INTEGRATING ALGEBRA & GEOMETRY UNIT

Prework is assigned as homework with the purpose of "getting the student ready" for the lesson as opposed to practicing what occurred in class. It is used to provide scaffolding for the learning.

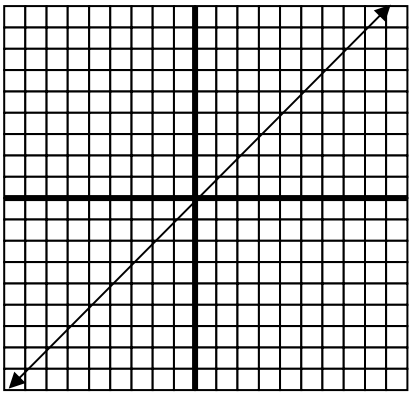
Prework, i.e. homework, understanding is checked through journal entries & observing group discussion. Students make a journal entry that relates to the prework at the start of the class.

There is a whole group summary and the class ends with students making a second journal entry.

[Created by Nicole Leone, Newtown High School]

Pre-Work #1:

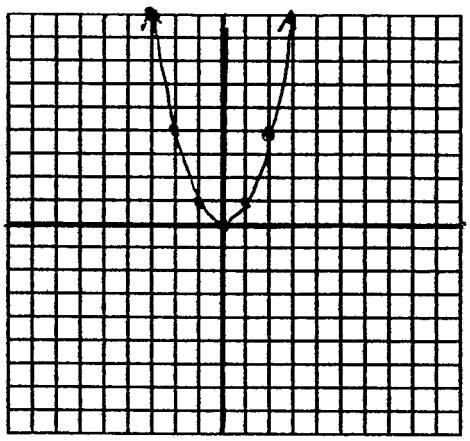
1. Look at the following graph, make a "T-chart" of the x and y values. Try to notice a pattern in the relationship between the x values and their corresponding y values. Can you figure out the equation for this graph?



x-values	y-values

Equation_____

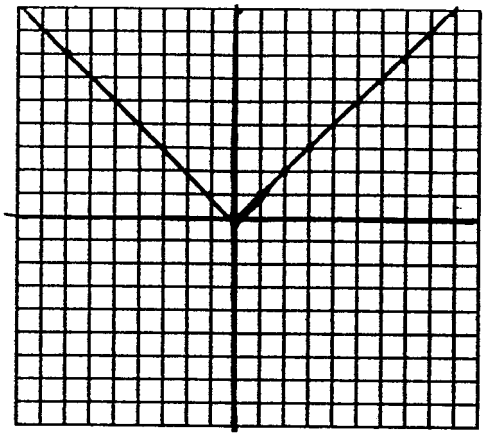
2. Look at the following graph, make a "T-chart" of the x and y values. Try to notice a pattern in the relationship between the x values and their corresponding y values. Can you figure out the equation for this graph?



x-values	y-values

Equation_____

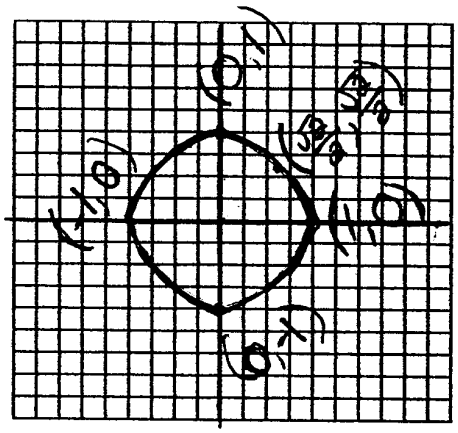
3. Look at the following graph, make a "T-chart" of the x and y values. Try to notice a pattern in the relationship between the x values and their corresponding y values. Can you figure out the equation for this graph?



