

Hypothesis Testing Worksheet

Name: Key Use  $\mu = 100$  Block \_\_\_\_\_

1) Each of the following situations requires a significance test about a population mean. State the appropriate null hypothesis  $H_0$  and alternative hypothesis  $H_a$  in each case:

a. Census Bureau data shows that the mean household income in the area served by a shopping mall is \$72,500 per year. A market research firm questions shoppers ~~at the mall~~ to find out whether the mean household income of mall shoppers is higher than that of the general population.  
 $H_0: \mu = \$72,500$   $H_a: \mu > \$72,500$

b. Last year, your company's service technicians took an average of 1.8 hours to respond to trouble calls from business customers who had purchased service contracts. Do this year's data show a different average response time?

$H_0: \mu = 1.8$  hours  
 $H_a: \mu \neq 1.8$  hours

The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures the motivation, attitude toward school, and study habits of students. Scores range from 0 to 200, with 200 being the highest level of motivation. The mean score for U.S. college students is about 115, and the standard deviation is about 30. A teacher who suspects that older students have better attitudes toward school gives the SSHA to 20 students who are at least 30 years of age.

2. State the null and alternative hypotheses.

30  $H_0: \mu = 115$   $H_a: \mu > 115$   
 35.2  $H_0: \mu = 115$   $H_a: \mu > 115$

3. Calculate the z-statistic ( $Z_0$ ).  
 (The teacher now collects the data from the 20 students, and their mean is 135.2)

$Z = 3.01$

4. Report the P-value of your test, and state your conclusion clearly.

$P = 0.001 \rightarrow$  reject  $H_0$

Since  $P < .05$ , we have enough evidence to reject  $H_0$  and conclude that the average score is more than 115.

Name \_\_\_\_\_

Your company sells exercise clothing and equipment on the Internet. To design the clothing, you collect data on the physical characteristics of your different types of customers. We take a sample of 24 male runners and find their mean weight to be 61.79 kilograms. Assume that the population standard deviation is  $\sigma = 4.5$ .

5. Does a test of

$n = 24$   
 $\bar{x} = 61.79$   
 $\sigma = 4.5$   
 $\mu = 61.3$   
 $\alpha = .05$

$H_0: \mu = 61.3$  kg  
 $H_a: \mu \neq 61.3$  kg  
 reject  $H_0$  at the 5% significance level?  
 $P = 0.57$

Fail to reject  $H_0$

6. Summarize your results from #5.

Since  $P > .05$  we do not have enough evidence to reject  $H_0$  and cannot conclude that the mean weight is different from 61.3 kg.

7. Last year the government made a claim that the average income of the American people was \$33,950. However, a sample of 50 people taken recently showed an average income of \$34,076 with a population standard deviation of \$324. Is the government's estimate too low? Conduct a significance test to see if the true mean is more than the reported average. Use an  $\alpha = 0.01$ .

$\mu = \$33,950$   $H_0: \mu \leq \$33,950$   $H_a: \mu > \$33,950$   
 $n = 50$

$\bar{x} = \$34,076$   $P = 0.003 \rightarrow$  reject  $H_0$

$\alpha = .01$  Since  $P < .01$ , we do have enough evidence to reject  $H_0$

and can conclude that the average income is more than \$33,950.

8. An environmentalist collects a liter of water from 45 different locations along the banks of a stream. He measures the amount of dissolved oxygen in each specimen. The mean oxygen level is 4.62 mg, with the overall standard deviation of 0.92. A water purifying company claims that the mean level of oxygen in the water is 5 mg. Conduct a hypothesis test with  $\alpha=0.001$  to determine whether the mean oxygen level is less than 5 mg.

$$n = 45$$

$$\mu = 5 \text{ mg}$$

$$\bar{x} = 4.62$$

$$s = 0.92$$

$$\alpha = 0.001$$

$$H_0: \mu = 5 \text{ mg} \quad H_a: \mu < 5 \text{ mg}$$

$$p = 0.004 - \text{Fail to reject.}$$

Since  $p > \alpha$ , we do not have enough evidence to reject  $H_0$  and cannot conclude that the mean oxygen level is less than 5 mg.

T-test!  
No  $\alpha$

9. A bus company advertised a mean time of 150 minutes for a trip between two cities. A consumer group had reason to believe that the mean time was more than 150 minutes. A sample of 40 trips showed a mean  $\bar{x} = 153$  minutes and a standard deviation  $s = 7.5$  minutes. At the .05 level of significance, test the consumer group's belief.

$$\mu = 150 \text{ min}$$

$$n = 40$$

$$\bar{x} = 153 \text{ min}$$

$$s = 7.5$$

$$\alpha = 0.05$$

$$H_0: \mu = 150 \text{ min}$$

$$H_a: \mu > 150 \text{ min}$$

$$p = 0.008 - \text{Reject } H_0$$

Since  $p < \alpha$ , we have enough evidence to reject  $H_0$  and can conclude that the mean trip time is greater than 150 min.