Worksheet – Sections 8.1

A **hypothesis test** consists of a pair of hypotheses, observed data, significance level, and conclusion.

Null hypothesis H_0: population parameter is *equal to* a value

Alternative hypothesis H_a: population parameter is *less than*/ *greater than*/ *not equal to* the value

p-value: probability of the event as extreme as or more extreme than the observed event.

- If p-value $<$ significance level, then you reject H_0.
- If p-value $\geq$ significance level, then you don't reject H_0 (thus, support H_a).

If the hypothesis test is about *population proportion p*, you may use *Central Limit Theorem* to compute the p-value. In that case, z-score $= \frac{\hat{p}-p_0}{SE}$ where p_0 is the population proportion claimed by the null hypothesis and $SE = \sqrt{\frac{p_0(1-p_0)}{n}}$.

1) State the null hypothesis and alternative hypothesis in the following situations.

(a) Historically, students enrolled in a certain course obtain an average of 78% on the final exam. An instructor believes a new teaching method has improved scores.

(b) A dice is supposed to be fair, so the probability of rolling a 3 should be 1/6. A player thinks the die rolls a 3 too often.

(c) A casino uses a coin that is supposed to be fair. An inspector wants to test whether the probability of heads is different from 0.50.

(d) An exam has multiple-choice questions with 4 answer choices, so a student who guesses randomly should answer correctly about 25% of all the questions. A teacher thinks a certain student truly studied for the exam and is getting more correct answers than random guessing.

2) You toss a coin 10 times and get only one Head. You suspect that the coin is biased toward Tail.

(a) State the null hypothesis and alternative hypothesis.

(b) Describe the event as extreme as or more extreme than the observed event.

(c) Find the p-value.

(d) Reject or not reject the null hypothesis at significance level 0.05.

3) A public university claims that 18% of its students work a part-time job during the semester. A professor suspects that the true proportion is higher than 18%. To investigate, she takes a simple random sample of 200 students and finds that 46 of them work part-time.

(a) State the null hypothesis and alternative hypothesis.

(b) Describe the event as extreme as or more extreme than the observed event.

(c) Check if the three conditions for Central Limit Theorem for Sample Proportions are satisfied.

(d) Find the p-value.

(e) At significance level 0.05, should the professor reject or not reject the null hypothesis?