

ASSIGNMENT-2

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1. The incidence of an occupational disease in an industry is such that the workers have a 20% chance of suffering from it, what is the probability that out of 6 workers at random, four or more will suffer from the disease?

CODE:

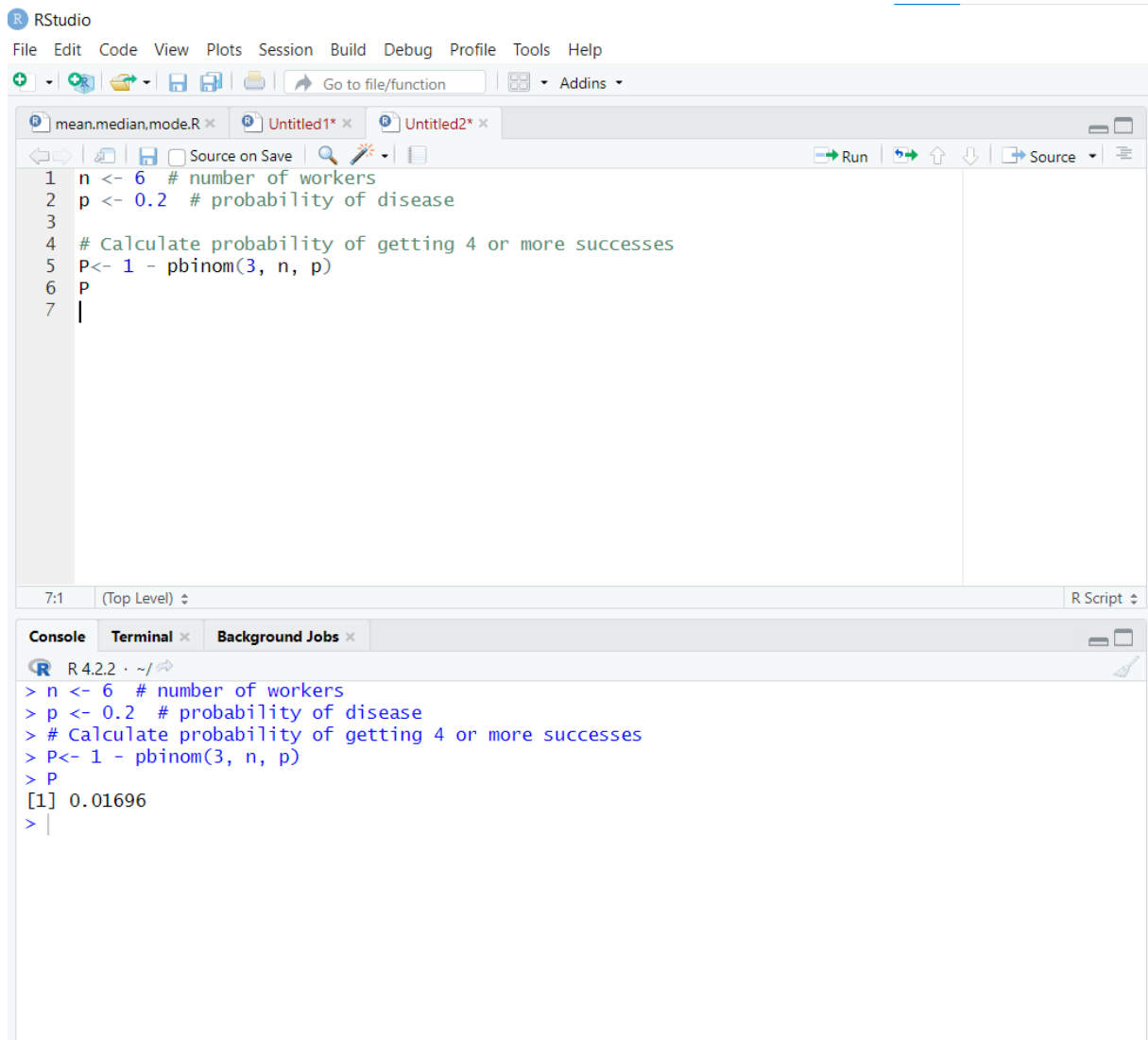
```
n <- 6 # number of workers
```

```
p <- 0.2 # probability of disease
```

```
# Calculate probability of getting 4 or more successes
```

```
P<- 1 - pbinom(3, n, p)
```

```
P
```



The screenshot shows the RStudio environment. The source editor contains the following R code:

```
1 n <- 6 # number of workers
2 p <- 0.2 # probability of disease
3
4 # Calculate probability of getting 4 or more successes
5 P<- 1 - pbinom(3, n, p)
6 P
7 |
```

The console shows the execution of this code:

```
> n <- 6 # number of workers
> p <- 0.2 # probability of disease
> # Calculate probability of getting 4 or more successes
> P<- 1 - pbinom(3, n, p)
> P
[1] 0.01696
> |
```

2. Out of 800 families with 5 children each. Assume equal probability for boys and girls. How many would

you expect to have

(a) 3 boys

(b) 5 girls.

