**Testing the Difference Between Two Sample Means**

**From**

Tokunaga, H, T. (2015). *Fundamental Statistics for the Social and Behavioral Sciences*. SAGE Publications, Inc.

* **Locate** the 7.13 exercises on page 256 of the Tokunaga (2016) text.
* **Complete** Exercise 2, 6, 10 and 32 using SPSS.
* **Locate** the 8.12 exercises on page 301 of the Tokunaga (2016) text.
* **Complete** Exercise 8 and 12 using SPSS.
* **Locate** the 10.10 exercises on page 411 of the Tokunaga (2016) text.
* **Complete** Exercise 4 and 16 using SPSS.

**The questions are bellow:**

2.   For each of the following situations, calculate the population standard error of the mean

a.   σ = 18; *N* = 36

b.   σ = 9.42; *N* = 49

c.   σ = 1.87; *N* = 60

d.   d. σ = .91; *N* = 22

e.   e. σ = 21.43; *N* = 106

6.   For each of the following situations, calculate the *z-*statistic (*z*), make a decision about the null hypothesis (reject, do not reject), and indicate the level of significance (*p* > .05, *p* < .05, *p* < .01).









10.   In the GRE test example (Exercise 9), what if it was believed that the only possible alternative to the null hypothesis is one in which the students’ GRE scores increase (i.e., they cannot decrease).

a.   State the null and alternative hypotheses (H0 and H1).

b.   Make a decision about the null hypothesis.

(1)   Set alpha (α), identify the critical values, and state a decision rule. Why is the decision rule different in this situation?

(2)   Calculate a statistic: *z*-test for one mean. Is it a different value in this situation? Why or why not?

(3)   Make a decision whether to reject the null hypothesis.

(4)   Determine the level of significance.

c.   Draw a conclusion from the analysis.

d.   What are the implications of this analysis for the GRE class?

32.   A sixth-grade teacher uses a new method of teaching mathematics to her students, one she believes will increase their level of mathematical ability. To assess their mathematical ability, she administers a standardized test (the Test of Computational Knowledge [TOCK]). Scores on this test can range from a minimum of 20 to a possible maximum of 80. The TOCK scores for the 20 students are listed below:



To interpret their level of performance on the test, she wishes to compare their mean with the hypothesized population mean (μ) of 50 for sixth graders in her state.

a.   Calculate the mean () and standard deviation (*s*) of the TOCK scores.

b.   State the null and alternative hypotheses (H0 and H1) (allow for the possibility that the new teaching method may, for some reason, lower students’ mathematical ability).

c.   Make a decision about the null hypothesis.

(1)   Calculate the degrees of freedom (*df*).

(2)   Set alpha (α), identify the critical values (draw the distribution), and state a decision rule.

(3)   Calculate a statistic: *t*-test for one mean.

(4)   Make a decision whether to reject the null hypothesis.

(5)   Determine the level of significance.

d.   Draw a conclusion from the analysis.

e.   Relate the result of the analysis to the research hypothesis.

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8.   How long does it take an ambulance to respond to a request for emergency medical aid? One of the goals of one study was to estimate the response time of ambulances using warning lights (Ho & Lindquist, 2001). They timed a total of 67 runs in a small rural county in Minnesota. They calculated the mean response time to be 8.51 minutes, with a standard deviation of 6.64 minutes. Calculate a 95% confidence interval for the mean for this set of data.

a.    State the desired level of confidence.

b.   Calculate the confidence interval and confidence limits.

(1)  Calculate the standard error of the mean ().

(2)  Calculate the degrees of freedom (*df*) and identify the critical value of *t*.

(3)  Calculate the confidence interval and confidence limits.

c.  Draw a conclusion about the confidence interval.

12.   For each of the following sets of numbers, calculate a 95% confidence interval for the mean (**σ** known); before going through the steps in calculating the confidence interval, the sample mean () and standard deviation (*s*) must first be calculated. Next, draw a conclusion about each confidence interval.

a.   4, 7, 3, 6, 2, 5, 2, 4, 3 (assume **σ** = 1.50)

b.   43, 34, 48, 31, 39, 32, 45, 40, 46, 37, 42 (assume **σ** = 6.25)

c.   18, .15, .20, .16, .14, .18, .22, .17, .26, .13, .15, .09, .23, .13 (assume **σ** = .06)

4.   For each of the situations below, describe what would be considered a Type I and Type II error.

a.   A consumer group wants to see if people can tell whether they are drinking tap water or bottled water.

b.   A college instructor wishes to see whether his students prefer to work on assignments individually or in groups.

c.   A teacher evaluating a program designed to improve math skills gives her students a test before and after the program.

d.   A college student conducts searches on two different Internet search engines to see if they differ in terms of the number of relevant results provided.

(Tokunaga 412)

16.   A researcher is investigating the birth-order theory that middle siblings are greater risk takers than are first-born siblings. The following statistics are obtained for the study as a measure of risk taking:

Middle siblings:



First born

: 

a.   Calculate the standard error of the  and the *t*-test for independent means.

b.   Is this difference statistically significant? At what level of significance?

c.   Calculate *r*2 and Cohen’s *d* and specify whether it is a “small,” “medium,” or “large” effect.

d.   Report the result of this analysis in APA format

# SPSS Practice: Testing the Difference Between Two Sample Means

* + **Locate** Exercise 9.10 on page 354 of the Tokunaga (2016) text.

**Complete** the exercise using SPSS.

**Copy** the output from the exercise and paste it into a Microsoft® Word document.