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 Lesson Plan
 CMST

Graphing Linear Equations

Standard #3

Key Idea: Patterns & Functions, Modeling/ Multiple Representation

Objective: Students will be able to represent and analyze using verbal descriptions, tables, equations, and graphs working in groups of two within a given block period.

Vocabulary: equation, graphs, table, function, rule, Zoom, linear, STAT, cursor (blinking shaded box), TRACE, PLOT, Y=, slope (students already have these vocabulary words in their notes from the previous lesson yet, make sure to use these words constantly throughout the lesson to check for understanding)

Materials: TI-83 Plus/Silver Edition Graphing Calculator

Launch Activity:						
1	2	3	4	5	6	
3	4	5	6	7	8	
What is the rule for this table? _____ to the top values to get the bottom values.						
X	1	2	3	4	5	6
Y	3	4	5	6	7	8
What is the rule for this table? _____ to the x values to get the y values.						

Example 1: Graph the equation $X + 2$ using the TI-83 Plus Silver Edition (This would be modeled with the students step by step and constantly monitoring and adjusting along the way to make sure everyone is on task).

Table Method using “STAT” key

Step 1 : Turn on the calculator use the “on” button

Step 2 : Press the “STAT” key and then press “1” or “ENTER”
(You should see 3 columns L1, L2, and L3 this just means List of data Set 1, List of data Set 2, List of data Set 3, etc.)

Step 3 : Enter your “X” values from the launch activity into your L1 column
Press “1” then “ENTER”, Press “2” then “ENTER”, Press “3” then “ENTER”, Press “4” then “ENTER”, Press “5” then “ENTER”, and Press “6” then “ENTER”

If you make a mistake and press the wrong number, use the arrow keys to go either up or down or left or right, then replace with the correct number and press “ENTER”

Step 4 : Use your “blue right arrow” key to move to the L2 column

Enter your “Y” values from the launch activity into the L2 column

Press “3” then “ENTER”, Press “4” then “ENTER”, Press “5” then “ENTER”, Press “6” then “ENTER”, Press “7” then “ENTER”, and Press “8” then “ENTER”

If your calculator turns off at any time, then press the “on” button and you should be at the exact same spot as where you left off.

Make sure you only have six values in each column:

You can check this by moving the “blue downward arrow” key to the last value in each column, each column should say L1(6) or L2(6) and have the last value entered, the 6 tells us that we have only six values in each column.

Step 5 : Press the yellow button that says “2nd” and then press the blue button that says “Y=” (this takes into the plotting of our data”

Press “1” or the “ENTER” key

Step 6 : Make sure the cursor (blinking box) is over the word “on” and then press “ENTER”

Where you see the word “type” choose the 2nd graph that looks like points connected by moving your “right arrow” key and press “ENTER”

Step 6 :
(continued)

Where it says X list make sure you put “L1” by pressing the “2nd” key and then press “1” (you should see a L1 over the top of the “1” button in yellow) (since it is in yellow you have to use the yellow key which is the “2nd” key)

Where it says Y list make sure you put “L2” by pressing the “2nd” key and then press “2” (you should see a L2 over the top of the “2” button in yellow)

Where it says Mark, make sure you press the key that looks like a “dot with a box around it” (this helps you “see” the points plotted)

Press “ENTER”

Step 7 :

Press the key that says “Y=”
Use the “upward arrow” key to get the cursor over the “Plot1” and Press “ENTER” (make sure the Plot1 is shaded)

Make sure the Y1,Y2,Y3,Y4,Y5,etc, is cleared

Step 8 :

Press the blue “ZOOM” key and move the “downward arrow” key until you reach “9:Zoom Stat” and press “ENTER” (this allows you to see the points to the most accuracy)

Step 9 :

Press the blue “Graph” key (to see your points plotted)
Press the blue “Trace” key (to be able to move on the line)

Step 10 :

Press the “upward arrow” key to move along the line

As you move on the line it tells you the X values and Y values for each specific point and it tells you in the upper left corner that you are looking at the plot for L1and L2 (list1 and list2)

When these points were connected they made a _____.

Did this seem like it took a lot of work to graph? Come on, be honest. _____

Do you think we could graph another set of points on the same graph? _____

What do you think we would have to do? (Hint there are only a couple of things we need to do). Work in your assigned pairs to answer this question.

