

TEST 4 ANSWERS MATH 111 DUPRE SPRING 2009

SECTION #:

LAST NAME:

(PRINT ABOVE IN **LARGE CAPITALS**)

22 APRIL 2008

FIRST NAME:

(PRINT ABOVE IN **LARGE CAPITALS**)

CIRCLE LAB DAY:

TUESDAY

THURSDAY

CIRCLE MWF LECTURE HOUR:

10AM

2PM

The Trolley Company claims that on average at least $\mu = 6$ trolleys arrive per hour at my trolley stop. I stand there for 4 hours and see only 18 trolleys arrive at my trolley stop. I then want to know the P-Value of this as evidence that the rate at which trolleys arrive is less than 6 per hour so I can decide whether to confront the Trolley company.

1. The ALTERNATE hypothesis, H_A , for the hypothesis test I use is (circle choice):

$$H_A : \mu \leq 24 \quad H_A : \mu \geq 24 \quad H_A : \mu < 24 \quad H_A : \mu > 24$$

CORRECT CHOICE: $H_A : \mu < 24$

2. Under the NULL hypothesis, the value of μ_0 we must use for calculating the P-value of our data here should be (circle choice):

$$\mu_0 = 24 \quad \mu_0 = 18 \quad \mu_0 = 6 \quad \mu_0 = 4$$

CORRECT CHOICE: $\mu_0 = 24$

3. What is the P-value of my data for establishing the alternate hypothesis H_A ?

ANSWER: P-value = $poissoncdf(24, 18) = .128$

4. I am testing a drug to see if it causes shivers in healthy lab rats less than 30 percent of the time it is administered. In 10 trials each involving a different rat, there were 2 cases of rats having the shivers as a result of taking the drug. What is the P-value of this as evidence that the true probability the drug causes shivers, is less than 30 percent?

ANSWER: P-value = $binomialcdf(10, .3, 2) = .383$

5. Joe is working a hypothesis test at level of significance $.01 = 1/100$. His data has significance equal to $3/10 = .3$. Joe should (circle choice):

regard his null hypothesis as proven by his data.

regard his alternate hypothesis as proven by his data.

know he made a Type I error.

regard his data as inconclusive.

CORRECT CHOICE: regard his data as inconclusive.

A wildlife biologist is studying a population of bears in a national forest. A sample of 15 adult bears had mean weight 412 pounds with standard deviation 17 pounds. He is hoping this data proves that the population mean weight of adult bears in this population is over 400 pounds.

6. He must assume the weight of adult bears in the population is (circle choice):

uniformly distributed.

normally distributed.

Poisson distributed.

binomially distributed.

CORRECT CHOICE: normally distributed

7. Based on the wildlife biologist's data, what is the MARGIN OF ERROR of the 95 percent confidence interval for the true population mean weight of adult bears in this population?

ANSWER: Since you do not know the population standard deviation and must use the sample standard deviation in its place, use the **t-interval** from the STAT TEST MENU in the TI-83 or TI-84 calculator to find the MARGIN OF ERROR, ME , and enter $\bar{x} = 0$. You then find

$$ME = 9.41.$$

8. What is the P-value of this data as evidence that the true population mean weight of adult bears in this population exceeds 400 pounds?

ANSWER: Since you do not know the population standard deviation and must use the sample standard deviation in its place, use the **t-test** from the STAT TEST MENU in the TI-83 or TI-84 calculator to find the P-value, reported as p in the calculator's readout. Be sure to choose the proper alternate hypothesis $> \mu_0$.

P-value = .00807.

9. What is the 95 percent confidence interval for the true population mean weight of these adult bears?

ANSWER: Since you do not know the population standard deviation and must use the sample standard deviation in its place, use the **t-interval** from the STAT TEST MENU in the TI-83 or TI-84 calculator to find the confidence interval and enter $\bar{x} = 412$. You then find the confidence interval is

$$(403, 421)$$

which means here we are 95 percent confident that

$$403 \leq \mu \leq 421.$$

10. What would be the P-value of the wildlife biologist's data, if the wildlife biologist were to find out that the true population standard deviation in weight of adult bears in this population is actually 35?

ANSWER: Given this new information, the wildlife biologist must now use the **z-test** with $\sigma = 35$. This gives

$$\text{P-value} = .0921.$$

11. If we are working a hypothesis test at level of significance .05 and the P-value of our data is only .01, then we should (circle choice)

reject the null hypothesis since $.01 < .05$

conclude we made a type II error at .05

regard the alternate hypothesis as inconclusive

regard our data as supportive of the null hypothesis

CORRECT CHOICE: reject the null hypothesis since $.01 < .05$

Donald Duck is running against Goofy for mayor of Duckburg. He is concerned that Goofy might win the election because he asked 5 registered voters and only 1 said they would vote for him if the election were held tomorrow.

12. What is the P-value of this data as evidence that Donald would lose the election if it were held tomorrow?

ANSWER: The sample size 5 is way to small to justify using the 1-prop Z Test from the test menu, we must use the binomial distribution directly, in the calculator, *binomialcdf*, to compute the P-value here.

$$\text{P-value} = \text{binomialcdf}(5, .5, 1) = .1875.$$

During the election, the Duckburg TV station WDBTV conducts exit polls. They will announce a winner as soon as the exit poll data can establish either candidate as winner at level of significance .001, or equivalently, establish that the other candidate is the loser at level of significance .001.

13. What is the P-value of the early result that only 8 votes went for Goofy out of 20 votes cast?

ANSWER: The sample size 20 is actually way to small to justify using the 1-prop Z Test from the test menu, we must use the binomial distribution directly, in the calculator, *binomialcdf*, to compute the P-value here.

$$\text{P-value} = \text{binomialcdf}(20, .5, 8) = .252.$$

Under the very weak approximation criterion that you need at least 5 successes and 5 failures, one might be tempted to use the 1-prop Z Test, and if you do, it gives the P-value as $\text{P-value} = .186$, which is substantially less than the true P-value, and it is always a dangerous thing to under estimate a P-value, since that makes the type I error more likely.

14. If the early results show only 8 votes for Goofy out of 20 votes cast, should WDBTV announce that Donald has won?

ANSWER: Definitely **NOT**, since the P-value of the data, .252, is larger than the level of significance, .001.

15. **We are trying to prove that a certain population of rope is strong enough to use for mountain climbing. If we make the type I error, then (circle choice)**

the population of rope is actually strong enough but we think it is not.

the population of rope is not strong enough but we think it is.

we have miscalculated the sample mean.

we have miscalculated the standard deviation.

CORRECT CHOICE: the population of rope is not strong enough but we think it is.