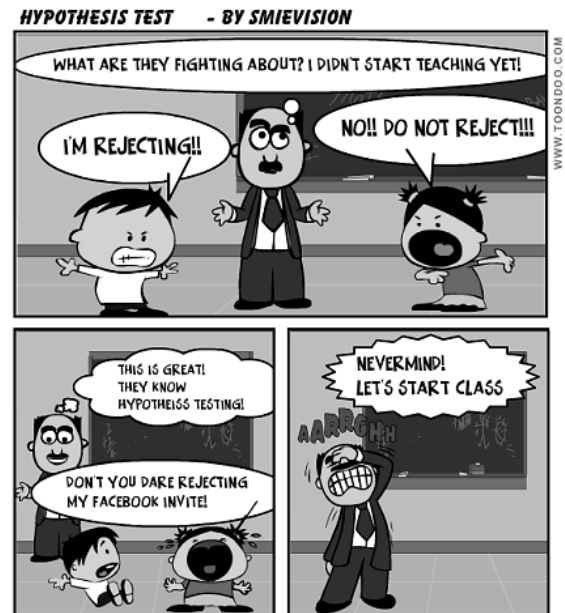


1. **Set up Hypotheses**
 - What is α ? Is it a one-tail test? or a two tail test?
 - Set up null hypothesis H_0
 - Set up alternative hypothesis H_a
2. **What is the appropriate test statistic to use?**
 Is σ known? is the sample size large enough? What is the mean?
 (t-test, z-test, X^2 test, F-test)
3. **Calculate the test statistics value**
 (t_{observed} , Z_{observed} , X^2_{observed} , F_{observed})
4. **Find the critical value for the test statistic.**
 (t_{critical} , Z_{critical} , X^2_{critical} , F_{critical})
5. **Define your decision rule**
 (Reject H_0 if..., Do not Reject H_0 if....)
6. **Make your decision**
 (Since the observed value does not fall/falls in the rejection region, we Reject/Do not Reject H_0)
7. **Interpret the conclusion in context**



PROBLEM # 8.1 What is the difference between a null hypothesis and an alternative hypothesis? Is the null hypothesis always the same as the verbal claim or assertion that led to the test? Why or Why not?

PROBLEM # 8.2 Following a major earthquake, the cite engineer must determine whether the stadium is structurally sound for an upcoming athletic event. If the null hypothesis is “the stadium is structurally sound,” and the alternative hypothesis is “the stadium is not structurally sound,” which type of error (Type I or Type II) would the engineer least like to commit?

PROBLEM # 8.3 A researcher wants to carry out a hypothesis test involving the mean for a sample of size $n = 18$. She does not know the true value of the population standard deviation, but is reasonably sure that the underlying population is approximately normally distributed. Should she use a z-test or a t-test in carrying out the analysis? Why?

PROBLEM # 8.4 The president of a company that manufactures central home air conditioning units has told an investigative reporter that at least 85% of its homeowner customers claim to be “completely satisfied” with the overall purchase experience. If the reporter were to subject the president’s statement to statistical scrutiny by questioning a sample of the company’s residential customers, would the test one-tail or two-tail? What would be the appropriate null and alternative hypotheses?

PROBLEM # 8.5 It has been claimed that no more than 5% of the units coming off an assembly line are defective. Formulate a null hypothesis and an alternative hypothesis for this situation. Will the test be one-tail or two-tail? Why? If the test is one-tail, will it be left-tail or right-tail? Why?

PROBLEM # 8.6 In hypothesis testing, what is meant by the decision rule? What role does it play in the hypothesis testing procedure?

PROBLEM # 8.7 What is the central limit theorem, and how is it applicable to hypothesis testing?

PROBLEM # 8.8 If the population standard deviation is known, but the sample size is less than 30, what assumption is necessary to use the z-statistic in carrying out a hypothesis test for the population mean?

PROBLEM # 8.9 For a sample of 35 items from a population for which the standard deviation is $\sigma=20.5$, the sample mean is 458.0. At the 0.05 level of significance, test $H_0: \mu = 450$ versus $H_1: \mu \neq 450$. Determine and interpret the p-value for the test.

PROBLEM # 8.10 For each of the following tests and z-values, determine the p-value for the test:

- Right-tail test and $z=1.54$
- Left-tail test and $z=-1.03$
- Two-tail test and $z=1.27$

PROBLEM # 8.11 For a sample of 12 items from a normally distributed population for which the standard deviation is $\sigma=17.0$, the sample mean is 230.8. At the 0.05 level of significance, test $H_0: \mu \leq 220$ versus $H_1: \mu > 220$. Determine and interpret the p-value for the test.

PROBLEM # 8.12 In the past, patrons of a cinema complex have spent an average of \$5.00 for popcorn and other snacks, with a standard deviation of \$1.80. The amounts of these expenditures have been normally distributed. Following an intensive publicity campaign by a local medical society, the mean expenditure for a sample of 18 patrons is found to be \$4.20. In a one-tail test at the 0.05 level of significance, does this recent experience suggest a decline in spending? Determine and interpret the p-value for the test.

PROBLEM # 8.13-Based on the sample data, a confidence interval has been constructed such that we have 90% confidence that the population mean is between 120 and 180. Given this information, provide the conclusion that would be reached for each of the following hypothesis tests at the $\alpha=0.10$ level:

- $H_0: \mu = 170$ versus $H_1: \mu \neq 170$

- $H_0: \mu = 110$ versus $H_1: \mu \neq 110$
- $H_0: \mu = 130$ versus $H_1: \mu \neq 130$
- $H_0: \mu = 200$ versus $H_1: \mu \neq 200$

PROBLEM # 8.14 Under what circumstances should the t-statistic be used in carrying out a hypothesis test for the population mean?