CODE:

```
n <- 5 # number of children
```

```
p <- 0.5 # probability of having a boy or girl
```

```
f<- 800 # total number of families
```

```
# Calculate expected number of families with 3 boys
```

```
b <- 3 # number of boys
```

```
B<- dbinom(b, n, p)
```

```
Eb<- B * f
```

```
Eb
```

```
# Calculate expected number of families with 5 girls
```

```
g<- 5 # number of girls
```

```
G<- dbinom(g, n, p)
```

```
Eg <- G * f
```

```
Eg
```

The screenshot shows the RStudio environment. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. Below the menu is a toolbar with icons for file operations and a 'Go to file/function' search bar. The main editor window displays an R script with the following code:

```
1 n <- 5 # number of children
2 p <- 0.5 # probability of having a boy or girl
3 f<- 800 # total number of families
4
5 # Calculate expected number of families with 3 boys
6 b <- 3 # number of boys
7 B<- dbinom(b, n, p)
8 Eb<- B * f
9 Eb
10
11 # Calculate expected number of families with 5 girls
12 g<- 5 # number of girls
13 G<- dbinom(g, n, p)
14 Eg <- G * f
15 Eg
16
17 |
```

The status bar at the bottom of the editor shows '17:1 (Top Level)' and 'R Script'. Below the editor is a console window with the following output:

```
R 4.2.2 · ~/
> n <- 5 # number of children
> p <- 0.5 # probability of having a boy or girl
> f<- 800 # total number of families
> # Calculate expected number of families with 3 boys
> b <- 3 # number of boys
> B<- dbinom(b, n, p)
> Eb<- B * f
> Eb
[1] 250
> # Calculate expected number of families with 5 girls
> g<- 5 # number of girls
> G<- dbinom(g, n, p)
> Eg <- G * f
> Eg
[1] 25
>
> |
```

3. The probability that an individual suffers a bad reaction from an injection is 0.001. Determine the probability that out of 2000 individuals
- (a) three will suffer the reaction.
 - (b) more than two will suffer the reaction.

CODE:

```
n <- 2000 # number of individuals
```

```
p <- 0.001 # probability of a bad reaction
```

```
# Calculate probability that three individuals will suffer a bad reaction
```

```
h <- 3 # number of individuals with bad reaction
```

```
H<- dbinom(h, n, p)
```

