Super Tic-Tac-Toe and Coordinate Graphing

from CUNY Curriculum: What's My Rule?

Rationale:

Identifying and recording the location of a point on a flat surface is a critical skill for students in their work with graphs and functions. This game is a pleasant way of introducing students to graphing and ordered pairs.

Objective:

The student will be able to record ordered pairs as a part of playing Super Tic-Tac-Toe on a coordinate grid.

Materials:

One large sheet of 1" grid graph paper
Handout: *Super Tic-Tac-Toe* , adapted from Lessons for Algebraic Thinking by Marilyn Burns

Lesson Development:

1. This game was drawn from Marilyn Burns' Lessons for Algebraic Thinking, Grades 3-5. See pages 56-70 in that text if you want more information on how to introduce and develop this particular activity.
    I highly recommend all three texts in this series to math teachers in our programs. Ordering information is available on the CUNY Math Staff Development Website. Look under *Recommended Print Materials for Algebra*.

2. Take a sheet of 1" grid graph paper and cut a 9 x 9 section. Use a dark marker and a ruler to create the dark lines and arrows shown here.
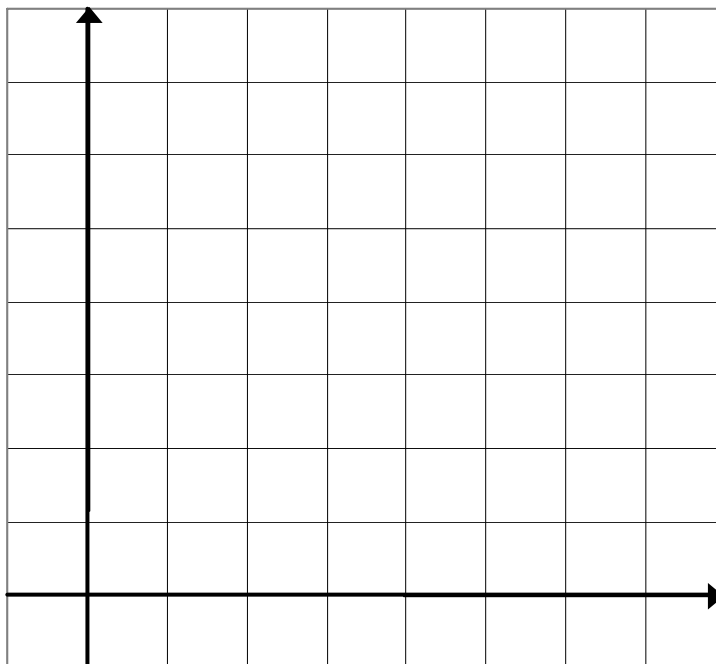
3. If you can create a grid with squares that are larger than one square inch, use it. Do not, however, try to hand-draw a grid on the board. What you may gain in size you will lose in precision, which could complicate your students' understanding.

4. Tape your grid to the board, and add the triangle and square markings beside the arrows. See the diagram.

   If you are using the 1" grid, you probably will need to ask your students to cluster around the board to be sure they can see and discuss what is happening.

5. Here is a possible introduction to the game for your students.

   You are going to be learning about graphing and algebra by playing a game called Super Tic-Tac-Toe. The rules are similar to regular Tic-Tac-Toe, except in this game the X's and O's will be placed where the lines cross and not in the spaces. Also, you will need to get four in a row to win, not three. You may get four horizontally, vertically, or diagonally.

   Write the words horizontal, vertical, and diagonal on the board so you and your students may refer to them later.

6. You, the teacher, will play against the class. You will be X's and the class will be O's. You will play first. Choose any numbers you like between 1 and 8. Let's assume you choose 4 and 7. I am intentionally avoiding 0 for the moment, even though it is possible to graph points with that value.

7. Write the following table beside the graph, where we will record the moves. Write the table large enough so that all students can read it clearly.

