

Sessions 7 and 8

Mystery Graphs

Materials

- Paper 11" by 17" or larger (2 pieces per group)
- Light and dark pens (1 each per group)
- Student Sheet 16 (1 per student, plus 1 cut up)
- Posted copy of list on Student Sheet 16

What Happens

Students make line graphs that show how the population changes throughout a day in different (unnamed) places or activities. The class tries to match the mystery graphs to a list of places and activities. Students revise their graphs to clarify anything that was confusing, and make a display to post outside the classroom. Their work focuses on:

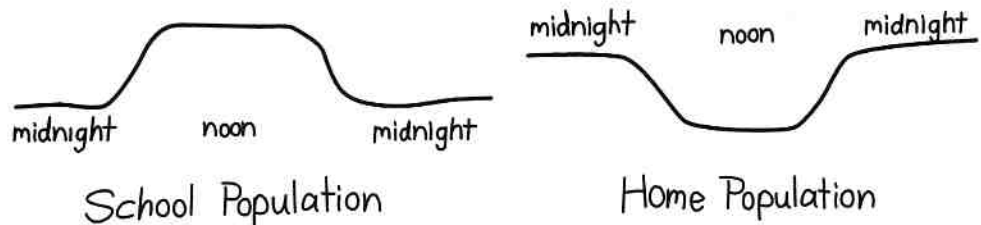
- making and interpreting different graphical shapes

Activity

Making Graphs of Changing Population

Explain that students are going to make “mystery graphs.” These graphs will show how the population of a certain place or a certain activity in your local area changes over 24 hours, on a school day. Then others in the class are going to try to guess which graph goes with each place or activity. These should be simple line graphs without numbers, similar to the plant graphs on Student Sheet 14.

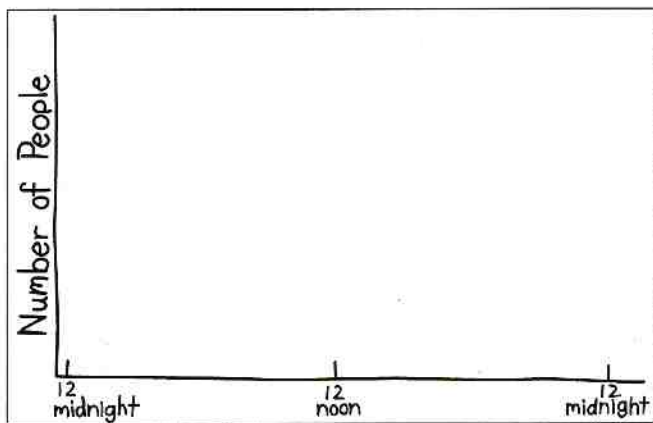
Remind students about the shape of the home and school population graphs you discussed earlier. Draw these shapes on the board, listing some times along the horizontal axis.



Point out that you are not showing exact numbers of people, and students should not use actual numbers in their mystery graphs, either. The graphs should just compare times when there are many people, few people, or no people.

Split the class into small groups of 3–4 students to make the mystery graphs. (Students need not work with the same partners from earlier sessions.) Hand out two large sheets of paper to each group. Suggest that they use a pencil to make a rough draft first. Then they can go over the lines with a light-colored marking pen so the graph can be seen from the front of the room. (They will use darker marking pens to make corrections later.)

Suggest that students place the paper with the longer dimension horizontal. They draw a line near the bottom of the paper for a horizontal axis. Along the line, they write 12:00 midnight at each end and 12:00 noon in the middle. They may write in other hours if they wish. They draw a vertical axis and write next to it only the words *number of people*. They do not write *any* numbers along it.



Hand each group of students a slip of folded paper with the name of a place or an activity from the cut-up copy of Student Sheet 16. Tell students not to let other groups know what they will be graphing, and not to put titles on their graphs. After they look at the piece of paper, they should put it away, out of sight.

Allow your students only 10 or 15 minutes to make their graphs. Warn them when there are only 2 or 3 minutes left to work.

While students are working, try to get around to every group. As you circulate and talk with students, encourage students to think about whether their graphs show precisely what they mean to show. Describe to them the story of their graph as you see it. For example, here is a description of TV watching that the students didn't intend:

Here the line slopes up gradually between about 3 o'clock and 9 o'clock in the morning. More and more people must have started this activity all through that six-hour period of time.

