

Chapter 3 Review

Topics:

- Use population claims to construct the null and alternative hypothesis. Also, know how to determine the type of tail for the test.
 - Know the assumptions necessary to do one-population mean or proportion hypothesis tests.
 - Be able to explain the meaning of the Z-test statistic for one-population proportion hypothesis tests.
 - Be able to explain the meaning of the T-test statistic for one-population mean average hypothesis tests.
 - Be able to determine how likely it is for the sample data to of occurred by random chance.
 - Know how to interpret significance by judging whether the test statistic falls in the tail corresponding to the critical value.
 - Know how to use “Theoretical Distributions” menu in StatKey to use the significance level to look up critical values.
 - Know how to use “Theoretical Distributions” menu in StatKey to use the test statistic to look up the P-value.
 - Know how to create randomized simulations and use the significance level to judge the tails. Also, know how to use the sample statistic to calculate the P-value.
 - Know how to use the P-value and significance level to determine if the sample data could have happened because of sampling variability or if it was unlikely.
 - Know the definition of P-value.
 - Know how to use the P-value and significance level to determine if we should reject the null hypothesis or fail to reject the null hypothesis.
 - Be able to write the formal conclusion for a hypothesis test and explain its meaning.
 - Know the definitions of Type 1 and Type 2 Errors. Know how to analyze Type 1 and Type 2 errors.
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Chapter 3 Review Practice Problems

1. Write a definition for the following key terms.
 - hypothesis test
 - Null hypothesis
 - Alternative Hypothesis
 - Population Claim
 - Test statistic
 - one-population proportion Z test statistic
 - one-population mean T test statistic
 - Critical Value
 - Sampling Variability (Random Chance)
 - P-value
 - significance level (alpha level)
 - Randomized Simulation
 - beta level
 - type 1 error
 - type 2 error
 - Conclusion
2. How is randomized simulation used in hypothesis testing and describe what it can tell us.
3. How can we know if the sample data significantly disagrees with the null hypothesis?
4. How can we determine how likely it is for the sample data to have occurred because of sampling variability?



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5. How do we know if we reject the null hypothesis or fail to reject the null hypothesis?
6. What are the four steps to writing conclusions?
7. What assumptions do we need to check for the following:

When testing a hypothesis about a one-population mean average?
 When testing a hypothesis about a one-population proportion (percentage)?
 When testing a hypothesis about a one-population randomized simulation?

8. Fill out the following table regarding test statistics and critical values.

Test Statistic	Critical Value	Does sample significantly disagree with H_0 or not?
T = +1.774	± 2.751	
Z = -2.481	-1.96	
T = -3.394	± 2.566	
Z = +1.362	+1.645	

9. Fill out the following table regarding P-value and Significance levels.

P-value	P-value %	Significance Level	Sampling Variability or Unlikely	Reject H_0 or Fail to reject H_0 ?
0.0002		5%		
0.3327		1%		
1.84×10^{-5}		10%		
0.0941		5%		

10. Fill out the following table to practice writing conclusions.

P-value	Claim	Write the Conclusion addressing Evidence and claim
Low	H_0	
High	H_A	
High	H_0	
Low	H_A	

11. Write the null and alternative hypotheses for the following. Which is the claim? Is this a left-tailed, right-tailed, or two-tailed test?

