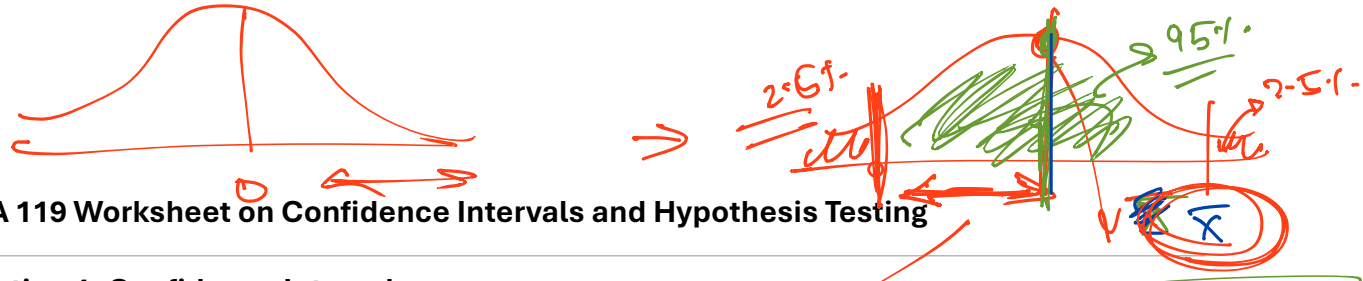


STA 119 Worksheet on Confidence Intervals and Hypothesis Testing

Section 1: Confidence Intervals

Problem 1

The average amount of excess waste from 16 cans of juice was measured and found to be 3.25 ounces, with a population standard deviation of 0.3 ounces.

1. Determine a 95% confidence interval for the population mean.
2. Determine a 98% confidence interval for the population mean.
3. Determine a 99% confidence interval for the population mean.

Problem 2

The average score of 78 students was calculated as 78, with a population standard deviation of 1.75.

1. Determine a 95% confidence interval for the population mean.
2. Determine a 98% confidence interval for the population mean.
3. Determine a 99% confidence interval for the population mean.

$$\left(\bar{x} - z_{\alpha/2}\frac{\sigma}{\sqrt{n}},\ \bar{x} + z_{\alpha/2}\frac{\sigma}{\sqrt{n}}\right)$$

Section 2: Determining Sample Size

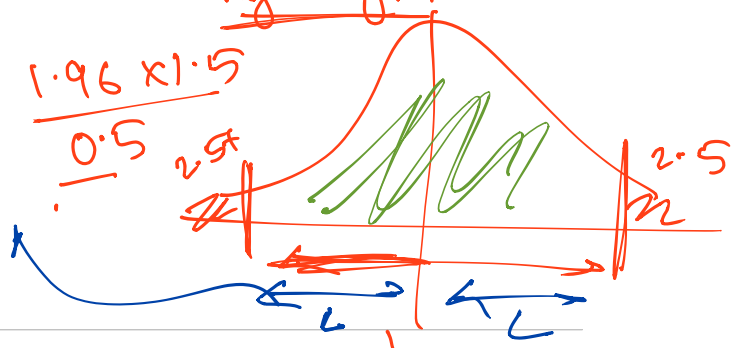
Problem 1

To calculate a 95% confidence interval for the population mean with a population standard deviation of 1.5, determine the sample size required if the desired margin of error is 0.5.

$$L = z_{\alpha/2}\frac{\sigma}{\sqrt{n}} \Rightarrow \sqrt{n} = \frac{1.96 \times 1.5}{0.5}$$

$$\Rightarrow 0.5 = 1.96 \times \frac{1.5}{\sqrt{n}}$$

half-length



Problem 2

Calculate the sample size necessary to achieve a 95% confidence interval for the mean, assuming a population standard deviation of 1.0 and a margin of error of 0.25.

$\alpha = 0.05$ $\quad \alpha/2 = 0.025$ $\quad$ half length

$$\Rightarrow 0.25 = 1.96 \times \frac{1.0}{\sqrt{n}}$$

$$n = 8$$

Section 3: Confidence Interval for Population Mean

Problem 1

The average baking time for 10 cookies at a bakery is 20 minutes, with a sample standard deviation of 1.25 minutes.

1. Determine a 95% confidence interval for the population mean.

2. Determine a 99% confidence interval for the population mean.

Problem 2

A doctor measured the average blood sugar level in 25 patients with a particular disease, finding a mean of 124 and a standard deviation of 2.5.

1. Determine a 95% confidence interval for the population mean.

2. Determine a 99% confidence interval for the population mean.

3. Determine a 98% confidence interval for the population mean.

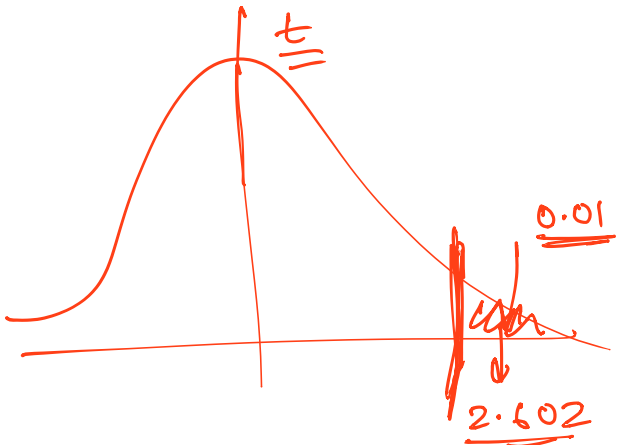
Section 4: Hypothesis Testing

Problem 1

Company A claims its tires last 7,000 miles longer than those of Company B. For Company B, the known population mean is 30,000 miles. Company A's data is n=16, $\bar{x}$=40,000, and s=4,000s. Test this claim at the 0.01 significance level.

$H_0: \mu_A = 37000 \rightarrow \mu_0$

$H_a: \mu_A > 37000$



$t_{\alpha/2, n-1}$

$t_{0.005,15} =$

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

$$= \frac{40000 - 37000}{4000/\sqrt{16}} \Rightarrow \frac{3000}{4000} \times 4$$

$t \Rightarrow 3$

Problem 2

The average flight time on a specific path is 10.5 hours. A new route is being tested to reduce this time. For a sample of 15 flights on the new path, the average time is 9.75 hours, with a standard deviation of 0.5 hours. Test at the 0.05 significance level whether the new path reduces the flight time.