Problem 1

A company claims that their new smartphone battery lasts longer than the industry standard of 24 hours. A sample of 20 batteries was tested, showing an average life of 26 hours with a standard deviation of 2 hours. Test the company's claim at a 0.05 significance level.

Problem 2

An educational institution claims that its new study method improves student performance, with students scoring 5 points higher on average than the national mean score of 80. For a sample of 25 students who used the method, the average score was 87 with a standard deviation of 10. Test this claim at the 0.01 significance level.

Problem 3

The average processing time for a software task is claimed to be 15 seconds. A new algorithm is tested to determine if it improves processing speed. In a sample of 18 trials, the average processing time was 13.5 seconds with a standard deviation of 1.8 seconds. Test at the 0.05 significance level whether the new algorithm reduces processing time.

Problem 4

A coffee chain claims that their new blend increases customer satisfaction ratings by 2 points on average compared to the standard score of 75. A random sample of 30 customers rated the new blend with an average satisfaction score of 78.2 and a standard deviation of 3.5. Test this claim at a 0.01 significance level.

Population Standard Deviation Testing with Chi-Square

Problem 5
The manufacturer of a machine claims that the standard deviation of its operating life is 5 years. To test this, a sample of 15 machines was collected, with a sample standard deviation of 6.2 years. Test the manufacturer's claim at a 0.05 significance level using the chi-square distribution.

Problem 6
A health organization claims that the standard deviation of weights in a certain population is 15 kg. A random sample of 20 individuals was taken, and the sample standard deviation was found to be 12 kg. Test the health organization's claim at the 0.01 significance level using the chi-square distribution.