If what you describe is not what they intended, then they may have to rethink the shape of their line.

Here the line goes up fast around 6 o'clock in the evening. It looks as if a lot of people start that activity all at once.

This hump is almost twice as high as this one. Were there twice as many people there at that point?

On this graph, the line never goes all the way to the bottom. There is always someone there.

There are two humps at about 12 noon and 9 o'clock. Those must be the times when a lot of people were there.

This line is pointed at the top. The most people were there for just a short while.

This graph has several high spots. People came and went in several groups.

When most groups are nearly finished, begin to collect the finished graphs and post them at the front of the room. For identification, write a different letter on each graph.

Activity

Discussing the Shapes of the Graphs

As the class views their displayed work, focus attention on one graph at a time. Ask students to notice the shape of the curve. They are not to guess yet what place or activity is depicted, just to make observations about the shape of the graph and what they can deduce from it. To give students the idea, begin with some comments like those you made to individual groups about the shape of the graph and what it means. Ask the authors of each graph if what the class sees is what they intended to show. For a sample discussion, see the **Dialogue Box**, *The Shape of Mystery Graphs* (p. 69).

Making Small Revisions Students take back their graphs to revise them as needed. Hand out dark-colored pens. Students do not make new graphs, but put in new parts of lines with the darker pen and draw over the old parts of lines they want to keep. Even the most accurate of the graphs may need to have a small change, such as making the slope of a line steeper to show that people came or went during a shorter period of time.

Remind students that their goal is to make the graph communicate so well that their classmates can guess which activity it describes; they are not trying to stump the others. Tell students that they will have a chance to make a clean copy of the graph later, so they should focus now on correcting the graph to make it as clear and accurate as possible.

Matching Graphs to Activities

Collect and post the groups' corrected graphs. Then post the large list of Mystery Places and Activities, and hand out Student Sheet 16. (To make the task a little easier, you might tell students to cross off a few of the options that no one graphed.)

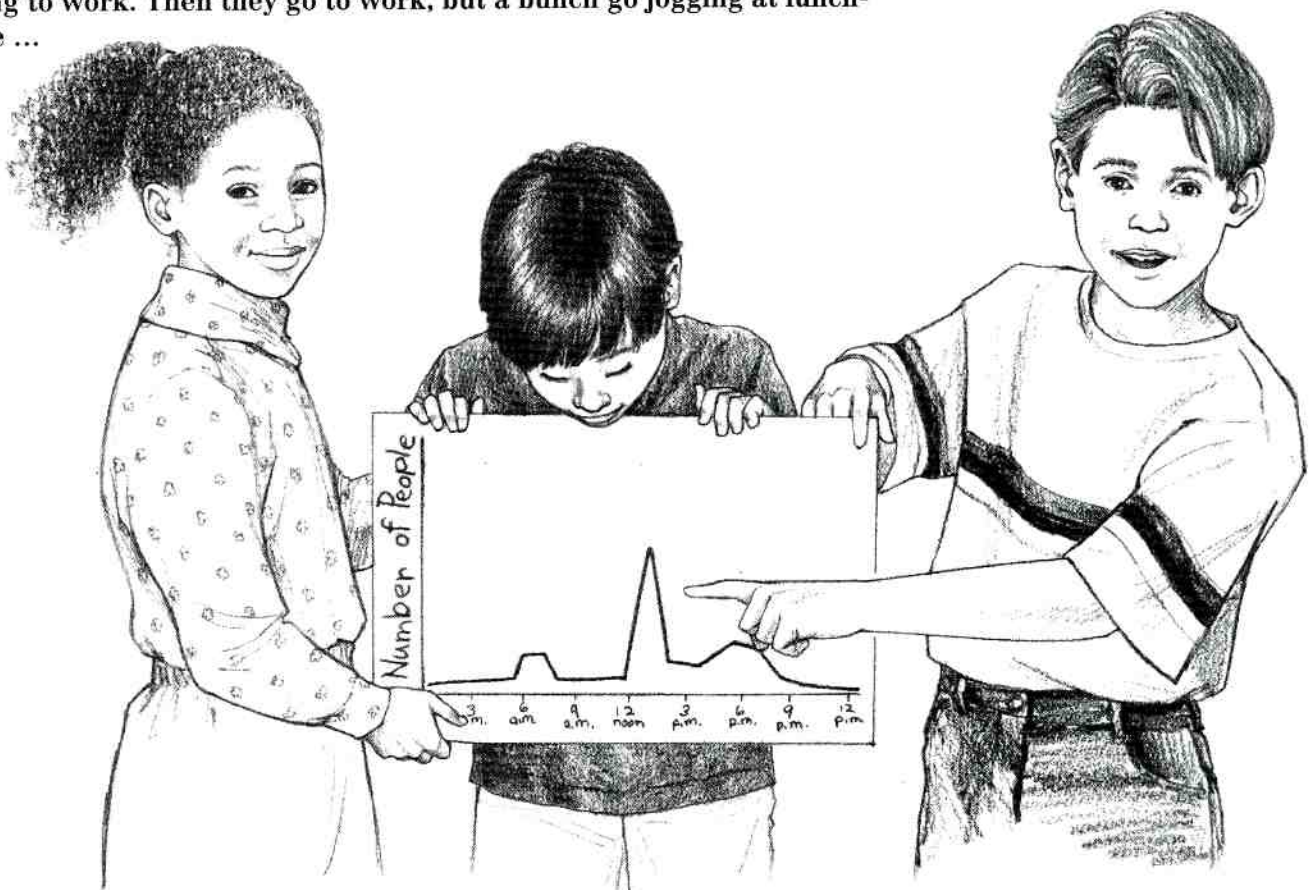
Students write the letters of the group-made mystery graphs on the blanks where they think they belong.

