Stairs -- Part I

To execute the **stair()** program, you can either
◊   type in the word "stair" followed by a pair of empty parentheses, or
◊   fetch the word from 2nd VAR-LINK (or CATALOG F4), and add the closing parenthesis.

Then, press ENTER. You will see a pop-up menu. Choose **Stair.** The program will ask you for the x and y coordinate of a starting point, and the rise and run of the staircase. (Unfortunately, you are in ALPHA mode, so you need to start by pressing ALPHA to get out of it and have access to the numbers.) For example, enter the following inputs (to delete errors, use ←):

        x: 0
        y: 0
        Run: 1
        Rise: 2

Press ENTER, twice if necessary. The program will draw a staircase by starting at the origin, and going up 2 and over 1, repeatedly until it gets off the screen. Then it draws a straight line back to its starting point. At that point:
◊   To try a different staircase, press ENTER, and then select **Stair**.
◊   To erase all staircases, press ENTER, and then select **Erase**.
◊   To quit the program, press ENTER, and then select **Quit**.

1. Try making various types of stairs. Write down some notes about how you achieve these results.
    a. Some should go up, some down.
    b. Some should be steep, some not.
    c. Some should sit on top of their line, some should hang below it.

2. What happens when you use 0 for the rise? For the run? (For this, don't start at the origin.)

3. Record the inputs you use to solve these problems.
    a. Draw a staircase that starts in the lower left corner and goes to the upper right corner.
        ... Now start at the top right, and go back to the bottom left, getting the same line.
    b. Similarly, draw a staircase that starts in the upper left corner and goes to the lower right corner.
        ... Now start at the bottom right and go to the upper left, getting the same line.
    c. Explain how you did this.

4. Erase. Now draw two staircases with the same line, but different-sized steps. Explain how you did it.

5. Erase. Now draw two staircases with parallel lines. Explain how you did it.

6. **Challenge**: Draw two staircases with perpendicular lines.

Staircases -- Part II
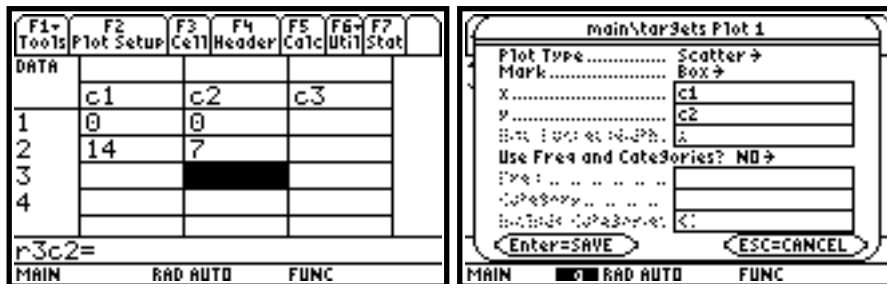
1. If you are in **stair()**, quit. Enter the two points $(0, 0)$ $(14, 7)$ in the data editor (APPS 6, NEW. You might name the data set "targets".) Then use ◊ Y= PLOT 1, ENTER to show both points as little boxes (**Scatter** plot, **Box**, **x…**c1, **y…**c2). Check the boxes are displayed on the graph by using ◊ GRAPH. Finally, press HOME and use **stair()** to draw a staircase whose line goes through both points. (It is OK to start on one of the points.) More than one staircase would be even better. You may use graph paper to plan your move.
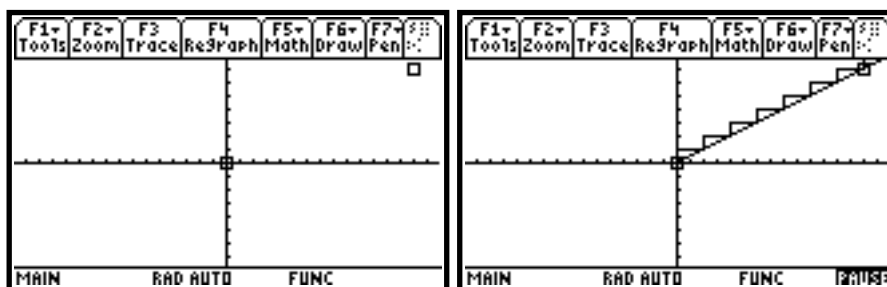
2. Repeat #1 for each pair of points. Be sure to erase and quit between problems, in order to be able to go back to the data editor and enter the new points. When you go to the data editor (APPS 6) choose CURRENT rather than NEW, and replace the old points by the new ones.
    a. $(5, 4)$ $(-10, -5)$
    b. $(-10, -3)$ $(8, 3)$
    c. $(1, -5)$ $(5, 3)$
    d. $(-5, -1)$ $(9, 6)$

3. Erase and quit. For each problem, use Y= to graph the equation, and then use **stair()** to draw a staircase whose line matches the given line exactly. Write down how you did it.
    a. $y = x / 3$
    b. $y = 2x - 1$
    c. $y = -3x + 2$

4. For each problem, make the stairs, and then find the equation of the line. Check by graphing the line, perhaps with the style "thick" (**Style** is in F6 in the Y= editor).
    a. x=0, y=3, Rise=2, Run=-3
    b. x=2, y=3, Rise=-5, Run=2

5. Make interesting staircase designs.