BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set E1 Data Analysis: Graphing

Includes

Skills & Concepts

- ★ construct and analyze picture and bar graphs and use them to answer questions and solve problems
- ★ organize data in tables, pictographs, bar graphs, and dot plots
- ★ interpret data in tables, pictographs, bar graphs, and dot plots
- ★ analyze dot plots, pictographs, and bar graphs to make predictions about populations
- ★ compare the benefits of using tables, bar graphs, and dot plots as representations of a given data set

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Bridges in Mathematics Grade 3 Supplement
Set E1 Data Analysis: Graphing

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P201304

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set E1 ★ Activity 1

ACTIVITY

Ice Cream Survey

Overview

The teacher surveys the class to find out which of four ice cream flavors each student likes best. The data is organized and students work in pairs to represent the survey results on a pictograph. Each student then transfers the information to a bar graph. Students interpret the results of these two graphs and evaluate the two different presentations.

Skills & Concepts

★ construct and analyze picture and bar graphs and use them to answer questions and solve problems

You'll need

★ Ice Cream Cones (page E1.4, quarter-class set cut in half)

★ Ice Cream Bar Graph (page E1.5, class set)

★ 1 sheet of 8½″ × 11″ or 8½″ × 14″ copy paper for each student pair (see note)

★ 3″ × 3″ sticky notes, 1 per student

★ scissors

★ glue sticks

★ crayons or colored pencils

★ pencils and rulers

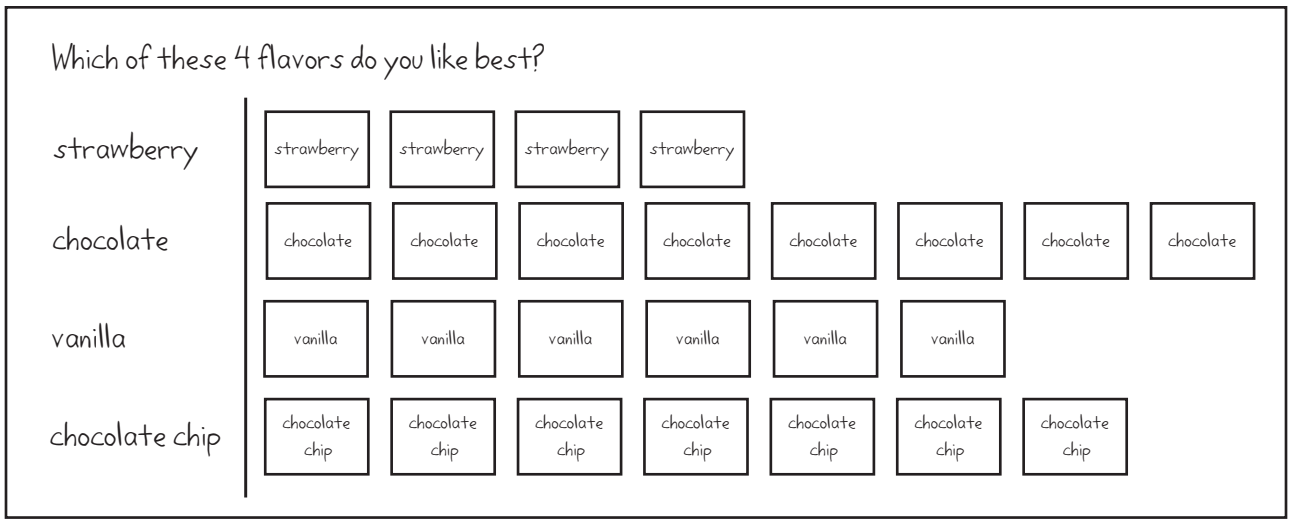
Note Give students a choice of copy paper size for their pictographs. Their choice will depend to some extent on your class size and the results of the survey.

Instructions for Ice Cream Survey

1. Tell students you want to conduct a survey about ice cream flavors today. Write the following flavors on the whiteboard: strawberry, chocolate, vanilla, and chocolate chip. Ask students to think privately about which of these 4 flavors is their favorite. Give out 3" × 3" sticky notes, and ask each student to write his or her favorite flavor on a note without talking to anyone else. (This allows each student to make his or her own choice without being influenced by classmates.)

2. Call students up to post their sticky notes in rows beside the appropriate flavor, and discuss the data briefly. How many students chose each flavor? Which flavor is most popular? Which is least popular? How many students participated in the survey?

Activity 1 Ice Cream Survey (cont.)

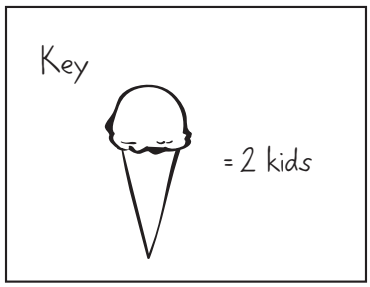


3. Once the data is recorded, ask students to pair up or assign partners. Give each pair a half sheet of the Ice Cream Cones, and show them the 2 different sizes of copy paper. Explain that you'd like them to use these materials, along with their scissors, glue sticks, and crayons, to present the results of the survey in the form of a pictograph, or a graph that uses pictures. Give them a minute to pair-share ideas about what they'll need to do to accomplish the job. Then ask volunteers to share their thinking with the class.

> ***Students*** *We can cut the ice cream cones apart and glue them on the paper.*
> *We're going to color the chocolate ones brown and the strawberry ones pink.*
> *Can we make our graph up and down instead of sideways?*
> *I think we're going to need that long paper instead of the regular paper.*

4. If it doesn't come up in discussion, remind students that each pair only has 15 ice cream cones to work with, which is probably fewer than the number of people who participated in the survey. Discuss ways they might solve the problem. (Making more copies of the cones or drawing more aren't options.) Someone will probably generate the idea of using 1 ice cream cone to stand for more than 1 student, but if no one does, propose it yourself. Depending on your class size, each cone will need to stand for 2 or even 3 students.

5. Once the class has decided how many students each cone will stand for, record the decision on the whiteboard.



6. Ask students how many cones they'd need to represent 4 children. What about 6? 8? What about 5?

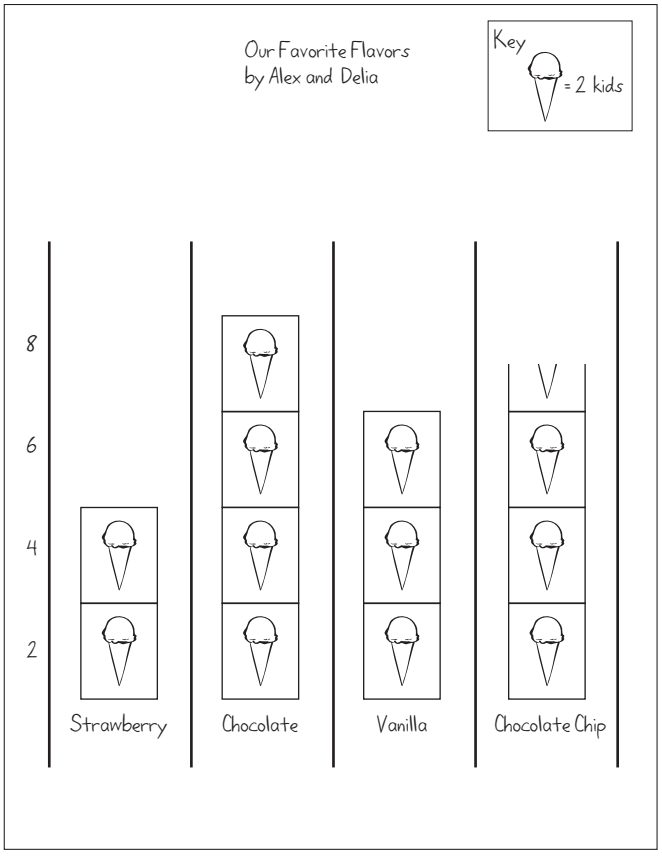
Activity 1 Ice Cream Survey (cont.)

