Student Information

Name : Solution

ID :

Answer 1

a)

First we need to calculate the mean and the standard deviation, $\mu = 6.8$ and $\sigma = 1.05$. Since the sample size is small, T-distribution must be used. With 15 degrees of freedom and $\alpha = 0.02$, t value is 2.602. The confidence interval is $6.8 \pm \frac{1.05}{\sqrt{16}} * 2.602 = [6.12; 7.48]$.

b)

The null hypothesis claims that the new consumption is equal to the old consumption, $H_0 : \mu = 7.5$ and alternative hypothesis is $H_A : \mu < 7.5$. For 5% level significance $t_{0.05} = 1.75$ with 15 degrees of freedom (one-sided test). To calculate t value;

$$t = \frac{6.8 - 7.5}{1.05/\sqrt{16}} = -2.67$$

Since $t < -t_{0.05}$, we can reject H_0 and claim that the improvement is effective.

c)

Since the old mean was lower than the current mean, there is no need for a calculation, we can reject the claim of an improvement directly. The current mean would belong to the acceptance region already.

Answer 2

a)

Firstly, Ali's claim should be the null hypothesis since he argues for the absence of an effect over the normal situation.
The null hypothesis, $H_0 : \mu = 5000$ and the alternative hypothesis, $H_A : \mu > 5000$.

b)

We need to calculate Z value and compare it to $z_\alpha = z_{0.05} = 1.645$. Note that α is kept as 0.05 since Ahmet's claim is a one-sided alternative hypothesis.

$$Z = \frac{5500 - 5000}{2000/\sqrt{100}} = 2.5$$

Since $2.5 > 1.645$, Z value is in the rejection region and we reject the null hypothesis. Ahmet provided sufficient evidence in favor of the alternative hypothesis that the rent prices in Ankara has increased from the last year.

c)

P-value for $Z = 2.5$ can be checked from Table A4. It is .0062 indicating that Ahmet may further increase the confidence for his claim to be 0.01.

d)

In this case, we need to use two-sample Z-test. The null hypothesis H_0 can be defined as $\mu_A = \mu_I$ and H_A as $\mu_A < \mu_I$. Similar to part b, this is a one-sided hypothesis, so $\alpha = 0.01$ can be used to find $z_\alpha = -2.326$

$$Z = \frac{5500 - 6500}{\sqrt{3000^2/60 + 2000^2/100}} = \frac{-1000}{435.9} = -2.29$$

Since $-2.29 > -2.326$, we can not reject H_0 and we can not claim that the rent prices in Ankara is lower than the rent prices in Istanbul.

Answer 3

H_0 : The number of rainy days in Ankara is independent of the season
H_A : The number of rainy days in Ankara depends on the season
Each season has 90 days and a total of 100 days are rainy. The expectation is that if the amount of rainy days is independent of season, there would be 25 rainy days for each season.

$$X^2_{obs} = \frac{(34-25)^2}{25} + \frac{(32-25)^2}{25} + ... + \frac{(75-65)^2}{65} + \frac{(71-65)^2}{65} = \frac{266}{25} + \frac{266}{65} = 14.73$$

According to Table A6, with 3 degrees of freedom, 14.73 corresponds to P-value 0.005, indicating that we have a significant evidence to claim that number of rainy days in Ankara is dependent on the season.

Answer 4

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X = [34 32 15 19; 56 58 75 71];
Row = sum(X');
Col = sum(X);
Tot = sum(Row);
k = length(Col);
m = length(Row);
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)^2/e;
chistat = sum(sum(chisq))
Pvalue = 1-chi2cdf(chistat,(k-1)*(m-1))
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