Answer on Question #84613 – Math – Statistics and Probability

Question

We would like to conduct a hypothesis test at the 2% level of significance to determine whether the true mean pH level in a lake differs from 7.0.
Lake pH levels are known to follow a normal distribution. We take 11 water samples from random locations in the lake. For these samples, the mean pH level is 7.3 and the standard deviation is 0.37. Using the critical value approach, the decision rule would be to reject H0 if the test statistic is:

A) less than -2.054 or greater than 2.054

B) less than -2.326 or greater than 2.326

C) less than -2.359 or greater than 2.359

D) less than -2.718 or greater than 2.718

E) less than -2.764 or greater than 2.764

Solution

$H_0: \mu = 7.0, \qquad H_1: \mu \neq 7.0$
This is a two-tailed test.
Population normal, σ unknown

$$Sample: n = 11, \overline{x} = 7.3, s = 0.37, se = \frac{s}{\sqrt{n}} = \frac{0.37}{\sqrt{11}} \approx 0.11156$$

$$df = n - 1 = 10$$

$$\overline{x} - t_{\alpha/2,df} \cdot \frac{s}{\sqrt{n}} \leq \mu \leq \overline{x} + t_{\alpha/2,df} \cdot \frac{s}{\sqrt{n}}$$

$$\alpha = 0.02$$

$$t_{\alpha/2,df} = t_{0.01,10} = -2.763767$$

Using the critical value approach, the decision rule would be to reject H_0 if the test statistic is:
E) less than -2.764 or greater than 2.764.
Answer: E).