

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 labeled 'Go to file/function'. The file explorer shows three open files: 'Fibonacci series.R', 'list operations.R', and 'Lab Assignment-4.R\*'. The main editor window shows the following R code:

```
1 # Sum-1 (Case-3)
2 sample_mean = 46500
3 population_mean = 50000
4 sample_sd = 9800
5 population_sd = 8000
6 n=28
7 z_alpha = abs(qnorm(1-0.05,lower.tail = FALSE))
8 z = abs(((sample_mean-population_mean)/population_sd) / (sqrt(n)))
9 ifelse(z_alpha>z,"H0 is accepted","H0 is rejected")
```

The status bar at the bottom indicates '10:1 (Top Level)'. Below the editor is a console window with tabs for Console, Terminal, and Jobs. The console shows the execution of the code:

```
~/> population_mean = 50000
> sample_sd = 9800
> population_sd = 8000
> n=28
>
> z_alpha = abs(qnorm(1-0.05,lower.tail = FALSE))
> z = abs(((sample_mean-population_mean)/population_sd) / (sqrt(n)))
>
> ifelse(z_alpha>z,"H0 is accepted","H0 is rejected")
[1] "H0 is accepted"
>
```

a) Sample Mean  $\Rightarrow 46,500$   
 • Sample SD  $\Rightarrow 98000$   
 Population Mean  $\Rightarrow 50,000$   
 Population SD  $\Rightarrow 8000$   
 $n \Rightarrow 28$

1)  $H_0 \Rightarrow \mu \geq 50,000$   
 $H_1 \Rightarrow \mu < 50,000$  (A)

2) It is left tailed test

3)  $Z_{\alpha} \Rightarrow -1.644854$

4)  $Z \Rightarrow \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} \Rightarrow \frac{\frac{46500 - 50000}{8000}}{\sqrt{28}}$

