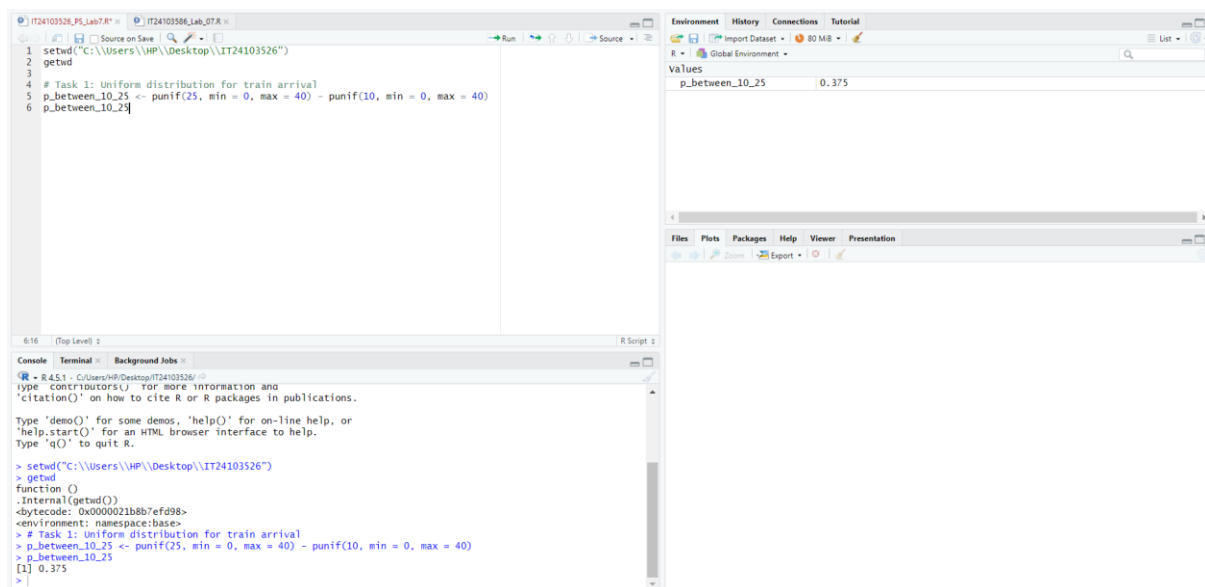
IT2120 - Probability and Statistics

Lab Sheet 07

IT24103526 - Senaratne P.A.R.T.

Exercise

1. A train arrives at a station uniformly between 8:00 a.m. and 8:40 a.m. Let the random variable X represent the number of minutes the train arrives after 8:00 a.m. What is the probability that the train arrives between 8:10 a.m. and 8:25 a.m.?



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

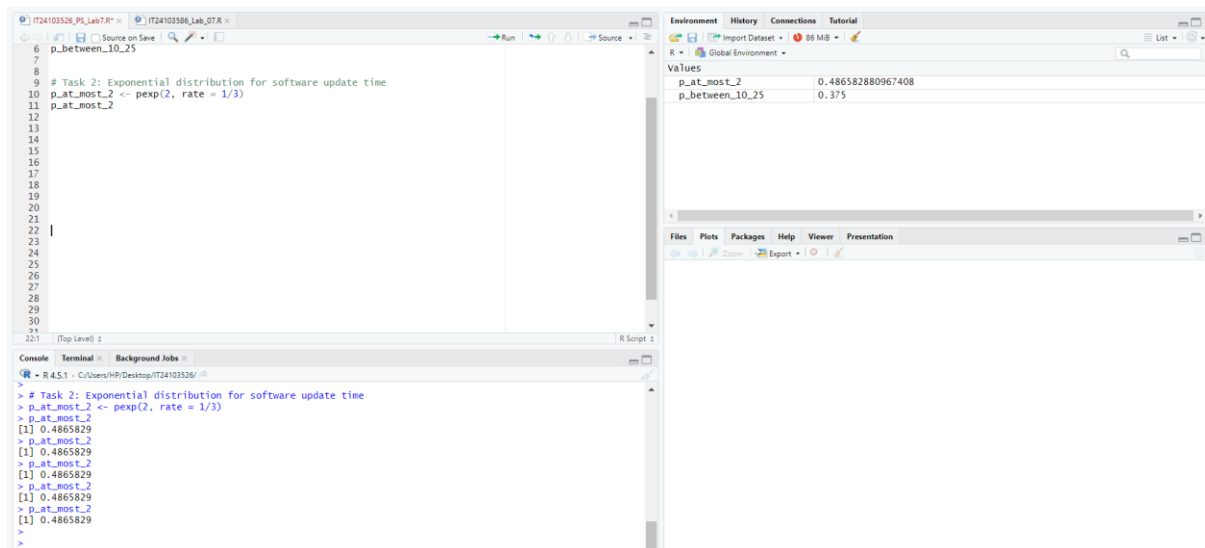
```
1 setwd("C:\\Users\\HP\\Desktop\\IT24103526")
2 getwd()
3
4 # Task 1: Uniform distribution for train arrival
5 p_between_10_25 <- punif(25, min = 0, max = 40) - punif(10, min = 0, max = 40)
6 p_between_10_25
```