Let's say we wanted to plot this table on the same graph as the 1st set of points:

x	1	2	3	4	5	6
y	4	5	6	7	8	9

What is the correct equation for this table? _____

Follow some of the same steps as before to graph this equation:

Step 1 : Press the "STAT" button and go to L3 (list 3)

Step 2 : You notice that your New X list looks the same as the old X list so, use the L1 for your X list

The Y list has changed so, make the new Y list your L3 column by pressing the necessary values starting with "4" and ending with "9" from the above table but remember, to press "ENTER" each time after you press the numbers

Step 3 : Press the "2nd" button and then press the "Y=" button (this will take us to the options for plotting the data)

Press "2" or "ENTER"

Step 4 : Use the "upward arrow" key to go to "Plot 2" and press "ENTER"

Use the "downward arrow" key to place the cursor over the On and press "ENTER" (this will turn plot 2 on)

Your type of graph should already be selected as the second graph that looked like the one from the previous example

Your X list is still in the L1 column but your Y list now is in the L3

Step 4 (cont.) column thus, you have to place where you see Y list press “2nd” then “3” and you should see L3.

Your mark should already be selected as the same as the previous example.

Step 5 : Press the “Zoom” key and then select “9:ZoomStat” and then press press the “TRACE” button.

You should see two sets of lines with each having six sets of points

Step 6 : You can move on either line by pressing the up or down arrow keys a and you can move on one line at a time by pressing the left or right arrow keys.

In the upper left corner the calculator will tell you what list you are looking at and in the bootom of the window of the calculator you will see the corresponding x and y values for each specific point.

What type of lines do these look like? _____

What is different about the two lines? Hint there are at least two differences.

Is there a different way to graph equations? Yes, of course and the calculator will do it for you with a small amount of work on your part:

Let us graph the same equation “ $y = X + 2$ ” from the first example:

Step 1 : Press the “Y=” button and make sure all the Plot1, Plot2, and Plot3 buttons are turned off by using your “upward arrow” key and press “ENTER”.

To make sure you turned off these functions, you will see that the plots are not shaded in any way



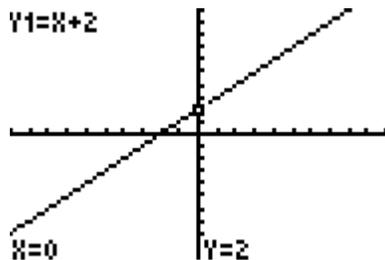
Step 2 : Where it says Y1, press the **2** button, then press the “+” key and then press the “2”.

(Your equation should look like this: $X + 2$)

Step 3 : Press the “Zoom” key and then press “6” for Zoom Standard (when you press Zstandard it automatically gives you a range on your X and Y axis of -10 to 10)

You could press the blue “window” key to set your range for your X and Y Axis to see how your graph looks with different ranges but for now use the “Zstandard” key located within the screen of the “ZOOM” button.

You should see a graph that looks like:



Step 4 : When you press the “TRACE” button you will be able to move on the line and you will be able to see at any given point the X and Y values at the bottom of the window of the calculator.

Also the calculator tells you what equation you are viewing in the top left corner of the window.

Now let us graph the equation “ $Y = X + 3$ ” and “ $Y = X + 4$ ” on the same graph.

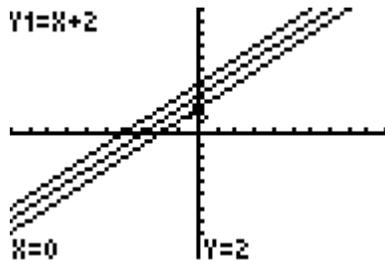
Step 1 : Go down to Y2 and press **X,T,O,n** and press the “+”, and then press the “3”

Step 2 : Go down to Y3 and **X,T,O,n** press and press the “+”, and then press the “4”

Step 3: Press the “Zoom” key and press “6” for Zstandard and you should see all three equations on the same graph.

Press the “TRACE” key and you will be able to move to each line by pressing the _____ or _____ arrow key and you will be able to move on a specific line by moving the _____ or _____ arrow key.

Your graph should look like this:



What looks similar about the three equations?

What looks different about the three equations?

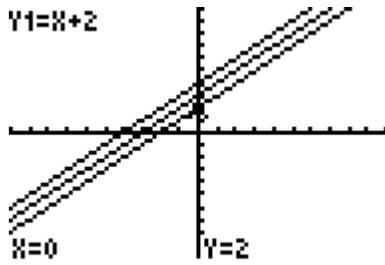
Now let us look at the equations “ $Y = X + 2$ ”, “ $Y = 2X + 2$ ”, and “ $Y = 3X + 2$ ”

Step 1 : Press the “Y=” button and press the “upward arrow” key to move to the first equation and press “CLEAR” button and move downward until you have cleared all the equations.