Telling the Stories Invite one group of students at a time to come up and show their graph. Ask the other students:

What place or activity do you think this is? Explain why you think so.

Students may be able to give more than one answer that they can support with a reasonable story. After some discussion, the group who made the graph tells what place it represents and explains the curve through the day. They should not go hour by hour, but show the overall trends. For example:

During the morning, some people go jogging before breakfast and before going to work. Then they go to work, but a bunch go jogging at lunch-time ...



Call up another group and repeat this process. After the class knows about a few of the graphs, it will be easier to figure out all of them, so your questions for discussion can change a little. For example:

When are the most people doing this activity? What other graph is like this one? How are they similar? How are they different? How can you tell this is not [the subject of the similar graph]?

Before finishing this activity, ask students about the process they went through in planning their graphs.

To plan these graphs in your group, what things did you talk about? What things did you have to agree on? What things were hard to agree on?

Activity

Revising the Mystery Graphs

With their mystery graphs in front of them, the small groups plan how they will improve them. Introduce this activity briefly by discussing the shapes of the lines:

Now that you know about how curves can show slow change or fast change or no change at all, plan how you will make your mystery graph clearer than it was before.

Think of a place that fills up with people within a short time. (for example, school, concert hall) **How would you use a line to show that?**

What places do people enter over a longer period of time? (for example, museums, public transportation) **How would you show that?**

What kind of place or activity do people go to and from all day, so that about the same number of people are there over a long period of time? (for example, shopping) **How would you show that?**

Students make new graphs that show more clearly the changing population of people doing the activity. While they are working, ask them to clarify the times at which people are coming and going and how quickly or slowly the number of people is changing.

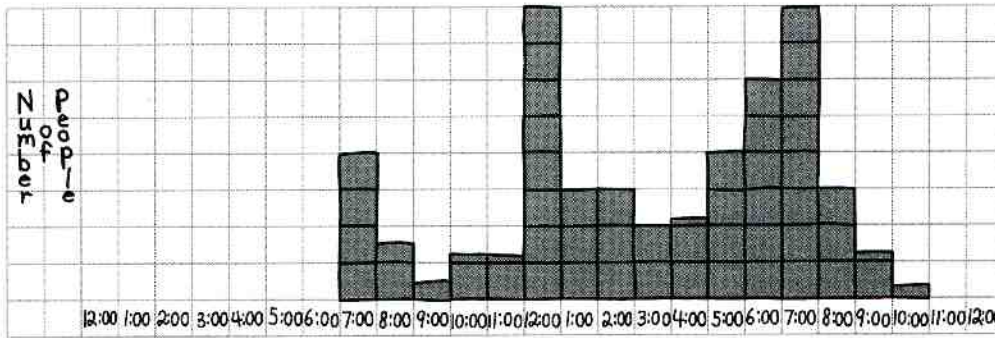
Plan with students how to make a display of their mystery graphs as a quiz for others in the school. Post the improved graphs, with letters for identification, in a hall or other public area. Put with them a list of all the places and activities represented, adding a few extra items to the list. You might post an answer key, telling which graph represents which place or activity, in an inconspicuous place nearby or just inside your classroom door.