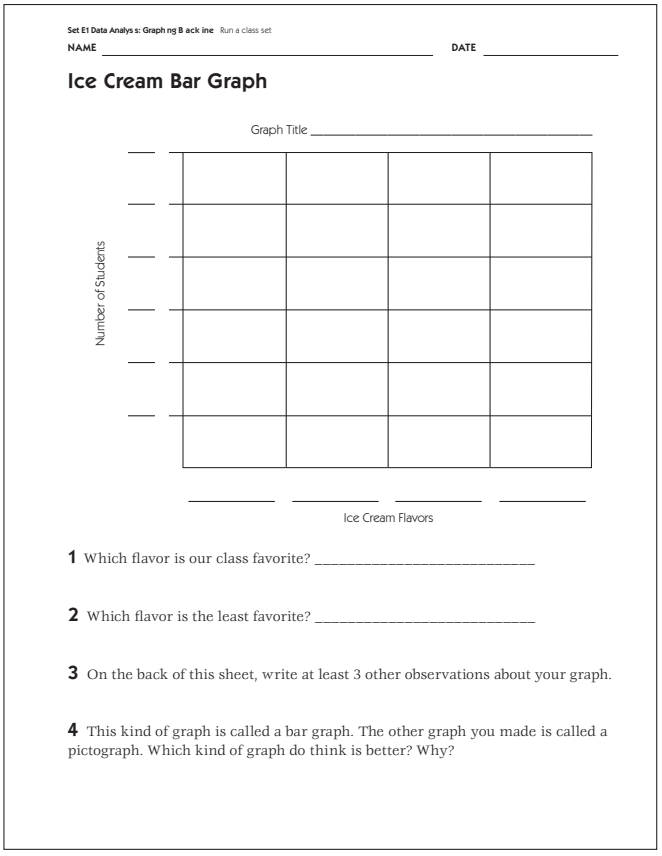
Twilight *It's 2 cones for 4 kids, 3 cones for 6, and 4 cones for 8, but how can we show 5? That's impossible!*

Rosa *I know! We can cut a cone in half, so for 5 kids, it would be 2 cones and then half a cone.*

7. Once students understand what to do, have them go to work in pairs, cutting, organizing, and gluing their cones onto the size paper they've selected. Let them know that they can organize the cones into rows or columns. Remind them to give the graph a title, label both axes, and include a key to show how many children each cone stands for.

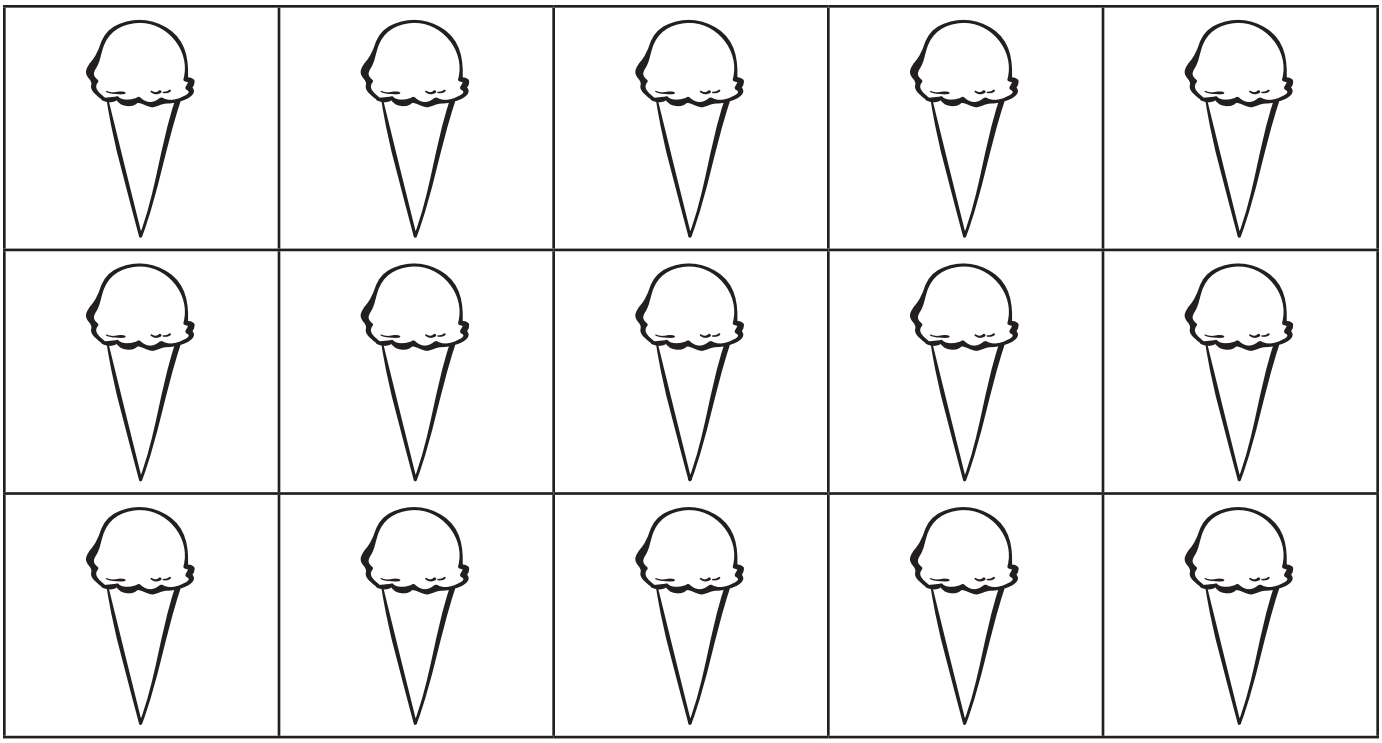
8. As the first pairs finish their pictographs, give each student a copy of the Ice Cream Bar Graph blackline. Explain that they'll each need to show the results of the survey as a bar graph as well as a pictograph. Talk with them about some of the things they'll need to do to transfer the information from one to the other. Each cone stands for 2 (or 3) students. Will they be able to keep the same scale on their bar graph, coloring in 1 cell for every 2 (or 3) students, or will they need to change the scale in some way? As you discuss the assignment with the class, elicit some of the similarities and differences between pictographs and bar graphs.

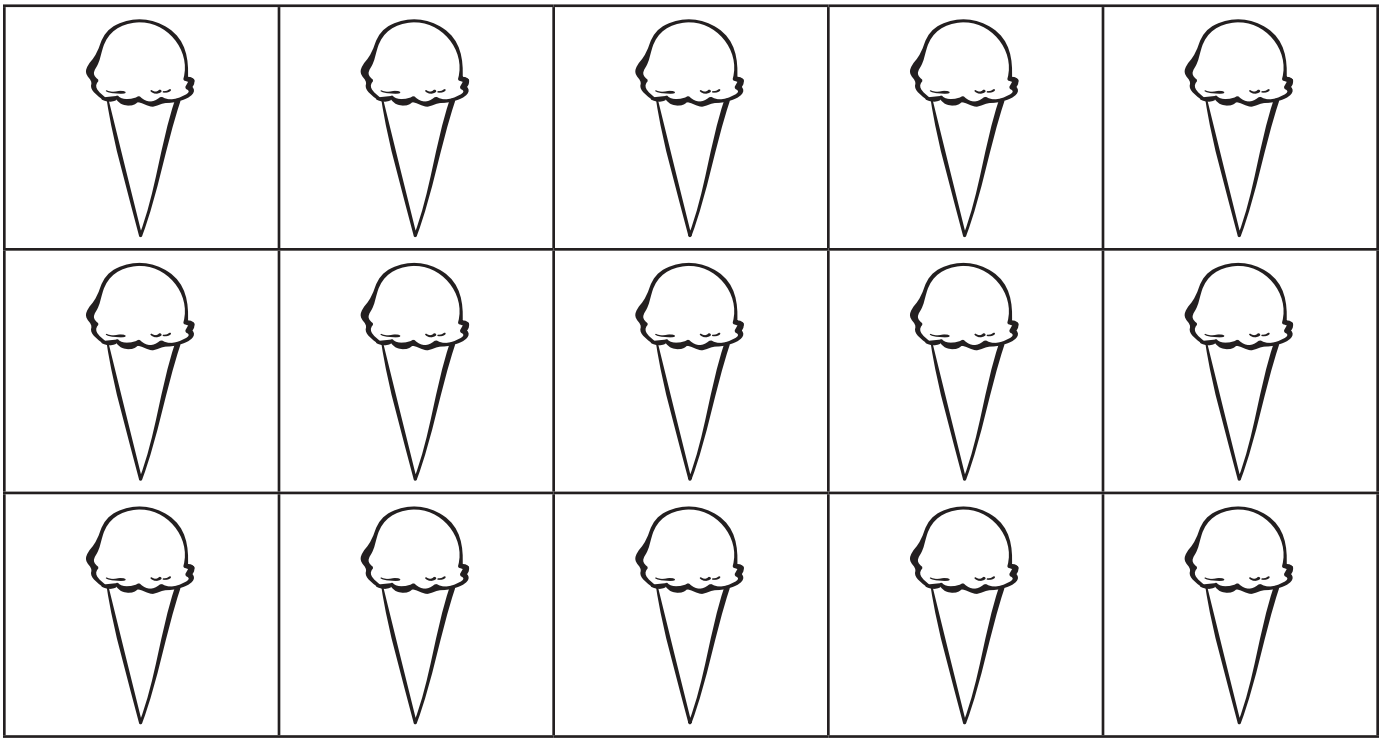




9. Give students who are still working on their pictographs time to complete them, while the others start work on their bar graphs. When they're finished with both, they may have definite preferences for one or the other. Encourage them to voice and explain their opinions as they complete question 4 at the bottom of the bar graph sheet. Which type of graph is more fun to make? Which is easier to read? Why?