$\Rightarrow \frac{-7/16}{\sqrt{28}} \Rightarrow \frac{-0.4375}{\sqrt{28}}$

$Z \Rightarrow -0.08267$

$|Z| \Rightarrow 0.08267$

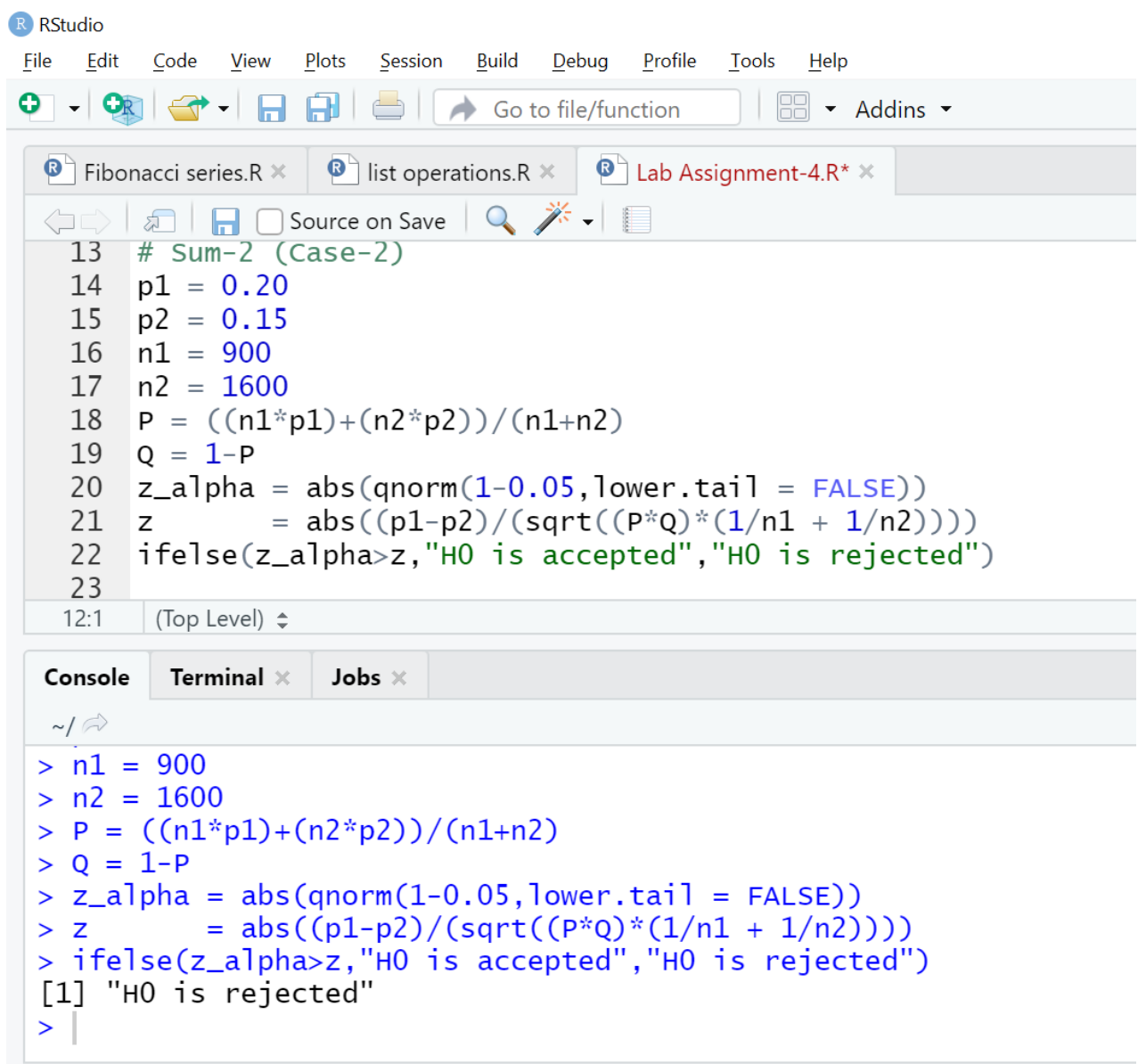
$|Z_{\alpha}| \Rightarrow 1.644854$

$Z_{\alpha} > Z$

$H_0$  is accepted and  $H_1$  is rejected

Company's claim is accepted

- (b) In the large city A, 20 per cent of random sample of 900 school children had defective eye-sight. In the large city B, 15 percent of random sample of 1600 school children had the same defective. Is this difference between the two proportions significant? Obtain 95% confidence limits of the difference in the population proportions.



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```
13 # Sum-2 (Case-2)
14 p1 = 0.20
15 p2 = 0.15
16 n1 = 900
17 n2 = 1600
18 P = ((n1*p1)+(n2*p2))/(n1+n2)
19 Q = 1-P
20 z_alpha = abs(qnorm(1-0.05,lower.tail = FALSE))
21 z       = abs((p1-p2)/(sqrt((P*Q)*(1/n1 + 1/n2))))
22 ifelse(z_alpha>z,"H0 is accepted","H0 is rejected")
23
```

The console window at the bottom shows the execution of the code, with the final output being '[1] "H0 is rejected"'. The console text is as follows:

