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Answer 1

a)
We have to know $\bar{X}$, the sample mean, and the standard deviation of the sample in order to build the interval. We can calculate them with the following formulas:
$\bar{X} = \dfrac{1}{n} * \sum_{i=1}^{n} X_i$ and
$s = \sqrt{\dfrac{1}{n-1} * \sum_{i=1}^{n} (X_i - \bar{X})^2}$
$\bar{X} = (8.4 + 7.8 + ... + 8.5) * \dfrac{1}{16} = 6.81$
$s = \dfrac{1}{4} * \sqrt{(7.8 - 6.81)^2 + ... + (8.5 - 6.81)^2} = 1.06$
The formula for building a confidence interval is $\bar{X} \pm t_{\dfrac{\alpha}{2}} * \dfrac{s}{\sqrt{n}}$
We use the student's t-distribution since the sample size is small and the population standard deviation is unknown. We can calculate the value as $t_{\dfrac{\alpha}{2}} = t_{0.01} = 2.62$
Using them in the formula:$6.81 \pm 2.602 * 1.055 * 0.25 = [6.12, 7.50]$ is the confidence interval.
b)
We can construct our H_0 hypothesis as:
$H_0 : \mu = 7.5$ and
$H_1 : \mu < 7.5$
We use the t table to decide our critical value because the population standard deviation is not available and the sample size is small. Our rejection part is in the left tail.
Using the table from the book, the critical value is -1.75.
The t-test value can be calculated as : $\dfrac{\bar{X} - \mu}{\dfrac{s}{\sqrt{n}}}$
We already calculated s and $\bar{X}$ replacing in the equation:
$\dfrac{(6.81 - 7.50)}{\dfrac{1.055}{\sqrt{16}}} = -2.62$
Since $-2.62 < -1.75$, it is in the rejection area and we reject H_0 means we accept H_1.
c)Since our test value, $\dfrac{\bar{X} - \mu}{\dfrac{s}{\sqrt{n}}}$ is positive and the value we need to reject the null hypothesis must be smaller than zero, we cannot reject it immediately.

Answer 2

a)
Null hypothesis is $H_0 : \mu = 5000$
Alternative hypothesis $H_1 : \mu > 5000$
Ali's is the null hypothesis.
b)
We constructed the hypothesis, and now, we calculate the z-test variable using the formula $\frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$.

$$\text{z var} = \frac{5500 - 5000}{\frac{2000}{\sqrt{100}}} = 2.5$$

And the critical point using 0.05 and the z-table is 1.65.
Since $2.5 > 1.65$ Our H_0 is false and H_1 is true. There is an increase in the rent values.
c)$P\{Z >= 2.5\}$ = 1- P$\{Z < 2.5\}$
1-value of the z variable in the z-table is our p-value.
1-0.9938=0.0062 is our p-value. Small p-value means our argument is strong. And it is smaller than our alpha so we can reject the null hypothesis. The smaller p-value, the stronger we reject H_0.
d)
$H_0 : \mu_1 = \mu_2$
$H_1 : \mu_1 < \mu_2$
where μ_1 is the sample average of Ankara and the other is İstanbul.
We use the z table and z test since the sample size is big and standard deviations are known. We can calculate the z variable for 2 groups as:

$$\frac{\bar{X_1} - \bar{X_2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

And we can calculate the critical point using the z table value for 0.01. we take the negative value of it because of the H_1 hypothesis. Using the formulas:

$$\frac{5500 - 6500}{\sqrt{\frac{2000^2}{100} + \frac{3000^2}{60}}} = -2.29$$

and the critical point is -2.33
Since the critical point is less than the z variable, our estimation is not in the rejection zone and we cannot reject H_0. We cannot say the hypothesis İstanbul rents are more than Ankara rents is true for 1% significance level.

Answer 3

Our assumptions will be like: H_0 : There is no link between rainy days and seasons.
H_1 : There is a link between rainy days and seasons.
To use Chi-square test, we need to obtain the following values:

Mean of the first row = (34+32+15+19)/4 = 25
Mean of the second row = (56+58+75+71)/4 = 65
$\chi^2 = \dfrac{(34-25)^2}{25} + \dfrac{(32-25)^2}{25} + ... + \dfrac{(71-65)^2}{65} = 14,73$
The degrees of freedom = (row-1)*(column-1) = $(4-1)*(2-1) = 3$
When we take a look to the chi-square table from the book, we observe our p-value is between 0.005 and 0.001. Since the p-value is small, we can say our null hypothesis is strong and we can accept it more safely.

Answer 4

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X = [34 32 15 19; 56 58 75 71];
Col = sum(X);
Row = sum(X');
Tot = sum(Row);
m = length(Row);
k = length(Col);
e = zeros(size(X));
for i=1:m; for j=1:k; e(i,j) = Row(i)*Col(j)/Tot; end; end;
chisq = (X-e).*(X-e)./e;
chistat = sum(sum(chisq));
1-chi2cdf(chistat,(m-1)*(k-1))
Xsqr=chistat
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