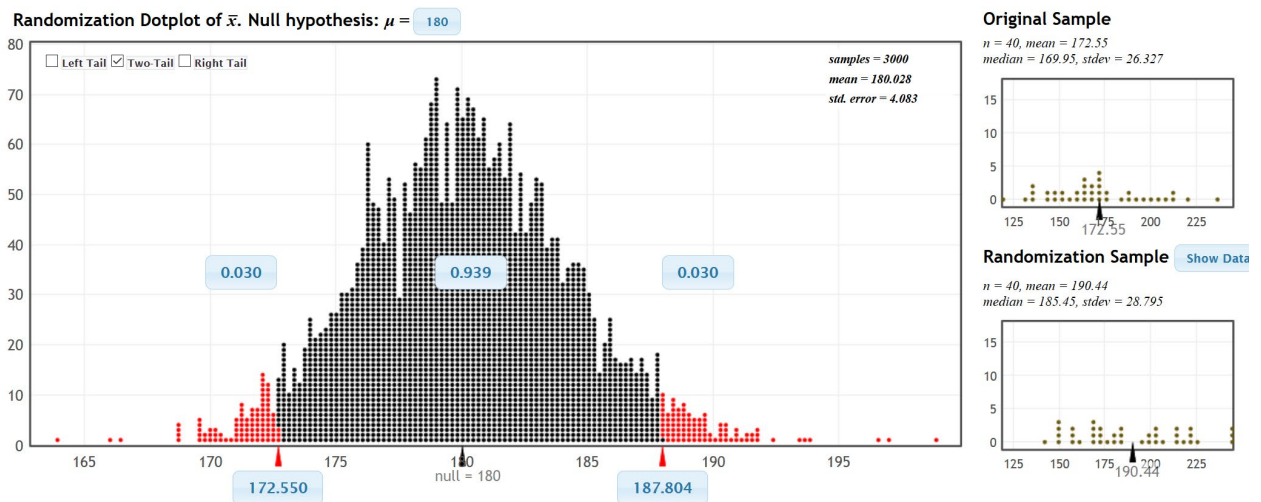
- a) "We used to think that the population mean average normal body temperature for all humans was exactly 98.6 degrees Fahrenheit. Now we think it is lower."
- b) "The percentage of all people in China with Typhoid (π_1) used to be higher than the percentage of all people in India with Typhoid (π_2). Now we think the percentage is about the same."
- c) "The population mean average age of students at UCLA (μ_1) is the same as the population mean average age of students at USC (μ_2)."



12. Answer the following questions about type 1 and type 2 errors.

- What is a type 1 error?
- What is a type 2 error?
- What is the probability of type 1 error called?
- What is the probability of type 2 error called?
- Why do type 1 and type 2 errors occur?
- What can we do to limit the chances of a type 1 error?
- What can we do to limit the chances of a type 2 error?
- Which significance level is best for keeping both type 1 and type 2 errors low?
- If the significance level is 1%, what happens to the probability of type 1 and type 2 errors?
- If the significance level is 10%, what happens to the probability of type 1 and type 2 errors?

13. An article states that the mean average weight of men in the U.S. is 180 pounds. The random health data at teachoutcoc.org was pasted into StatKey and the following randomized simulation was created in order to test the article's claim. Use a 1% significance level. Make sure to check the assumptions. Give the null and alternative hypothesis, estimate the P-value, and the conclusion. Write a sentence to explain the P-value. Was there a significant difference between the sample mean and the population mean? How likely was it that the sample data occurred by random chance if the population mean really is 180 pounds?



14. Use the Statcato printout below to test the following claim. A speaker at a nursing convention said that the population mean average hourly salary of a registered nurse used to be \$25 per hour, but now is greater than \$25 per hour. A random sample of 28 nurses gave a sample mean of \$26.82 and a standard deviation of \$4.37. A histogram of the salaries showed a bell shaped distribution. Use a 5% significance level. Make sure to check the assumptions. Give the null and alternative hypothesis, test statistic, P-value, and the conclusion. Write a sentence to explain the test statistic. Write a sentence to explain the P-value. Was there a significant difference between the sample mean and the population mean? How likely was it that the sample data occurred by random chance if the population mean really is \$25?

N	Sample Mean	Stdev s	Significance Level	Critical Value	Test Statistic	p-Value
28	26.82	4.37	0.05	1.703	2.204	0.0181



15. Use simulation on www.lock5stat.com to test the following claim. The Harris Poll conducted a random survey in which they asked 1097 women "How many tattoos do you currently have?" Of the 1,097 females surveyed, 143 responded that they had at least one tattoo. A tattoo magazine claimed that more than 10% of women have at least one tattoo. Use a 5% significance level to test the magazine's claim. Give the null and alternative hypothesis, the estimated P-value, and the conclusion. Write a sentence to explain the P-value. Was there a significant difference between the sample percent and the population value? How likely was it that the sample data occurred by random chance from a 10% population.

