MM 225 – 2024 - 1
Problems for Practice 4

1. A set of 10 determinations, by a method devised by the chemist Karl Fischer, of the percentage of water in a methanol solution yielded the following data.

   .50, .55, .53, .56, .54, .57, .52, .60, .55, .58

   Assuming normality, use these data to give a 95 percent confidence interval for the actual percentage.

2. A standardized test is given annually to all sixth-grade students in the state of Washington. To determine the average score of students in her district, a school supervisor selects a random sample of 100 students. If the sample mean of these students' scores is 320 and the sample standard deviation is 16, give a 95 percent confidence interval estimate of the average score of students in that supervisor's district.
3. A sample of 20 cigarettes is tested to determine nicotine content and the average value observed was 1.2 mg. Compute a 99 percent two-sided confidence interval for the ean nicotine content of a cigarette if it is known that the standard deviation of a cigarette's nicotine content is $\sigma = .2$ mg.
4. The daily dissolved oxygen concentration for a water stream has been recorded over 30 days. If the sample average of the 30 values is 2.5 mg/liter and the sample standard deviation is 2.12 mg/liter, determine a value which, with 90 percent confidence, exceeds the mean daily concentration.
5. The capacities (in ampere-hours) of 10 batteries were recorded as follows:

   140, 136, 150, 144, 148, 152, 138, 141, 143, 151

   a. Estimate the population variance σ^2.
   b. Compute a 99 percent two-sided confidence interval for σ^2.
   c. Compute a value v that enables us to state, with 90 percent confidence, that σ^2 is less than v.
6. The following are independent samples from two normal populations, both of which have the same standard deviation σ.

   16, 17, 19, 20, 18 and 3, 4, 8

   Use them to estimate σ.

7. The amount of beryllium in a substance is often determined by the use of a photometric filtration method. If the weight of the beryllium is μ, then the value given by the photometric filtration method is normally distributed with mean μ and standard deviation σ. A total of eight independent measurements of 3.180 mg of beryllium gave the following results.

   3.166, 3.192, 3.175, 3.180, 3.182, 3.171, 3.184, 3.177

   Use the preceding data to

   a. estimate σ;

b. find a 90 percent confidence interval estimate of σ.