

Are They Truly Random?

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Activity overview

In this activity, students will develop lists of random numbers generated by the TI-Nspire handheld. They will explore their set of numbers and engage in a discussion of whether the random number generator is truly generating numbers at random. In addition, students will look at statistical models of their numbers and discuss whether “patterns” they see in the set of random numbers are possible if the numbers are truly random. In addition, I would have students save their progress on this activity as we will go on to discuss Chi Squared calculations.

Concepts

Statistics, random samples and visual representations of numerical data. In addition, students should save this activity until later in the course until they do Chi squared calculations.

Teacher preparation

No specific prep is required. However, I recommend that the teacher complete this activity before giving it to the students and think about the specific questions their students will pose.

Classroom management tips

I recommend that students be placed in groups of two to four so that they can compare and contrast their data and graphs in order to draw conclusions.

TI-Nspire Applications

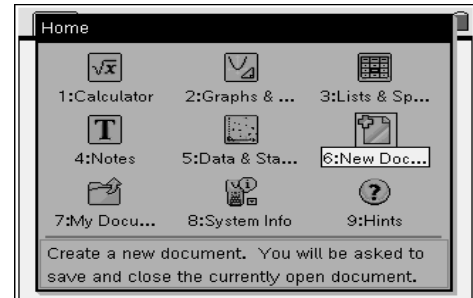
Lists and Spreadsheets, Data and Statistics, and Notes.

Step-by-step directions

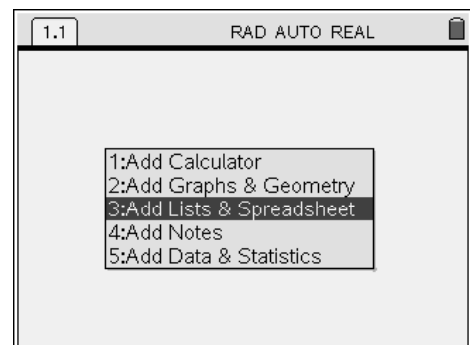
1. Before you begin this activity, answer the following questions:
 - a. If you have your handheld generate a set of random numbers, what would you expect:
 1. Numbers evenly spaced throughout the interval assigned?
 2. Number to be repeated?
 3. Some numbers that are grouped together and other numbers that are spread far apart?
 - b. If you were to graph your random numbers in a histogram, would you expect your graph to be symmetrical, uniform, or skewed (left or right)?

Now, you will first build a document that will create a set of random numbers.

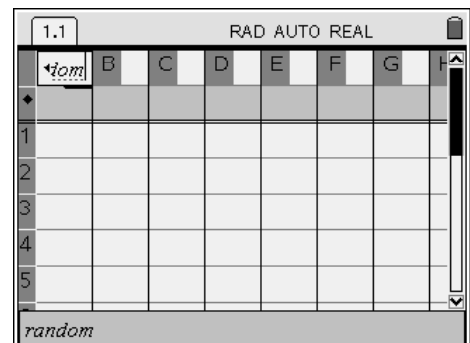
- Open a new Document by pressing the  and selecting  New Document.



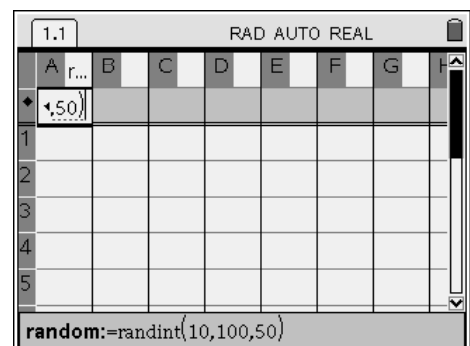
- Select : Add Lists and Spreadsheets.



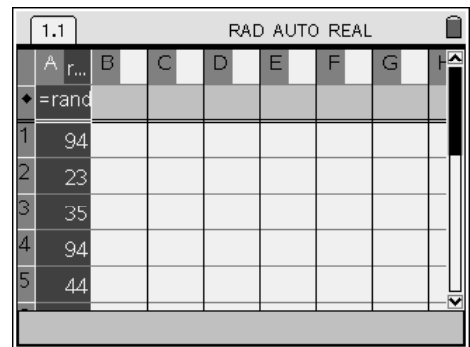
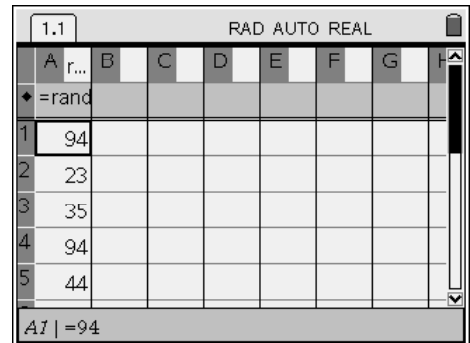
- Press the up arrow on the **NavPad** until the top cell of the column is highlighted and type the name of this column of data – **random**. Press **Enter**.



