Calculating Standard Deviation

Overview:
This activity is meant to show how to use the TI-Nspire to step through, "by hand," calculating the standard deviation of a set of data. Students will then use the One-Var Stats feature to do the same calculation and compare the two processes – plusses and minuses of both. The data being used can be changed depending on your own preference in data.

Objectives:
- Compare the calculation of standard deviation by hand and using the TI-Nspire One-Var Stats function.

Materials:
- TI-Nspire™ or TI-Nspire™ CAS computer software *
- TI-Nspire™ or TI-Nspire™ CAS *
- Calculating Standard Deviation student worksheet (a copy for each student) (Calc Stand Dev SW.doc)
- Calc Stand Dev.tns (for students)
- Calc Stand Dev ans.tns (for the teacher only)

*Note – This activity is meant to be done as a class:
1. By teacher demonstration using the TI-Nspire™ computer software,
2. By teacher demonstration using the TI-Nspire™ viewscreen, or
3. By the student with their own TI-Nspire™ at their desk.

Procedure:
1. If the students will be doing the exploration on their own, the file ***Calc Stand Dev.tns*** will need to be transferred to each handheld. Each student will need a copy of the Calculating Standard Deviations Student Worksheet (***Calc Stand Dev SW.doc***).

2. Open the file ***Calc Stand Dev.tns*** in TI-Nspire™. The first couple of screens give a brief overview of the activity.
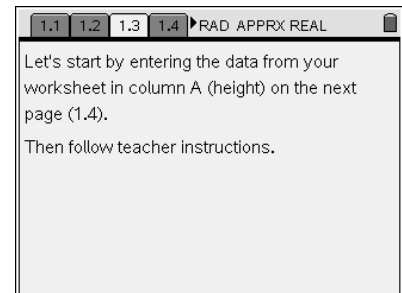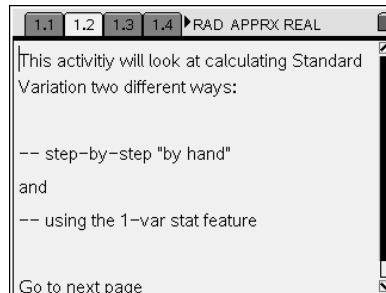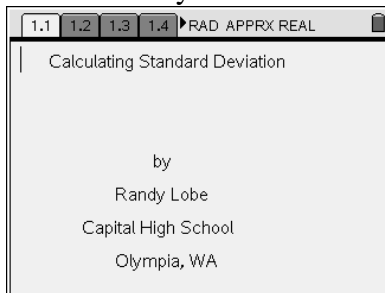
3. Next, have each student stop on page 1.3 in the activity. They will need to enter the data given below which represents the heights of tall buildings in Philadelphia, PA. Have them enter this data into the column labeled *height*.

Height (in feet) of tall buildings in Philadelphia, PA						
548	375	490	435	405	364	435
848	375	492	390	792	400	482
500	700	475	384	400	572	450
490	491	739	412	492	945	572
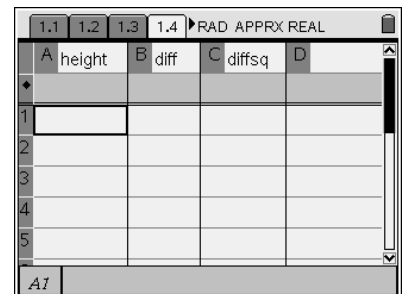
4. In the equation line of the next column (*diff*), enter the following equation

   = *height* – mean(*height*)

   Now push enter and talk about what just happened.

A height	B diff	C diffsq	D
	=height–		
548.	31.82		
848.	331.8		
500.	-16.18		
490.	-26.18		
375.	-141.2		

B diff:=height–mean(height)

5. The next column, labeled diffsq, have students enter in the equation line

   =diff^2

   Now push enter and talk about what just happened.

A height	B diff	C diffsq	D
	=height–	=diff^2	
548.	31.82	1013.	
848.	331.8	1.101E5	
500.	-16.18	261.7	
490.	-26.18	685.3	
375.	-141.2	1.993E4	

C diffsq:=diff^2

6. In cell D1, type "sum ="
   (the " " are very important here)

7. In cell D2, type =sum(diffsq)

height	B diff	C diffsq	D
	=height–	=diff^2	
548.	31.82	1013.	sum=
848.	331.8	1.101E5	6.312E5
500.	-16.18	261.7	
490.	-26.18	685.3	
375.	-141.2	1.993E4	

D2 =sum(diffsq)

8. In cell D3, type "variance ="
   (the " " are very important here)

9. In cell D4, type =d2/27
   (the 27 is for n-1 or 28-1)

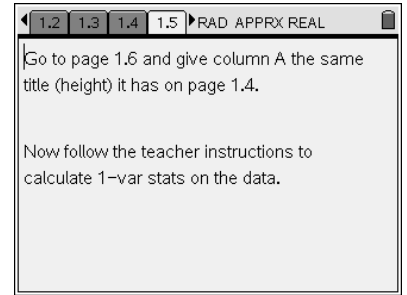| height	B diff	C diffsq	D
	=height–	=diff^2	
548.	31.82	1013.	sum=
848.	331.8	1.101E5	6.312E5
500.	-16.18	261.7	variance=
490.	-26.18	685.3	2.338E4