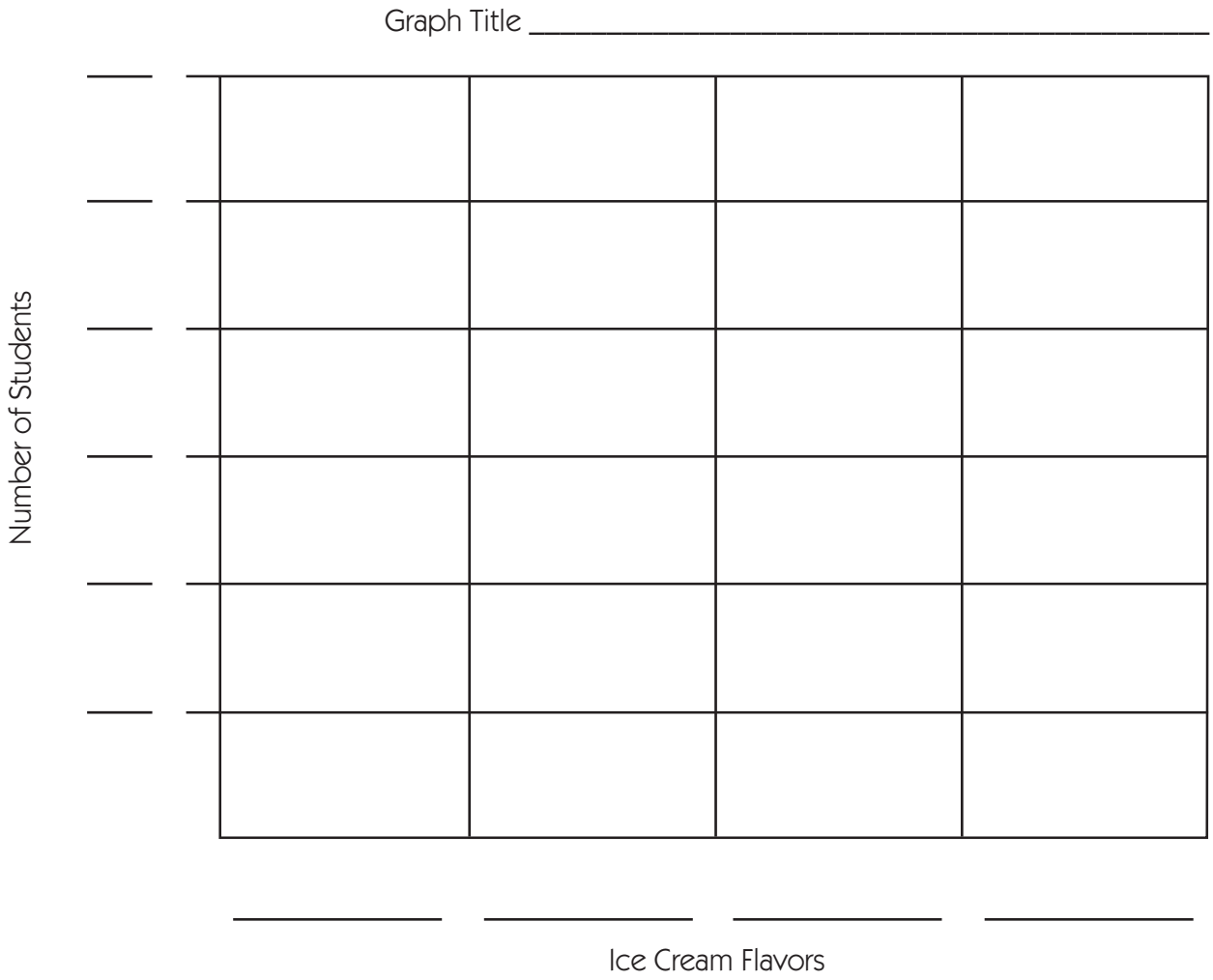
Ice Cream Cones





NAME _____ **DATE** _____

Ice Cream Bar Graph



1 Which flavor is our class favorite? _____

2 Which flavor is the least favorite? _____

3 On the back of this sheet, write at least 3 other observations about your graph.

4 This kind of graph is called a bar graph. The other graph you made is called a pictograph. Which kind of graph do think is better? Why?

Set E1 ★ Activity 2

ACTIVITY

Book Lovers' Survey

Overview

The teacher surveys the class to find out which of four types of books each student likes best. The data is organized and students work in pairs to represent the survey results on a pictograph. Each student then transfers the information to a bar graph. Students interpret the results of these two graphs and evaluate the two different presentations.

Skills & Concepts

★ construct and analyze picture and bar graphs and use them to answer questions and solve problems

You'll need

★ Book Markers (page E1.10, quarter-class set cut in half)

★ Book Bar Graph (page E1.11, run a class set)

★ 1 sheet of 8½″ × 11″ or 8½″ × 14″ copy paper for each student pair (see note)

★ 3″ × 3″ sticky notes, 1 per student

★ scissors

★ glue sticks

★ crayons or colored pencils

★ pencils and rulers

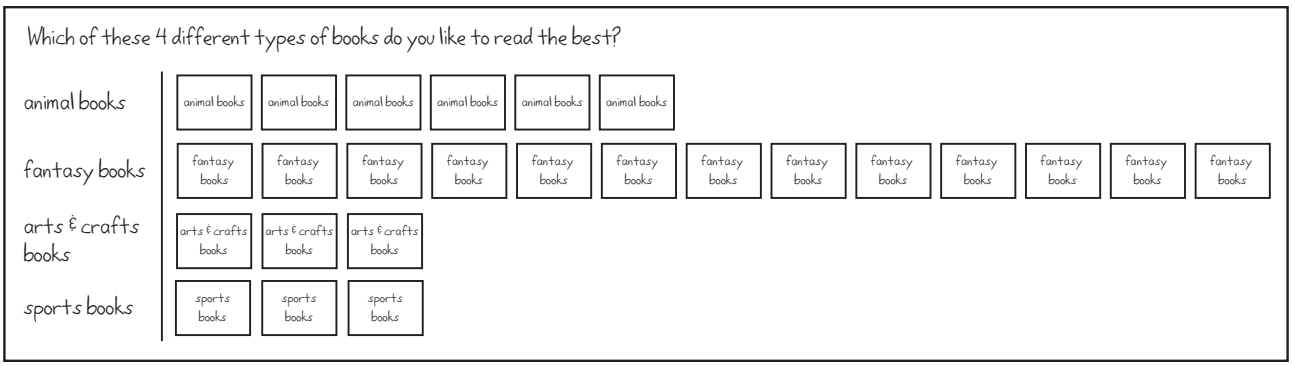
Note Give students a choice of copy paper size for their pictographs. Their choice will depend to some extent on your class size and the results of the survey.

Instructions for Book Lovers' Survey

1. Tell students you want to conduct a survey about the kinds of books they most like to read. Write the following on the whiteboard: animal books, fantasy books, arts and crafts books, and sports books. (If these don't match what your students actually love to read, change the list. Ask students to think privately about which of these 4 types of books they like best to read. Give out 3" × 3" sticky notes, and ask each student to write his or her favorite of the 4 on a note without talking to anyone else. (This allows each student to make his or her own choice without being influenced by classmates.)

2. Call students up to post their sticky notes in rows beside the appropriate listing, and discuss the data briefly. How many students chose each type of book? Which type of book is most popular? Which is least popular? How many students participated in the survey?

