

# Rural vs. Urban Mathematics Education

## Materials

- TI-Nspire™ or TI-Nspire CAS™
- Statistics\_Ruralvsurban\_Stallings.tns
- TI-Nspire™ software

## Mathematical Concepts

- Statistical Analysis
  - range
  - variance
  - mean
  - standard deviation
  - z-test of independent means
  - hypothesis testing

## Overview

Students who have had prior experience with any TI (handheld or computer) will learn to use TI-Nspire™ more easily than others. It is important that you master some basic skills in order to facilitate learning.





## Classroom Setup

Students who have access to the TI software can work alone, but if students only have access to TI handhelds, students should work in groups of two.

## Introduction

The following research problem is a sample problem used for a Masters Degree study. This could be used as an introduction to statistics or as a review of previously learned concepts. Students will use many aspects of the calculator within this activity. The most important concept to learn here is that you must choose which test and graph best represent the provided data. Students should also **THINK** about the problem and consider why this may be an important question to study before making any calculations. What does the researcher really want to know and can it truly be proven simply by making calculations and observing data?

## Getting Started.

1. Download the file  
**Statistics\_Ruralvsurban\_Stallings.tns**
2. Open a new document by pressing  Home and selecting  My Documents, (See Figure 1).
3. Move to the next page using  NAVPad  right wheel. Read the background

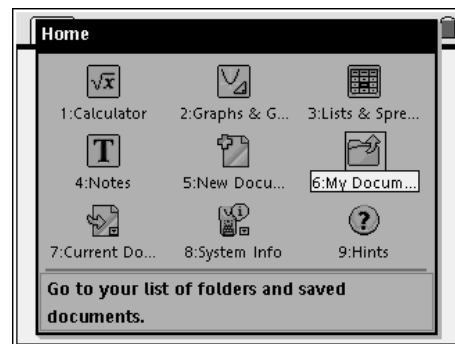


Figure 1

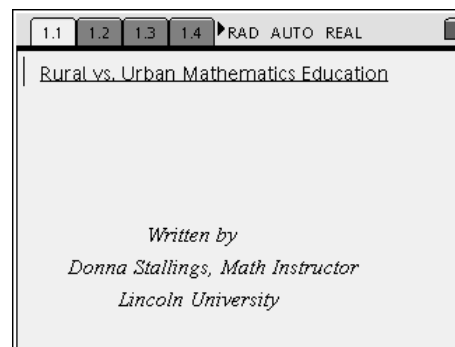


Figure 2

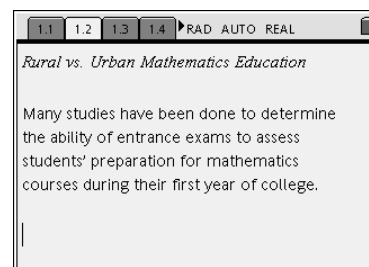


Figure 3

information.

**Think First. Write each statement in as a complete sentence.**

3. Why is this an important study question?

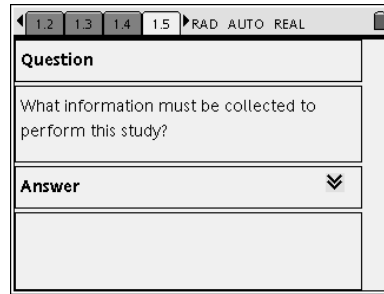
3a. Who would be interested in the results?  
Why?

4. What information must be collected to perform this study?

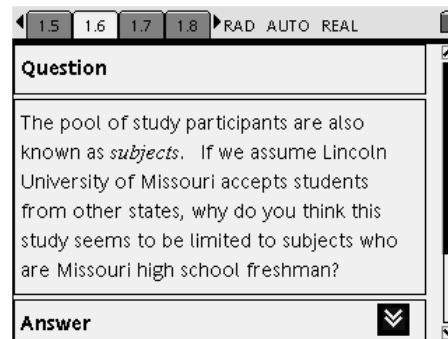
5. Why do you think this study seems to be limited to subjects who are Missouri high school freshman?

6. What are the operational definitions for urban, rural, and freshman?

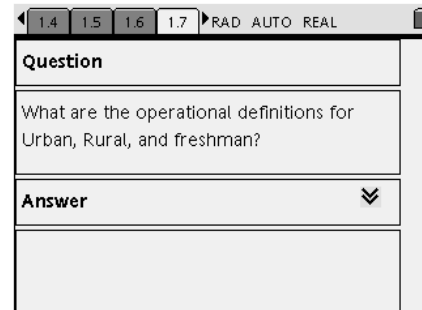
7. Identify the subjects in this study.



**Figure 4**



**Figure 5**






**Figure 6**

8. What characteristics will the subjects have that are the same? Different?

### Collecting Data

If you are using the software, Open the data file “Statistics\_Ruralvurbandata\_Stallings.tns

Home then select My Documents. If you are in a group, one person should download and open the data file while the other student keeps the main file open and inserts each **\*datum**.