x-values	y-values

Equation_____

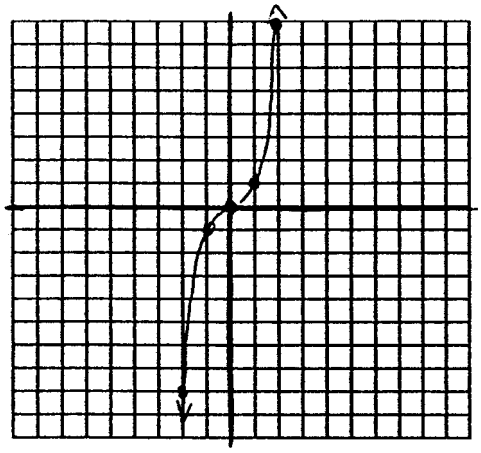
4. Look at the following graph, make a "T-chart" of the x and y values. Try to notice a pattern in the relationship between the x values and their corresponding y values. Can you figure out the equation for this graph?



x-values	y-values

Equation_____

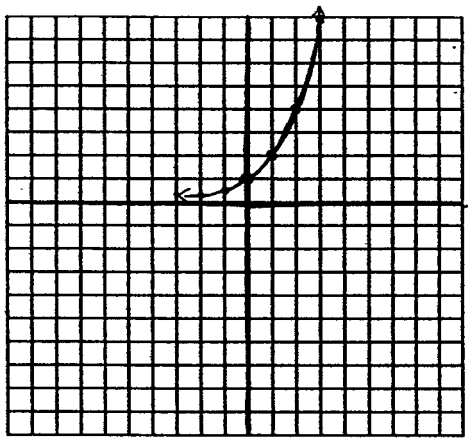
5. Look at the following graph, make a "T-chart" of the x and y values. Try to notice a pattern in the relationship between the x values and their corresponding y values. Can you figure out the equation for this graph?



x-values	y-values

Equation_____

6. Look at the following graph, make a "T-chart" of the x and y values. Try to notice a pattern in the relationship between the x values and their corresponding y values. Can you figure out the equation for this graph?

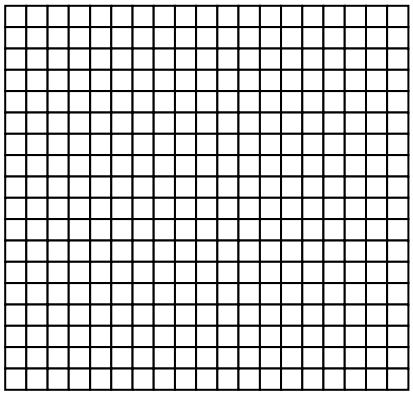


x-values	y-values

Equation_____

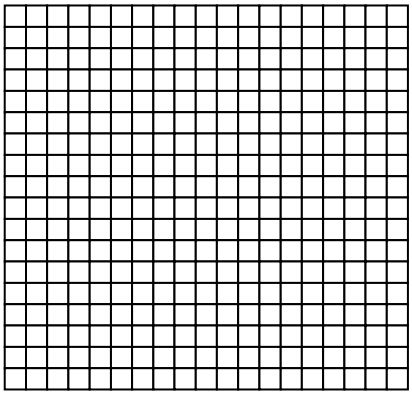
Pre-Work #2:

1. Graph the line y = x by either making a T-chart or using a graphing calculator.



2. How do you think that the graph would change if, instead of y = x you graphed y = x + 2?

3. Graph y = x + 2, by making a T-chart or using a graphing calculator, to see if you are correct.



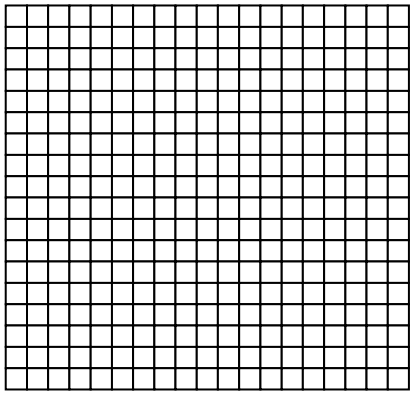
4. What do you think the graphs of y = x-2, y = 2x, y= ½x, and y = -x would look like?

