Name ______________________________ Date ______________ Period ________

Hypothesis Test Practice:
Population Mean *and* Population Proportion

1. Is the national crime rate really going down? Some sociologists say yes! They say that the reason for the decline in crime rates for the 1980s and 1990s is demographics. It seems that the population is aging, and older people commit fewer crimes. According to the FBI and the Justice Department, 70% of all arrests are of males aged 15 to 34 years. Suppose that you are a sociologist in Rock Springs, Wyoming, and a random sample of police files showed that of 32 arrests last month, 24 were of males 15 to 34 years. Use a 1% significance level to test the claim that the population proportion of such arrests in Rock Springs is different from 70%. Ho: P=.7

   Ho: P≠.7   z=.617   P value .537

   .537 > .01 fail to reject

2. Maureen is a cocktail hostess in a very exclusive private club. The Internal Revenue Service is auditing her tax return this year. Maureen $\boxed{\text{claims}}$ that her average tip last year was $4.75. To support this claim, she sent the IRS a random sample of 52 credit card receipts showing her bar tips. When the IRS got the receipts, they computed the sample average and found it to be $5.25 with a sample standard deviation of $1.15. Do these receipts indicate that the average tip Maureen received last year was more than $4.75? Use a 1% significance level.

   Ho: μ = 4.75   Ha: μ > 4.75   (t test)   t=3.135   Pvalue .0014 < .01   Reject

3. *Consumer Reports* indicated that the mean acceleration time (0 to 60 mph) for the Dodge Intrepid was 10.2 seconds. In most tests of this type, regular unleaded gasoline is used. Suppose that 41 such tests were made using premium unleaded gasoline (octane over 91), and the sample mean acceleration time was 9.7 seconds with standard deviation 2.1 seconds. Does this indicate that premium gasoline tends to reduce average acceleration time? Use α = 0.05.   n=41 $\bar{x}$=9.7   sx=2.1

   Ho: μ=10.2   Ha: μ<10.2   (t test)   t=-1.52   P=.0676 > .05 fail to reject

   no significant

4. The U.S. Department of Transportation, National Highway Traffic Safety Administration, reported that 77% of all fatally injured automobile drivers were intoxicated. A simple random sample of 27 records of automobile driver fatalities in Kit Carson County, Colorado, showed that 15 involved an intoxicated driver. Do these data indicate that the population proportion of driver fatalities related to alcohol is less than 77% in Kit Carson County? Use a 1% significance level.

   $\hat{p}$=.55

   Ho: p=.77   Ha: p<.77   z=-2.64   Pvalue = .00405 < .01   reject

   there is evidence to suggest

5. Let *x* be a random variable that represents the pH of arterial plasma (i.e., the acidity of the blood). For healthy adults, the mean of the *x* distribution is 7.4 pH.. A new drug for arthritis has been developed. However, it is thought this drug might change blood pH. A random sample of 33 patients with arthritis took the drug for 3 months. Blood tests showed a mean of 8.1 pH and a standard deviation of 1.9. Use α = 0.05 to test the claim that the drug has changed the mean pH of the blood.   t = 2.116   .042 < .05   reject

   there is evidence changes ph

   Ho: μ=7.4   Ha: μ≠7.4   p=.042

6. Hypertension is defined as a blood pressure over 140 mm Hg systolic and/or over 90 mm Hg diastolic. Hypertension, if not corrected, can cause long-term health problems. In the college-age population (18-24 years), about 9.2% have hypertension. Suppose that a blood donor program is occurring in a college dormitory during final exam week. Before each student gives blood, the nurse takes a blood pressure reading. Of 196 donors, it was found that 29 have hypertension. Do these data indicate that the population proportion of students with hypertension during final exams week is higher than 9.2%? Use a 5% level of significance.

   $\hat{p}$ = .148

   Ho: p=.092

   Ha: p>.092   z=2.711

   p value = .0034 < .05   reject   there is evidence higher

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othesis Testing Review:

A recent news story stated that the mean credit card balance among families that have a balance is greater than \$2,600. You do some research and find that a random sample of 6 cardholders has a mean credit card balance of \$2528 with a standard deviation of \$325.

$H_0: \mu = 2600$ $H_a: \mu < 2600$

a) Based on a significance test using $\alpha = .10$, what conclusions can you draw. Assume the population is normally distributed. (Be sure to show all steps)

★They claim 2600 (or more)

You claim less than 2600 so we test the opposite.

$t = -.543$

p value $= .305 > .10$ fail to reject

not significant ev. to suggest less than 2600 credit card balance

b) Construct a 90% confidence interval for the mean credit card balance and comment on the news reports claim. (Be sure to show all steps)

$df = 5$

$t^* = 2.015$

$\sigma_{\bar{x}} = \frac{325}{\sqrt{6}}$

$2528 \pm 2.015\left(\frac{325}{\sqrt{6}}\right)$

$(2260, 2795.4)$

c) Describe a Type 1 error for this scenario (in context)

Claim the mean value is less than 2600 when actually is 2600 or more

d) If the Probability of a type I error is .05 and the probability of a type II error is .3, what is the power of the test?

$P(\text{type I}) = a = .05$

$P(\text{type II}) = .3 = \beta$

Power $= 1 - \beta$
$= 1 - .3 = .7$

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A researcher claims that 24% of adults in the United States are afraid to fly. You want to test this claim. You find that in a random sample of 1075 adults in the United States, 292 are afraid to fly.

a) At a significance level of .05, can you reject the researcher's claim? (Show all steps)

$H_0: p = .24$ $\hat{p} = .27$

$H_a: p \neq .24$ $z = 2.428$

p value = .0152 < .05

reject suggests there is a difference in the claim.

there is significant evidence to

b) Describe a Type II error for question 2 (in context)

Claiming 24% afraid to fly when actually more or less than 24% are afraid to fly

the result differs from

c) What is the probability of a type 1 error?

.05 = sig. level

d) Construct a 95% confidence interval for the proportion of adults afraid to fly and comment on the researcher's claim

$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$.27 \pm 1.96 \sqrt{\frac{(.24)(.76)}{1075}}$

calc (.2450, .298)

hand (.244, .296)

reject claimed value doesn't fall in interval

9. A recent national survey indicated that 19% of employees in the manufacturing industry are concerned about losing their jobs. A politician would like to use this information in a speech focusing on employee issues. However, he doubts the 19% figure and has his own survey done. A random sample of 1,000 employees in manufacturing jobs is surveyed, and 230 indicated they are concerned with losing their jobs. At a 5% significance level, does this result support the politicians doubt?

$H_0: p = .19$ $H_a: p > .19$ $\hat{p} = .23$

Using your calculator identify the following values and draw a conclusion:

Z = 3.22 P-value = ~~.0006~~ Decision: reject there is sig. evidence more than 19% of m employess concerned!

.0006 < .05

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Hypothesis Test Review

1. Identify the four steps in conducting a hypothesis test by using P-values: (9.1)
2. What must every null hypothesis have? (9.1)
3. Identify the formula for a test statistic for each of the following:

1-proportion z-test	1 sample mean z-test	1 sample t-test
(9.2)	(9.3)	(9.3)

4. What are the conditions for a mean test? (9.3)
5. What are the conditions for a proportion test? (9.2)
6. What is the definition of a p-value? (9.1)
7. What is a rejection region and how is it calculated? (page 12) based off alpha
8. What is a type I error? Type II? (9.1/9.2)
9. How is a type I error measured? Type II? 9.2)
10. What is the power of a test and how is it calculated? (page 12)