```
> n1 = 900
> n2 = 1600
> P = ((n1*p1)+(n2*p2))/(n1+n2)
> Q = 1-P
> z_alpha = abs(qnorm(1-0.05,lower.tail = FALSE))
> z       = abs((p1-p2)/(sqrt((P*Q)*(1/n1 + 1/n2))))
> ifelse(z_alpha>z,"H0 is accepted","H0 is rejected")
[1] "H0 is rejected"
>
```

	<u>City-A</u>	<u>City-B</u>
$\hat{p}_1 \Rightarrow$	20%	$\hat{p}_2 \Rightarrow 15\%$
$p_1 \Rightarrow$	$20/100 \Rightarrow 0.2$	$p_2 \Rightarrow 15/100 \Rightarrow 0.15$
$n_1 \Rightarrow$	900	$n_2 \Rightarrow 1600$

$$P \Rightarrow (n_1 p_1 + n_2 p_2) / (n_1 + n_2)$$

$$\Rightarrow (0.2)(900) + (0.15)(1600) / (1600 + 900)$$

$$\boxed{P \Rightarrow 0.168} \quad (P + Q \Rightarrow 1)$$

$$Q \Rightarrow 1 - P$$

$$\Rightarrow 1 - 0.168$$

$$\boxed{Q \Rightarrow 0.832}$$

1)  $H_0: P_1 = P_2$   
 $H_1: P_1 \neq P_2$

2)  $z_{\alpha} \Rightarrow 1.959964$

3)  $z \Rightarrow \frac{(p_1 - p_2)}{\sqrt{PQ \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$

$$\Rightarrow \frac{(0.2 - 0.15)}{\sqrt{(0.168 * 0.832) \left( \frac{1}{900} + \frac{1}{1600} \right)}}$$

$$\Rightarrow \frac{0.05}{\sqrt{0.139176 \left( \frac{1}{576} \right)}} \Rightarrow \frac{206.0439}{576} \Rightarrow 3.209$$

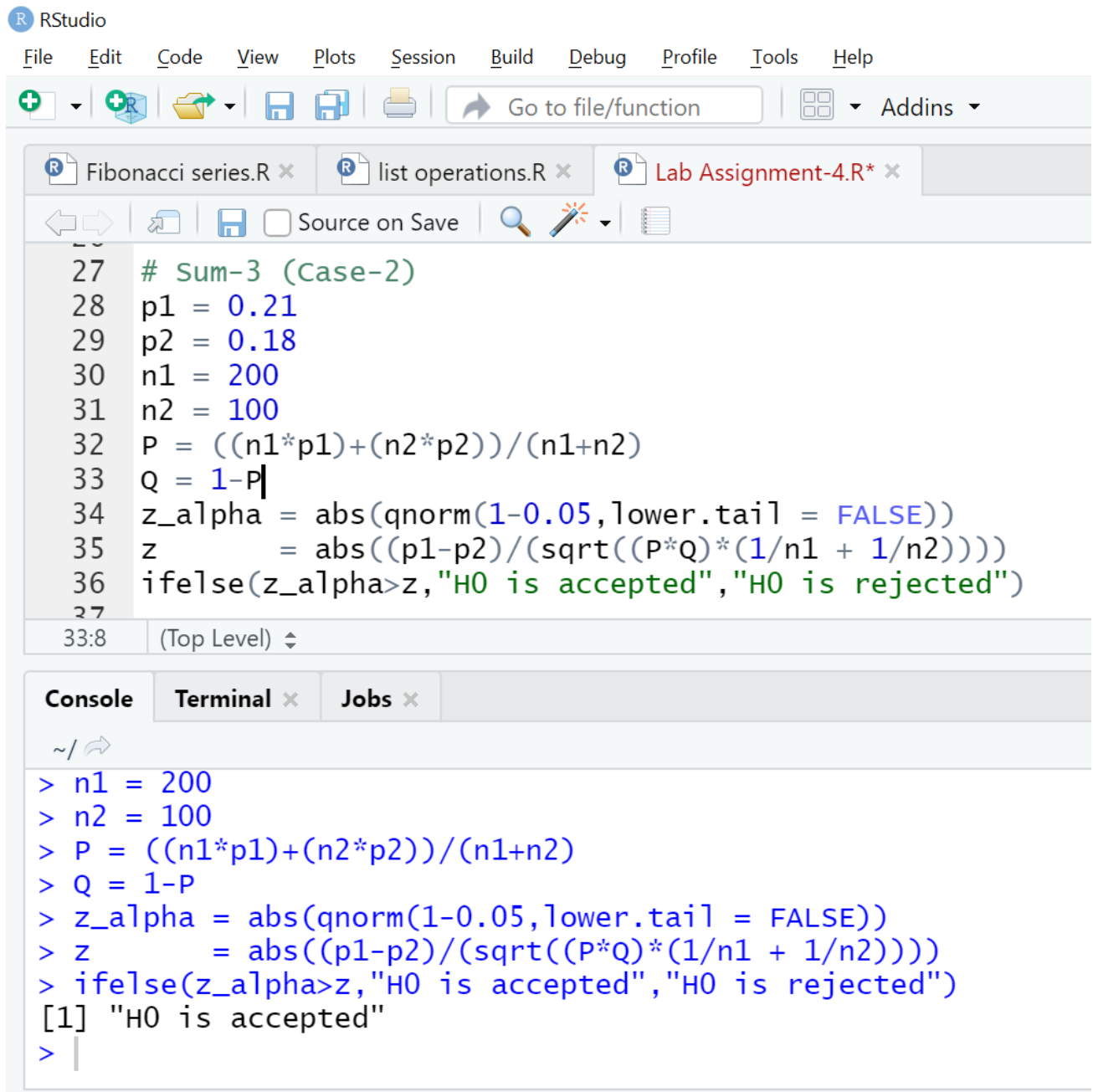
$$Z_d \Rightarrow 1.959964$$

$$Z \Rightarrow 3.209$$

$$Z > Z_{\alpha}$$

$H_0$  is rejected, Difference between  
the two population proportion  
is significant.

- (c) A cigarette manufacturing firm claims its brand A of the cigarettes outsells its brand B by 8%.if its found that 42 out sample of 200 smoker prefer brand A and 18 out of another random sample of 100 smokers prefers brand B, test whether the 8% difference is a valid cliam.



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 creating a new file, opening a file, saving, and other functions. The main editor window displays a script with the following R code:

