1. **(Problem 9-10 in book)** The heat evolved in calories per gram of a cement mixture in approximately normally distributed. The mean is thought to be 100, and the standard deviation is 3. You wish to test $H_0: \mu = 100$ and $H_1: \mu \neq 100$ with sample of $n = 9$ specimens

   a. If the acceptance region is defined as $98.5 \leq \bar{x} \leq 101.5$, find the type I error probability $\alpha$.
   
   b. Find $\beta$ for the case in which the true mean heat evolved is 103.
   
   c. Find $\beta$ for the case where the true mean heat evolved is 105. This value of $\beta$ is smaller than the found in (b). Why?

2. **(Problem 9-40 in book)** The mean water temperature downstream from a power plant cooling tower discharge pipe should be no more than 38°C. Past experience has indicated that the standard deviation of temperature is 1.1°C. The water temperature is measured on nine randomly chosen days, and the average temperature is found to be 37°C.

   a. Is there evidence that the water temperature is acceptable at $\alpha = 0.05$?
   
   b. What is the $P$-value for this test?
   
   c. What is the probability of accepting the null hypothesis at $\alpha = 0.05$ if the water has a true mean temperature at 40°C?


   | 421.0 | 425.6 | 456.1 | 494.6 | 373.8 |
   | 90.5  | 110.7 | 96.4  | 81.7  | 102.4 |
   | 241.0 | 296.0 | 317.0 | 290.9 | 256.5 |
   | 447.8 | 687.6 | 705.7 | 879.0 | 88.8  |
   | 296.0 | 273.0 | 268.0 | 227.5 | 279.3 |
   | 258.5 | 296.0 |      |      |      |

   a. Test the hypothesis that mean body weight is 310 g. Use $\alpha = 0.05$.
   
   b. What is the smallest level of significance at which you would be willing to reject the null hypothesis?
   
   c. Explain how you could answer the question in part (a) with a two-sided confidence interval on mean body weight.

pp.1-17] presents data on dissolved oxygen concentration in streams below 20 dams in Tennessee Authority system. The observations are (in milligrams per liter): 5.0, 3.4, 3.9, 1.3, 0.2, 0.9, 2.7, 3.7, 3.8, 4.1, 1.0, 1.0, 0.8, 0.4, 3.8, 4.5, 5.3, 6.1, 6.9, and 6.5.

a. Test the hypothesis $H_0: \mu = 4$ versus $H_1: \mu \neq 4$. Use $\alpha = 0.01$. Find P-value.

b. Check the normality assumption.

c. Compute the power of the test if the true mean dissolved oxygen concentration is as low as 3.

d. What sample size would be required to detect a true mean dissolved oxygen concentration as low as 2.5 if you wanted the power of the test to be at least 0.9?

e. Explain how the question in part (a) could be answered with a confidence interval.

5. (Problem 9-82 in book) If the standard deviation of hole diameter exceeds 0.01 mm, there is an unacceptably high probability that the rivet will not fit. Suppose that $n = 15$ and $s = 0.008$ mm.

a. Is there strong evidence to indicate that the standard deviation of hole diameter exceeds 0.01 mm? Use $\alpha = 0.01$. State any necessary assumptions about the underlying distribution of the data. Find the P-value for this case.

b. Suppose that the actual standard deviation of hole diameter exceeds the hypothesized value by 50%. What is the probability that this difference will be detected by the test described in part (a)?

c. If $\sigma$ is really as large as 0.0125 mm, what sample size will be required to detect this with power of at least 0.8?