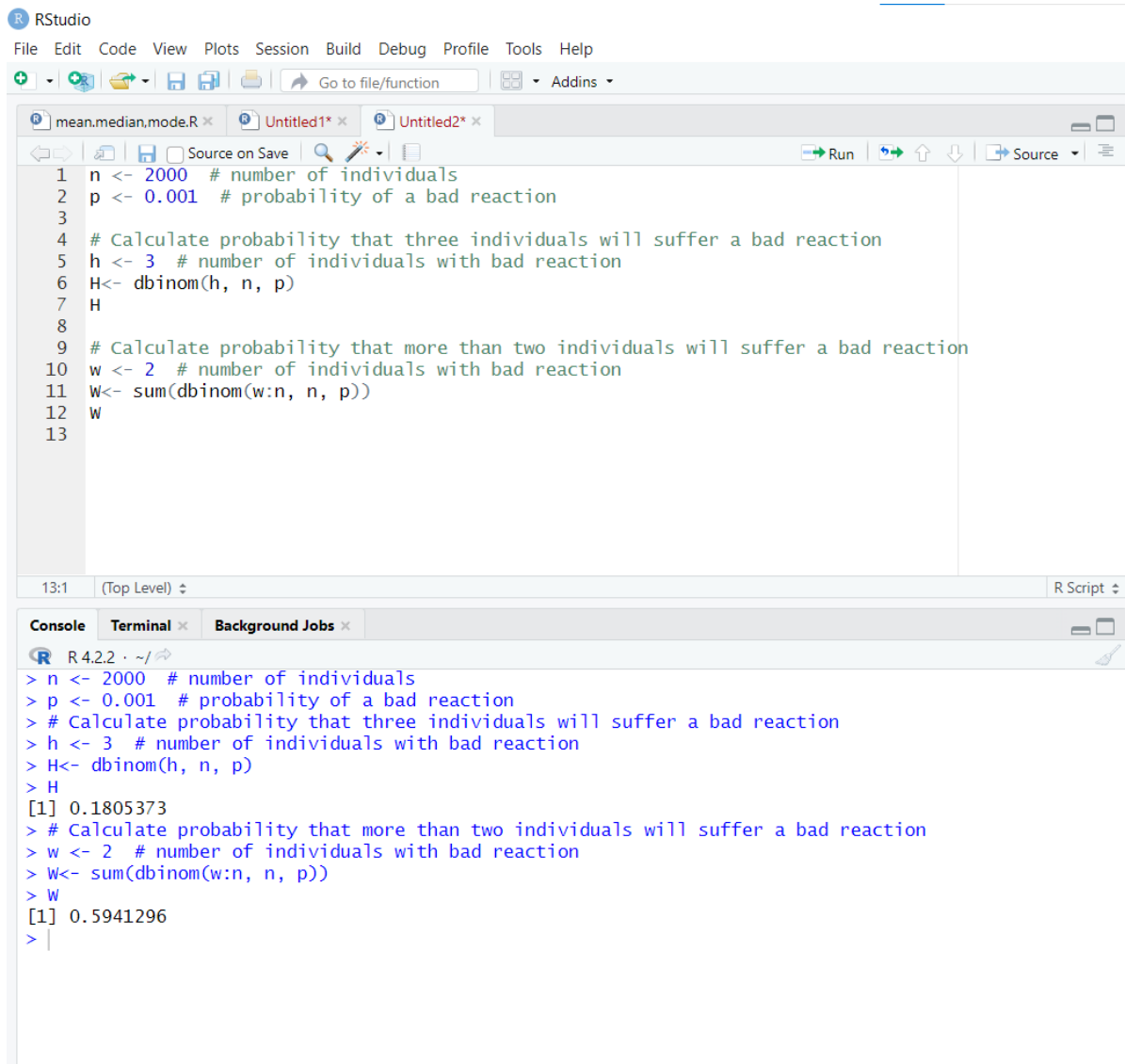
```
H
```

```
# Calculate probability that more than two individuals will suffer a bad reaction
```

```
w <- 2 # number of individuals with bad reaction
```

```
W<- sum(dbinom(w:n, n, p))
```

```
W
```



4. If 2% of light bulbs are defective. Find

(a). at least one is defective.

(b). Exactly 7 are defective.

(c). $P(1 < x < 8)$ in a sample of 100.

CODE:

```
n <- 100 # sample size
```

```
p <- 0.02 # probability of being defective
```

(a) Probability that at least one bulb is defective

```
o <- 1 - dbinom(0, n, p)
```

```
o
```

```
# (b) Probability that exactly 7 bulbs are defective
```

