X's and O's

Grades 3–5

Goals

- Locate points on a rectangular coordinate plane using ordered pairs
- Use the point of origin (0, 0) as a point of reference
- Understand and use positive and negative integers to identify points in four quadrants

Prior Knowledge

The students should be familiar with number lines and moving forward and backward along them. They should know *left* and *right* and be able to name positive and negative numbers. (Thermometer readings in weather reports are useful in establishing the vocabulary for positive and negative numbers.) Through graphing activities, the students should have had multiple experiences using grids. It would also be helpful for them to have played ticktacktoe, or at least be familiar with the game. They should have practiced writing explicit instructions. As an example, you might perform an activity (e.g., get out from under a desk, make a peanut-butter-and-jelly sandwich, go to a closet and open the door to remove a designated item) at the direction of a student.

Materials and Equipment

pp. 109–12

- A copy of blackline masters "Coordinate Grids, A–D" for each pair of students
- An overhead projector with a transparency copy of each coordinate grid
- Transparency markers and crayons or colored pencils (one red, one blue)

Learning Environment

For the modeling activity, divide the class into two groups. Designate one group the blue team and the other the red team. During the exploration time, students work in pairs.

Important Geometric Terms

Coordinate points, ordered pair, x-axis, y-axis, point of origin, horizontal, vertical, diagonal

Activity

Engage

Tell the students that they are going to play a game similar to ticktacktoe. Half the class, the red team, whose symbol is *X*, will play against the other half, the blue team, whose symbol is *O*. Display "Coordinate Grid A" on the overhead projector, and discuss how the game is to be played: You will call one of the teams. One person from

the team will tell you where to place an *X* or *O* by naming an ordered pair. All the students' responses must be given in terms of ordered pairs. Explain that the first number called locates the position along the *x*-axis and the second number of the ordered pair locates the position along the *y*-axis. Be sure that the *X* or the *O* is placed on the intersection of the grid lines.

When you play the game, emphasize the point of origin as you count aloud from the origin to represent the first number in the ordered pair. As the students give you successive coordinate points, plot them on the graph. The first team to have four *X*s or four *O*s in a row—horizontal, vertical, or diagonal—will be the winner.

Allow time for the teams to discuss who their spokespersons will be and to talk about their strategy for the placement of their symbol (*X* or *O*) on the first move. You might post the following questions in the classroom to stimulate discussion and help the students develop problem-solving strategies. Then repeat the questions after the first game has been completed.

- What are some strategies that will help you win this game?
- Is there a pattern?
- Is it better to try to get your marks in a row or to try to block the other team?
- How will you play the game differently next time? (*Use this question in the discussion after the first game.*)

Play the game again on the same grid, recording the *X*s and *O*s exactly as the teams indicate. Remind the spokespersons to check with their teammates before calling out the next move. Allow time for consultation if necessary. Note the changes in the strategies that each team is implementing. Incorporate your observations into the discussion after the second game. Again discuss the questions in the list above. The students may share ideas such as "It is always better to begin with (2, 2) if you want to win" or "You need to get your first two in a row and then block the other team." You might want to try the game in this format once more or move on.

Explore

Distribute "Coordinate Grid A," pair the students to play the game, and observe them as they play against each other. Listen to their conversations, and challenge their thinking with questions similar to those posed earlier. Ask additional questions such as these to help them think about their problem-solving strategies:

- When did you know you would win?
- What does it take to win this game?
- Would the game be harder or easier if we added more rows? Why?