```
27 # Sum-3 (Case-2)
28 p1 = 0.21
29 p2 = 0.18
30 n1 = 200
31 n2 = 100
32 P = ((n1*p1)+(n2*p2))/(n1+n2)
33 Q = 1-P
34 z_alpha = abs(qnorm(1-0.05,lower.tail = FALSE))
35 z = abs((p1-p2)/(sqrt((P*Q)*(1/n1 + 1/n2))))
36 ifelse(z_alpha>z,"H0 is accepted","H0 is rejected")
```

The console window at the bottom shows the execution of the code:

```
> n1 = 200
> n2 = 100
> P = ((n1*p1)+(n2*p2))/(n1+n2)
> Q = 1-P
> z_alpha = abs(qnorm(1-0.05,lower.tail = FALSE))
> z = abs((p1-p2)/(sqrt((P*Q)*(1/n1 + 1/n2))))
> ifelse(z_alpha>z,"H0 is accepted","H0 is rejected")
[1] "H0 is accepted"
>
```



c) brand-A

$$n_1 \Rightarrow 200$$

$$p_1 \Rightarrow \frac{42}{200} \Rightarrow 0.21$$

brand-B

$$n_2 \Rightarrow 100$$

$$p_2 \Rightarrow \frac{18}{100} \Rightarrow 0.18$$

1)  $H_0 \Rightarrow p_1 = p_2$   
 $H_1 \Rightarrow p_1 \neq p_2$

2) Two tailed test ( $Z_{\alpha} \Rightarrow 1.750686$ )

$$p \Rightarrow \frac{(n_1 p_1) + (n_2 p_2)}{(n_1 + n_2)} \Rightarrow \frac{200(0.21) + 100(0.18)}{(200 + 100)} \Rightarrow 0.2$$

$$p = 0.2$$

$$Q \Rightarrow 0.8$$

$$(Z) \Rightarrow \frac{p_1 - p_2}{\sqrt{pq \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

$$\Rightarrow \frac{(0.21 - 0.18)}{\sqrt{(0.2)(0.8) \left( \frac{1}{200} + \frac{1}{100} \right)}} \Rightarrow \frac{0.03}{\sqrt{(0.16)(0.015)}}$$

$$\Rightarrow \frac{0.03}{0.04898} \Rightarrow 0.612372$$

$$|Z_{\alpha}| > |Z|$$

So  $H_0$  is accepted, the difference of 8% is an invalid claim

$$0.21 - 0.18 \Rightarrow 0.03$$

$$0.03 \times 100 \Rightarrow 3\%$$

$$\text{Given} \Rightarrow 8\%$$

$$\text{found} \Rightarrow 3\%$$

claim is wrong