D4 $=\dfrac{d2}{27}$

10. In cell D5, type "sx ="
    (the " " are very important here)

11. In cell D6, type $=\sqrt{d4}$
   You should now see the value of the sample standard deviation in cell D6.

height	B diff	C diffsq	D
	=height–	=diff^2	
500.	-16.18	261.7	variance=
490.	-26.18	685.3	2.338E4
375.	-141.2	1.993E4	sx=
375.	-141.2	1.993E4	152.9
700.	183.8	3.379E4	

D6 $=\sqrt{d4}$

You have now effectively calculated, "by hand," the sample standard deviation.

12. Have the students go on to page 1.5, read and follow the directions.

Go to page 1.6 and give column A the same title (height) it has on page 1.4.

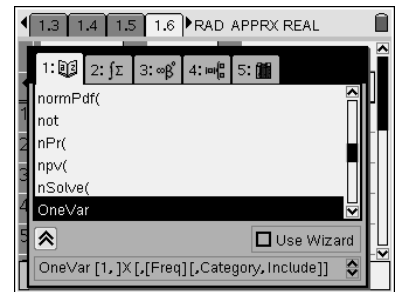Now follow the teacher instructions to calculate 1-var stats on the data.

13. Once they have entered height into the title of column A and pressed enter, notice that all of the data previously entered for height is copied to the spreadsheet. The students should now be ready and waiting for your instructions.

A height	B	C
1	548.	
2	848.	
3	500.	
4	490.	
5	375.	
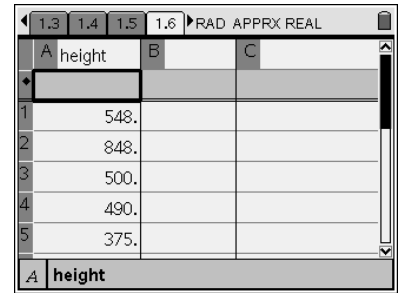
A | height

14. In the equation line for column C, have the students enter the following

=OneVar(height,1)

To do this, press ⌨, then ⊚, choose OneVar from the list.

1: 🔲 2: ∫Σ 3: ∞β° 4: ▦ 5: 🔲

normPdf(
not
nPr(
npv(
nSolve(
OneVar
❯   ☐ Use Wizard
OneVar [1,]X [,[Freq] [,Category, Include]] ⬍

Then press enter and see what happens. Discuss the data that is given.

The value in C5 is the sx value and C6 is the σx value. The value in C13 is the SSX value (these are the values the students need for their worksheet).

B	C		D	E
	=onevar('height,1)			
1	One-Variable Stat...			
2	516.2			
3	1.445ε4			
4	8.092ε6			
5	152.9			

C | =onevar('height,1)
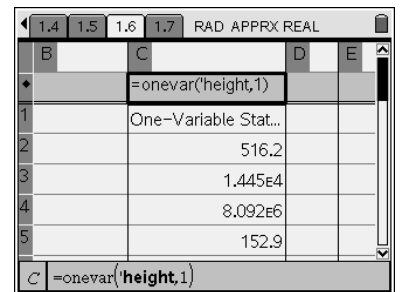
15. Have a brief discussion about the two ways of using the TI-Nspire handheld to do the Standard Deviation calculations and the usefulness of each method.

16. Have the students take a few minutes to transfer the data to their worksheets and answer the few questions about the two methods. (feel free to change the questions to fit your teaching style)

Answer the rest of the questions on your worksheet.

Push ctrl – home and "Save" your work (DO NOT "Save As," change the name or change folders).

17. Have the students save their document on their handhelds. tools, file, save, 🔧 ① ③ (Use the saving protocol you normally use).
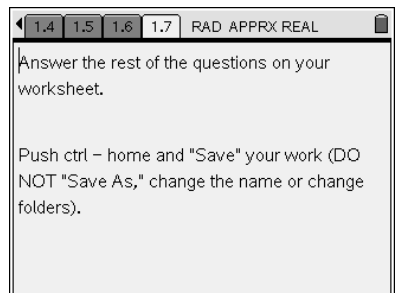
Calculating Standard Deviation

by

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This activitiy will look at calculating Standard Variation two different ways:

-- step-by-step "by hand"

and

-- using the 1-var stat feature

Go to next page

Let's start by entering the data from your worksheet in column A (height) on the next page (1.4).

Then follow teacher instructions.

A height	B diff	C diffsq	D
◆			
1			
2			
3			
4			
5			

A1

Go to page 1.6 and give column A the same title (height) it has on page 1.4.

Now follow the teacher instructions to calculate 1-var stats on the data.

A	B	C
◆		
1		
2		
3		
4		
5		

A1

Answer the rest of the questions on your worksheet.

Push ctrl - home and "Save" your work (DO NOT "Save As," change the name or change folders).