Name________________________________

Exam 4 Practice Test - PART II

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

For each problem, find:
1. Null, Alternate Hypothesis, type of test & level of significance
2. Check the conditions.
3. Compute the sample test statistic, draw a picture and find the P–value.
4. State the conclusion about the Null Hypothesis.
5. Interpret the conclusion.

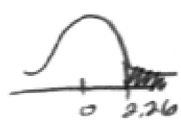
1) An article in a journal reports that 34% of American fathers take no responsibility for child care. A researcher claims that the figure is higher for fathers in the town of Littleton. A random sample of 234 fathers from Littleton yielded 96 who did not help with child care. Test the researcher's claim at the 0.05 significance level. 1) ____________

① $H_0: p = 0.34$ $\quad n = 234 \quad \hat{p} = \frac{96}{234} = 0.41$

$H_a: p > 0.34$ (right tailed) $\quad \alpha = 0.05 \quad q = 0.66$

② $np = (234)(0.34) = 79.56 \geq 10$ ✓ $\quad nq = (234)(0.66) = 154.44 \geq 10$ ✓

③ $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{(0.41 - 0.34)}{\sqrt{\frac{0.34 \times 0.66}{234}}} = 2.26$



pvalue $= 1 - 0.9881$
$= 0.0119 < 0.05$

④ since pvalue $< \alpha$, reject H_0.

⑤ At a 5% level of significance, there is enough evidence to say that the percent of american fathers who take no responsibility for childcare in Littleton is higher than 34%.

2) In a sample of 88 adults selected randomly from one town, it is found that 6 of them have been exposed to a particular strain of the flu. At the 0.01 significance level, do the data provide sufficient evidence to conclude that the percentage of all adults in the town that have been exposed to this strain of the flu differs from the nationwide percentage of 8%? 2) ____________

$n = 88 \quad \hat{p} = \frac{6}{88} = 0.07$

① $H_0: p = 0.08$ $\quad \alpha = 0.01 \quad q = 0.92$

$H_a: p \neq 0.08$ (two tailed)

② $np = (88)(0.08) = 7.04 \cancel{\geq} 10 \quad nq = (88)(0.92) = 80.96 \geq 10$

does not meet conditions

$n = 165 \quad \hat{p} = \frac{30}{165} = 0.18$

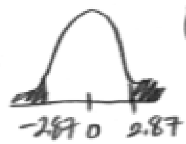
3) In a sample of 165 children selected randomly from one town, it is found that 30 of them suffer from asthma. At the 0.05 significance level, do the data provide sufficient evidence to conclude that the percentage of all children in the town who suffer from asthma is different from 11%? 3) ________

① $H_0: p = 0.11$ $\quad \alpha = 0.05 \quad q = 0.89$

$H_a: p \neq 0.11$ (two tailed)

② $np = (165)(0.11) = 18.15 \geq 10$ ✓ $\quad nq = (165)(0.89) = 146.85 \geq 10$ ✓

③ $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.18 - 0.11}{\sqrt{\frac{0.11 \times 0.89}{165}}} = 2.87$



pvalue $= 2(0.0021)$

$= 0.0042 < 0.05$

④ since pvalue $< \alpha$, reject Ho

⑤ At a 5% level of significance, there is enough evidence to conclude that the percent of children in the town who suffer from asthma is different from 11%.

4) Last year, the mean running time for a certain type of flashlight battery was 8.5 hours. This year, the manufacturer has introduced a change in the production method which he hopes will increase the mean running time. A random sample of 40 of the new light bulbs was obtained and the mean running time was found to be 8.7 hours. Do the data provide sufficient evidence to conclude that the mean running time, μ, of the new light bulbs is larger than last year's mean of 8.5 hours? Perform the appropriate hypothesis test using a significance level of 5%. Assume that σ = 0.5 hours. 4) ________

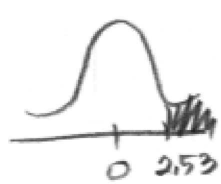
$n = 40 \quad \bar{x} = 8.7 \quad \sigma = 0.5$

① $H_0: \mu = 8.5$

$H_a: \mu > 8.5$ (right tailed) $\quad \alpha = 0.05$

② $n \geq 30$ ✓ $\quad \sigma$ is known → standard normal

③ $z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{8.7 - 8.5}{0.5 / \sqrt{40}} = 2.53$



pvalue $= 1 - 0.9943$

$= 0.0057 < 0.05$

④ since pvalue $< \alpha$, reject Ho.

⑤ At a 5% level of significance, there is enough evidence to conclude that the mean running time μ of the new light bulbs is larger than last year's mean of 8.5 hrs.

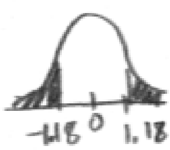
5) In 2000, the average duration of long-distance telephone calls originating in one town was 9.4 minutes. A long-distance telephone company wants to perform a hypothesis test to determine whether the average duration of long-distance phone calls has changed from the 2000 mean of 9.4 minutes. They randomly sampled 50 calls originating in the town and found that the mean duration of these 50 calls was 8.6 minutes. Do the data provide sufficient evidence to conclude that the mean call duration, μ, has changed from the 2000 mean of 9.4 minutes? Perform the appropriate hypothesis test using a significance level of 1%. Assume that $\sigma = 4.8$ minutes. $n=50$ $\bar{x}=8.6$ $\sigma=4.8$

5) ______________

(1) $H_0: \mu = 9.4$
$H_a: \mu \neq 9.4$ (two tailed) $\alpha = 0.01$

(2) $n \geq 30$ ✓ σ is known → st. normal dist.

