For each of the below questions (1, 3, 5), determine the observed significance level. How would I do this?

1. The data below represents a random sample of weights (in grams) from a batch of a particular product. The nominal value is 87.5 grams. Prove that this sample is consistent with the nominal value, to a 90% confidence level.

Ans:

Mean=86.4

Standard deviation = 5.333

The degree of freedom is 20-1=19.

The critical t value at 0.1 significance level is 1.73

Margin of error=critical value\*standard deviation/sqrt(n)=1.73\*5.333/sqrt(20)=2.1

Upper limit: 86.4+2.1=88.5

Lower limit: 86.4-2.1=84.3

Therefore, the 90% confidence interval is [84.3, 88.5]

Since the value 87.5 is within this interval, this sample is consistent with the nominal value, to a 90% confidence level.

Data: (85.81274288, 88.7236203, 83.33202174, 87.39825986, 80.80214318, 79.35480832, 80.6169453, 72.96436719, 90.04840768, 91.57450896, 88.99970927, 87.72667891, 86.87734579, 89.72700899, 94.49946214, 95.43705338, 83.83021658, 88.22971068, 83.5693944, 88.4552547)

3. A manufacturer claims that a particular kind of solar shade can reduce the ambient temperature by 2 degrees centigrade over traditional materials. Over random times over several days, temperatures were taken at the same time under a traditional awning and an adjacent awning using this brand of solar shade. In the Data file below, column A is the traditional and column B is the new shade. Prove whether or not the manufacturer’s claims are true to 95% confidence level.

Ans:

First figure out the difference for each, then figure out the mean and standard deviation for the difference.

Mean = 2.10168

Standard deviation = 0.52158

Degrees of freedom: 20-1=19

The critical value for 95% confidence interval is 2.09

Margin of error = 2.09\*0.52158/sqrt (20) = 0.24375

Lower limit: 2.10168-0.24375=1.85793

Upper limit: 2.10168+0.24375=2.34543.

Since the interval [1.85793, 2.34543] contains the value of 2, we could not conclude that the manufacturer's claims are true to 95% confidence level.

A B

|  |  |
| --- | --- |
| 24.24313 | 21.87521 |
| 28.72897 | 28.0444 |
| 21.48468 | 19.51498 |
| 26.08379 | 24.38939 |
| 25.78293 | 23.63512 |
| 24.10804 | 21.26163 |
| 30.84396 | 28.50113 |
| 18.90814 | 16.52972 |
| 21.3339 | 19.36128 |
| 24.68048 | 22.21857 |
| 29.16487 | 27.20792 |
| 19.73482 | 17.45729 |
| 15.69726 | 12.61739 |
| 21.36029 | 18.98967 |
| 31.69022 | 30.10404 |
| 20.35358 | 18.84266 |
| 24.07602 | 22.27601 |
| 26.95173 | 24.68808 |
| 14.39104 | 11.87781 |
| 24.77026 | 22.96222 |

5. A random sample of 135 dentists indicated that 84 recommended sugarless gum for their patients that chew gum. What is a 99% confidence interval for the true proportion of dentists in the population that would make such a recommendation?

ANS:

=Proportion of doctors who recommended sugarless gum=84/135=0.62222

1-0.62222=0.37778

n=sample size=135

Since we are not given population parameters, we will approximate them with sample statistics.

p==0.62222

q=0.37778

Estimated standard error of proportion=S.E =0.041728

Since sample size is large, we will use z statistics. A 99% confidence level will include 49.5% of the area on either side of the mean in the sampling distribution.

Refer to the Standard normal distribution tables and look for area=0.475

We get Z=2.58.

Lower limit of confidence interval=0.62222-2.58\*0.041728=0.51456

Upper limit of confidence interval=0.62222+2.58\*0.041728=0.72988

We can say with 99% confidence that proportion of true proportion of the doctors who recommended sugarless gum lies between 0.51456 and 0.712988.