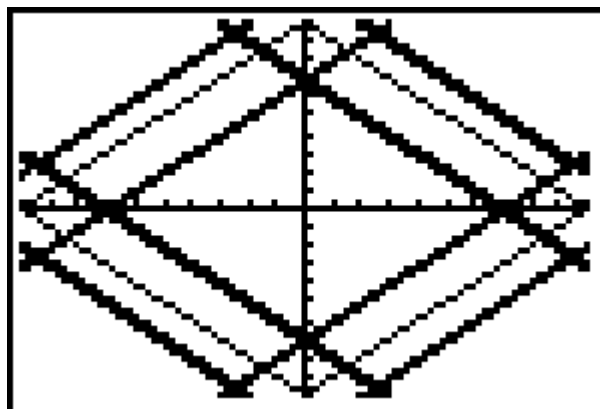


Use Calculator ART to Assess Student Knowledge of Linear Equations



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Suggested materials other than the calculator:

Pencils or thick spaghetti, pieces of acetate cut to the size of the overhead window, overhead markers.

This actually is a powerful multiple day activity when teacher lead.

Students at first do not like this activity because they "...have to think"

Here is a road map that you can add to or subtract to fit your needs.

Though the pictures turn out similar, each experiment is changed slightly for a mental twist.

Using Slope Intercept form: Part I

Start with standard window and Axes On.

Have students come up with the equation that will create a line that goes from the bottom left corner to the top right corner of screen. Use the window values to help them out. Place a pencil on the view screen panel to demonstrate.

Type in their guess in $y_1=$, press graph and lift pencil to see if the equation is correct. (The slope is 1 and the line goes through (0,0))

DO NOT CLEAR THE EQAUTION>

Change the window by going to ZOOM SQUARE

Does the line go from corner to corner? Why? Why not?

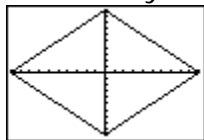
Create a line that does go from corner to corner. What needs to be changed in that old equation?

Next move the pencil so that it crosses the 2nd quadrant (corner to corner) and is parallel to the previous line. Review with them what the equations of parallel line have in common.

Type in the their guess in $y_2=$, press graph and lift pencil to see if the equation is correct.

Next move the pencil so that it crosses the 4th quadrant (corner to corner) and is still parallel to the previous lines. Type this in $y_3=$. Next move the pencil so that it crosses the 1st quadrant (corner to corner) but it is not parallel anymore. Last put in the equation of the line that will cut the 3rd quadrant (corner to corner).

Turn off $y_1=$ to get the diamond shape



Add to the design by putting in more parallel lines. You can create a plaid look by alternating lines thick or thin. You can also turn off axis for effect.

See cover. This picture took 12 equations. You can make picture with as many equations as need be. All you have to do is STO the graph in a PIC location. RECALL the PIC, add to it with more equations re-STOR and continue.

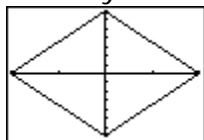
Using Slope Intercept form: Part I I

Change the window again. Keep it symmetric about both axes.

EX. $x[-2,2]$ $y[-7,7]$

Do not clear the equations (yet). Good discussion can happen.

When you are ready clear equations and repeat the directions from above.



The picture should look similar. The object is to have the students connect the window values to the steepness of the slope.

Using Slope Intercept form: Part I I I

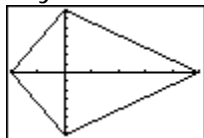
Change window again. Keep it symmetric about only 1 of the axes.

EX. $x[-2,5]$ $y[-7,7]$

Again good discussion can happen when you do not clear previous equations.

When you are ready. Continue as before.

This exercise throws in new equations, because some of the lines are NOT parallel anymore.

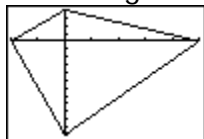


Using Slope Intercept form: Part IV

Change the window again. This time do not have either axes symmetric, but do have both negative & positive values.

EX. $x[-2,5]$ $y[-12,4]$ Again you may keep the old equations to help with needed changes.

Encourage the students to try this mentally. This actually becomes 'hard'.



NOT Slope Intercept form!

This is where I strongly encourage students NOT to be dependant on knowing the y-intercept. POINT SLOPE IS NEEDED!!!!

Change the window, so that the y-axis does not show up.

Be nice and give symmetric values for y min-max for parallel lines.

EX. $x[2,4]$ $y[-5,5]$

Suggestions:

Draw the diamond. Vertices occur at ends of axes and at top(bottom) middle of screen.

$$Y_1 = -5(x-4) + 0 \quad \text{or} \quad -5(x-3) + 5 \quad \text{will give the same result.}$$

$$Y_2 = -5(x-3) - 5 \quad \text{or} \quad -5(x-2) + 0 \quad \text{will give same result.}$$

$$Y_3 = 5(x-3) + 5$$

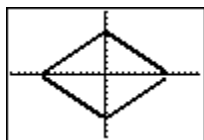
$$Y_4 = 5(x-3) - 5$$

Of course there is NOT Using Slope Intercept Parts I I...

All you need to do is change the axes to nonsymmetrical and ending with no axes showing up at all.

For an advanced added touch to the cover picture is not to have the 'inside' lines be drawn from edge to edge. You can restrict the line by restricting the domain using Boolean Algebra.

EX. To only draw the line $2/3x + 7$ from $(-10 < x < 0)$ $Y_1 = (2/3x + 7) / ((x > -10)(x < 7))$



the cover now looks like...

