Student Information

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Answer 1

a)

As σ is unknown and sample size n is small (n¡30) we will use student's t distribution for CI.
t value for 98 is 2.326 according to the t value table.
mean=$\frac{8.4+7.8+6.4+6.7+6.6+6.6+7.2+4.1+5.4+6.9+7.0+6.9+7.4+6.5+6.5+8.5}{16} = 6.81$
s=$\sqrt{\frac{\sum(x-mean)^2}{n-1}} = \sqrt{\frac{(8.4-6.81)^2+(7.8-6.81)^2+(6.4-6.81)^2+..}{16-1}}$=1.055
mean$\pm t\frac{s}{\sqrt{n}} = 6.81 \pm 2.326\frac{1.055}{\sqrt{16}}$=[6.18;7.41]

b)

$H_0 = \mu \geq 7.5$
$H_A = \mu < 7.5$ one sided, left tail
t=$\frac{mean-\mu}{s/\sqrt{n}} = \frac{6.81-7.5}{1.055/4} = -2.65$
critical value of significance level of 5 is 1.7 according to table.
So, we fail to reject H_0 therefore we can't claim that improvement was efficient

c)

The value 6.5 is in the interval of CI so we can't immediately reject H_0

Answer 2

a)

$H_0 : \mu = 5000$ Ali's claim
$H_A : \mu > 5000$

b)

$\sigma = 2000$
n=100
$\alpha = 0.05$
$\mu = 5000$
sample mean=5500
t=$\frac{5500-5000}{2000/\sqrt{100}} = 2.5$

z(0.05)=1.645 one sided test
As $2.5 > 1.645$, we have to reject H_0. Ahmet can claim that there is an increase in price.

c)

In t distribution table lookup for the value of 2.5 and 99(100-1). It is 0.07.

The p-value of 0.007 is less than the significance level of 0.05. Therefore, we have sufficient evidence to reject the null hypothesis. Ahmet's claim is supported by the data, suggesting a significant increase in rent prices.

d)

Sample size in Ankara: n1 = 100
Sample mean in Ankara: x1=5500
Standard deviation in Ankara: $\sigma 1 = 2000$
Sample size in Istanbul: n2 = 60
Sample mean in Istanbul: x2 = 6500
Standard deviation in Istanbul: $\sigma 2 = 3000$

$$\text{t} = \frac{x1-x2}{\sqrt{\frac{\sigma 1^2}{n1} + \frac{\sigma 2^2}{n2}}} = \frac{5500-6500}{\sqrt{\frac{2000^2}{100} + \frac{3000^2}{60}}} = -2.77$$

Degree of freedom (n1 + n2 - 2) is 158.

Looking up the p-value corresponding to a t-statistic of -2.77 and 158 degrees of freedom in the t-distribution table it is 0.006.

The corrected p-value of 0.006 is still less than the significance level of 0.01. Therefore, we still have sufficient evidence to reject the null hypothesis.Thus, based on the corrected calculations, we can still claim that the rent prices in Ankara are significantly lower than the rent prices in Istanbul at 0.01

Answer 3

The table below is derived from Expected Value = $(TotalRow * TotalColumn)\,/GrandTotal$

