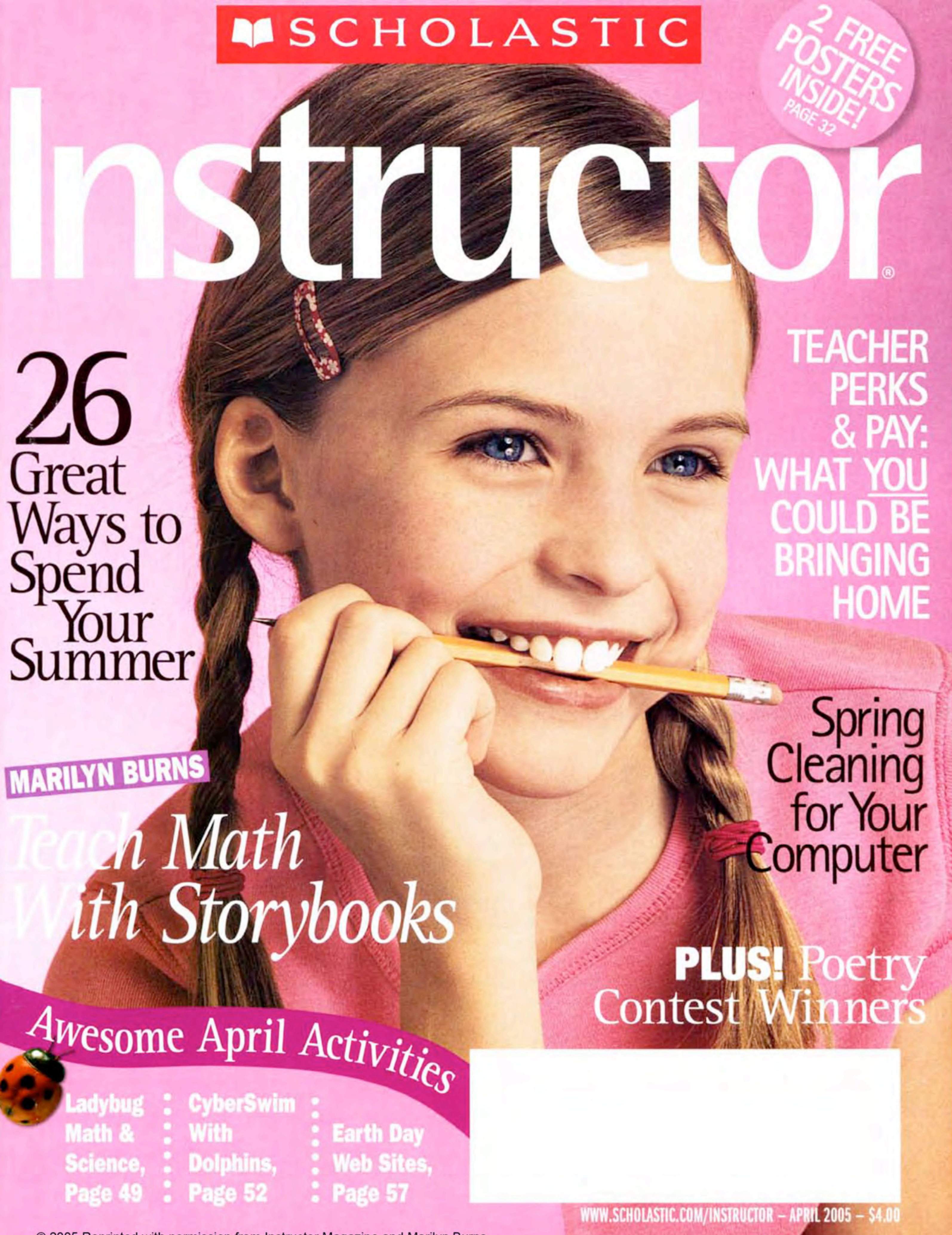
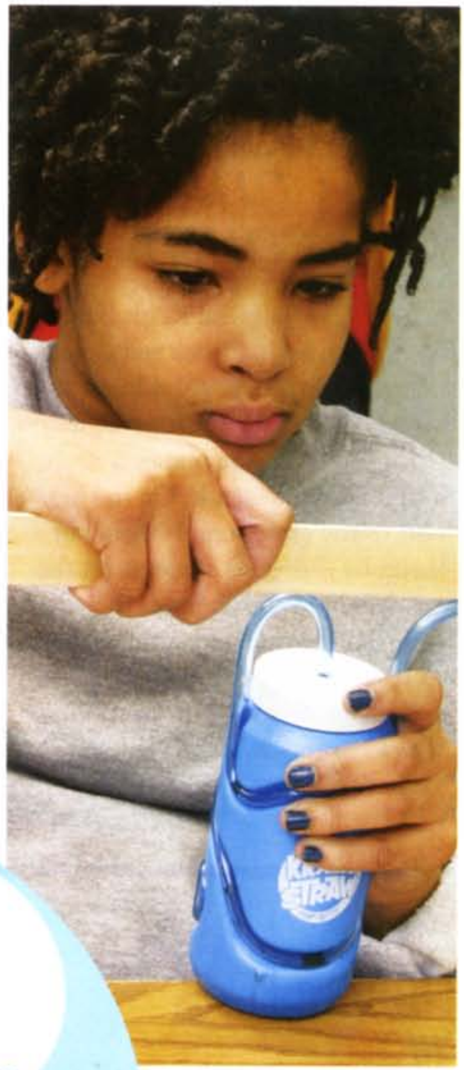

