Equitable Equations: *Introduction to confidence intervals*

Problem 1

In a random sample of $n = 55$ repairs at a certain auto garage, the average cost was \$374.75. Construct a level 90% confidence interval for the population mean repair cost at this garage. Assume the population standard deviation is $\sigma = \$72.50$.

Problem 2

Repeat problem 1 with a sample of size $n = 85$. Which confidence interval is wider? Briefly explain.

Problem 3

In a random sample of $n = 218$ eruptions of a geyser, the mean duration was 2.42 minutes. Construct a level 95% confidence interval for the population mean. Assume the population standard deviation is $\sigma = 1.04$ minutes.

Problem 4

Repeat problem 3 with a standard deviation of $\sigma = 1.92$. Which confidence interval is wider? Briefly explain.

$c = 90$

1) $z^* = 1.645$

$$\mu = 374.75 \pm 1.645\left(\frac{72.50}{\sqrt{55}}\right) = 374.75 \pm 16.08$$

2) smaller because n is larger leading to smaller $\sigma_{\bar{x}}$ and a smaller margin of error

$$\mu = 374.75 \pm 1.645\left(\frac{72.50}{\sqrt{85}}\right) = 374.75 \pm 12.94$$

3) $c = 95$
$z^* = 1.960$

$$\mu = 2.42 \pm 1.960\left(\frac{1.04}{\sqrt{218}}\right) = 2.42 \pm 0.14$$

4) Wider because σ is larger leading to larger margin of error

$$\mu = 2.42 \pm 1.960\left(\frac{1.92}{\sqrt{218}}\right) = 2.42 \pm 0.25$$