5. Graph the above equations by making a T-chart or using a graphing calculator, to see if you were correct.

6. Predict what the graphs of $y = 2x-3$, and $y = \frac{1}{2}x + 2$ and check your predictions by graphing.

Class Activity #1:

1. Graph the line $y = 3x + 5$



2. What does the number 5 seem to determine about the graph? What about the 3?

3. What if you had a linear equation like $2(y+6) – 17 = 4x – 7$, how would you graph that?

4. For each of the following, use the given information to first draw the graph of the line and then to find the equation.
   a. The slope of the line is ½ and the y-intercept is 2

   b. The line is parallel to the line $y = -2x + 1$ and intercepts the y-axis at –2

   c. The slope of the line is –1 and the line goes through the point (1,2)

   d. The line is perpendicular to the line $y = ½x – 4$ and goes through the point (1,2)

   e. The lines goes through the two points (-1,3) and (5,-4)

Pre-Work #3:

Movie Theater Manager

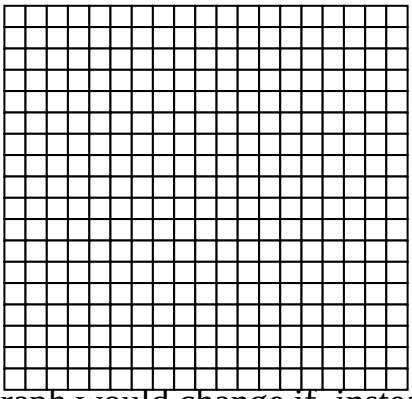
A manager of a movie theater has the following expenses each weekend:

Advertising	$400.00
Employee Pay	$1000.00
Heat	$200.00
Tape Rental	$5000.00
Food	$600.00
Total	**$7200.00**

1. Assume that each ticket that is sold at this movie theater costs $7.50 and that, on average, each customer spends $1.50 on food. Write expressions to represent the following:
   - The total (from food and ticket sales) **revenue** the Movie Theater realizes each weekend.
   - The total **cost** the Movie Theater realizes each weekend.
   - The total **profit** the Movie Theater realizes each weekend.
2. How many tickets must be sold in order for the Movie Theater to break even?
3. How might you represent this scenario graphically?

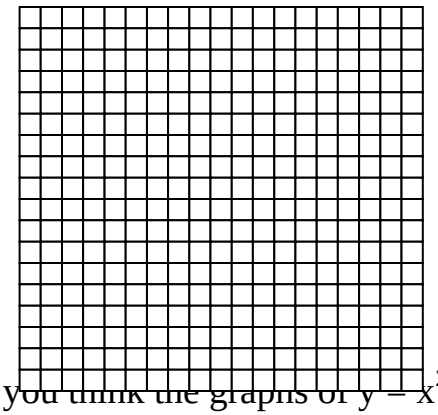
Class Activity #2:

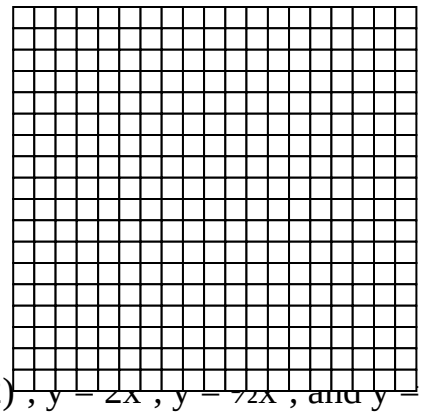
1. Graph the parabola $y = x^2$ by either making a T-chart or using a graphing calculator.



2. How do you think that the graph would change if, instead of $y = x^2$ you graphed $y = x^2 + 2$? What about $y = (x+2)^2$?

3. Graph $y = x^2 + 2$ and $y = (x + 2)^2$, by making a T-chart or using a graphing calculator, to see if you are correct.





4. What do you think the graphs of $y = x^2 - 2$, $y = (x-2)^2$, $y = 2x^2$, $y = \frac{1}{2}x^2$, and $y = -x^2$ would look like?

