# Math 10 MPS - Homework 6 ANSWERS

1. What are the two types of hypotheses used in a hypothesis test? How are they related?

**Ho: Null Hypotheses – A statement about a population parameter that is assumed to be true for the purposes of testing**

**Ha: Alternative Hypothesis - A statement about a population parameter that is assumed to be true is the Null Hypothesis is rejected during testing.**

**These two Hypotheses are complements of each other**.

2. Describe the two types of error possible in a hypothesis test decision.

**Type I error: Rejecting a true Ho**

**Type II error: Failing to reject a false Ho**

***True or False?***

In Exercises 3-8, determine whether the statement is true of false. If it is false, rewrite it as a true statement.

3. In a hypothesis test, you assume the alternative hypothesis is true. **False, you assume the Null Hypothesis is true.**

4. A statistical hypothesis is a statement about a sample. **False, it is a statement about a population parameter.**

5. If you decide to reject the null hypothesis, you can support the alternative hypothesis. **True**

6. The level of significance is the maximum probability you allow for rejecting a null hypothesis when it is actually true. **True**

7. A large P-value in a test will favor a rejection of the null hypothesis. **False, a small p-value supports rejecting the null hypothesis.**

8. If you want to support a claim, write it as your null hypothesis. **False, to support a claim write it as the alternative hypothesis.**

***Stating Hypotheses***

In Exercises 9-14, use the given statement to represent a claim. Write its complement and state which is Ho and which is *Ha.*

9. Ha: $p > .65$ **Ho: $p \leq 65$**

10. Ho: $\mu \leq 128$ **Ha: $\mu > 128$**

11. Ha: $\sigma^2 \neq 5$ **Ho: $\sigma^2 = 5$**

12. Ho: $\mu = 1.2$ **Ha: $\mu \neq 1.2$**

13. Ho: $p \geq 0.45$ **Ha: $p < 0.45$**

14. Ha: $\sigma < 0.21$ **Ho: $\sigma \geq 0.21$**

15. A study claims more than 60% of students text-message frequently. In a poll of 1000 students, 660 students said they text message frequently. Can you support the study's claim? Conduct the test with $\alpha$ = 1%

**Ho: p ≤ 0.60 Ha: p > 0.60**

**$\alpha$ = 1%** **Model:** $Z = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{(p_0)(1-p_0)}{n}}}$

**Reject Ho if p-value <.01**

$$\hat{p} = \frac{660}{1000} = 0.66$$

$$Z = \frac{0.66 - 0.60}{\sqrt{\dfrac{(0.60)(1-0.60)}{100}}} = 3.87$$

$$P(Z > 3.87) \approx .0000$$

**Reject Ho**

**The study is correct. More than 60% of students text-message frequently.**

16. 15 I-pod users were asked how many songs were on their I-pod. Here are the summary statistics of that study:

$$\bar{X} = 650 \qquad s = 200$$

a. Can you support the claim that the number of songs on a user's I-pod is different from 500? Conduct the test with $\alpha$= 5% .

**Ho: $\mu$ = 500 Ha: $\mu \neq 500$**

**Test of mean vs. Hypothesized Value, population standard deviation unknown.**

$$t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}} \quad df = 14$$

**Due to the small sample size, we must assume the data is approximately normal (or at least not heavily skewed) for the central limit theorem to apply.**

**Reject Ho if t >2.145 or t<-2.145 (Two tailed test)**

**t = (650-500)/(200/sqrt(15)) = 2.90 → Reject Ho**

**The mean number of songs on a user's Ipod is not 500. It is more.**