5. Adjust the column width.    then click the NAVPAD to the right until the column width shows the entire label.
6. You will need this table to make some calculations. If you are using the software, use screen capture and save as table 1. (**File, Save Selected Screen(s) As**)
7. Use the information in the current spreadsheet; create a new spreadsheet that displays the number of students who tested into lower level math vs. college level math. (See Figure 9)

### THINK...

8. What information do you need in order to complete the above table?

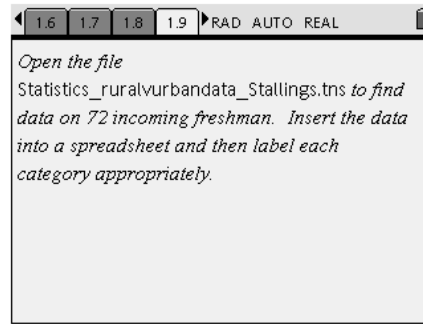


Figure 7

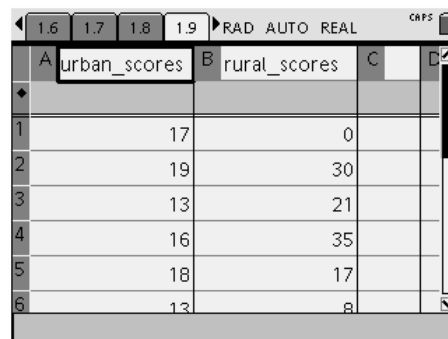
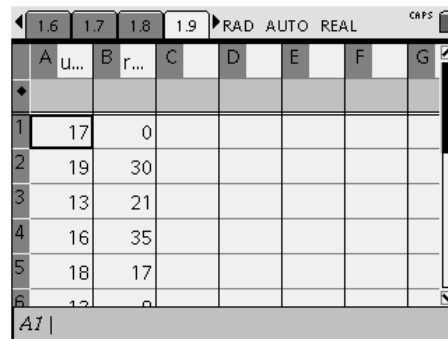


Figure 8

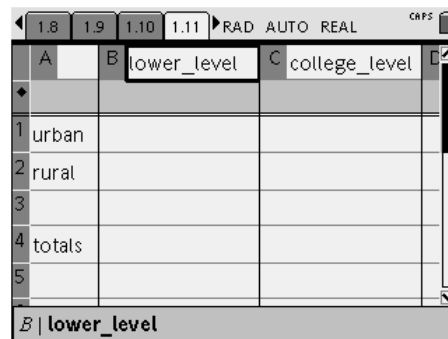



Figure 9

9. Use the provided definitions to help you complete the table.

*Lower Level Placement:* includes students that scored 0-17 on the math placement exam. These students were required to enroll in remedial math courses.

*Regular College Level:* includes students that scored 18 - 50 on the math placement exam. These students were allowed to enroll in regular college level courses.

10. You will need this table to make some observations and further calculations. If you are using the software, use screen capture and save as table 2. **(File, Save Selected Screen(s) As)** (See Figure 11)

11. Now, insert new columns that will show the fractional representation of the number of students placed in lower level vs. college level courses out of the total number, n, of subjects per category. 

(Figure 12).

12. Label the new columns appropriately and adjust the column widths.
  - Now repeat the process of inserting new columns. Include column labels. Include the percentages that are equivalent to the fractional representations.

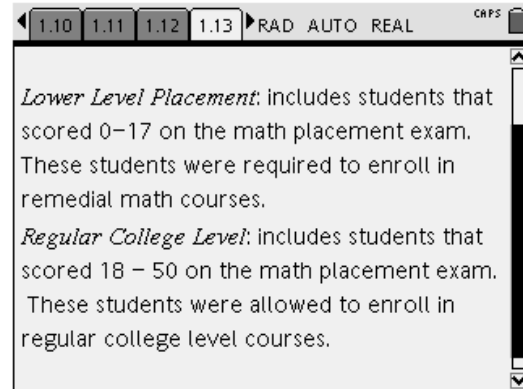


Figure 10

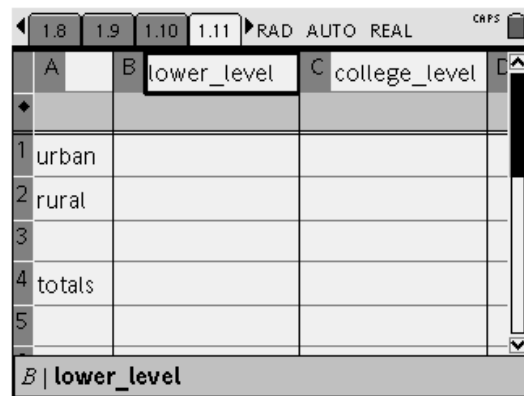


Figure 11

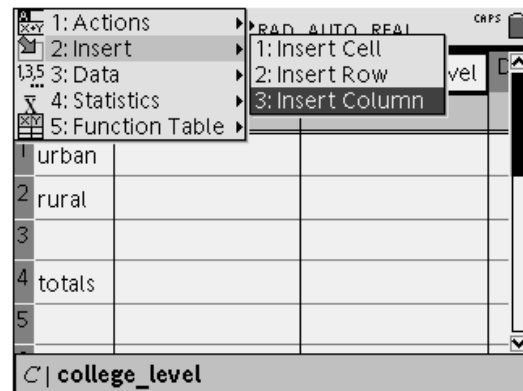








Figure 12

PARTNER HELP: One group member should open a calculator page    and using the fractions from the table, convert each to a decimal.   