(3) $z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{8.6-9.4}{4.8/\sqrt{50}} = -1.18$



Pvalue $= 2(0.1190)$
$= 0.238 > 0.01$

(4) since pvalue $\geq \alpha$, fail to reject H_0

(5) At a 1% level of significance, there is not enough evidence to say that the mean call duration is different from 9.4 min.

6) A manufacturer claims that the mean amount of juice in its 16-ounce bottles is 16.1 ounces. A consumer advocacy group wants to perform a hypothesis test to determine whether the mean amount is actually less than this. The mean volume of juice for a random sample of 70 bottles was 15.94 ounces. Do the data provide sufficient evidence to conclude that the mean amount of juice for the 16-ounce bottles, μ, is less than 16.1 ounces? Perform the appropriate hypothesis test using a significance level of 10%. Assume that $\sigma = 0.9$ ounces.

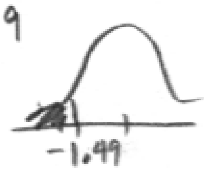
6) ______________

$n=70$ $\bar{x}=15.94$ $\sigma=0.9$

(1) $H_0: \mu = 16.1$
$H_a: \mu < 16.1$ (left tailed) $\alpha = 0.10$

(2) $n \geq 30$ ✓ σ is known → st. normal

(3) $z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{15.94-16.1}{0.9/\sqrt{70}} = -1.49$



pvalue $= 0.0681 < 0.10$

(4) since pvalue $< \alpha$, reject H_0.

(5) At a 10% level of significance, there is enough evidence to say that the mean amount of juice for 16 oz bottles is less than 16.1 oz.

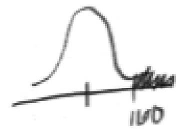
7) A large software company gives job applicants a test of programming ability and the mean for that test has been 160 in the past. Twenty-five job applicants are randomly selected from one large university and they produce a mean score and standard deviation of 183 and 12, respectively. Use a 0.05 level of significance to test the claim that this sample comes from a population with a mean score greater than 160. Use the P-value method of testing hypotheses. Assume normal distribution. $n = 25$ $\bar{x} = 183$ $s = 12$ 7) ____________

① $H_0: \mu = 160$
$H_a: \mu > 160$ (right tailed) $\alpha = 0.05$

② normal distribution . σ unknown → t dist.

③ $t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{183 - 160}{12/\sqrt{25}} = 9.58$

d.f. = 24



$9.58 > 2.80$

pvalue < 0.005 $<$ 0.05

④ since pvalue $< \alpha$, reject H_0.

⑤ at a 5% level of significance, there is enough evidence to say that the mean score for the test is greater than 160.

8) A cereal company claims that the mean weight of the cereal in its packets is 14 oz. The weights (in ounces) of the cereal in a random sample of 8 of its cereal packets are listed below. Assume normal distribution 8) ____________

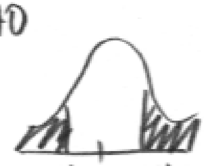
14.6 13.8 14.1 13.7 14.0 14.4 13.6 14.2

Test the claim at the 0.01 significance level. $n = 8$ $\bar{x} = 14.05$ $s = 0.35$

① $H_0: \mu = 14$
$H_a: \mu \neq 14$ (two tailed) $\alpha = 0.01$

② normal dist. σ unknown → t dist.

③ $t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{14.05 - 14}{0.35/\sqrt{8}} = 0.40$



d.f. = 7

$0.4 < 1.41$

pvalue > 0.2 > 0.01

④ since pvalue $\geq \alpha$, fail to reject H_0.

⑤ at a 1% level of significance, there is not enough evidence to conclude that the mean weight of cereal is different from 14 oz.

9) A light-bulb manufacturer advertises that the average life for its light bulbs is 900 hours. A random sample of 15 of its light bulbs resulted in the following lives in hours. 9) ____________

995	590	510	539	739	917	571	555
916	728	664	693	708	887	849	

At the 10% significance level, test the claim that the sample is from a population with a mean life of 900 hours. Use the P-value method of testing hypotheses. Assume normal distribution.

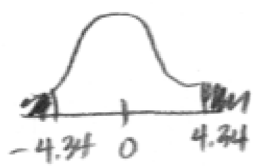
$n = 15 \quad \bar{x} = 724.07 \quad s = 156.92$

① $H_0: \mu = 900$

$H_a: \mu \neq 900$ (two tailed) $\quad \alpha = 0.10$

② normal distribution. σ unknown $\rightarrow$ t dist.

③ $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{724.07 - 900}{156.92/\sqrt{15}} = -4.34$



d.f. = 14 $\quad 4.34 > 2.98$

pvalue $< 0.01 < \alpha$

④ since pvalue $< \alpha$, reject H_0.

⑤ At a 10% level of significance, there is enough evidence to conclude that the mean life of its light bulbs is not 900 hrs.