Inside the Coordinate Grid
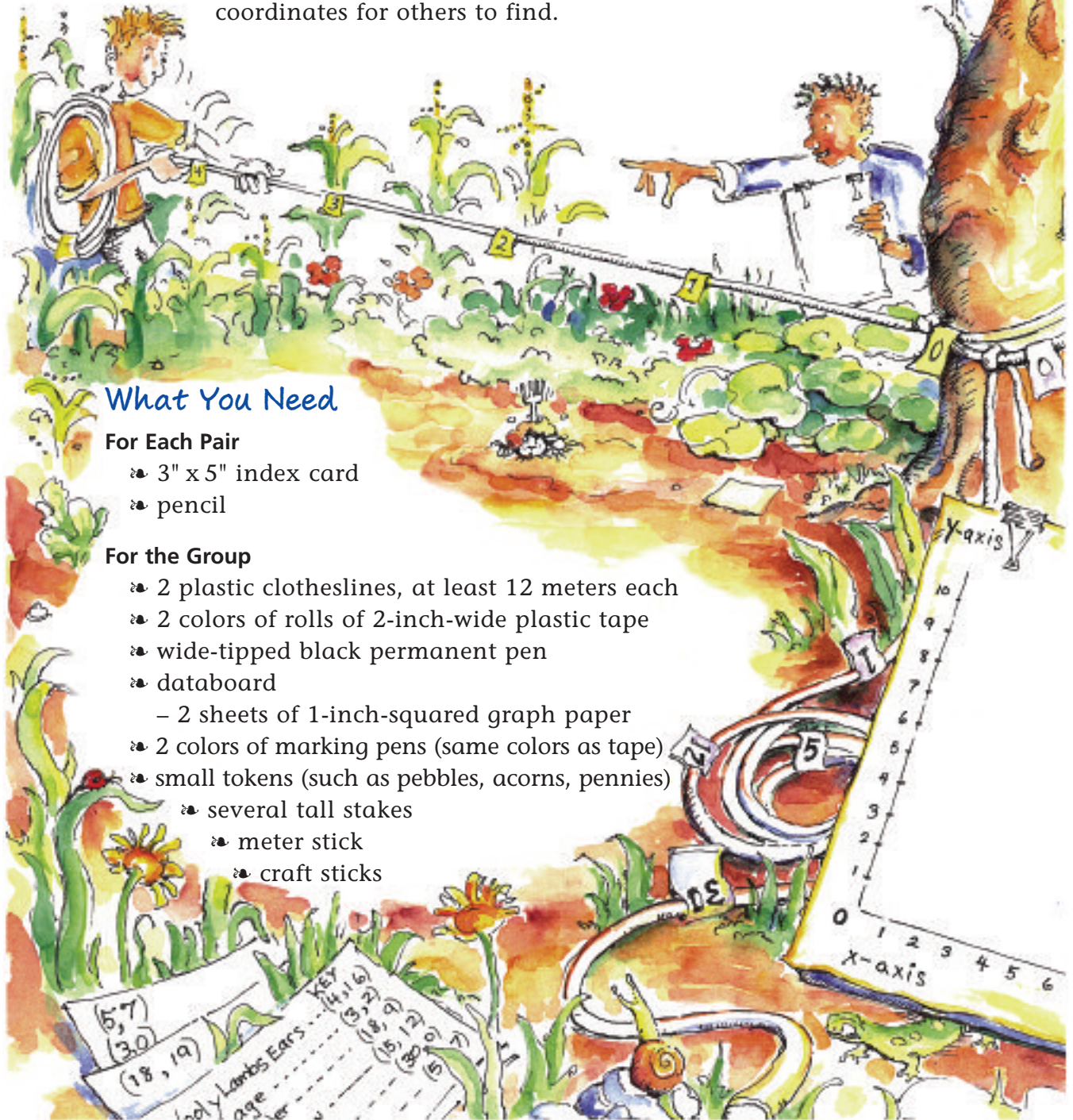
Ages 8-13

This activity introduces an *x*- and *y*-coordinate grid and graphing language to locate points in the garden.

Youth use coordinates in a life-sized grid to find locations of items in the garden. They then place stakes in the garden grid and record the coordinates for others to find.

## What You Need

For Each Pair
- 3" x 5" index card
- pencil

For the Group
- 2 plastic clotheslines, at least 12 meters each
- 2 colors of rolls of 2-inch-wide plastic tape
- wide-tipped black permanent pen
- databoard
  – 2 sheets of 1-inch-squared graph paper
- 2 colors of marking pens (same colors as tape)
- small tokens (such as pebbles, acorns, pennies)
- several tall stakes
- meter stick
- craft sticks

Getting Ready

1. Make two grid axes from the clotheslines. Leave enough line at the ends to tie them to garden structures. Place pieces of plastic tape numbered at 1-meter intervals on each of the lines. Start numbering with a zero and continue through 10. Use a different color tape for each line — one for the *x*-axis and one for the *y*-axis.

2. On each sheet of graph paper, draw and label a coordinate grid with numbered *x*-axis and *y*-axis. Use the pen color that matches the axis color of the clothesline. One grid will be your "master" with locations, and the other will be a display grid used with the youth.