From here change each decimal to a percent and have the other partner insert the new values into the table. Screen capture and Save as table 3.

LET'S MAKE SENSE OF THE VALUES!!

13. A Statistician claims that over 50% of freshman educated in rural and urban areas attended Lincoln University of Missouri. Discuss whether you believe this is a true or false statement and why.

14. How can you determine if a statement is **valid** or not?

15. Write two “*valid*” statements that describe information from table 2.

**Range** shows how spread out the data values are. The range of the values should be calculated to show the **validity** of the **mean**: how close the data values actually are to the mean.

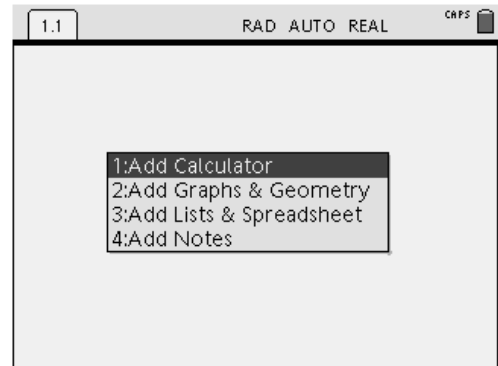


Figure 13

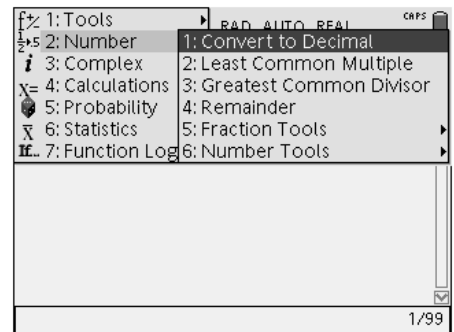


Figure 14

It is possible for two groups to have the same or similar means and have significantly different data values due to outliers or how spread out the data values are.

16. What is the **range** of values within the urban and rural groups?

Next we will further attempt to validate the **mean** by calculating the variance and **standard deviations** for both groups. The **variances** show that the data values may not necessarily be truly close to the mean. The standard deviations can be compared to each other to determine the variability of the data in the two independent groups. A higher standard deviation would mean the data in that particular group is more variable than the data in the other group.

17. \*First graph the data in a way that best models the spread of the data. The current nspire cannot graph statistical data.  
PARTNER HELP: One partner should switch their nspire to a TI-84, create L1 (list one) with Urban scores and L2 (list two) with Rural scores. Be prepared to explain why you think one representation works best over another.

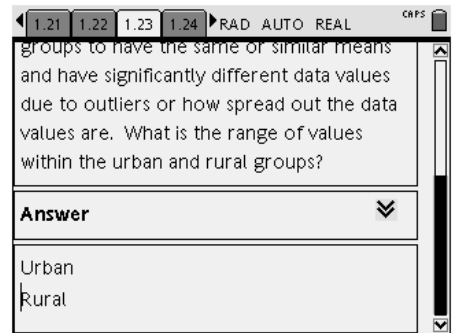


Figure 15

18. Now use table 1 to find the mean, variance, and standard deviation using one variable statistics. **menu** 4 1 1

Insert a calculator page **home** 5 1 and display the statistics results. **menu** 6 6 2

19. Screen capture and save as STATSUMMARY

20. Perform a **two-tailed z-test** to find the critical values and make a final conclusion on whether or not there is a statistically significant difference. **menu** 6 7 1

21. What are the  $z$  values?

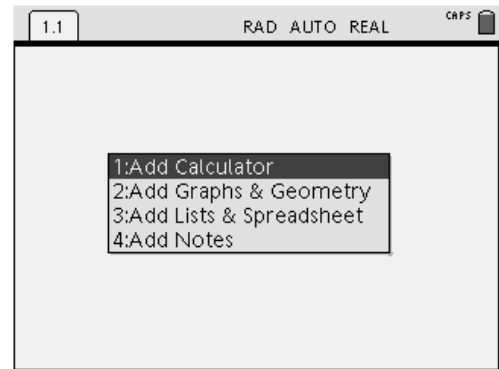
22. What is the null hypothesis?

23. Based on the  $z$ -values, should the null hypothesis be rejected?

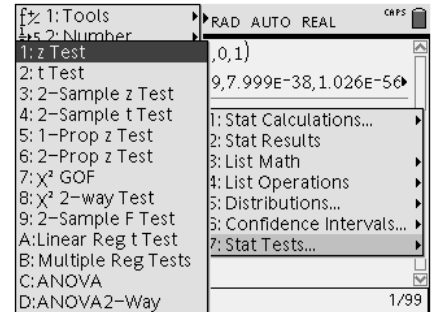
24. What conclusions can you make on the data based on the  $z$ -test?

**EXTENSIONS:**

Have students print out each completed table and prepare an oral presentation.



**Figure 16**



**Figure 17**

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