SCHOLASTIC
Instructor®
2 FREE POSTERS INSIDE! PAGE 32
26 Great Ways to Spend Your Summer
TEACHER PERKS & PAY: WHAT YOU COULD BE BRINGING HOME
MARILYN BURNS
Teach Math With Storybooks
Spring Cleaning for Your Computer
PLUS! Poetry Contest Winners
Awesome April Activities
Ladybug Math & Science, Page 49
CyberSwim With Dolphins, Page 52
Earth Day Web Sites, Page 57
WWW.SCHOLASTIC.COM/INSTRUCTOR – APRIL 2005 – $4.00



3 Lessons By Marilyn Burns

USING STORYBOOKS TO TEACH MATH

For many of us, the storybook shelf isn't the first place we go to when we start to plan a math lesson. But children's books can be a great math teaching tool. They spark students' imaginations in ways that exercises in textbooks or workbooks often don't. When I visit classrooms, I find that connecting math to literature can boost the confidence of those who love books but are "math-wary." And students who love the abstraction of math can learn to appreciate stories in a whole new way. Here are just three of the many possible lessons based on favorite classroom read alouds. ▶

PHOTOS: BOB ADLER

LESSON #1

ADDITION WITH *QUACK AND COUNT*

When I first read Keith Baker's wonderful *Quack and Count* (Harcourt Brace, 1999), I knew it would be ideal for a first-grade lesson about ways to break numbers apart into different addends. On my next visit to the classroom, I began our lesson by gathering students on the rug. I showed the children the cover and read the title and author's name.

"It's about ducks!" Nelson exclaimed after my introduction. "Ducks go quack," he added.

"Let's find out," I responded. I opened to the first spread and read, "Seven ducklings in a row. Count those ducklings as they go." The children counted along with me as I pointed to each of the ducklings.

I asked the children to count as I read the next rhyme—first the six ducklings on the left and then the one duckling on the right.

"How many ducklings do you think there are all together?" I asked. Some of the children knew that there were seven, while others weren't so sure. Together we counted all of them to verify that there were indeed seven!

I continued reading the rest of the book aloud and asking questions in this same way. On each page, we counted. We then had a class discussion of the book, talking about all the

LESSON #2

TEACHING MEASUREMENT WITH *INCH BY INCH*

In Leo Lionni's *Inch by Inch* (HarperTrophy, 1996), a clever inchworm persuades a robin to spare his life by offering to measure the robin's tail. He goes on to measure a flamingo's neck, a toucan's beak, and other animals' parts. When I shared this book with a group of lively second graders, they were delighted by the way the worm inched his way to safety.

After reading the story together, the children and I launched into a measurement lesson. We used a one-inch square tile to measure the length of the inchworm in the book.

Then I put down the book and asked the children, "I wonder if any things in our classroom measure about one inch long." We tested various items—the width of a chalkboard eraser, the length of a pencil, the spines of several books. None was close. Then I held up an envelope with a postage stamp on it. Several of the children clapped when they saw that a side of the stamp was just about one inch long. Then we measured a quarter and discovered that it was one inch across.

On a sheet of chart paper, I wrote *One Inch* and underneath recorded *stamp* and *quarter*. With the One-Inch Challenge underway, the children moved about the classroom with their one-inch tile "worms" in search

things the ducklings did.

