Class Activity – Introduction to Hypothesis Testing

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1. The main concern of a quality control (QC) manager at the chili factory is whether or not the machines are consistently placing a proper amount of chili in the cans. Suppose the factory produces 30 ounce cans of chili. Set up Null and Alternative Hypotheses for the following situations:

   (a) **QC Manager Dave:** "I'm not concerned if the can has more than 30 oz of chili. Nobody's going to complain about that. I don't want to have complaints about cans being underfilled."

   (b) **QC Manager Susan:** "I am concerned about any significant weight deviations on the assembly line. If the weights are getting too high or too low we need to stop the line and recalibrate the machines."

2. Set up Null and Alternative Hypotheses for the purpose of testing the effectiveness of a new weight loss pill. Let μ represent average weight loss.

3. Consider the following hypothesis test

$$H_0: \mu = 0.64$$
$$H_a: \mu \neq 0.64$$

Suppose that the p-value for this test is equal to 0.038. Can we reject H_0 at level of significance $\alpha = 0.01$? Can we reject H_0 at level of significance $\alpha = 0.05$? Explain your reasoning.

4. Consider the following hypothesis test

$$H_0: \mu \geq 80$$
$$H_a: \mu < 80$$

A sample size of 100 is used and the population standard deviation is $\sigma = 12$. Assume that the level of significance is $\alpha = 0.01$. If $\bar{x} = 77$, compute the **_p-value_** for this test and determine whether or not we can reject H_0.

5. Consider the following hypothesis test

$$H_0: \mu \le 12$$
$$H_a: \mu > 12$$

A sample size of 25 is used and the population standard deviation σ is unknown. Assume that the level of significance is $\alpha = 0.01$. Suppose the sample mean is $\bar{x} = 14$ and the sample standard deviation is $s = 4.32$.

(a) Compute the test statistic.

(b) What is an estimate for the p-value? Do you reject H_0 at $\alpha = 0.01$? Do you reject H_0 at $\alpha = 0.05$?

(c) What is the rejection rule using the **_critical value/region_** approach for $\alpha = 0.01$ and $\alpha = 0.05$?

6. Consider the following hypothesis test
$$H_0: \mu = 80$$
$$H_a: \mu \neq 80$$

A sample size of 100 is used and the population standard deviation is $\sigma = 12$. Assume that the level of significance is $\alpha = 0.01$. If $\bar{x} = 77$, compute the **_p-value_** for this test and determine whether or not we can reject H_0.

7. Consider the following hypothesis test
$$H_0: \mu \leq 12$$
$$H_a: \mu > 12$$

A sample size of 25 is used and the population standard deviation σ is unknown. Assume that the level of significance is $\alpha = 0.01$. Suppose the sample mean is $\bar{x} = 14$ and the sample standard deviation is $s = 4.32$.

(a) Compute the test statistic.

(b) What is the rejection rule using the **_critical value_** approach? Do you reject H_0?

(c) What is an estimate for the p-value? Do you reject H_0 at $\alpha = 0.01$? Do you reject H_0 at $\alpha = 0.05$?