1. The typical American life expectancy is about 78 years. In an experiment, sixteen people were given spinach to eat every day from the ages of 40 to 50. Their average age at death was 80.4 with a sample standard deviation of 4 years.

   (a) Set up null and alternative hypotheses to test whether such a consumption of spinach increases life expectancy.

   (b) What is the t-statistic for this data?

   (c) At a significance level of $\alpha = .01$, what do you conclude? Use the table on the back.

2. After a terrible radioactive disaster in the Amazon rainforest, there are reports of gigantic boa constrictors. Scientists measure a random sample of 25 of boa constrictors in the area and find their length to be 8 m on average with a sample standard error of 5 m. Usually, boa constrictors are an average of 2.5 m long. Is there evidence that the radioactive disaster increased the size of the boa population? (Use the table on the back and a significance level of $\alpha = .05$) What are the null and alternative hypotheses for this test and what is the relevant t statistic?

3. The usual levels of ammonia in a river were .01 mg/L before a factory was built on the site. After the factory was built and became active, over the course of nine days environmental workers sampled the ammonia concentrations on nine different occassions and got an average of .02 mg/L each day with a sample standard deviation of 1.5 μg/L. At a significance level of $\alpha = .001$ is there evidence that the factory is polluting the river with ammonia? (Use the table on back)

4. Scientists are testing a new kind of drug that they think targets malignant cancer cells and kills them. In a particular kind of stomach cancer, 10% of individuals are known to contain antibodies that fight the cancer. Scientists tested the hypotheses:

$$p = \text{proportion of people resistant to the cancer with the drug}$$

$$H_A : p > .1$$

$$H_0 : p = 1.$$

   (a) In your opinion, which would be worse in this situation: a Type I or a Type II error and why?

   (b) As a result of their test, the scientists obtained a z-statistic of 1.4. Would they have evidence that their drug successfully fights the cancer at a significance level of $\alpha = .01$?

5. In a two-sided z-test the z-statistic obtained is 1.6. Does this test result in the null being rejected? Why or why not?

6. In a one-sided t test on a sample size of 15, the t-statistic obtained is 2.3. For which of the following rejection levels is the null rejected?

$$\alpha = .001,\ \alpha = .01,\ \alpha = .05, \alpha = .1$$

   (Use the table on the back)

7. In a two-sided t on a sample size of 22, the t-statistic obtained is 1.87. Is the null rejected or retained at a significance level of $\alpha = .05$? (Use the table on the back)

8. In a statistical test with significance level $\alpha = .01$, if the null is true what is the chance of a type I error?

9. How can you change a statistical test to reduce the chance of a type I error?

10. How could you change a statistical test to reduce the chance of both type I and type II errors?