- In the formula cell at the top of this column, type in the following: **randInt(10,100,50)** and press **Enter**. This will generate a list of fifty random numbers between 10 and 100.

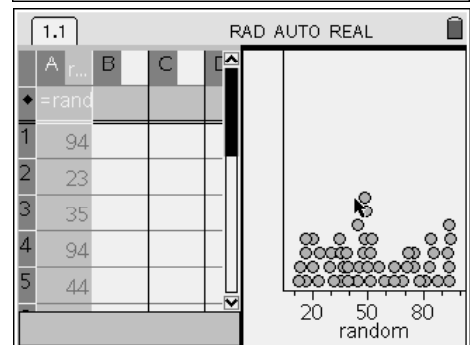
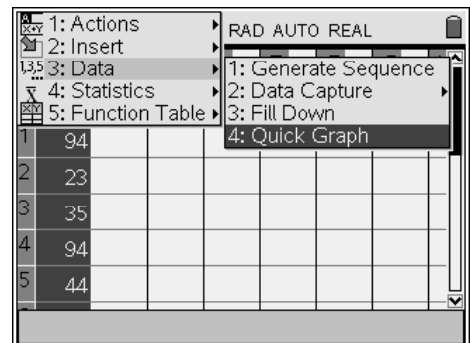


6. On the **NavPad**, press the up arrow three times (or until the entire column is highlighted).

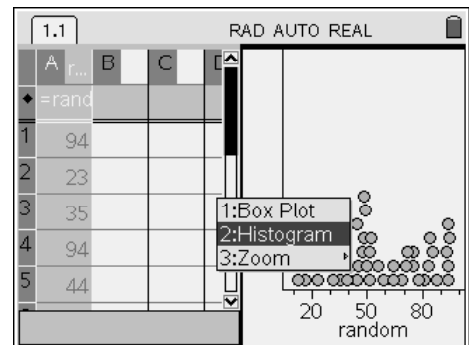


7. Press the menu key, and select 3 :Data, then 4 :Quick Graph.

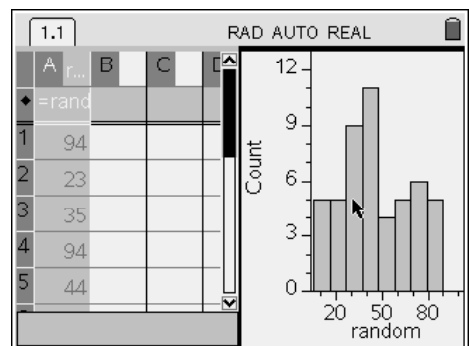
The screen will automatically split vertically inserting a dot plot of your random numbers on the right side of the screen.



8. Once you have the dot plot displayed on the right side of your screen, press ctrl tab until you have a dark rectangle around the Data & Statistics application work area.



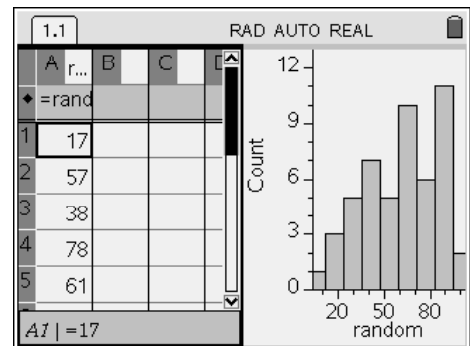
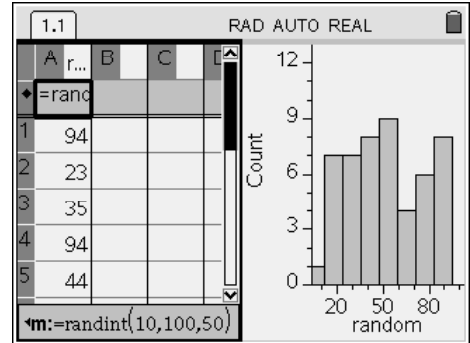
9. Change the plot type of the graph to a Histogram. To do this press ctrl menu and select 2 :Histogram.



