

## Algebra Walk Plan

1. Before going outside, give each student a data sheet (BC-1 Resource Page) and at least one colored card with one of the integers between -6 and 6, written on the left half of the card. There should be thirteen cards for each color, one for each x-value. Each color relates to one of the equations in BC-1 parts (a) through (e). Each student will also need a pencil for sketching the “human graphs” while outdoors.
2. Once outside, situate students so they are facing the x-axis, looking toward the positive y-direction. This orientation is important because it corresponds to the standard orientation we use when graphing.

Call for students with red cards to find their places along the horizontal axis. The students should stand with both feet on the x-axis facing the positive “y” direction, with their backs to the rest of the class. Start with BC-1 part (a),  $y=2x+1$ . Give the following directions: “Be sure you are standing on the mark that corresponds to the number on your card. Look at the number. Multiply it by 2. Add one. (Pause) Got it? Record the resulting number on your resource page. When I say “GO”, take that number of paces forward or backwards. A pace is the distance between two marks on the vertical axis. Ready? GO!”

Mistakes will be made. Encourage students to help each other out. In most cases, the students will handle corrections themselves. Resist the urge to manage this yourself.

3. Have the student observers complete the appropriate section of their data sheet. They should roughly sketch and describe each shape they see. You may need to modify the sheet if the colors of your cards and dots are different.
4. Repeat this process for each rule on the resource page. You might have students who do rule (c) stay in position while others graph rule (d), to introduce the idea of the intersection of lines.

If you want to extend the exercise, have a set of students take two steps to their right after they have created a graph of a function. Ask them what features of the graph change and what features stay the same. This begins an intuitive introduction to translations that will appear occasionally during the year.

5. Back in class: record data on one large graph using poster graph paper and sticky dots. Have teams of students record their (x,y) coordinates in tables for each rule on the chalkboard, or ask for verbal responses for each separate graph and record the data yourself.
6. Lead a discussion after students complete BC-1 (f) and (g) or have students complete these questions on the back of their data sheets in their study teams.

If the outdoor activity cannot be done due to weather, one alternative is to do the activity as described using the floor of your classroom. Another method is to use large poster graph paper, but this should be avoided if at all possible. Doing this problem outside makes this one of the most memorable and enjoyable problems of the year.

## Algebra Walk Notes

- Students without cards will be observers. Anticipate (or prompt) a question, what do I do for negative 2 paces? Ask the class what they should do. People will suggest going backwards on their own.
- The graphing on graph paper piece is important as we try to tie the experiences being the points to the actual coordinate system. It's not trivial to go from the live perspective to the top-down perspective.
- PRIME Teachers made the following excellent suggestions.
  - Instead of using ropes, use masking tape. Better in the wind.
  - Have each graph point hold a rope so people can see the collective shape better.
  - Or people who are points of the same graph could wear the same color shirt.
  - People who are points can sit down so observers can see better, and even walk around the graph.
- Extensions. I might try after  $y=x^2$ , to say every point get a friend (or use purple cards). That friend will take 7 paces backwards from the original point. What graph do you get? Is it a graph of  $y=x^2$ ? What is it a graph of? ( $y=x^2-7$ ). Next, friends will do something new. Take your shared x and add 2, THEN square it. How does the new graph compare to the old? What is the equation of this graph? It's not  $y=x^2$ , it's  $y=(x+2)^2$ . The new graph shifted 2 to the left of the old graph. Why? Instead of adding 2 then squaring, I could have cheated and asked my original graph friend two x units to the right for her answer.