3. In the garden, tie the two numbered lines about 2 feet above the ground to the same object so that the zeros overlap. Extend the numbered lines to form a 90° angle. Standing with your back to the (0,0) location, the *x*-axis is on your right, and the *y*-axis is on your left. As needed, use garden structures and stakes to keep the lines straight and off the ground to be easily seen.

4. Choose about 10 objects in the garden that cannot move and are inside your *x*- and *y*-axis lines. Make a key for the activity by recording these objects with their coordinates on the master grid with the *x* coordinate first, followed by the *y* coordinate (*x,y*).

5. For each pair of youth, make a card with the coordinate locations of at least 5 of these mystery objects. Sequence them differently on each card. This way each pair starts at a different place in the garden.
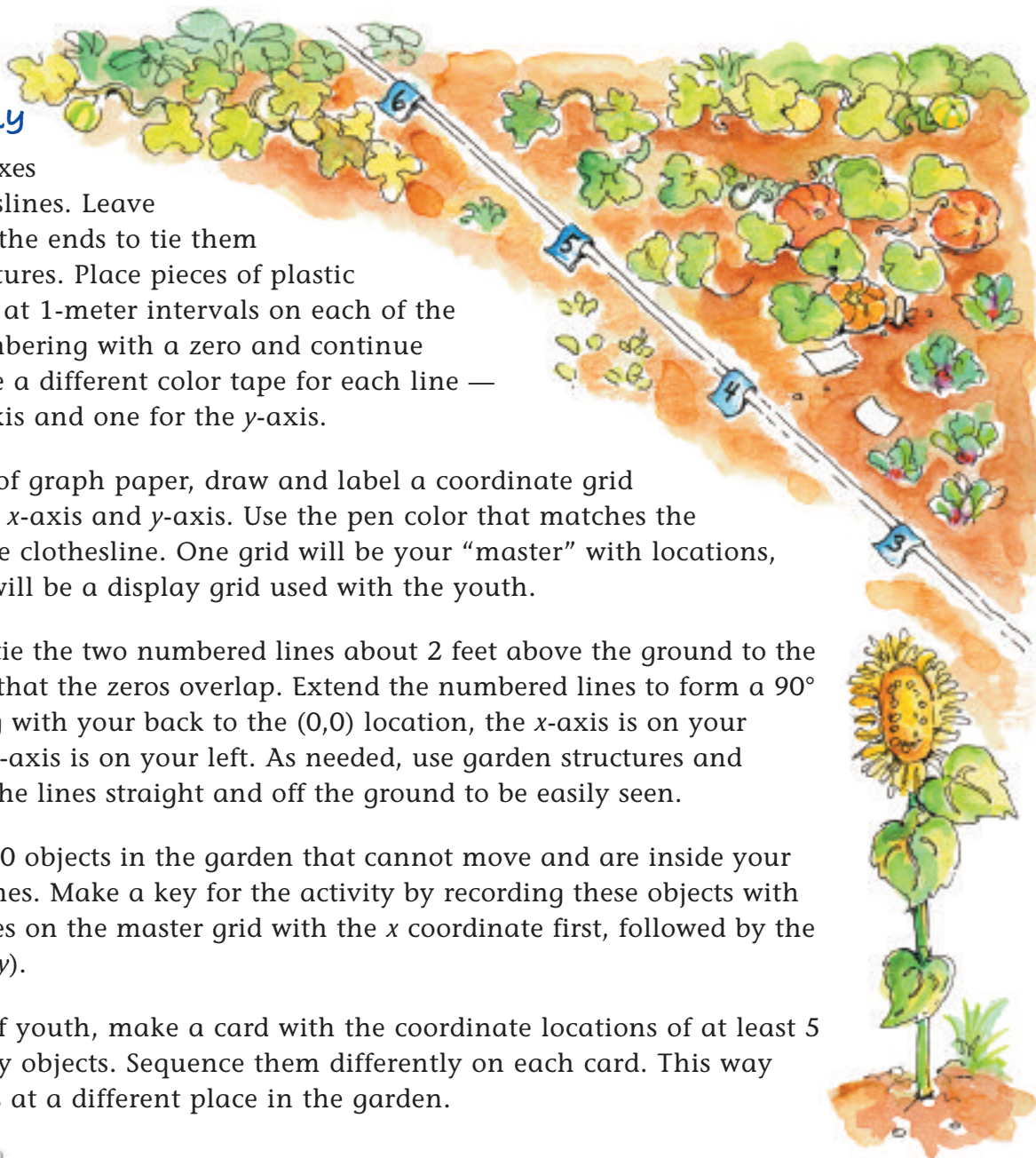
Here We Go
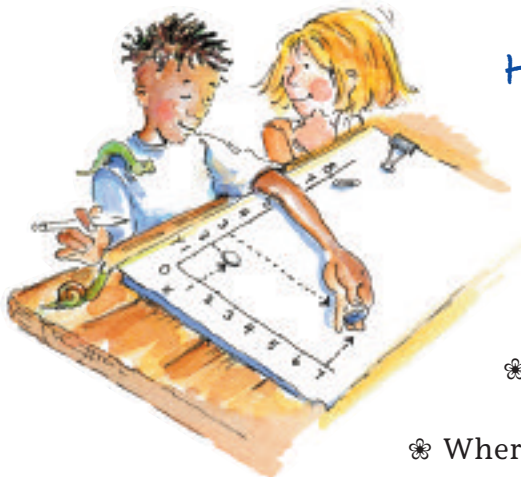
1. Out in the garden, gather around the databoard. Find out what the group knows about coordinate grids. Ask:
   ❀ Who has seen or used a grid like this before? For what purpose?
   ❀ Where is the *x*-axis? [It's the horizontal number line across the bottom.]
   ❀ Where is the *y*-axis? [It's the vertical number line up the side.]
   ❀ Where is the origin point? [at (0,0)]

