Tutorial 7: Questions

March 7, 2018

		The Truth	
		H_0 is True	H_A is True
Conclusion Based on Sample	Reject H_0	**Type I Error**	**Correct Decision**
	Do Not Reject H_0	**Correct Decision**	**Type II Error**

Review

- Null Hypothesis vs. Alternative Hypothesis

- Type I Error, Type II Error

- p-values

Question 8.1.4, Page 325

Pairs of p-values and significance levels, α, are given. For each pair, state whether the observed p-value would lead to rejection of H_0 at the given significance level.

(a) $p = .084$, $\alpha = .05$

(b) $p = .003$, $\alpha = .001$

(c) $p = .498$, $\alpha = .05$

(d) $p = .084$, $\alpha = .10$

(e) $p = .039$, $\alpha = .01$

(f) $p = .218$, $\alpha = .10$

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 μ 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. If $\overline{x} = 1340$, should H_0 be rejected using a significance level of .01? [Hint: What is the probability distribution of the test statistic when H_0 is true?]

  (i) Use the test statistic method

(ii) Consider the test procedure with test statistic X itself (not standardized), i.e. find the critical region in terms of $\overline{X}$.

(c) What is the probability distribution of the test statistic when $\mu = 1350$? For a test with $\alpha = .01$, what is the probability that the mixture will be judged unsatisfactory when in fact $\mu = 1350$ (a type II error)?

Question 8.2.25, Page 334

Body armor provides critical protection for law enforcement personnel, but it does affect balance and mobility. An article reported that for a sample of 52 male enforcement officers who underwent an acceleration task that simulated exiting a vehicle while wearing armor, the sample mean was 1.95 sec, and the sample standard deviation was 0.20 sec. Does it appear that true average task time is less than 2 sec? Carry out a test of appropriate hypotheses using a significance level of 0.01.

Question 8.3.36, Page 345

Have you ever been frustrated because you could not get a container of some sort to release the last bit of its contents? An article reported on an investigation of this issue for various consumer products. Suppose five 6.0 oz tubes of toothpaste of a particular brand are randomly selected and squeezed until no more toothpaste will come out. Then each tube is cut open and the amount remaining is weighed, resulting in the following data (consistent with what the cited article reported): .53, .65, .46, .50, .37. Does it appear that the true average amount left is less than 10% of the advertised net contents?

(a) Check the validity of any assumptions necessary for testing the appropriate hypotheses.

(b) Carry out a test of the appropriate hypotheses using a significance level of 0.05. Would your conclusion change if a significance level of 0.01 had been used?

(c) Describe in context type I and II errors, and say which error might have been made in reaching a conclusion.