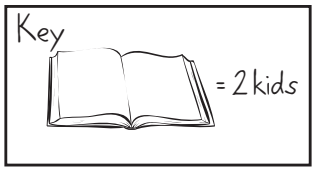
Activity 2 Book Lovers' Survey (cont.)



3. Once the data is recorded, ask students to pair up or assign partners. Give each pair a half sheet of the Book Markers, and show them the 2 different sizes of copy paper. Explain that you'd like them to use these materials, along with their scissors and glue sticks, to present the results of the survey in the form of a pictograph (a graph that uses pictures). Give them a minute to pair-share ideas about what they'll need to do to accomplish the job. Then ask volunteers to share their thinking with the class.

4. If it doesn't come up in discussion, remind students that each pair only has 15 book markers to work with, which is probably fewer than the number of people who participated in the survey. Discuss ways they might solve the problem. (Making more copies of the markers or drawing more aren't options.) Someone will probably generate the idea of using 1 book marker to stand for more than 1 student, but if no one does, propose it yourself. Depending on your class size, each marker will need to stand for 2 or even 3 students.

5. Once the class has decided how many students each marker will stand for, record the decision on the whiteboard.



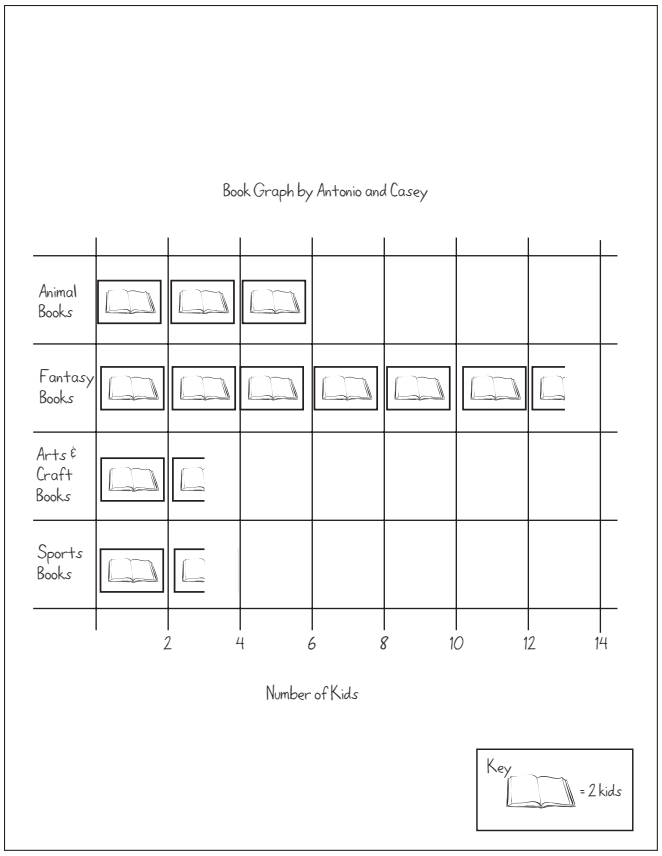
6. Ask students how many books they'd need to represent 6 children. What about 8? 10? What about 7? If it doesn't come from the class, ask children to cut the book markers as needed to represent the survey numbers (e.g., use $3\frac{1}{2}$ markers to represent 7 students, or $3\frac{2}{3}$ markers to represent 8 students if each marker stands for 3 students).

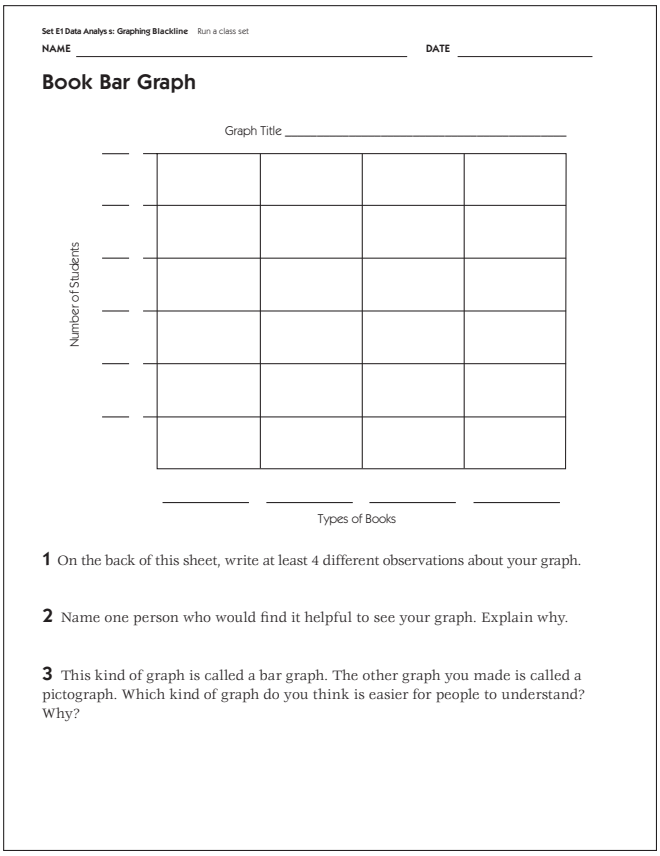
7. Once students understand what to do, have them go to work in pairs, cutting, organizing, and gluing their markers onto the size paper they've selected. Let them know that they can organize the markers into rows or columns. Remind them to give the graph a title, label both axes, and include a key to show how many children each marker stands for.

8. As the first pairs finish their pictographs, give each student a copy of the Book Bar Graph blackline. Explain that they'll each need to show the results of the survey as a bar graph as well as a pictograph. Talk with them about some of the things they'll need to do to transfer the information from one to the other. Each book marker stands for 2 (or 3) students. Will they be able to keep the same scale on their bar graph, coloring in 1 cell for every 2 (or 3) students, or will they need to change the scale in some

Activity 2 Book Lovers' Survey (cont.)

way? As you discuss the assignment with the class, elicit some of the similarities and differences between pictographs and bar graphs.





Casey *Oh, oh, I can see a problem right now. There are only 6 boxes for each kind of book on that bar graph, and 13 kids in our class like fantasy books the best. We said each marker stands for 2 kids, but what are we supposed to do on that bar graph?*

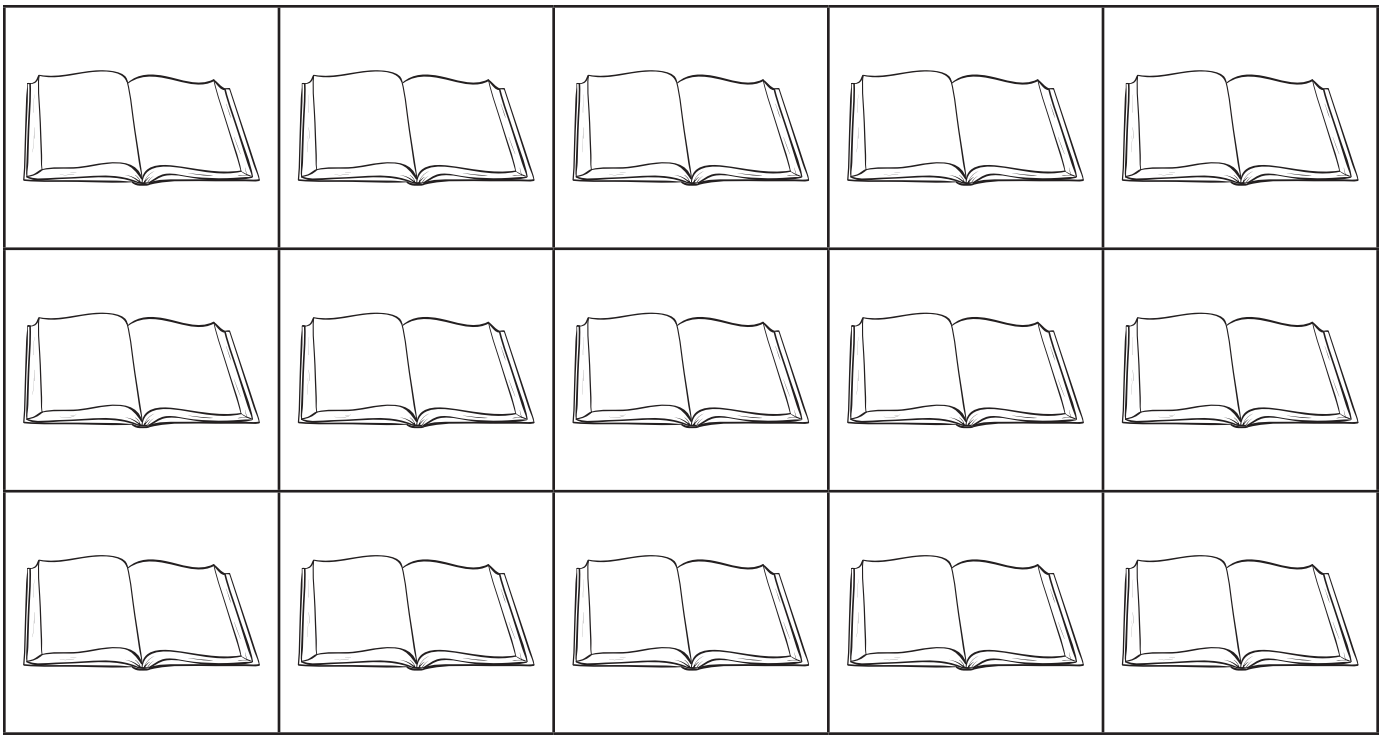
Antonio *We could make each box be for 3 kids. Let's see … 3, 6, 9, 12, 15, 18. Yep, that would work.*

