Exam 3, Mathematics 2501, Section TR3 30 copies
3:40–4:50 pm, December 2, 2021, IA-137
Instructor: Attila Máté

Follow these instructions carefully:

Work on the paper provided; do not use your own paper. *Work only on one problem on each sheet (you should not work on two different problems on the two sides of the same sheet).* On the top of each page, *print* your name (*encircle your last name*) and indicate the number of the problem you are working on by writing e.g. *"Problem #4".* Always *encircle* your final answer. If there are several parts to a problem, always indicate the part that you are answering, e.g. by writing *"Answer to Part b)"* (the number of the problem should be on the top of the page). Do not use a *red* pen or a *red* pencil. Do not write in the corner covered up by the staple (top left corner on the front side, top right corner on the back side). Each problem is worth the *same* amount of credit. **Show all your work.**

1. The numbers

$$81.1, \qquad 84.7, \qquad 77.8, \qquad 76.4$$

represent the temperature measured at a certain location and at a certain time. This is regarded as a random sample from a distribution $\mathcal{N}(m, \sigma^2)$, where m is the true temperature, and σ^2 measures the precision of the method.

a) Find an unbiased estimate for m.
b) Find an unbiased estimate for σ^2 if it is known that $m = 79.0$.
c) Find an unbiased estimate for σ^2 if m is unknown.

2. The numbers

$$81.1, \qquad 84.7, \qquad 77.8, \qquad 76.4$$

represent the temperature measured at a certain location and at a certain time. This is regarded as a random sample from a distribution $\mathcal{N}(m, 16)$, where m is the true temperature, and $\sigma^2 = 16$ measures the precision of the method; the value of m is not known. Find a 90% confidence interval for m.

3. The numbers

$$81.1, \qquad 84.7, \qquad 77.8, \qquad 76.4$$

represent the temperature measured at a certain location and at a certain time. This is regarded as a random sample from a distribution $\mathcal{N}(m, \sigma^2)$, where m is the true temperature, and σ^2 measures the precision of the method; the values of m and σ^2 are not known. Find a 90% confidence interval for m.

4. The numbers

$$81.1, \qquad 84.7, \qquad 77.8, \qquad 76.4$$

represent the temperature measured at a certain location and at a certain time. This is regarded as a random sample from a distribution $\mathcal{N}(m, \sigma^2)$, where m is the true temperature, and σ^2 measures the precision of the method; the values of m and σ^2 are not known.

a) Find a 90% confidence interval for σ^2.
b) Find a 90% confidence interval for σ.

5. In a random sample of 500 persons eating lunch at a department store cafeteria, 204 persons had dessert. Construct a 90% confidence interval for the true proportion of persons usually eating dessert in this cafeteria.