Assess

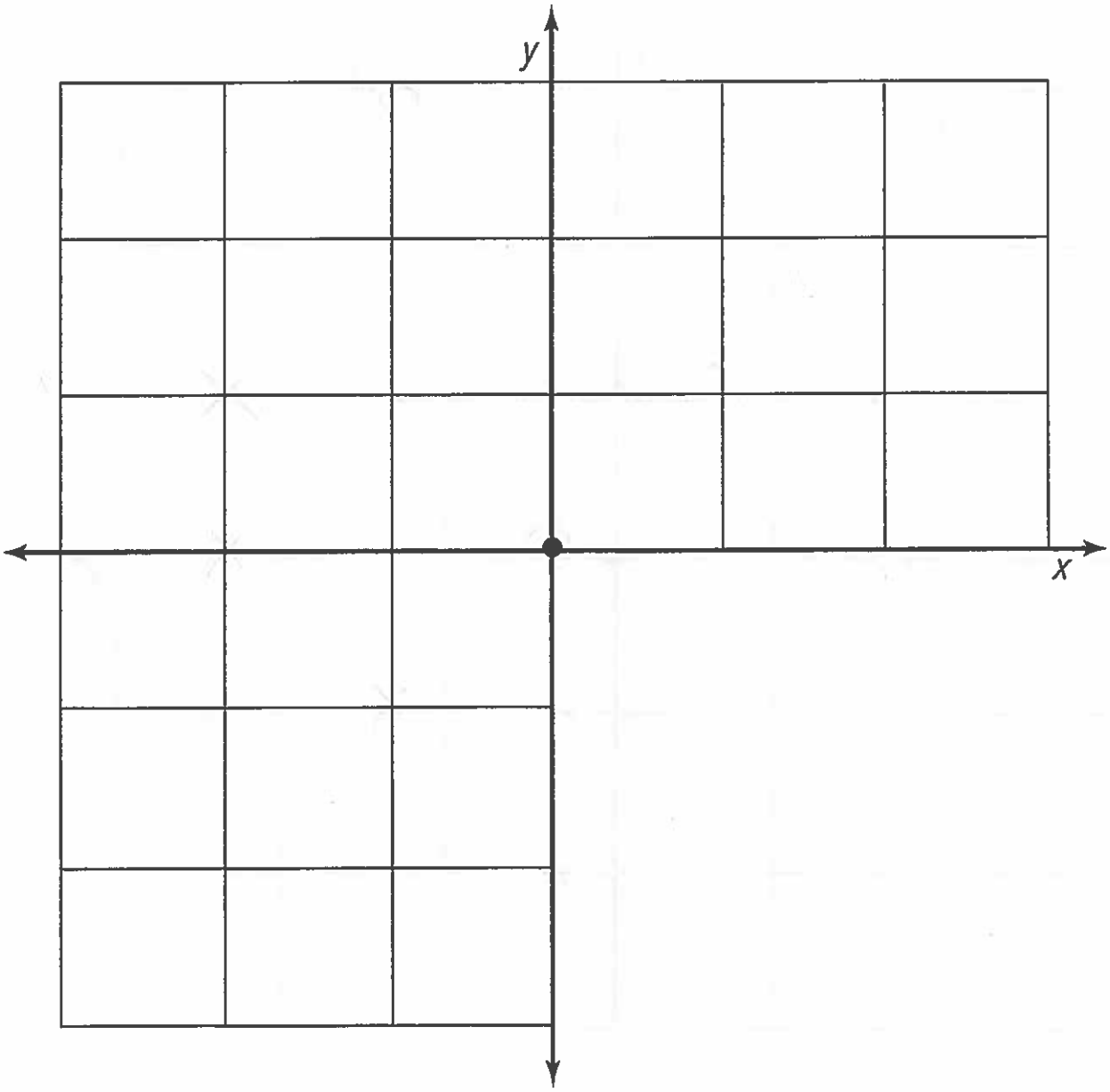
Have the students write in their journals, using prompts such as these:

- How do you think you can win the *X* and *O* game?
- Write down directions for another student to follow in placing your symbol. Be sure to be specific so that your *X* or *O* is placed where you want it to be.

You may want to research games of other cultures with features similar to those of tacktacktoe. For example, "go" and "go-moku," played in Asian cultures, require placing five markers in a row.