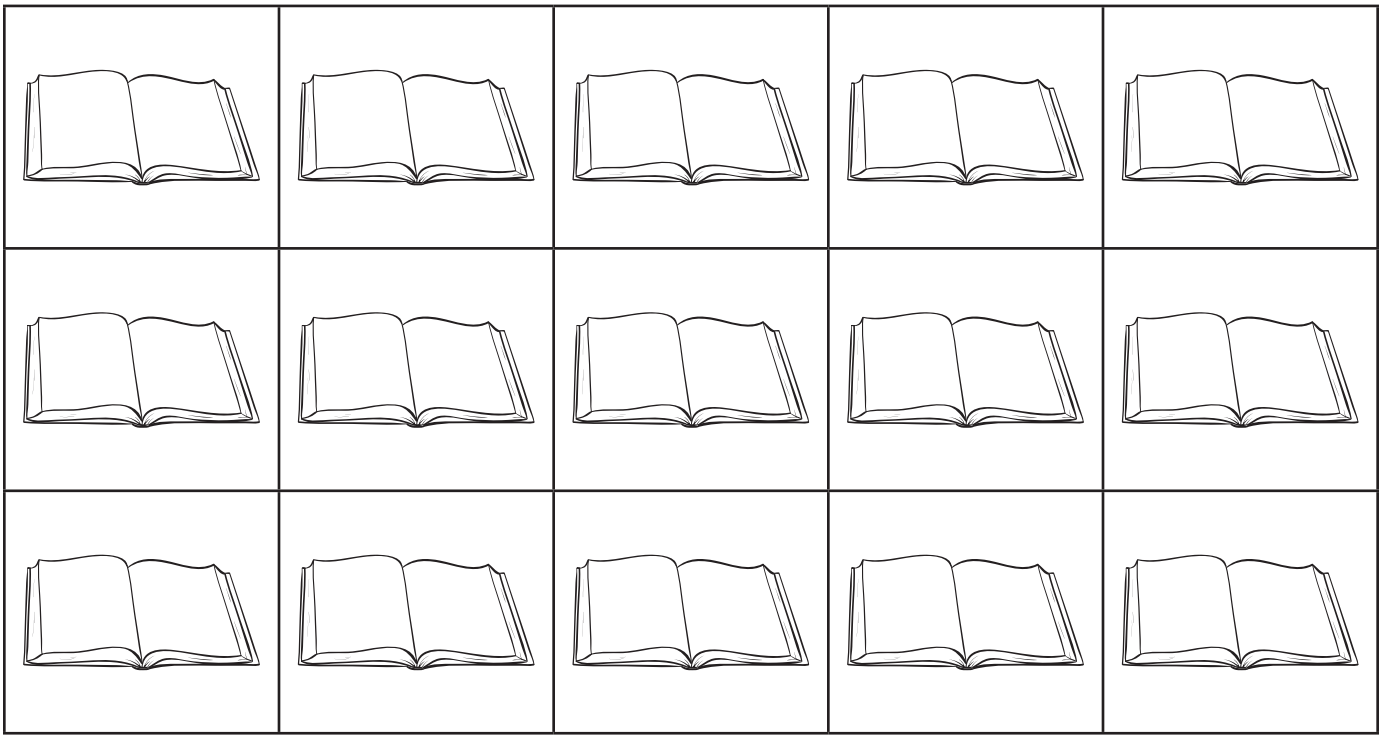
9. Give students who are still working on their pictographs time to complete them, while the others start work on their bar graphs. When they're finished with both, they may have definite preferences in terms of which they find easier to read and understand. Encourage them to voice and explain their opinions as they complete question 3 at the bottom of the bar graph sheet.

INDEPENDENT WORKSHEET

See Set E1 Independent Worksheet 1 for more practice with pictographs and bar graphs.

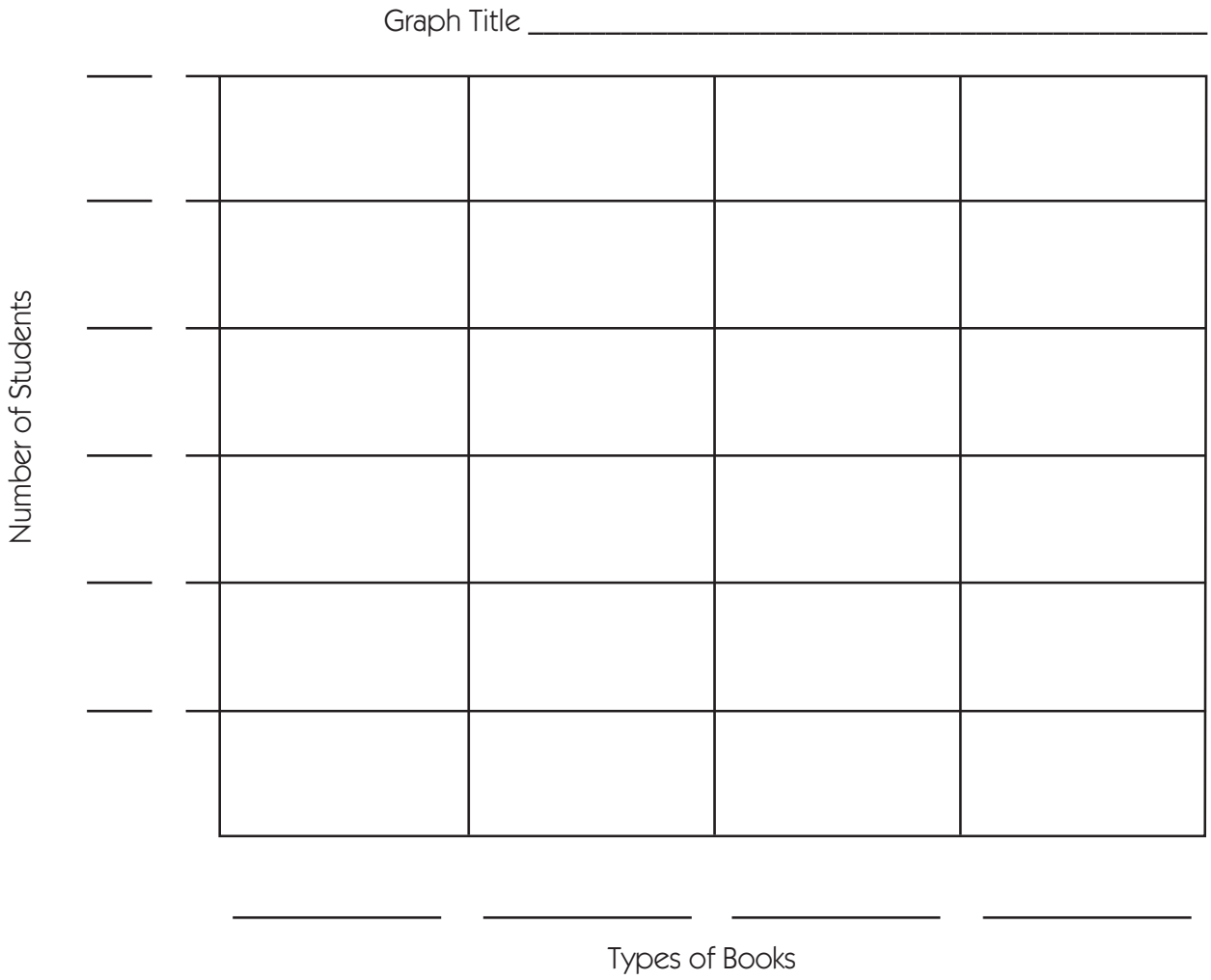
Book Markers





NAME _____ **DATE** _____

Book Bar Graph



1 On the back of this sheet, write at least 4 different observations about your graph.

2 Name one person who would find it helpful to see your graph. Explain why.

3 This kind of graph is called a bar graph. The other graph you made is called a pictograph. Which kind of graph do you think is easier for people to understand? Why?