PROBLEM # 8.15 For a simple random sample of 40 items, $\bar{x}=25.9$ and $s=4.2$. At the 0.01 level of significance, test $H_0: \mu = 24.0$ versus $H_1: \mu \neq 24.0$

PROBLEM # 8.16 For a simple random sample of 15 items from a population that is approximately normally distributed, $\bar{x}=82.0$ and $s=20.5$. At the 0.05 level of significance, test $H_0: \mu \geq 90.0$ versus $H_1: \mu < 90.0$.

PROBLEM # 8.17-The International Coffee Association has reported the mean daily coffee consumption for U.S. residents as 1.65 cups. Assume that a sample of 38 people from a North Carolina city consumed a mean of 1.84 cups of coffee per day, with a standard deviation of 0.85 cups. In a two-tail test at the 0.05 level, could the residents of this city be said to be significantly different from their counterparts across the nation? *Source: coffeeresearch.org, August 8, 2006.*

PROBLEM # 8.18 When carrying out a hypothesis test for a population proportion, under what condition is it appropriate to use the normal distribution as an approximation to the (theoretically correct) binomial distribution?

PROBLEM # 8.19-For a simple random sample, $n=200$ and $p=0.34$. At the 0.01 level, test $H_0: p_0 = 0.40$ versus $H_1: p_0 \neq 0.40$.

PROBLEM # 8.20- For a simple random sample, $n=1000$ and $p=0.47$. At the 0.05 level, test $H_0: p_0 \geq 0.50$ versus $H_1: p_0 < 0.50$.

PROBLEM # 8.21 A simple random sample of 300 items is selected from a large shipment, and testing reveals that 4% of the sampled items are defective. The supplier claims that no more than 2% of the items in the shipment are defective. Carry out an

appropriate hypothesis test and comment on the credibility of the supplier's claim.

PROBLEM # 8.22 It has been claimed that 65% of the homeowners would prefer to heat with electricity instead of gas. A student finds that 60% of the 200 homeowners prefer electric heating to gas. In a two-tail test at the 0.05 level of significance, can we conclude that the percentage who prefer electric heating may differ from 65%? Determine and interpret the p-value for the test.

PROBLEM # 8.23 For each of the following situations, determine whether a one-tail test or a two-tail test would be appropriate. Describe the test, including the null and alternative hypotheses, then explain your reasoning in selecting it.

- a. A machine that has not been serviced for several months is producing output in which 5% of the items are defective. The machine has just been serviced and quality should now be improved.

- b. In a speech during her campaign for reelection, a Republican candidate claims that 55% of registered Democrats in her county intend to vote for her.
- c. Of those who have bought a new car in the part, a dealer has found that 70% experience three or more mechanical problems in the first four months of ownership. Unhappy with this percentage, the dealer has heavily revised the procedure by which pre-delivery mechanical checks are carried out.

PROBLEM # 8.24 What is a p-value, and how it is relevant to hypothesis testing?

PROBLEM # 8.25 The p-value for a hypothesis test has been reported as 0.03. If the test result is interpreted using the $\alpha=0.05$ level of significance as a criterion, will H_0 be rejected? Explain.

PROBLEM # 8.26 A hypothesis test is carried out using the $\alpha=0.01$ level of significance and H_0 cannot be rejected. What is the most accurate statement we can make about the p-value for this test?

Understanding the Basics: Suggested Problems from the Book.

Chapter 9 - Hypothesis Testing															
9.1	The Null and Alternative Hypotheses and Errors in Hy	9.01	9.02	9.03	9.04	9.05	9.06	9.07							
9.2	z Tests about a Population Mean: Sigma known	9.08	9.09	9.10	9.11	9.12	9.13	9.14	9.15	9.16	9.17	9.18	9.19	9.20	
9.3	t Tests about a Population Mean: sigma unknown	9.21	9.22	9.23	9.24	9.25	9.26	9.27	9.28	9.29	9.30	9.31	9.32	9.33	
9.4	z Test about a population proportion	9.34	9.35	9.36	9.37	9.38	9.39	9.40	9.41	9.42					
	Supplementary	9.56	9.57	9.58	9.59										

This statistical workbook is compiled from the following books:

- Keller, G. (2012). *Statistics for management and economics*. Mason: Cengage Learning.
 - McClave, J. T., Benson, G. P., & Sincich, T. (2008). *Statistics for Business and Economics*. New Jersey: Prentice Hall.
 - Weiers, R. M. (2011). *Introduction to Business Statistics*. Mason: Cengage Learning.
 - (GMAC), F. t. (Ed.). (2005). *GMAT -Quantitative Review*. Oxford, UK: Blackwell.
- Bowerman, B. L., O'Connell, R. T., Murphree, E., Huchendorf, S. C., & Porter, D. C. (2003). *Business statistics in practice*(pp. 728-730). New York: McGraw-Hill/Irwin.

Samie's Tips! Lesson 8-The Exam corner- TIPS and TRICKS!

Hello,

We are now reaching the period of "hypothesis testing", from now on, all chapters will be about testing a hypothesis using a specific table and knowing whether you should be using the t-tables, z-tables, f-table or X^2 table. Understand the 7 steps and you should be okay. See you in class! Samie