8. After recording the first numbers in the table, go to the "game board". Four is under the square, so you will make 4 "jumps" or "hops" towards the square from the place where the dark lines cross. It is a good idea to name that place the "origin" and put that word on the board. That is a word that will be used again.
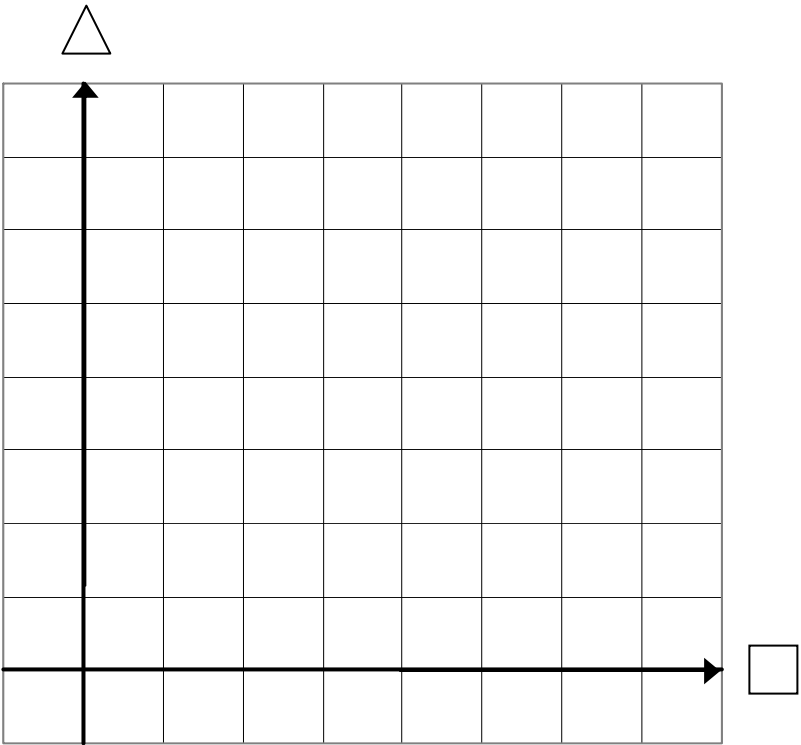
| X	
□	△
4	7

9. After showing the jumps towards the square, ask them what they think the 7 indicates. It tells us to make 7 jumps towards the triangle (up).

△

10. Once you have made both moves, put an **X** in the appropriate spot. See the diagram. It is worth mentioning that you draw the X only after you finish <u>both</u> moves.

X

□

11. Ask a student to give you 2 numbers between 1 and 8. Let us assume the numbers were 3 and 5.

12. Draw a second table to record the O moves. Your students should be able to fill in numbers and identify the placement on the graph.

O

□	△
3	**5**
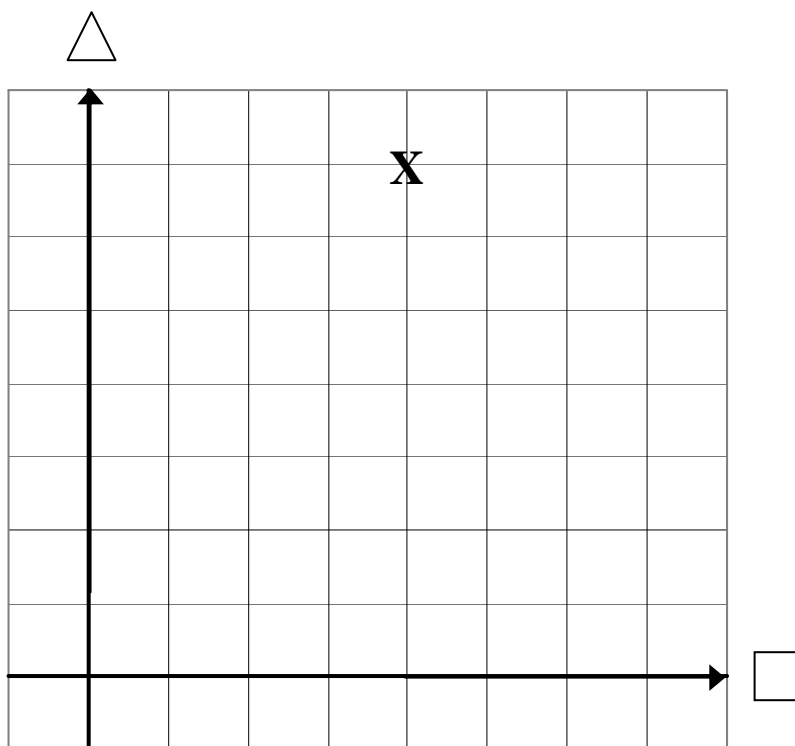
13. From this point forward, continue trading moves against the class. It is okay if a student wants to come up to count out where their next move should be. As much as possible, try to get different students to name coordinates, and ask students to confirm that the coordinates are correct. Once a few letters have been placed, you can stand back and let the students fill in both tables and record the X's and O's on the board. Remember to use a pencil on the grid, because there will be some