Set E1 ★ Activity 3

ACTIVITY

Under the Same Roof

Overview

Students collect, organize, interpret, and analyze data about the number of people living in their house right now. The data is organized in three different ways, and students are asked to compare the benefits of the different formats.

Skills & Concepts

★ organize data in tables, bar graphs, and dot plots

★ interpret data in tables, bar graphs, and dot plots

★ analyze dot plot and bar graphs to make predictions about populations

★ compare the benefits of using tables, bar graphs, and dot plots as representations of a given data set

You'll need

★ Under the Same Roof (pages E1.17 and E1.18, run a class set plus a copy of each sheet on a transparency)

★ 1 ½˝ × 2˝ sticky notes, one per student

★ a book about families (see Advance Preparation)

Advance Preparations It's fun to open this activity by reading a book about families. Several books that describe and honor the diversity of families are *All Families are Different*, by Sol Gordon; *The Family Book*, by Todd Parr; and *All Kinds of Families*, by Norma Simon.

Instructions for Under the Same Roof

1. Open this activity by reading a story or otherwise introducing the topic of families. Then propose to conduct a survey about people's families. Share with students the number of people living in your house right now, including yourself. Then record that number on a small sticky note.

> ***Teacher*** *There are four people living in my house: my son, my daughter, my husband, and myself. My sister was living with us last year, but now she has her own house. Right now, there are just 4 of us, so I will write 4 on my sticky note.*

2. Give students each a sticky note. Ask them to record the number of people living in their house right now, and place the sticky note on their desk in front of them.

3. Place the Under the Same Roof, sheet 1, on display at the overhead. Write a 2 in the first row, first column of the table. Ask students to raise their hands if they have 2 people living in their house right now. Solicit help from the class to count the number of hands raised, and record the number in the first row, second column. Continue in this fashion until you have recorded all the students' data.

Activity 3 Under the Same Roof (cont.)

Set E1 Data Ana ys s: Graphing B ack ine Run a c ass set and one copy on a transparency

NAME _____ DATE _____

Under the Same Roof page 1 of 2

How many people live in your house right now? Is it the same for everyone in our class? Let's do a survey and find out.

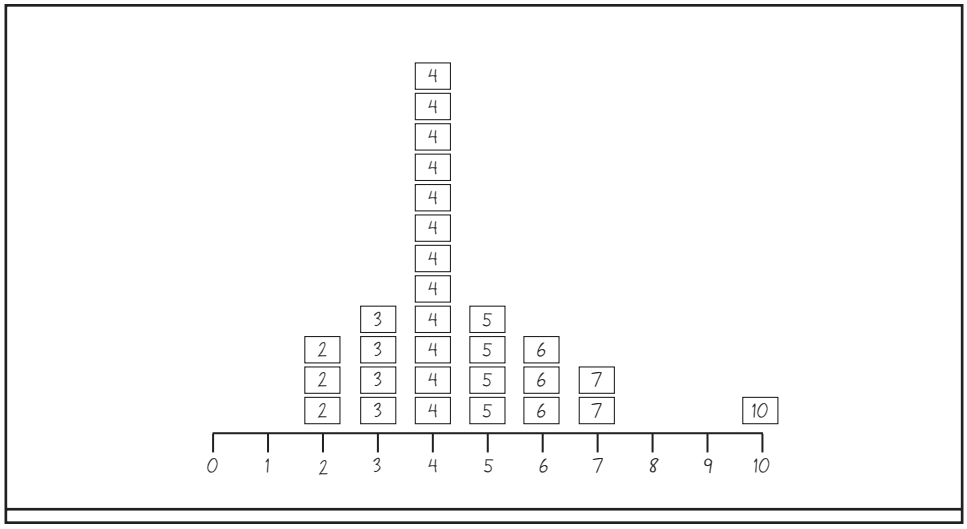
1 Record the data in a table.

Number of People in the House	Number of Students
2	3
3	4
4	12
5	4
6	3
7	2
10	1

4. Have students pair-share their observations about the data. What do they notice? What does the table tell them? Then ask a few volunteers to share their ideas with the class.

5. Tell students that there are different ways to organize data. Today, you are going to work together to organize the data in three different formats, and then consider the advantages of each. The format you just used is called a table. Now you are going to organize the information on a dot, or line plot. Draw a line along the bottom of the whiteboard. Record the numbers 0, 1, and 2 at evenly spaced intervals along the first part of the line. Ask students who live in households with any of those three numbers of people to bring their sticky notes up and place them where they belong.

6. Continue adding numbers and inviting students to post their sticky notes. Stop periodically to discuss the data. What do students notice? What is the difference between looking at the data in the table and on the dot plot? Does either format seem to have advantages over the other? Be sure students take note of the fact that the dot plots shows all the numbers in the range, even though there may be no entries. Does this make a difference?



Students *Wow! Look at how high it goes on 4.*
A lot of kids have 4 people in their house.
It's even on both sides of the 4. There are four 3s and four 5s.

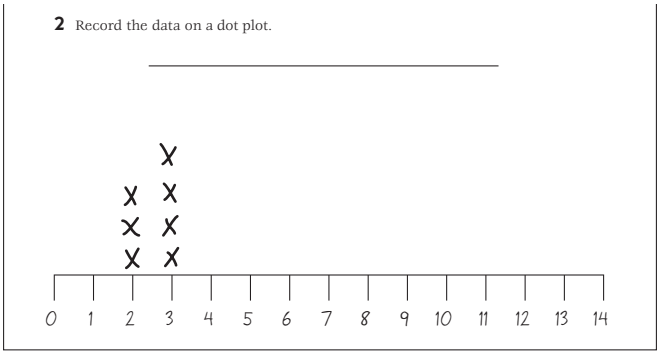
Activity 3 Under the Same Roof (cont.)

It goes way up, and then it goes back down.
There aren't any kids with 8 or 9 people in their house.

Teacher *Does it make any difference to look at our data on the dot plot? If you look at the table, you can see that lots of you have live in households with 4 people.*

Students *But you can see it even better on the graph.*
The table just shows numbers. The line plot is more like a picture.
The 12 doesn't seem so big on the table as when you see all the sticky notes on the board.
Also, you can see that no one has 0, 1, 8, or 9 people in the house. The table doesn't really tell you that.

7. When all the sticky notes have been posted, return to the overhead. Use the dot plot form at the bottom of the first sheet to show students how people use dots or x's to represent data. As you model how to transfer the information from the board to the paper, ask students to explain what each x or dot means.



Students *Those x's are like the sticky notes we put on the board.*
Each one of those is like a kid. Three kids have 2 people in their house, so there are 3 x's over the 2.
Four kids have 3 in their house, so there are 4 x's there.

8. Give students each a copy of both Under the Same Roof sheets. Review the instructions on both sheets with the class. Take a minute to examine the bar graph form on the second sheet together. Are there enough boxes in the columns to assign each a value of 1? If not, what scale would work best?

Students *There are only 8 boxes going up on the bar graph.*
So we can color in a box for each kid.
I don't think so. Twelve kids have 4 people in their house. There won't be enough room.
We could go by 2s, like each box could stand for 2 kids.
You're right. Too bad there aren't 12 boxes going up!

9. Once students understand what to do, give them the remainder of the math period to work.

Activity 3 Under the Same Roof (cont.)

Set E1 Data Analysis: Graphing Blackline Run a class set and one copy on a transparency

NAME _____ DATE _____

Under the Same Roof page 1 of 2

How many people live in your house right now? Is it the same for everyone in our class? Let's do a survey and find out.