The console shows the output of the code:

```
> setwd("C:\\Users\\HP\\Desktop\\IT24103526")
> getwd()
[1] "C:\\Users\\HP\\Desktop\\IT24103526"
> # Task 1: Uniform distribution for train arrival
> p_between_10_25 <- punif(25, min = 0, max = 40) - punif(10, min = 0, max = 40)
> p_between_10_25
[1] 0.375
```

The Environment pane on the right shows the variable `p_between_10_25` with a value of 0.375.

2. The time (in hours) to complete a software update is exponentially distributed with rate $\lambda = \frac{1}{3}$. Find the probability that an update will take at most 2 hours.



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

```
6 p_between_10_25
7
8
9 # Task 2: Exponential distribution for software update time
10 p_at_most_2 <- pexp(2, rate = 1/3)
11 p_at_most_2
12
13
14
15
16
17
18
19
20
21
22 |
23
24
25
26
27
28
29
30
31
```

The console shows the output of the code:

```
> # Task 2: Exponential distribution for software update time
> p_at_most_2 <- pexp(2, rate = 1/3)
> p_at_most_2
[1] 0.4865829
> p_at_most_2
[1] 0.4865829
> p_at_most_2
[1] 0.4865829
> p_at_most_2
[1] 0.4865829
> p_at_most_2
[1] 0.4865829
```

The Environment pane on the right shows the variable `p_at_most_2` with a value of 0.486582880967408.

3. Suppose IQ scores are normally distributed with a mean of 100 and a standard deviation of 15.
- What is the probability that a randomly selected person has an IQ above 130?
 - What IQ score represents the 95th percentile?

The screenshot shows the RStudio environment with the following components:

- Source Editor:** Contains R code for Task 3i.
- Environment:** Displays the values of the variables created in the code.
- Console:** Shows the execution output of the R code.

R Code (Source Editor):

```
14  
15 # Task 3i: Normal distribution for IQ scores  
16 p_above_130 <- 1 - pnorm(130, mean = 100, sd = 15)  
17 p_above_130  
18  
19 # Task 3ii: 95th percentile for IQ  
20 iq_95th <- qnorm(0.95, mean = 100, sd = 15)  
21 iq_95th  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39 [Top Level] |
```

Environment:

| Variable | Value |
|-----------------|--------------------|
| iq_95th | 124.672804404272 |
| p_above_130 | 0.0227501319481792 |
| p_at_most_2 | 0.486582880967408 |
| p_between_10_25 | 0.375 |

Console:

```
> R 4.5.1 - C:/Users/HP/Desktop/IT24103526/ - R  
>  
>  
>  
>  
>  
>  
>  
>  
>  
>  
> # Task 3i: Normal distribution for IQ scores  
> p_above_130 <- 1 - pnorm(130, mean = 100, sd = 15)  
> p_above_130  
[1] 0.02275013  
> # Task 3ii: 95th percentile for IQ  
> iq_95th <- qnorm(0.95, mean = 100, sd = 15)  
> iq_95th  
[1] 124.6728  
>
```