

**HOMEWORK — INFERENCE FOR μ (σ UNKNOWN)
PROB. AND STAT. FOR ENG. (STAT:2020; BOGNAR)**

1. The time, X (in minutes), it takes a robot to weld steel beams can be modeled by a $X \sim N(\mu, \sigma^2)$ distribution. A worker observed the welding times for 18 randomly selected beams and found the sample mean welding time was $\bar{x} = 140.2$ minutes with sample standard deviation $s = 8.5$ minutes.
 - (a) Test $H_0 : \mu = 145$ versus $H_a : \mu \neq 145$ at the $\alpha = 0.01$ significance level using a 3-step test.
 - (b) Based upon your answer in part (a), does μ significantly differ from 145? Why?
 - (c) Approximate the p -value for the test in part (a).
 - (d) Based upon your answer in part (c), does μ significantly differ from 145? Why?
 - (e) Find a 99% confidence interval for μ .
 - (f) Based upon your answer in part (e), does μ significantly differ from 145? Why?
 - (g) If the times were not normally distributed, could we still do inference for μ ? Why?
2. The time, X (in minutes), it takes a person to weld steel beams can be modeled by a $X \sim N(\mu, \sigma^2)$ distribution. A worker was timed when welding 16 randomly selected beams; the sample mean welding time was $\bar{x} = 175.4$ minutes with sample standard deviation $s = 18.1$ minutes.
 - (a) Test $H_0 : \mu = 160$ versus $H_a : \mu > 160$ at the $\alpha = 0.05$ significance level using a 3-step test.
 - (b) Based upon your answer in part (a), is μ significantly greater than 160? Why?
 - (c) Approximate the p -value for the test in part (a).
 - (d) Based upon your answer in part (c), is μ significantly greater than 160? Why?
 - (e) Find a 95% one-sided lower bound CI for μ .

Be sure to double check your work using Matt's sweet, sweet "Inference for μ " app on our webpage. <https://homepage.stat.uiowa.edu/~mbognar/2020>. Enter n and \bar{x} , select s from the drop-down box, and enter s . This will give you the CI (if the math symbols are messed up, refresh the page and re-enter the info – there is a bug I need to track down). To do the test, enter H_0 and H_a , (also make sure you have these specified correctly w/ the drop-down boxes), and choose the significance level α . Use the "Show Equations" button to display the equations. Be sure you can do the problems by hand – you can't use this app on the exam. Enjoy!!