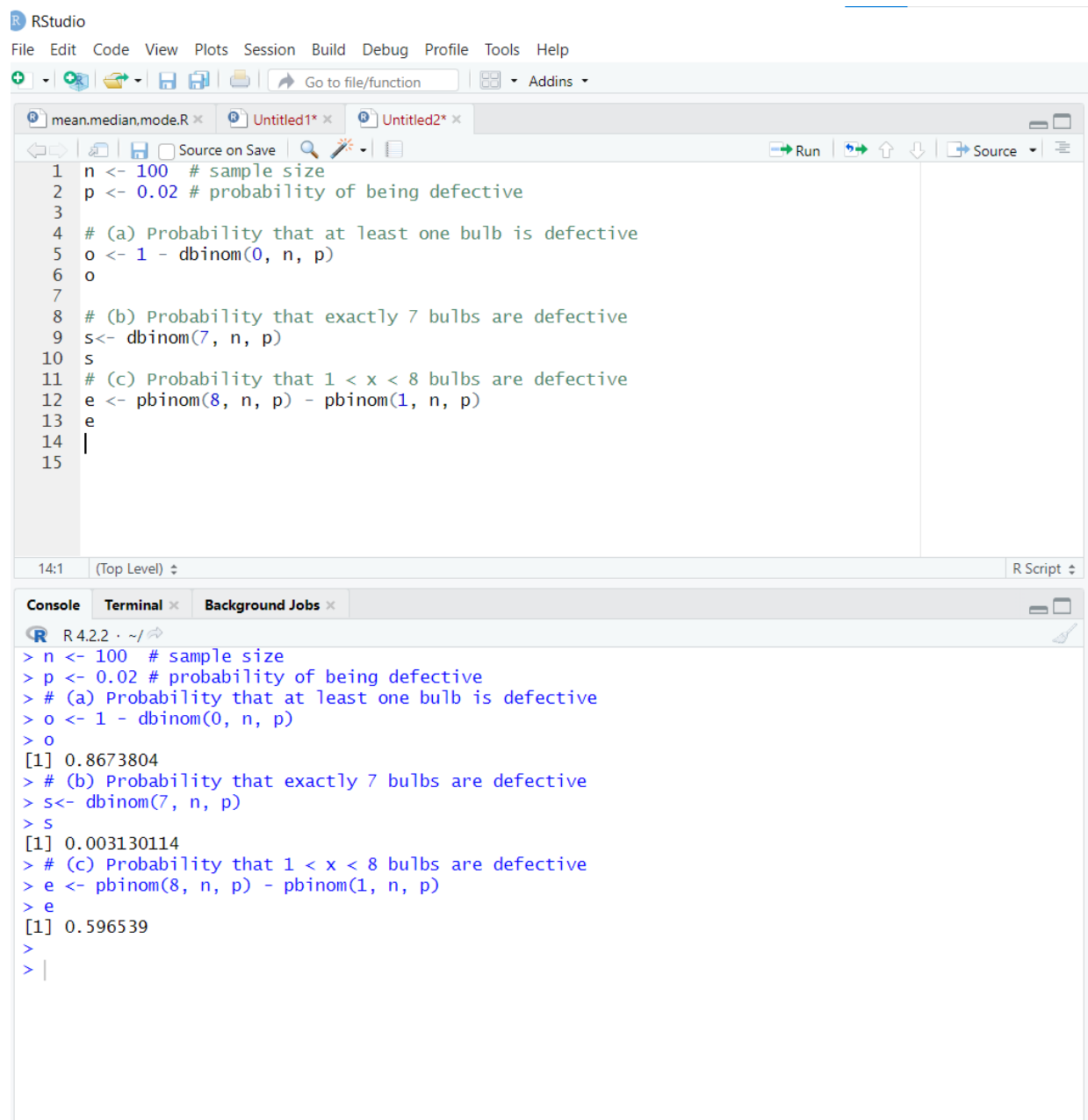
```
s<- dbinom(7, n, p)
```

```
s
```

```
# (c) Probability that  $1 < x < 8$  bulbs are defective
```

```
e <- pbinom(8, n, p) - pbinom(1, n, p)
```

```
e
```



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

```
1 n <- 100 # sample size
2 p <- 0.02 # probability of being defective
3
4 # (a) Probability that at least one bulb is defective
5 o <- 1 - dbinom(0, n, p)
6 o
7
8 # (b) Probability that exactly 7 bulbs are defective
9 s<- dbinom(7, n, p)
10 s
11 # (c) Probability that 1 < x < 8 bulbs are defective
12 e <- pbinom(8, n, p) - pbinom(1, n, p)
13 e
14 |
15
```

The bottom pane shows the console output for the executed code:

```
> n <- 100 # sample size
> p <- 0.02 # probability of being defective
> # (a) Probability that at least one bulb is defective
> o <- 1 - dbinom(0, n, p)
> o
[1] 0.8673804
> # (b) Probability that exactly 7 bulbs are defective
> s<- dbinom(7, n, p)
> s
[1] 0.003130114
> # (c) Probability that 1 < x < 8 bulbs are defective
> e <- pbinom(8, n, p) - pbinom(1, n, p)
> e
[1] 0.596539
>
> |
```

5. If 10% of the tools produced in a certain manufacturing process turns out to be defective. Find the

probability that a sample of 10 tools chosen at random, exactly two will be defective by using

(a) Binomial distribution

(b) Poisson Distribution.

CODE:

```
n <- 10 # sample size
```

```
p <- 0.1 # probability of being defective
```

```
k <- 2 # number of defective tools
```

```
# Probability of exactly 2 defective tools using the binomial distribution
```

```
t<- dbinom(k, n, p)
```

```
t
```

```
#mean
```