Step 2 : Press the X,T,O,n key and then press “+” and then press “2” and Then “ENTER”
Press the “2”, then the X,T,O,n key, then press “+” and then press “2” and then “ENTER”
Press the “3”, then the X,T,O,n key, then press, “+” and then press “2” and then “ENTER”

Step 3 : Press the “ZOOM” key and then press “_”
Press the “_____” button to move along the lines.
You should see _____ lines.

Your graph should look like this:



What looked similar when you graphed these equations?

What looked different when you graphed these equations?

Let us now look at these equations “ $Y = -X + 2$ ”, “ $Y = -2X + 2$ ”, and “ $Y = -3X + 2$ ”

Step 1 : _____ out all the equations that you see by pressing the “_____”
Button.

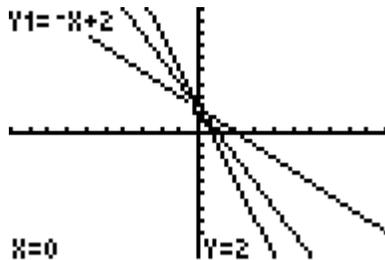
Step 2 : Go up to Y1 and press the “-“ (negative) key located beside the
ENTER button , then press X,T,O,n , then press “+”, then press “2”
and “ENTER”

At Y2 press “-“ key, then press “2”, then press X,T,O,n , then
press “+”, then press “2” and “ENTER”

At Y3 press “-“ key, then press “3”, then press X,T,O,n , then press “+”, then press “2” and “ENTER”

Step 3 : Press the “_____” key , then press the “_____” to actually see the graph and be able to move along the equations.

Your graph should look like this:



What do you see that is similar amongst the equations?

What do you see that is different amongst the equations?

In Conclusion, the students should be able to see that when you have an equation of a line in the form $y = mx + b$ your “m” tells you about the steepness or slope of a line whereas the “b” tells you where the line intersects the y axis. Also the students if given a set of equations should be able to tell if the equations are parallel or not and what direction the equation will go towards (positive or negative or none) by looking at the number in front of the “x” term.

The students are working in groups to learn how to help and learn from one another in the process of this activity. All throughout the activity the teacher is modeling to the students on the graphing calculator with the overhead screen and the overhead projector so, the students can actually see what is presented. This lesson will take a block period of time for the students to be able to fully understand what is being modeled and to have time to answer the questions after each activity.

Homework Assignment for The Graphing Linear Equations Activity :

Given these equations:

- 1.) $Y = 3X + 4$ 2.) $Y = 4X - 6$ 3.) $Y = 4X - 2$ 4.) $Y = -3X + 4$ 5. $Y = X - 6$

What two equations intersect at $y = 4$?

What two equations are perpendicular?

What equations are parallel to each other?

What equations have a positive slope?

What equation/s have a negative slope?

What equations intersect at $y = -6$?

What does the TRACE button allow us to do on an equation?

What does the Y = button allow us to do?

Do you think it is possible for us to graph equations other than linear equations? Explain.

How did you feel about this different way of graphing an equation with a graphing calculator versus the way of graphing by hand? Explain.

Rubric for Graphing Linear Equations Activity:

4 **Remained on task throughout the lesson and activity.**
Answered questions within the pair correctly with full understanding of the lesson and activity.
Asked questions that were related to the lesson.
Related the lesson and activity to real-world applications.
Behavior was exceptional throughout the lesson.
Able to help others throughout the lesson in other groups.

3 **Remained on task throughout the entire lesson and activity.**
Answered questions within the pair correctly with great understanding of the lesson and activity.
Asked questions that were related to the lesson and activity.
Behavior was great throughout the lesson and activity.

2 **On task for a lot of the activity but not all.**
A few questions were left unanswered on the activity and some of the questions that were answered had little understanding of the lesson and activity.
Behavior was good for the most part of the lesson.
Asked some questions throughout the lesson pertaining to the activity.

1 **Not on task for the most part of the lesson.**
Behavior was not acceptable during the lesson.
Did seldom answering of questions on the activity with partner .
Questions answered on the activity had very limited understanding if any of the lesson and activity.

0 **Refused to do anything during the activity after repeated help from teacher.**
Behavior was not acceptable during the lesson and was sent out of the room.