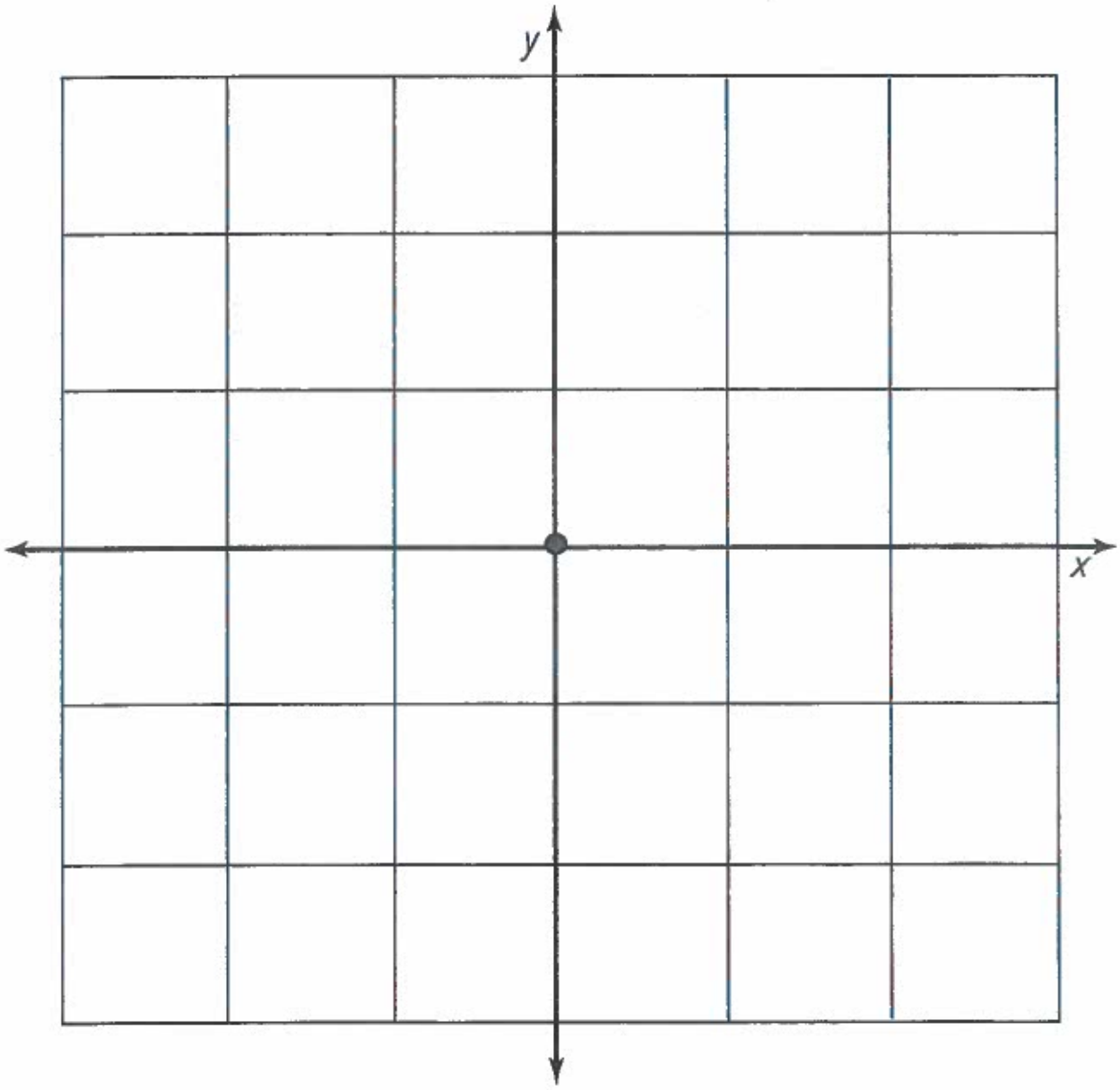
Coordinate Grid C

Name _____



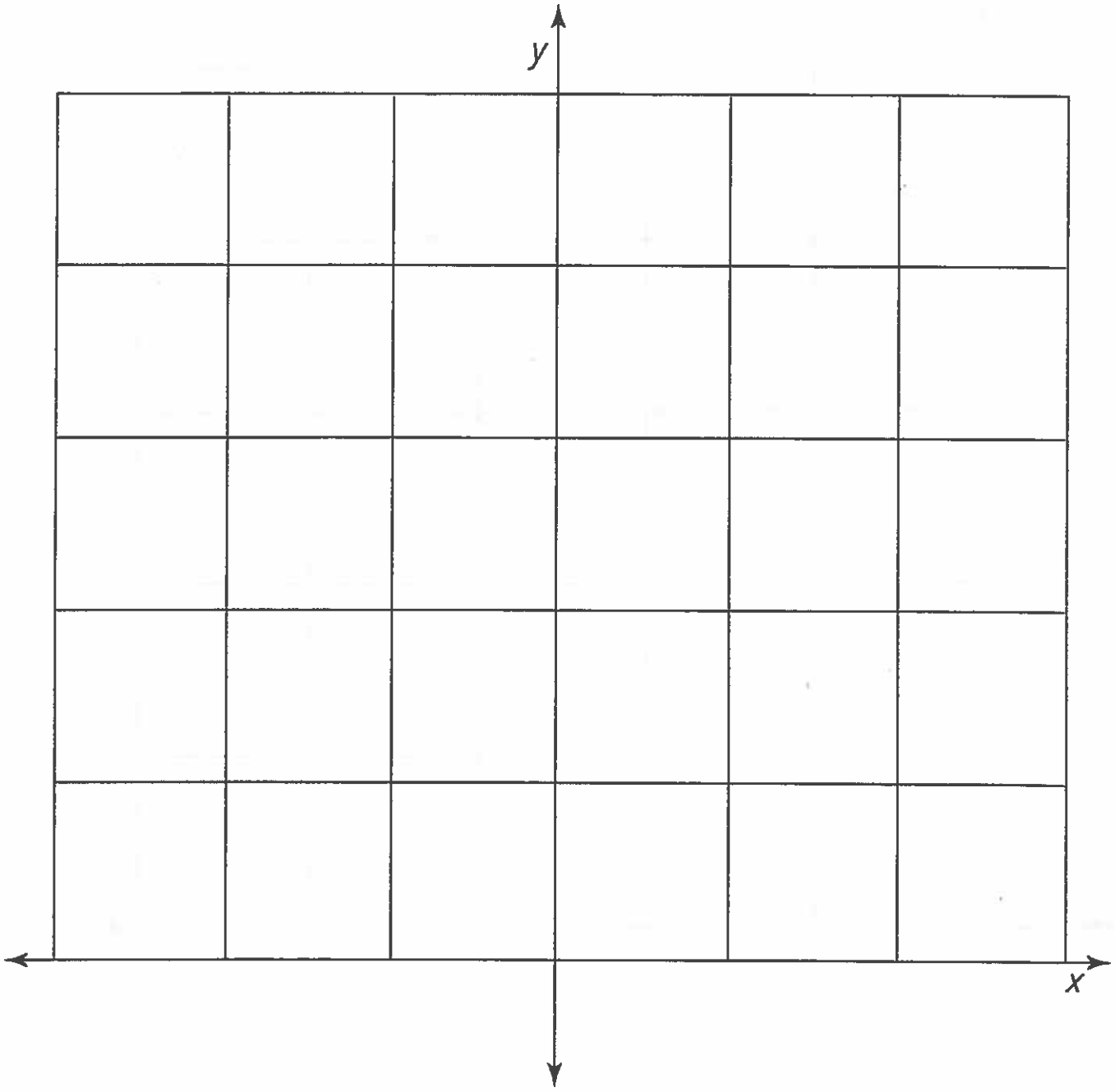
Coordinate Grid D

Name _____



Coordinate Grid B

Name _____



Coordinate Grid A

Name _____