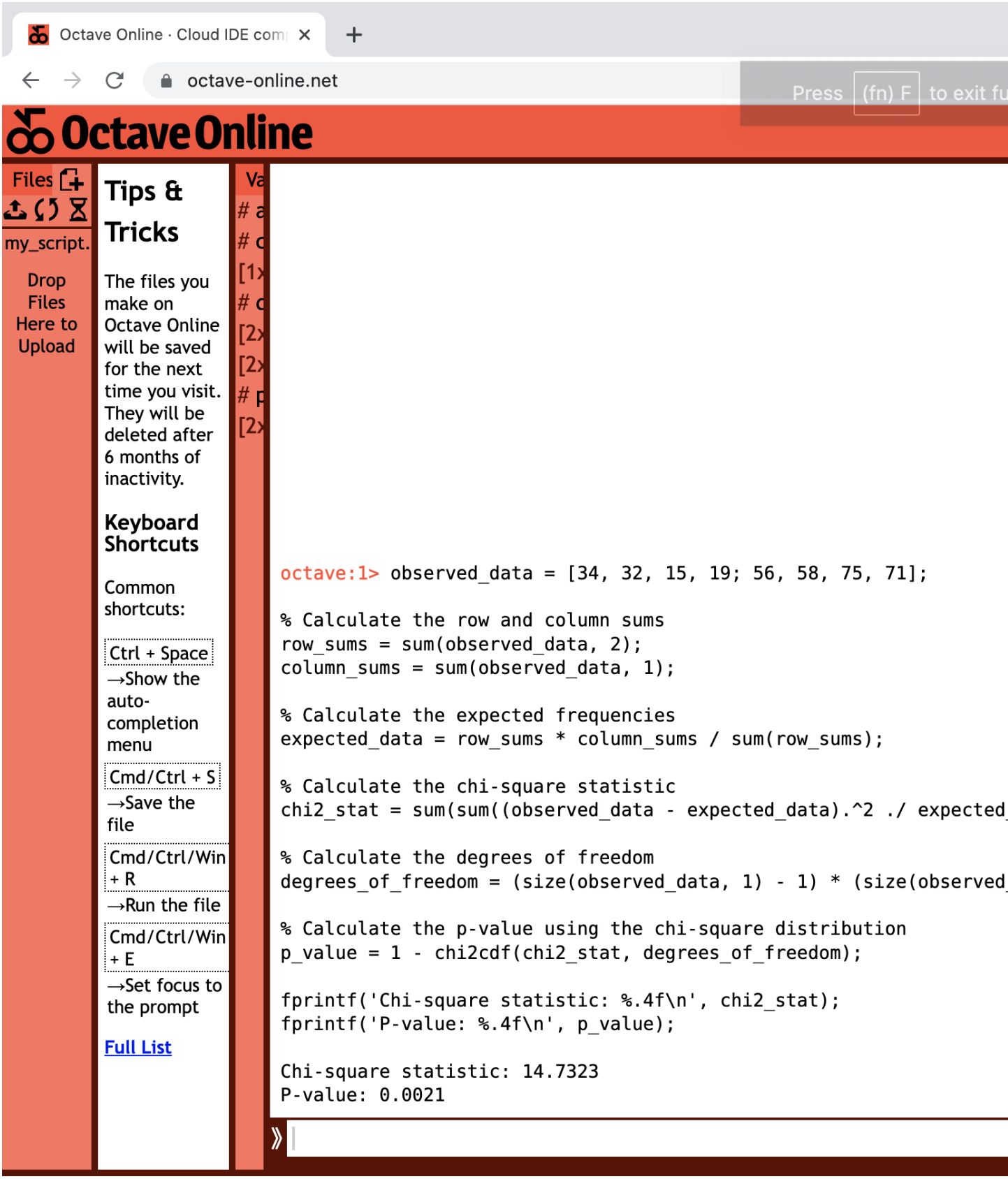
	Winter	Spring	Summer	Autumn	Total Row
Exp. Rainy	25	25	25	25	100
Exp.Non rainy	65	65	65	65	260
Total Column	90	90	90	90	360

$$X^2 = \sum \frac{(Exp-Obs)^2}{Exp} = \frac{(25-34)^2}{25} + \frac{(25-32)^2}{25} + \frac{(25-15)^2}{25} + \frac{(25-19)^2}{25} + \frac{(65-56)^2}{65} + \frac{(65-58)^2}{65} + \frac{(65-75)^2}{65} + \frac{(65-71)^2}{65} = 14.73$$

(r - 1) * (c - 1) degrees of freedom =(2 - 1) * (4 - 1) = 3
p-value for a Chi-square statistic of 14.73 with 3 degrees of freedom is approximately 0.002 according to the distribution table.

Based on the Chi-square test, we can conclude that the number of rainy days in Ankara is dependent on the season. The p-value indicates that probability of observing such a relation(independent) is only 0.002.

Answer 4


Octave Online · Cloud IDE com
octave-online.net
Press (fn) F to exit fu
Octave Online
Files
my_script.
Drop Files Here to Upload
Tips & Tricks
The files you make on Octave Online will be saved for the next time you visit. They will be deleted after 6 months of inactivity.
Keyboard Shortcuts
Common shortcuts:
Ctrl + Space
→Show the auto-completion menu
Cmd/Ctrl + S
→Save the file
Cmd/Ctrl/Win + R
→Run the file
Cmd/Ctrl/Win + E
→Set focus to the prompt
Full List
octave:1> observed_data = [34, 32, 15, 19; 56, 58, 75, 71];
% Calculate the row and column sums
row_sums = sum(observed_data, 2);
column_sums = sum(observed_data, 1);
% Calculate the expected frequencies
expected_data = row_sums * column_sums / sum(row_sums);
% Calculate the chi-square statistic
chi2_stat = sum(sum((observed_data - expected_data).^2 ./ expected
% Calculate the degrees of freedom
degrees_of_freedom = (size(observed_data, 1) - 1) * (size(observed
% Calculate the p-value using the chi-square distribution
p_value = 1 - chi2cdf(chi2_stat, degrees_of_freedom);
fprintf('Chi-square statistic: %.4f\n', chi2_stat);
fprintf('P-value: %.4f\n', p_value);
Chi-square statistic: 14.7323
P-value: 0.0021

```
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% Calculate the expected frequencies
expected_data = row_sums * column_sums / sum(row_sums);

% Calculate the chi-square statistic
chi2_stat = sum(sum((observed_data - expected_data).^2 ./ expected_data));

% Calculate the degrees of freedom
degrees_of_freedom = (size(observed_data, 1) - 1) * (size(observed_data, 2) -

% Calculate the p-value using the chi-square distribution
p_value = 1 - chi2cdf(chi2_stat, degrees_of_freedom);

fprintf('Chi-square statistic: %.4f\n', chi2_stat);
fprintf('P-value: %.4f\n', p_value);
```