

**HOMEWORK 12**

NAME: \_\_\_\_\_

**PROB. AND STAT. FOR ENG. (STAT:2020; BOGNAR)**

*Print this pdf file (do not use notebook paper), show your work in the provided space, use scanning app to scan pages (in order) into a single pdf file, submit in Gradescope. Be sure to get entire page in each shot — lay each page flat when scanning. You can use an iPad/tablet too. The Gradescope app works well for submitting too. Make sure the pages upload in order.*

1. The longevity of truck tires (in thousands of miles) follows a normal distribution with mean  $\mu$  and standard deviation  $\sigma = 20$ . Suppose  $n = 64$  tires are randomly selected and the sample mean  $\bar{x} = 76.5$ .

(a) Test  $H_0 : \mu = 75$  versus  $H_a : \mu \neq 75$  at the  $\alpha = 0.05$  significance level using a 3-step test.

(b) Based upon your answer in part (a), does  $\mu$  significantly differ from 75? Why?

(c) Find the  $p$ -value for the test in part (a).

(d) Based upon your answer in part (c), does  $\mu$  significantly differ from 75? Why?

(e) Find a 95% confidence interval for  $\mu$ .

(f) Based upon your answer in part (e), does  $\mu$  significantly differ from 75? Why?

(g) If the longevities were not normally distributed, could we still do inference for  $\mu$ ? Why?

2. A coffee shop knows that the temperature of their coffees has a distribution that is skewed to the left with mean  $\mu$  degrees and standard deviation  $\sigma = 8$  degrees. A random sample of 36 coffees yielded a sample mean temperature  $\bar{x} = 187$  degrees.

(a) Test  $H_0 : \mu = 190$  versus  $H_a : \mu \neq 190$  at the  $\alpha = 0.01$  significance level using a 3-step test.

(b) Based upon your answer in part (a), does  $\mu$  significantly differ from 190? Why?

(c) Approximate the  $p$ -value for the test in part (a).

(d) Based upon your answer in part (c), does  $\mu$  significantly differ from 190? Why?

(e) Find a 99% confidence interval for  $\mu$ .

(f) Based upon your answer in part (e), does  $\mu$  significantly differ from 190? Why?

(g) Suppose the sample size was 10, not 36. Could we still do inference for  $\mu$ ? Why?

3. Suppose a researcher tests  $H_0 : \mu = 125$  versus  $H_a : \mu \neq 125$  at the  $\alpha = 0.05$  significance level. If  $\sigma = 12$  and a 96.6% confidence interval for  $\mu$  is (118.26,126.74), find the  $p$ -value of the test.

4. Suppose a random sample of size 9 was obtained from a normal population with mean  $\mu$  and standard deviation  $\sigma = 6.3$ . It was determined that the  $p$ -value for the test  $H_0 : \mu = 80$  versus  $H_a : \mu \neq 80$  was 0.8336.

(a) If  $\bar{x} > \mu$ , find a 95% confidence interval for  $\mu$ .

(b) Approximately how large of a sample size  $n$  would be needed for the margin of error (at 95% confidence) to equal 2.0?