Answer Key to Students' Mystery Graphs (p. 67)

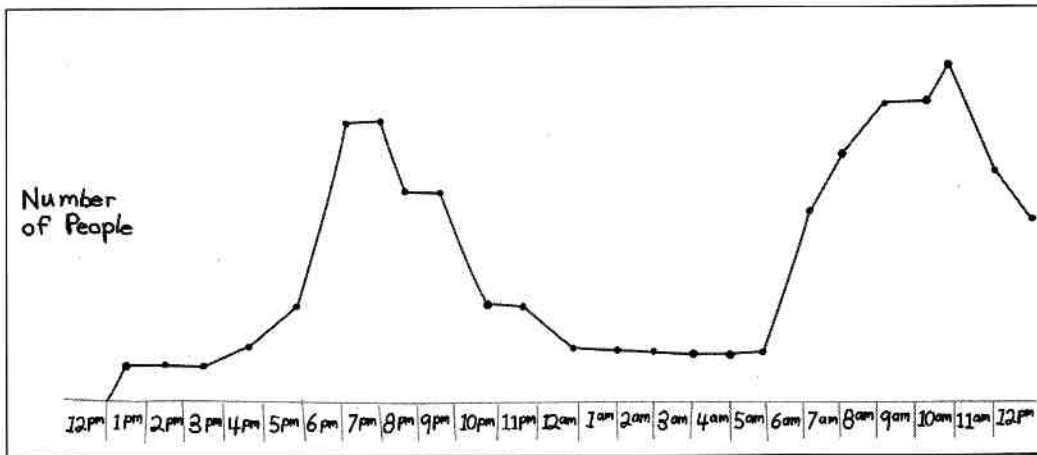
Mystery Graph A: eating meals;
Mystery Graph B: riding the city
subway (note that P.M. times are
shown first); Mystery Graph C:
at a movie theater.

Students can help you write an explanation to post with the display. For example:

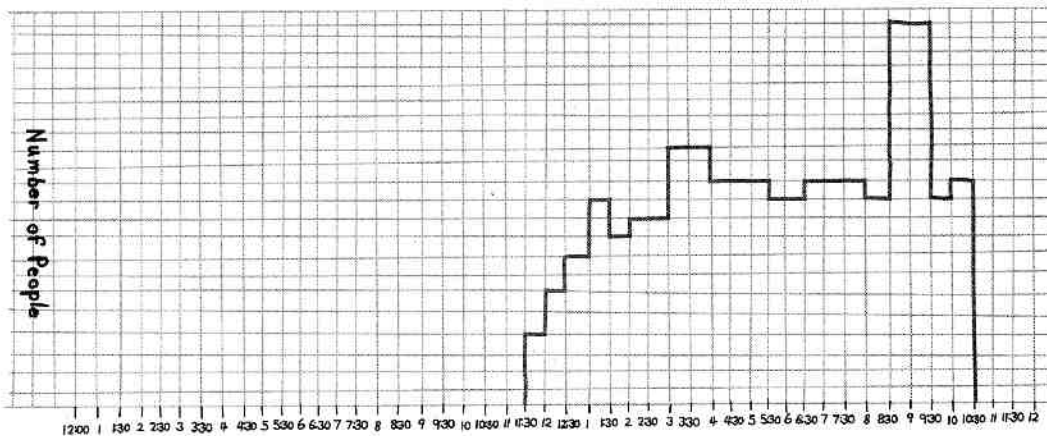
These graphs show the changing numbers of people doing activities or visiting certain places during a day. Look at the list of possible activities and places. Guess which graph goes with which place or activity. The correct answers can be found [tell where].



Mystery Graph A



Mystery Graph B



Mystery Graph C