Introduction to Function Notation

Name ____________________

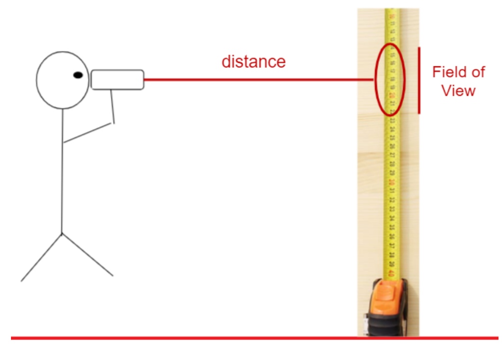
Teacher Notes for Student Activity (TI-Nspire)

Class____________________

In this activity students will collect data on the **field of view** that they can see through a "telescope" at **varying distances**. They will then use their data to make predictions on the field of view at other distances.

Put students in groups of 3 or 4. Have the groups assign one person to look through the telescope, one person to measure the distance from the telescope to the yard stick, one person to call out the field of view diameter, and one person to record the data on the data table below.

Here is a diagram of the set up.



An extension is to have different lengths of telescopes. A couple groups could have a full paper towel tube, a couple could have a tube ⅓ the full length and other groups could have a tube ⅔ of the length. The different lengths will produce different rates of change of the field of view.

Collect Distance vs FOV Data for <u>FIVE</u> different distances (there will be two blank rows)

Distance (inches)	Field of View (inches)	FOV Estimate from axis using fitted line	Prediction from function ***m1(x)***

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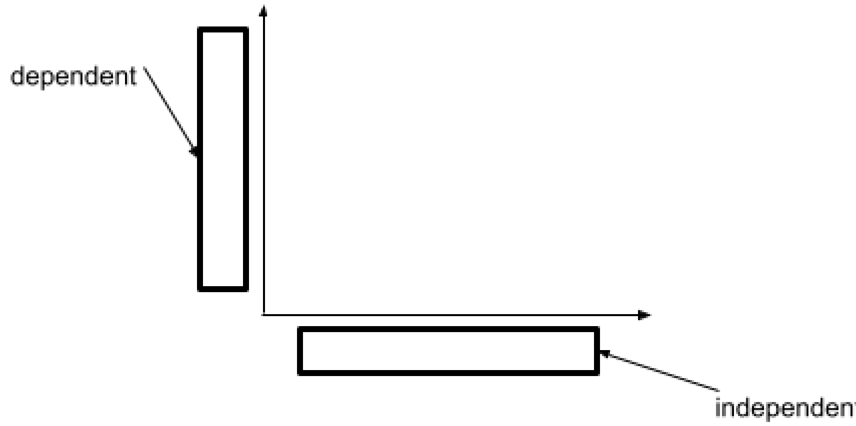
1. Add a List and Spreadsheet Page to your Nspire Document and enter your five Distance and Field of View data values.

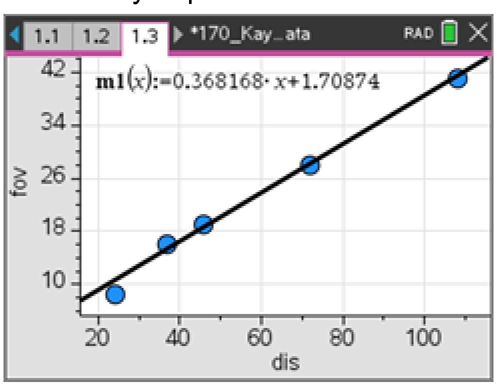
2. Add a Data and Statistics Page to plot your data. Determine which variable is the independent variable and which is the dependent variable.

independent variable __Distance__ dependent variable ___Field of View____
(variable that does NOT depend on the other) (variable that depends on the other)

Add the variable names to the axes.



3. Use the Analyze Menu to insert a moveable line. Long press the end of the line to grab it and twist it to “fit” it to the data. You can also long press the middle of the line to grab and shift the line vertically. Once you position the line to best model the data, record your equation below. (round to tenths)



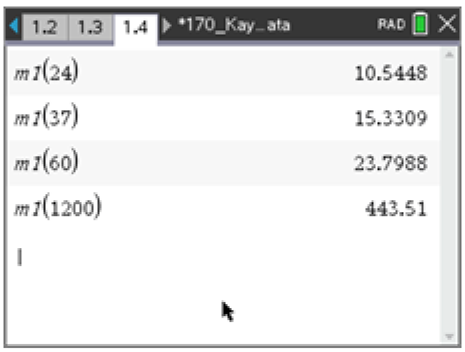
m1(*x*) = ______________________________

If you had a distance of zero, what should your field of view be?__the diameter of the tube, or approximately 1.75 inches_
Adjust your line so that if you put a zero in for the x-variable (the distance) you would get that value as your field of view and edit your m1(x) function above to be this new function.