2. Demonstrate how to use coordinate numbers to locate a specific point on the

display grid. Place an object on the grid. Move your finger along the *x*-axis until you get to the *x*-coordinate number below the object. Then move your finger vertically to get to the object at the *y*-coordinate. Read the *x*- and *y*- coordinates.

3. Tell them that mathematicians have agreed to use this order to name points in a coordinate grid. First they read the corresponding number on the *x*-axis (horizontal line) and then the *y*-axis (vertical line).

4. Place a new object on the grid and ask participants to name its coordinate numbers.

5. Show how (5,7) is different from (7,5). Demonstrate how if you reverse the *x*-coordinate and the *y*-coordinate, you are at a different point. Remember that by convention, *x* goes first, then *y*.

6. Have the youth practice locating spots on the grid:
   a. One at a time, have each person select an object and place it on a grid point.
   b. Have another person name the coordinates.
   c. Everyone takes a turn placing an object and others name its coordinates.

Finding Mystery Spots in the Garden

1. Gather the group at the (0,0) point of the clothesline axes. Practice locating points using this large-scale grid. Stand at (0,0) and ask two participants to join you, one to be the "*x*-axis walker" and another to be the "*y*-axis walker." Ask the "*x*-axis walker" to walk to the *x*-coordinate and stop. Ask the "*y*-axis walker" to walk to the *y*-coordinate and stop. As the children walk, the group "counts" off the numbers.

2. Now have the walkers turn and face into the grid. Tell them to walk a straight line into the grid. They will meet at the intersection of the coordinates.

To help youth walk in a straight line, suggest they look at something in front of them beyond the grid as they walk.

3. Give each pair one of the cards with mystery coordinates and ask them to write

their names on the front. Have them locate the coordinates on their cards by walking the *x*-axis and *y*-axis lines into the grid and writing down what they find at each point in the grid.

4. Tell the youth to check back with you about their findings. Help them as needed. Ask questions, such as:
   ❀ How did you locate this place?
   ❀ Which axis did you use first?
   ❀ What would happen if you used the other axis first?
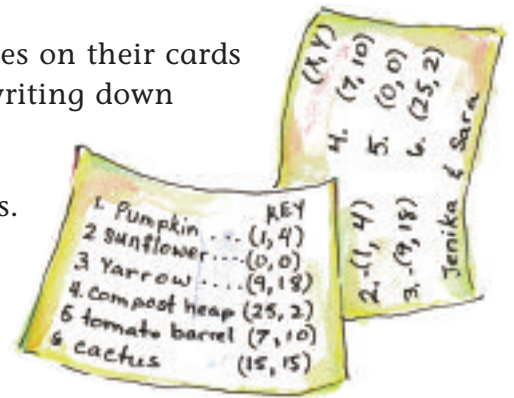
5. As pairs finish finding all of their mystery objects, give them this new challenge. Have them place a stake at a new location in the garden grid for other pairs to locate. Have them record the *x*- and *y*-coordinate numbers for their stake on the back of their card and return it to you.

6. Distribute these new mystery coordinates to pairs as they are ready.

Discussing the Activity

Pose a few questions to start a discussion of the activity. Ask:
   ❀ What techniques helped you succeed?
   ❀ If you chose a "treasure" located between two numbers, how did you indicate this coordinate? What are other ways? [used .5 or 1/2, added plus sign to indicate more]
   ❀ How can a coordinate grid be a helpful tool in the garden? [assigning task locations, making a map, recording observations, keeping track of changes over time]
   ❀ How else could a coordinate grid help you? [making a mural, playing a game, building a playhouse, creating a baseball diamond]

More Math in the Garden
(Especially good for ages 10–13)

Negative Numbers Extend the axes beyond the (0,0) to include negative numbers. Make two more numbered lines, one for negative *x* and one for negative *y*. Use corresponding colors of tape as you previously used for the positive *x*- and positive *y*-axes. Be sure to label these numbers with a negative sign. Find "mystery spots" using the four-quadrant grid.
a. Draw a four-quadrant grid on the databoard, and illustrate locations in each quadrant.
b. Practice finding spots on the databoard grid with the group.
c. Next, go to the garden grid and have the group locate given coordinates.
d. Finally, have pairs determine and record their own "mystery spot" coordinates, and try to find each other's spots.