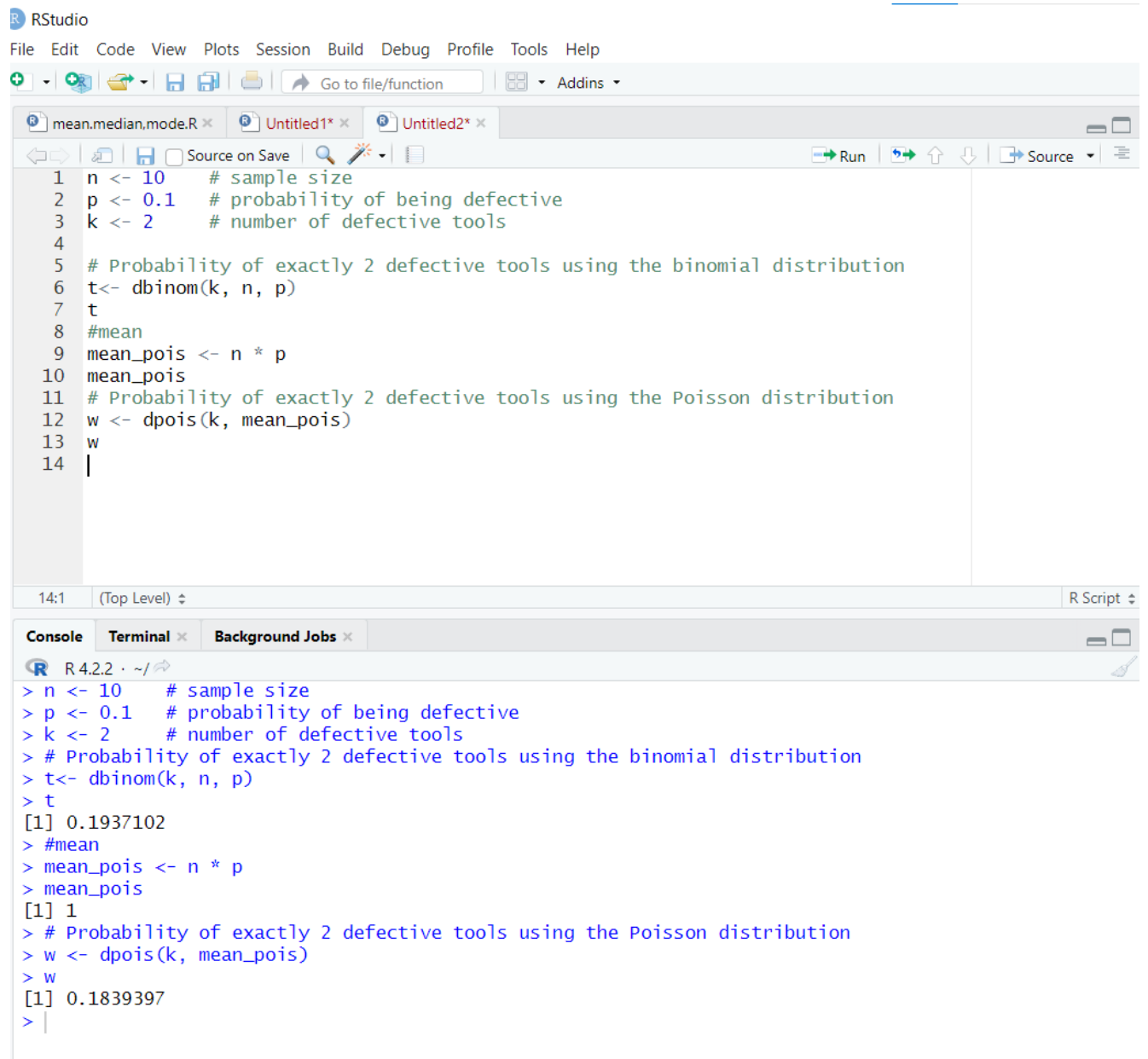
```
mean_pois <- n * p
```

```
mean_pois
```

```
# Probability of exactly 2 defective tools using the Poisson distribution
```

```
w <- dpois(k, mean_pois)
```

```
w
```

The screenshot displays the RStudio environment. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. Below the menu is a toolbar with icons for file operations and a search bar. The main editor window shows a script with the following R code:

```
1 n <- 10 # sample size
2 p <- 0.1 # probability of being defective
3 k <- 2 # number of defective tools
4
5 # Probability of exactly 2 defective tools using the binomial distribution
6 t<- dbinom(k, n, p)
7 t
8 #mean
9 mean_pois <- n * p
10 mean_pois
11 # Probability of exactly 2 defective tools using the Poisson distribution
12 w <- dpois(k, mean_pois)
13 w
14 |
```

The status bar at the bottom of the editor indicates line 14:1 at the top level. Below the editor is a console window with the following output:

```
R 4.2.2 · ~/
> n <- 10 # sample size
> p <- 0.1 # probability of being defective
> k <- 2 # number of defective tools
> # Probability of exactly 2 defective tools using the binomial distribution
> t<- dbinom(k, n, p)
> t
[1] 0.1937102
> #mean
> mean_pois <- n * p
> mean_pois
[1] 1
> # Probability of exactly 2 defective tools using the Poisson distribution
> w <- dpois(k, mean_pois)
> w
[1] 0.1839397
> |
```

END