

HW 8 - Math 10 Answers

For the following questions, State H_0 and H_a **and** choose the correct model from this list:

- a) One population, Z test for mean
- b) One population, t test for mean
- c) One population, Z test of proportion
- d) One population, Chi-square test of variance
- e) Z-test: comparing two independent population means
- f) t-test: independent samples, two population pooled variance.
- g) t-test: independent samples, two population unequal variance.
- h) t-test: dependent sampling, matched pairs

1. You want to support the claim that male bass singers are taller than male tenor singers. 20 singers of each type will be sampled. Assume that population variances are not equal for these two groups.

$$H_0: \mu_1 \leq \mu_2 \quad H_a: \mu_1 > \mu_2 \quad \text{Model: g}$$

2. You want to reject the claim that no more than 10% of students will suffer financial hardship if tuition increased. 400 students will be sampled.

$$H_0: p \leq .10 \quad H_a: p > .10 \quad \text{Model: c}$$

3. An investor wants to reject the claim that the standard deviation for mutual fund portfolios is no more than 10. A total of 31 mutual fund portfolios will be sampled.

$$H_0: \sigma \leq 10 \quad H_a: \sigma > 10 \quad \text{Model: d}$$

4. A study claims people now spend, on average, more time on the Internet than they do watching television. 200 people will be asked how much time they spent on the TV and on the Internet. You want to support this claim.

$$H_0: \mu_d \leq 0 \quad H_a: \mu_d > 0$$

$$\mathbf{d = \text{time on internet} - \text{time on TV} \quad \text{Model: h}}$$

5. Is there a difference in quality between vegetables bought at farmers markets and vegetables bought at a high end grocer? Test this claim by sampling random vegetables from 20 farmers markets and 20 high end grocers. Assume that population variances are equal for these two groups.

$$H_0: \mu_1 = \mu_2 \quad H_a: \mu_1 \neq \mu_2 \quad \text{Model: f}$$

6. A study claims the average age for a community college student is over 27. You want to support this claim and sample 20 students.

$$H_0: \mu \leq 27 \quad H_a: \mu > 27 \quad \text{Model: b}$$

7. A community college district compared the number of hours students worked at an outside job at its two colleges. Design and run a test to determine if there is a significant difference in hours worked by students at the 2 colleges. Use a 1% level of significance for this test. Assume population variances are equal.

<p>(a) (DESIGN) State your Hypothesis</p> <p>$H_0: \mu_1 = \mu_2 \quad H_a: \mu_1 \neq \mu_2$</p>	<p>(e) (DATA) Conduct the test and circle your decision</p> <table border="1" data-bbox="699 289 1463 464"> <thead> <tr> <th></th> <th>College A</th> <th>College B</th> </tr> </thead> <tbody> <tr> <td>sample mean</td> <td>25.57</td> <td>13.86</td> </tr> <tr> <td>sample std dev</td> <td>11.90</td> <td>11.19</td> </tr> <tr> <td>sample size</td> <td>14</td> <td>14</td> </tr> </tbody> </table>		College A	College B	sample mean	25.57	13.86	sample std dev	11.90	11.19	sample size	14	14				
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<p>(b) (DESIGN) State Significance Level of the test and explain Type I error.</p> <p>$\alpha = .01$, the maximum probability of Type I error: we would incorrectly claim that there is a difference in mean hours worked by students at the two colleges.</p>	<table border="1" data-bbox="699 512 1463 674"> <thead> <tr> <th>Reported p-values</th> <th>two tail</th> <th>lower tail</th> <th>upper tail</th> </tr> </thead> <tbody> <tr> <td>pooled variance t-test</td> <td>0.012</td> <td>0.006</td> <td>0.994</td> </tr> <tr> <td>unequal variance t-test</td> <td>0.013</td> <td>0.007</td> <td>0.993</td> </tr> <tr> <td>matched pairs t-test</td> <td>0.000</td> <td>0.001</td> <td>0.999</td> </tr> </tbody> </table>	Reported p-values	two tail	lower tail	upper tail	pooled variance t-test	0.012	0.006	0.994	unequal variance t-test	0.013	0.007	0.993	matched pairs t-test	0.000	0.001	0.999
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<p>(c) (DESIGN) Determine the statistical model (test statistic) Explain your reasoning.</p> <p>Model: Pooled variance t-test. This model is appropriate because there is independent sampling and we are assuming population variance are equal</p>	<p>Correct p-value 0.012</p> <p>Fail to Reject Ho</p>																
<p>(d) DESIGN) Determine decision rule (p-value method)</p> <p>Reject Ho if p-value < alpha.</p>	<p>(f) (CONCLUSION) State your overall conclusion in language that is clear, relates to the original problem and is consistent with your decision.</p> <p>There is insufficient evidence to conclude that there is a difference in mean hours worked by students at the two colleges.</p>																