10. Answer the following questions:

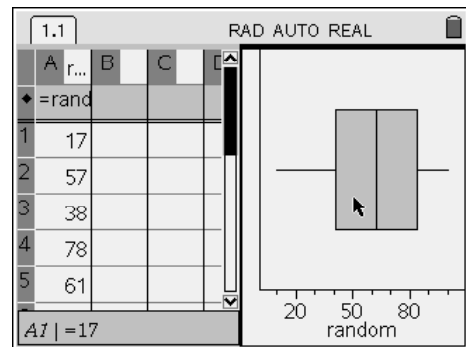
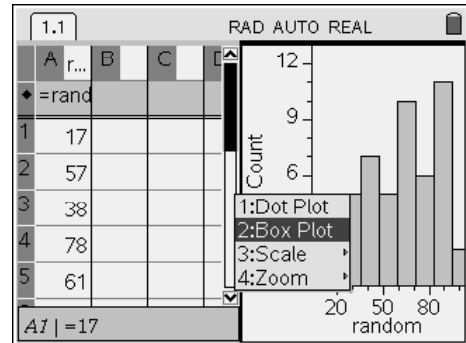
- Does your histogram look the same as the one in this diagram or the same as the other people in your group? Why or why not?
- Is your histogram symmetric, uniform or skewed? If there is a skew, is it to the left or the right?
- Compare these answers to your predictions that you made in step 1 of this activity. How do you answers now compare to you predictions. Why are there differences?

11. Use the NavPad to arrow up to highlight the formula. Press $\text{Ctrl} + \text{R}$ to recalculate the random numbers and get a new set of random numbers.



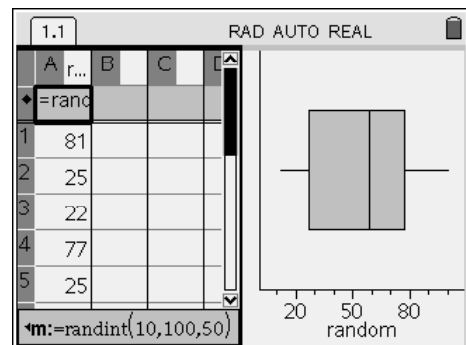
12. Press $\text{Ctrl} + \text{R}$ to recalculate again, and notice what change happen to your histogram. Repeat this step several times.
- How has your histogram changed?
 - Is this a change you would have expected?

13. Change your graph type to a Box Plot. (Make sure the graph application is highlighted and press ctrl menu and choose 1 : Box Plot).

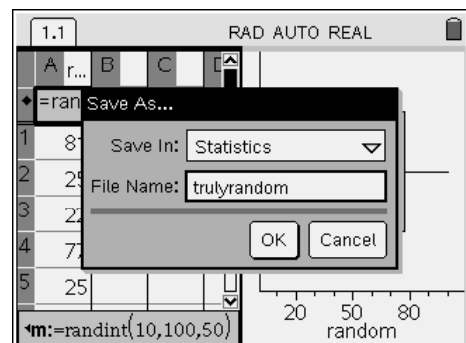


14. Return to the List and Spreadsheets side of the screen (ctrl tab). Highlight the formula in column A again and press ctrl R (recalculate) again and look at the difference in your Box Plot.

- How are your graphs alike or different?
- Compare your graphs with that of your neighbor. Are there any similarities or differences?



15. As a final step, save their work in a file that you will be able to find later in the school year. (Press ctrl S). This is an activity that is a good starting point for future discussions in the statistics class.



CLASS DISCUSSION!

At this point, you should open the class up to a discussion of random numbers and whether the handheld can generate a true random set of numbers. Below is a list of questions that you can ask students to start the conversation regarding the true randomness of a computer generated set of random numbers.

1. Ask the students how they think the handheld comes up with the set of random numbers.
2. Should their histograms all look the same? Why or Why Not?
3. What about the Box Plots? What do the parts of the box plot represent (mean, quartile markers, and extreme values)? Are these markers moving when the set of random numbers change?

Assessment and evaluation

- Collect students work and answers to the questions throughout the activity as an assessment.
- Class discussion should provide a good formative assessment opportunity.

Activity extensions

This activity can be recalled when one gets to the Chi Squared portion of the Statistics class.
