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?