Can you explain what the slope value means with respect to the distance and field of view? For example, as your distance increases 10 inches, your field of view will increase ______ inches.
If the slope were .4 or 4/10 then as the distance increases 10 inches, my FOV will increase 4 inches. (If you have used differing lengths of telescopes you can compare the slopes to see that the shortest telescopes have the largest slopes.)

4. For each of your distance values, estimate the field of view using your fitted line and the axes on your graph. Put these estimations in column 3 in your table.

5. Insert a Calculator Page in your Nspire document. Use m1 function notation to calculate the field of view for the distances in your data. On the calculator page type **m1**(__) and put the distance into the parentheses. (You can also use the VAR button and select **m1**) Put this value in the last column as the Predicted value from the function for each distance (round the decimal to the nearest tenth).



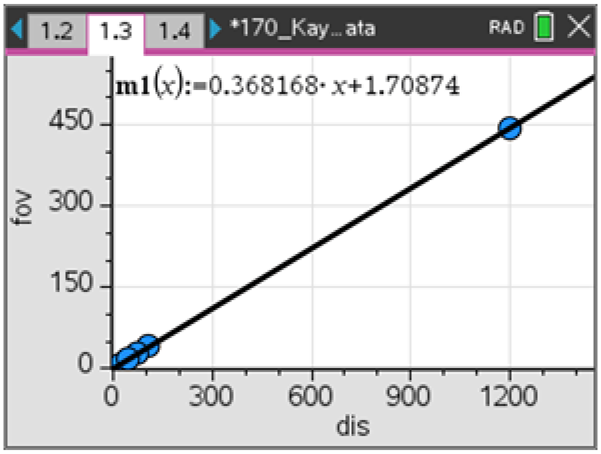
6. Choose a different distance from your horizontal axis and use the linear model to estimate what the field of view would be for that distance. **Add this distance and field of view value to your table above** in the 6th row by filling in "distance" and "FOV Estimate from axis using fitted line" columns. Use the function notation, **m1**(*dist*) on the calculator page as well to get the predicted FOV value.

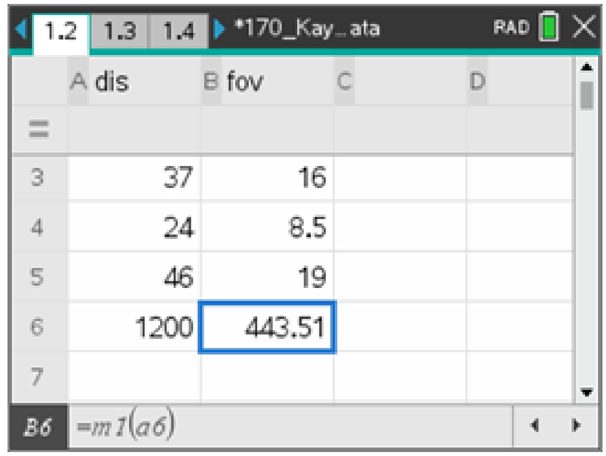
   If we stood _____inches from the wall, our field of view would have been _____ inches.

7. Select a distance of 100 feet (1200 inches) and use the function notation **m1**(1200) to calculate your field of view at a 100 foot distance. Put this data in your table on row 7 in the correct columns.

   If we stood _1200_inches from the wall, our field of view would have been _____ inches.

Check the accuracy of this value by grabbing the end of the x-axis and pulling it to the left to get the scale to extend to 1200 inches. Then you must grab the end of the y-axis and pull down to change the scale to see the moveable line y-value at the x-value of 1200 inches. The y-axis should read the same value you placed in the table from the m1(1200) function.





Lastly, on your List and Spreadsheet Page and at the bottom of your data enter the data point that you just calculated (1200, _____). When you go to your Data and Statistics Page you should see this data point plotted exactly on the moveable line.

<u>FUNCTION NOTATION</u>

m1(**dist**) = **fov**

m1(**input**) = **output**

m1(**independent var**) = **dependent var**

m1(**x**) = **y**

Our function was called *m1*. Many times we name functions with the letter *f*. So a typical function notation is: *f*(**x**) = **y**.

x is the input, **y** is the output
OR
x is the independent variable, **y** is the dependent variable

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