8. Does the home team have an advantage in NBA basketball games? In a study of 75 games, the visiting team points were compared to the home team points. Design and conduct a hypothesis test with a significance level of 5%

<p>(a) (DESIGN) State your Hypothesis</p> <p>$H_0: \mu_d \geq 0 \quad H_a: \mu_d < 0$</p> <p>d= visitor score-home score</p>	<p>(e) (DATA) Conduct the test and circle your decision</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 15%;">Visiting</th> <th style="width: 15%;">Home</th> <th style="width: 15%;"></th> <th style="width: 15%;"></th> </tr> </thead> <tbody> <tr> <td>sample mean</td> <td>95.47</td> <td>101.31</td> <td></td> <td></td> </tr> <tr> <td>sample std dev</td> <td>12.91</td> <td>12.72</td> <td></td> <td></td> </tr> <tr> <td>sample size</td> <td>75</td> <td>75</td> <td></td> <td></td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Reported p-values</th> <th style="width: 12.5%;">two tail</th> <th style="width: 12.5%;">lower tail</th> <th style="width: 12.5%;">upper tail</th> </tr> </thead> <tbody> <tr> <td>F-test for variances</td> <td>0.899</td> <td></td> <td></td> </tr> <tr> <td>pooled variance t-test</td> <td>0.006</td> <td>0.003</td> <td>0.997</td> </tr> <tr> <td>unequal variance t-test</td> <td>0.006</td> <td>0.003</td> <td>0.997</td> </tr> <tr> <td>matched pairs t-test</td> <td>0.000</td> <td>0.000</td> <td>1.000</td> </tr> </tbody> </table>		Visiting	Home			sample mean	95.47	101.31			sample std dev	12.91	12.72			sample size	75	75			Reported p-values	two tail	lower tail	upper tail	F-test for variances	0.899			pooled variance t-test	0.006	0.003	0.997	unequal variance t-test	0.006	0.003	0.997	matched pairs t-test	0.000	0.000	1.000
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9. Do directed reading activities in the classroom help elementary school students improve aspects of their reading ability? A treatment class of 21 third-grade students participated in these activities for eight weeks, and a control class of 23 third-graders followed the same curriculum without the activities. After the eight-week period, students in both classes took a Degree of Reading Power (DRP) test which measures the aspects of reading ability that the treatment is designed to improve. At the 5% level of significance, can you conclude that directed reading activities improved DRP scores?

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<p>(c) (DESIGN) Determine the statistical model (test statistic) Explain your reasoning.</p> <p>Model: Unequal variance t-test. This model is appropriate because there is independent sampling and there is a significant difference between the population variances (F-test pvalue=0.049)</p>	<p>Correct p-value 0.017</p> <p>Reject Ho</p>																				
<p>(d) (DESIGN) Determine decision rule (pvalue method)</p> <p>Reject Ho if p-value < alpha.</p>	<p>(f) (CONCLUSION) State your overall conclusion in language that is clear, relates to the original problem and is consistent with your decision.</p> <p>Directed reading activities in the classroom improved DRP scores, helping elementary school students improve aspects of their reading ability.</p>																				