△

X

O

□

*Super Tic-Tac-Toe and Coordinate Graphing*
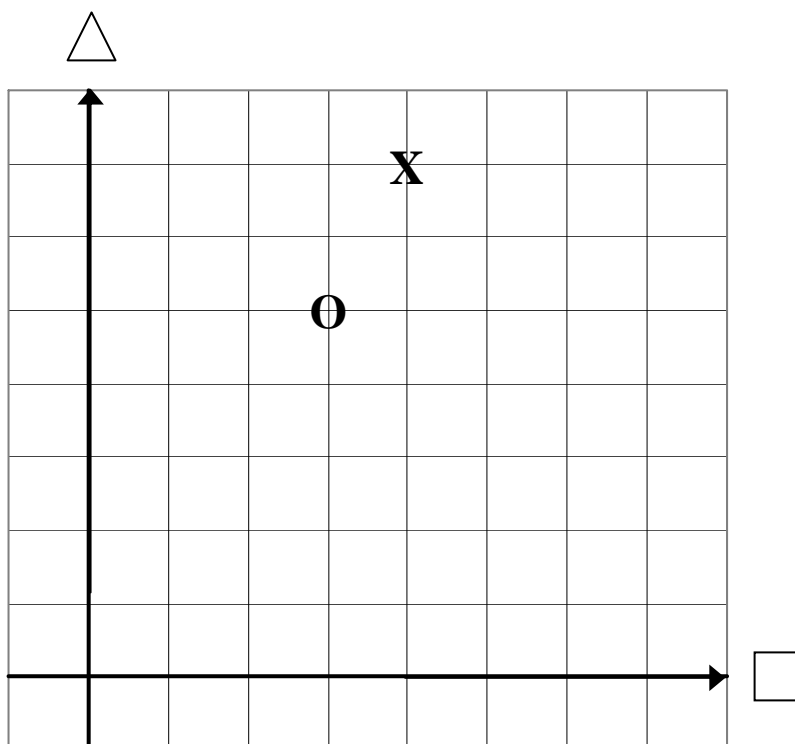
errors. When incorrect coordinates are given, or a letter is put in the wrong spot, allow time for other students to identify the error before you intervene.

14. Once you have completed one game as a whole, give them the handout *Super Tic-Tac-Toe* and ask them to play against each other. You could have students play individually, but it might work better to have pairs of students compete. That allows more peer checking for accuracy, and it means weaker students can be helped by stronger ones as you circulate.

15. Be sure that students are recording their moves in a table. If they simply write X's and O's on the grid, they are learning nothing about identifying coordinates.

16. Other games such as *Battleship* can help students identify coordinates, but the advantage of this game is that coordinates are made up of two numbers. *Battleship* uses numbers and letters and in this way is a bit different from the traditional *xy*-grid we are aiming towards in the upcoming functions lessons.

17. Do not worry about attaching *x* or *y* to the axes at this point. That will come later. Give your students a chance to play the game in class a few times, and not only on the day you introduce it. Play the game once a week for a few weeks to quicken the graphing skills.

18. At some point, one of your students is probably going to ask if you can play on one of the dark lines. You can say "yes" to this, but watch carefully to see how they label the coordinates.

    Imagine that a student wants to give the coordinates for the X you see pictured here. Ask the student how they think they should record the coordinates. You must make four jumps towards the square, and no jumps at all towards the triangle.

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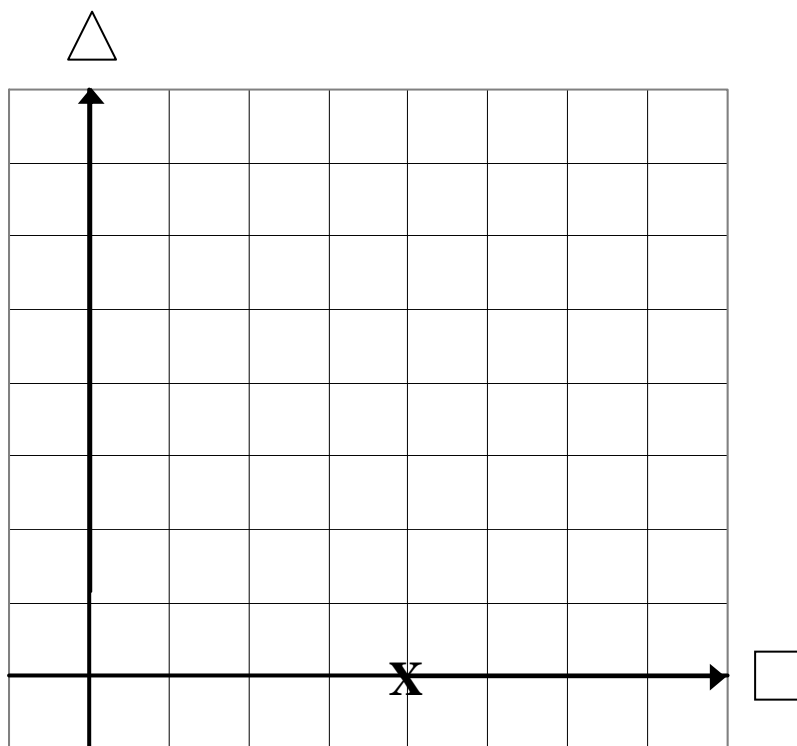
19. Once this arises for the first time, call the class together and show the letter location to the whole group on the board. Lead a discussion (using questions) about what the coordinates should be. Your students will probably be able to identify the correct coordinates without your direct help. Also include an example that lies along the vertical axis.

20. If students ask if they can play a letter outside of the dark lines, simply say "no". There is no need to address negative numbers at this point.

Super Tic-Tac-Toe