# Tutorial 7

Week of March 4, 2019

## Question 8.1.9, Page 325

Water samples are taken from water used for cooling as it is being discharged from a power plant into a river. It has been determined that as long as the mean temperature of the discharged water is at most 150°F, there will be no negative effects on the river's ecosystem. To investigate whether the plant is in compliance with regulations that prohibit a mean discharge water temperature above 150°, 50 water samples will be taken at randomly selected times and the temperature of each sample recorded. The resulting data will be used to test the hypotheses $H_0 : \mu \leq 150°$ versus $H_A : \mu > 150°$. In the context of this situation, describe type I and type II errors. Which type of error would you consider more serious? Explain.

## Question 8.1.12, Page 326

A mixture of pulverized fuel ash and Portland cement to be used for grouting should have a compressive strength of more than 1300 $KN/m^2$. The mixture will not be used unless experimental evidence indicates conclusively that the strength specification has been met. Suppose compressive strength for specimens of this mixture is normally distributed with $\sigma = 60$. Let $\mu$ denote the true average compressive strength.

(a) What are the appropriate null and alternative hypotheses?

(b) Let $\overline{X}$ denote the sample average compressive strength for $n = 10$ randomly selected specimens. Consider the test procedure with test statistic $\overline{X}$ itself (not standardized). If $\overline{X} = 1340$, should $H_0$ be rejected using a significance level of 0.01? [Hint: What is the probability distribution of the test statistic when $H_0$ is true?]

(c) What is the probability distribution of the test statistic when $\mu = 1350$? For a test with a $\alpha = 0.01$, what is the probability that the mixture will be judged unsatisfactory when in fact $\mu = 1350$ (a type II error)?

## Question 8.2.22, Page 334

To obtain information on the corrosion-resistance properties of a certain type of steel conduit, 45 specimens are buried in soil for a 2-year period. The maximum penetration (in mils) for each specimen is then measured, yielding a sample average penetration of $\overline{x} = 52.7$ and a sample standard deviation of $s = 4.8$. The conduits were manufactured with the specification that true average penetration be at most 50 mils. They will be used unless it can be demonstrated conclusively that the specification has not been met. What would you conclude?