HW1

Show your work (if appropriate) for full credits. Submit your answer in pdf format to blackboard.

1. To obtain information on the corrosion-resistance properties of a certain type of steel conduit, 35 specimens are buried in soil for a 2-year period. The penetration (in mils) for each specimen is then measured, yielding a **sample mean** penetration of $\bar{x} = 35.7$ and a **sample standard deviation** of s=4.2.

   A. Suppose the true population standard deviation is σ=5. Construct a 90% confidence interval for the true average penetration for this type of steel conduit. Interpret the interval.
   B. Now suppose the true standard deviation is unknown. Construct a 90% confidence interval for the true average penetration for this type pf steel conduit. Interpret the interval.

2. The recommended daily dietary allowance for zinc among males older than age 50 years is 15 mg/day. A study reports the following summary data on intake for a sample of males age 65–74 years: n=20, $\bar{x} = 10.23$, and s=5.17. The scientist wants to know if this data indicates that average daily zinc intake in the population <u>falls below</u> the recommended allowance.

   A. The QQ plot is provided on the right and Shapiro-Wilk normality test is provided. Use this to assess if it is plausible to assume that the daily zinc intake is normally distributed. Briefly explain your answer.

   Shapiro-Wilk normality test
   data: x
   W = 0.95112, p-value = 0.3844

Normal Q-Q Plot
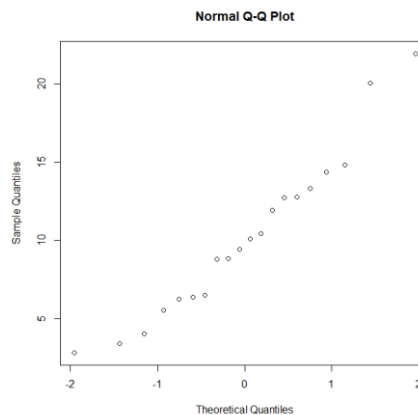
   R commands:
   x=c(9.41, 20.06, 8.80, 10.10, 14.38, 10.42, 13.30, 4.04, 3.40, 11.95, 12.77, 6.39, 21.95, 14.82, 12.75, 8.86, 5.56, 6.26, 6.52, 2.81)
   qqnorm(x)
   shapiro.test(x) # Test of H0: {Data come from a normal distribution.}

B. Carry out the test of H_0: $\mu=15$ vs H_a: $\mu<15$ at **α=0.05**. Make sure you calculate the test statistic, define the rejection region, and make a decision about the test. You can check your conclusion with R command: t.test(x,mu=15,alternative="less")

3. A pollution-control inspector suspected that a riverside community was releasing semi-treated sewage into a river and this, as a consequence, was changing the level of dissolved oxygen of the river. To check this, he drew 45 randomly selected specimens of river water at a location above the town and another 45 specimens below. The sample information for the measured oxygen level by groups are given blow.

	Sample mean	sd	n
Above	4.83	0.175	45
Below	4.55	0.234	45

A. Construct a 90% two-sided confidence interval for the difference between the average dissolved oxygen levels above town and below town. Does the data provide evidence to indicate a difference in the true average dissolved oxygen between locations above and below town?

B. The scientist wants to know if the average oxygen level below town is higher than above town. Run a hypothesis test at significance level α=0.05. Use the 4-step procedure: 1: State the null and alternative hypotheses. 2:Give the test statistic, 3 find the rejection region or the p-value, and 4: make a decision.