1 Record the data in a table.

Number of People in the House	Number of Students

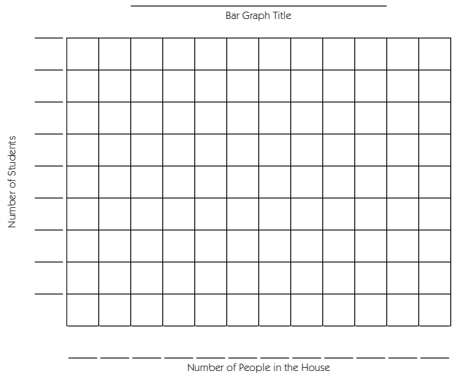
2 Record the data on a dot plot.

Set E1 Data Analysis: Graph ng Blackline Run a class set and one copy on a transparency

NAME _____ DATE _____

Under the Same Roof page 2 of 2

3 Record the data on a bar graph.



4 Write at least 3 observations about the data we collected. What do the graphs tell you about the number of people living in our houses? What was the most interesting thing you learned from our survey?

5 Which format do you think works best to show this data - the table, the dot plot, or the bar graph? Why?

INDEPENDENT WORKSHEET

Use Set E1 Independent Worksheet 2 to provide students with more practice organizing, interpreting, analyzing, and comparing the advantages of data in tables, dot plots, and bar graphs.

NAME _____ **DATE** _____

Under the Same Roof page 1 of 2

How many people live in your house right now? Is it the same for everyone in our class? Let's do a survey and find out.

1 Record the data in a table.

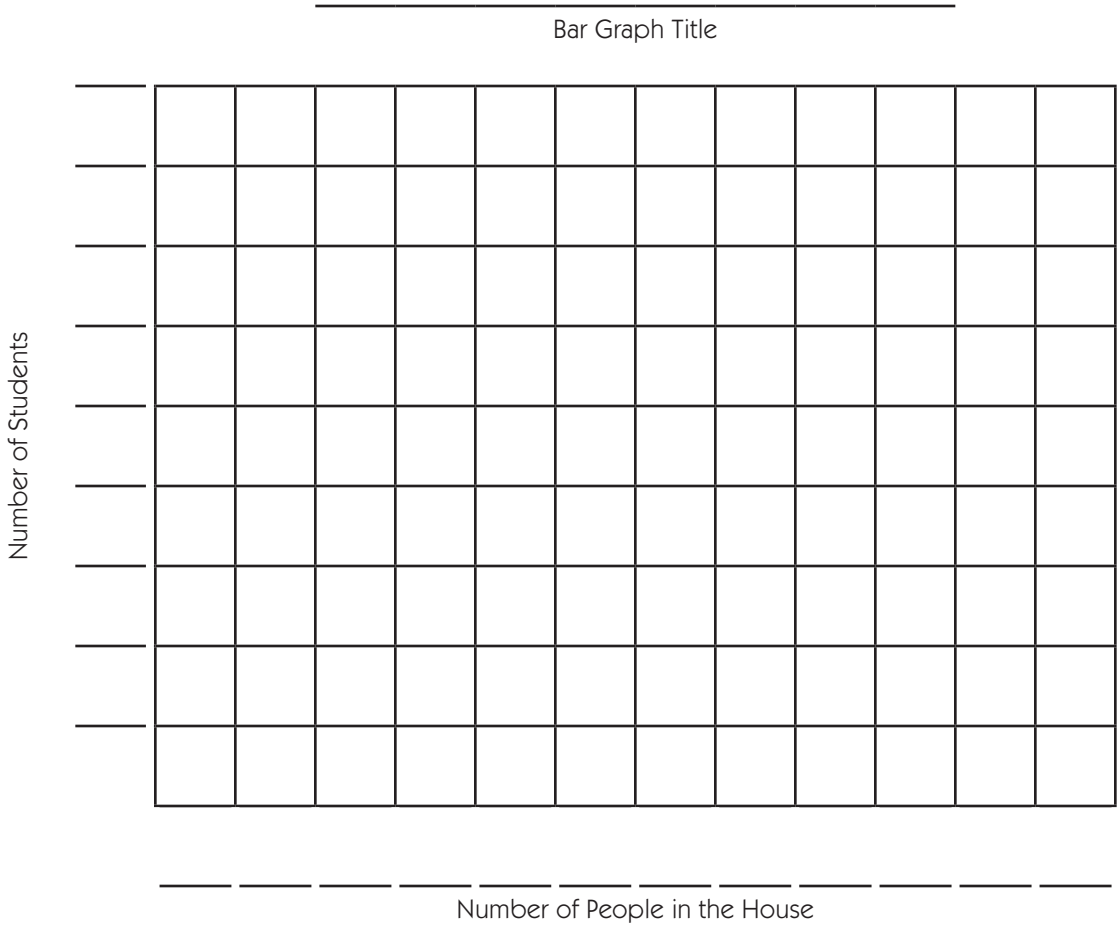
Number of People in the House	Number of Students

2 Record the data on a dot plot.

NAME _____ **DATE** _____

Under the Same Roof page 2 of 2

3 Record the data on a bar graph.



4 Write at least 3 observations about the data we collected. What do the graphs tell you about the number of people living in our houses? What was the most interesting thing you learned from our survey?

5 Which format do you think works best to show this data - the table, the dot plot, or the bar graph? Why?

NAME _____ **DATE** _____

Set E1 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Pizza Survey

1 The cafeteria at Morgan School did a survey to see what kind of pizza the kids like best. Here are the results from Mrs. Hill's third grade.

Type of Pizza	Number of Students Who Like It Best
Pepperoni	8 students
Cheese	14 students
Ham & Pineapple	6 students

a Make a pictograph to show this data. Give your graph a title and be sure to finish labeling both axes (sides).

Graph Title _____ Key ◯ = 2 students

Kind of Pizza

Number of Students

b How many students from Mrs. Hill's class took the survey? _____

c Do you think this survey would turn out about the same in your third grade? Why or why not?

(Continued on back.)

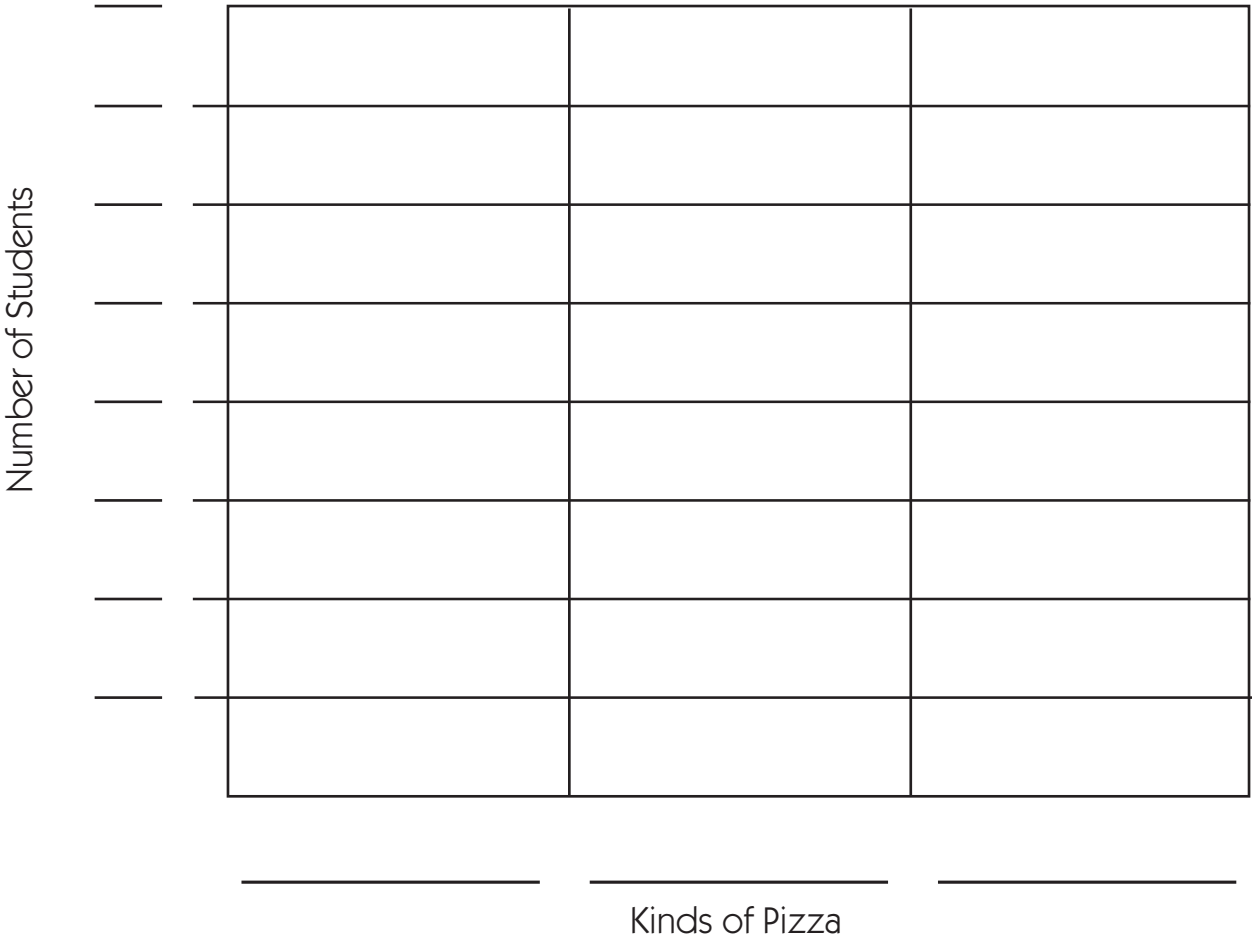
Independent Worksheet 1 Pizza Survey (cont.)

