Student Information

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Answer 1

Confidence Interval for population is:
CI=$\overline{x} \pm Z_{\alpha/2} * \frac{\sigma}{\sqrt{n}}$ when the population standard deviation is known.
$\overline{x}$=$\frac{20.1+12.8+18.9+16.4+20.3+10.1+15.4+12.4+24.7+18.5}{10}$=16.96

a) The critical value Z for % 90 CI from z table=1.6449
Hence:CI=16.96 $\pm$ 1.6449 $* \frac{3}{\sqrt{10}}$ =16.96 $\pm$ 1.5605
CI=(15.40,18.52)
The critical value Z for % 99 CI from z table=2.5758
Hence:CI=16.96 $\pm$ 2.5758 $* \frac{3}{\sqrt{10}}$ =16.96 $\pm$ 2.4436
CI=(14.52,19.40)

b) n=$(\frac{(Z*\sigma)}{\triangle})^2$ is the formula to calculate required sample size to attain a specific margin.
The critical value Z for % 98 CI from z table=2.3263
When we substitute the values on the formula: n=$(\frac{(2.3263*3)}{1.55})^2$=20.27 $\approx$ =21

Answer 2

a) If standard deviation is also known,mean rating and the sample size would be enough as statistics because standard deviation provides us information about the spread of the data. However,mean rating and sample size are not enough in this situation.

b) We can use hypothesis testing.
H_0:μ=7.5
H_a:μ < 7.5
α=0.05 (level of significance)
Since population standard deviation is not known and n $\geq$ 30 ; we need to use z-test.
z=$\frac{\overline{x}-\mu}{\frac{\sigma}{\sqrt{n}}}$=$\frac{7.4-7.5}{\frac{0.8}{\sqrt{256}}}$=-2 The critical value Z for α=0.05 from z table=-1.645 since it is one-tailed(left) region.We will reject H_0 if Z<-1.645,and not reject otherwise. When we compare these two z values,the computed one is less than the critical value,it means we need to reject H_0.With 95% confidence(1-α),Restaurant A will not be in list of candidate restaurants.

c) When the standard deviation equals to 1,the computed z value is equal to -1.6,Unlike part b,it is greater than the critical value so with 95 % confidence Restaurant A will be in list of candidate

restaurants.
z=$\frac{7.4-7.5}{\frac{1}{\sqrt{256}}}$=-1.6,-1.6 > -1.645

d) Since 7.6 > 7.5 we do not need to do any other statistical test,it will be in our list definitely.

Answer 3

Computer A:$\overline{x}_1$=211 s_1=5.2 n_1=20
Computer B:$\overline{x}_1$=133 s_1=22.8 n_1=32
$H_0 : \mu_1$-μ_2 = 90
$H_1 : \mu_1$-μ_2 < 90

a) Pooled variance:s$_p^2$=$\frac{(n_1*s_1^2+n_2*s_2)^2}{n_1+n_2-2}$=$\frac{(20-1)*5.2^2+((32-1)*22.8)^2}{20+32-2}$=332.576

Test Statistic:T=$\frac{\overline{x}_1-\overline{x}_2-(\mu_1-\mu_2)}{\sqrt{s_p^2(1/n_1+1/n_2)}}$=(211-133-90)/($\sqrt{332.576 * (1/20 + 1/32)}$)=-2.3085
Degree of freedom=$n_1 + n_2 - 2$=50
P-value=T.DIST(-2.3085,50,1)=0.0126
Since P-value > α ,H_0 can not be rejected.So it can not be inferred that Computer B provides a 90-minute or better improvement at 1% level of significance.

b) Test Statistic:T=$\frac{\overline{x}_1-\overline{x}_2-(\mu_1-\mu_2)}{\sqrt{(s_1^2/n_1+s_2^2/n_2)}}$=(211-133-90)/($\sqrt{5.2^2/20 + 22.8^2/32}$)=-2.8606
Degree of freedom=$\frac{(s_1^2/n_1+s_2^2/n_2)^2}{((s_1^2/n_1)/(n_1-1))+((s_2^2/n_2)^2)/(n_2-1))}$=35.97 $\approx$ 35
P-value=T.DIST(-2.8606,35,1)=0.0035
Since P-Value < α,We can reject the H_0 so it can be inferred that Computer B provides a 90-minute or better improvement at 1% level of significance.