Homework #4

1. Biologists studying the healing of skin wounds measured the rate at which new cells closed a cut made in the skin of an anesthetized newt. Here are data from a random sample of 18 newts, measured in micrometers (millionths of a meter) per hour:

29, 27, 34, 40, 22, 28, 14, 35, 26, 35, 12, 30, 23, 18, 11, 22, 23, 33

(a) Create a QQ plot of the data. Do you think it is reasonable to assume that the population distribution is normal? Explain your answer. (There isn’t a unique “right” answer.)

(b) Regardless of your answer to (a), assume the population distribution is normal and use that assumption to create a 90% CI for $\mu$. (Use a calculator to find $\bar{x}$ and $s$ and then use the formula provided in class to prepare for exams. Then check your answer with R if you wish.)

(c) Suppose the problem statement included the addition, “Prior experience in the lab indicates that the population standard deviation is close to $\sigma = 8$ (micrometers per hour).” This would call for which changes to your confidence interval calculation? Write down the letters of all that are correct.

   i. Replace $\bar{x}$ with $\bar{x}/n$.
   ii. Replace $t_{17,.05}$ with $z_{.05} = 1.645$.
   iii. Replace $\sqrt{n}$ with $n$.
   iv. Replace $s$ (calculated from the data) with $\sigma = 8$.
   v. Replace $s$ (calculated from the data) with $\frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{18}}$.

2. A pumpkin farmer weighed a simple random sample of size $n = 20$ pumpkins, with these results:

9.6, 8.8, 5.1, 9.7, 9.1, 8.9, 8, 9.2, 2.7, 9.1, 8.5, 7.3, 9.3, 9.6, 4.1, 9.9, 7.6, 9, 7.2, 8.5

(a) Create a QQ plot of the weights. Do you think it is reasonable to assume that the population distribution is normal? Explain your answer. (There isn’t a unique “right” answer to this problem.)

(b) Regardless of your answer to (a), use R to perform the bootstrap with 2000 resamplings to create a 90% CI for $\mu$. (Show your R code and its output.)