2 Here are the results from all the students at Morgan School.

Type of Pizza	Number of Students Who Like It Best
Pepperoni	55 students
Cheese	80 students
Ham & Pineapple	45 students

Make a bar graph to show this information. Give your graph a title and labels. You'll also need to decide how many students each box will stand for. (Hint: Look at the largest number in the data above to help.)

Graph Title _____



3 How many students in all took the survey? Show your work below.

(Continued on next page.)

NAME _____ **DATE** _____

Independent Worksheet 1 Pizza Survey (cont.)

4 The people who work in the cafeteria used the results of the pizza survey to help make some decisions about what to buy and what to cook. List 2 decisions they might have made after they saw the bar graph you just made.

-

-

CHALLENGE

5 Do a pizza survey in your own classroom. You can change the choices and have more if you want. After you've collected the data, make a pictograph or a bar graph to show the results.

NAME _____ **DATE** _____

Set E1 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

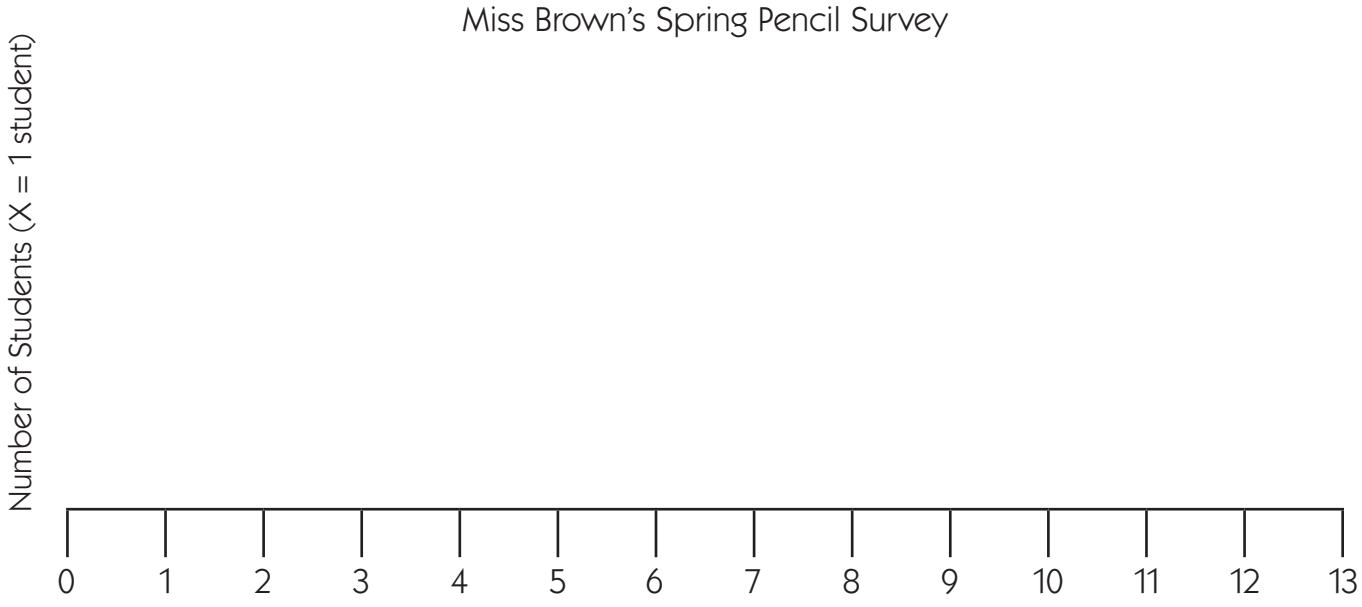
The Pencil Survey

One day last spring, Miss Brown asked her third graders to clean out their desks. She couldn't believe how many pencils most of the kids pulled out. "So that's where all the pencils have been!" she thought.

Miss Brown decided to take a survey to find out how many pencils had been hiding in the kids' desks. The table below shows the survey results.

Number of Pencils	Number of Students
1	2
2	7
3	8
4	5
7	3
8	2
10	1
12	1

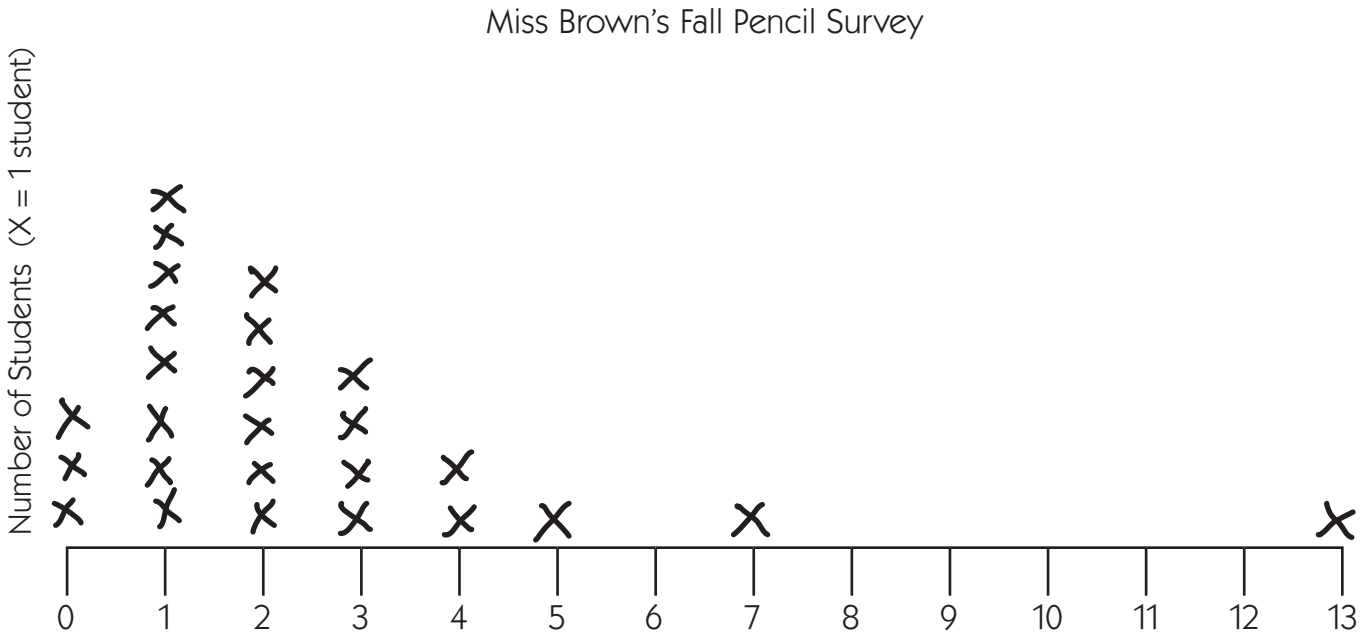
1 Record the data on the line plot below.



(Continued on back.)

Independent Worksheet 2 The Pencil Survey (cont.)

2 The next year, Miss Brown thought, "I will ask the children to clean out their desks earlier this year so we don't run out of pencils so fast." The line plot below shows how many pencils the kids found in their desks that time.



3 How many pencils did most of the kids have in their desks last spring?

4 How many pencils did most of the kids have in their desks in the fall?

5 Were there more pencils hiding in the kids' desks last spring or in the fall? Explain how you figured it out.

6 Why did the pencil survey turn out to be different in the fall than last spring? Give at least 2 possible explanations.