5. Graph the above equations by making a T-chart or using a graphing calculator, to see if you were correct.

Class Activity #3:

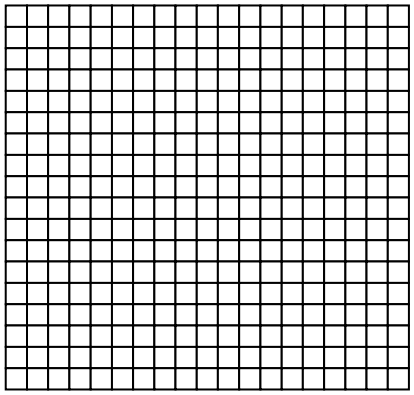
Swimming Pool

A contractor needs to build a swimming pool surrounded by a sidewalk of uniform width. She wants the dimensions of the pool and sidewalk together to be 16 meters by 20 meters.

- Write expressions for the length and width of the pool itself.

- Write an expression for the area of the pool.

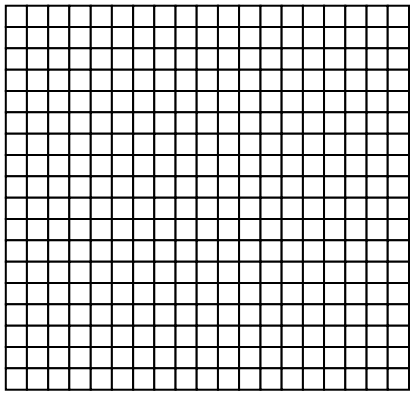
- How can you represent the area of the pool graphically?



- Find the x-intercepts.

- In this problem, what do the x-intercepts represent i.e. explain how each of the two values affect the size of the swimming pool?

- If the area of the pool was to be 192 meters…
  - Represent this graphically



  - Solve graphically for the width of the sidewalk
  - Explain how you got the answer
  - Solve algebraically to see if you get the same answer

(Recommended for Grades 11-12)

Class Activity #4:

1. When we looked at $y = x+2$ and $y = x^2+2$ we noticed that they looked just like $y = x$ and $y = x^2$, respectively, except for one difference.
   a. What was that difference?

   b. Given what you know about lines and parabolas how do you think that adding 2 would affect other shapes, for instance, what would $y = |x| + 2$ look like?

2. When we looked at $y = x+2$ and $y = (x+2)^2$ we noticed that they looked just like $y = x$ and $y = x^2$, respectively, except for one difference.
   a. What was that difference?

   b. Given what you know about lined and parabolas how do you think that adding 2 to the x would affect other shapes, for instance, what would $y = |x+2|$ look like? What about the circle $(x+2)^2 + y^2 = 1$?

   c. Think about what we did to the equations $y = x$ and $y = x^2$ to change them into equations whose graphs look just like $y = x$ and $y = x^2$ except they had moved up 2 units on the y-axis. If you did the same thing to the equation $x^2+y^2 = 1$ would the graph move up 2 units on the y-axis? Why or why not? How would you make the equation $x^2 + y^2 = 1$ move up 2 on the y-axis?

3. When we looked at $y = 2x$ and $y = 2x^2$ we noticed that they looked just like $y = x$ and $y = x^2$, respectively, except for one difference.
    a. What was that difference?

    b. Given what you know about lines and parabolas how do you think that multiplying by 2 would affect other shapes, for instance, what would $y = 2|x|$ look like? What about $2x^2 + y^2 = 1$?

    c. What do you think $x^2 + 2y^2 = 1$ would look like?

4. When we looked at $y = -x$ and $y = -x^2$ we noticed that they looked just like $y = x$ and $y = x^2$, respectively, except for one difference.
    a. What was that difference?

    b. Given what you know about lines and parabolas how do you think that multiplying by a negative would affect other shapes, for instance, what would $y = -|x|$ look like?

5. After learning how to graph lines and parabolas we used that knowledge to solve equations and systems of equations.
    a. How would you use graphing to solve the equation; $x + 2 = 2x - 5$ or the system of equations; $y = x^2 + 3$ and $y = (x+1)^2$?

    b. Could you use the same technique to solve the equation; $2|x-1| = |x-1| + 5$ or the system of equations; $x^2 + y^2 = 1$ and $(x-1)^2 + y^2 = 1$?