For the second reading, I turned the focus to recording equations that would show our work. As I read, I wrote number sentences on chart paper to keep track of the ducklings. For example, as the children counted the six ducks on the left and one on the right, I recorded:

7 = 6 + 1

I had the children read the number sentence aloud as I pointed to the symbols. Then I invited them to help me write equations for the rest of the story. A nice feature of this story is that the illustrations near the end of the book encourage thinking about seven with more than two addends. When we finished the rereading, the chart looked like this:

7 = 6 + 1	7 = 2 + 5
7 = 5 + 2	7 = 1 + 6
7 = 4 + 3	7 = 2 + 3 + 2
7 = 3 + 4	7 = 2 + 2 + 2 + 1

I then gave the children seven Unifix cubes each and had them show the combinations by representing each addend with a "train" of cubes.

Lastly, I gave the children an independent assignment. Each child chose one of the number sentences from the chart, copied it, and illustrated it. "You can draw ducklings or any other shapes," I told them. The result: artful number sentences from ducks to diamonds! Children ready to take on an additional challenge also wrote and illustrated their own equations, with combinations of more than two numbers that added up to seven.

LEFT: I begin the read aloud by asking the children to judge the book by its cover.

ABOVE: The children use trains of Unifix cubes to represent simple equations. The cubes also make excellent finger puppets!

LEFT: Leo Lionni's* Inch by Inch *is an ideal choice for combining literacy and hands-on learning.

CENTER: In our One-Inch Challenge, the children comb the classroom looking for objects the size of the inchworm hero.

of objects to measure. As they called out items, I listed them on the chart. After about 10 minutes, I called the children back to the rug and we reviewed the items on our list, from crayon stubs to barrettes.

Next we moved on to measuring longer lengths, starting with our index fingers. I traced my index finger on the board and showed them how I could measure its length in two ways—using tiles and also using a 12-inch ruler. We next measured a pencil and the height of a tissue box using the same two ways. I showed the children that there are three possible ways to record our measurements, as shown below:

Finger	3 inches	3 in.	3"
Pencil	7 inches	7 in.	7"
Tissue box	4 inches	4 in.	4"

Armed with a tile and a ruler, each child set off to measure at least five objects and record their findings in the three ways.

After about five minutes, I stopped the children to ask what we could do when a measurement wasn't an exact number of tiles, or fell between two numbers on a ruler. We talked about choosing the number that was closest (rounding) or, if they couldn't tell, adding half of an inch to the measurement.

A few weeks later, we repeated the activity again. First, we reread the book, savoring the story and the illustrations. Then the children again set off on a measurement quest, this time recording an estimate for each item before measuring. Afterwards we compared our estimates and the actual measurements. The children charted their results on posterboard.

When the math lesson ended, the children had the chance to take the book and their measuring tools home to share the story and their new skills with their families. ▶

LESSON #3

TEACHING MENTAL MATH WITH *NIGHT NOISES*

Mem Fox's book, *Night Noises* (Voyager, 1992) is filled with vivid language and opportunities for math learning. In it, the elderly Lily Laceby, with hair "as wispy as cobwebs in ceilings" and bones "as creaky as floorboards at midnight," is greeted with a surprise 90th birthday party!

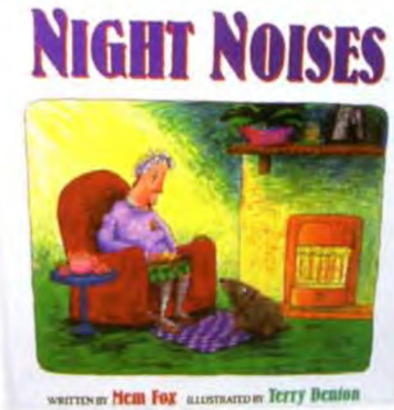
Knowing that I typically come to her third-grade class to teach a math lesson, Areli raised her hand and said, "I bet we get to figure out how many people came to the party."

"You're exactly right," I said, and reread the passage describing the guests: 2 sons, 3 daughters, 14 grandchildren, 35 great-grandchildren, 1 great-great-grandchild, and 47 other friends.

"Can we use paper to figure it out?" Brittany wanted to know.

"Let's try adding in our heads," I suggested. I wanted to give the children valuable and much-needed practice with mental calculation. "Then we'll check our answer with paper and pencil," I added.

The children attacked the problem using a variety of strategies, and we recorded each one. For example, after we had determined that 19 people



had arrived (adding the 2 sons, 3 daughters, and 14 grandchildren), I asked, "How many would there be when we add on the 35 great-grandchildren?" I wrote on the board: $19 + 35$.

Assia offered her strategy first:

$19 + 10 = 29$ $39 + 10 = 49$

$29 + 10 = 39$ $49 + 5 = 54$

Kevin used a different method:

$35 + 10 = 45$

$45 + 5 = 50$

$50 + 4 = 54$

Working together and sharing strategies, we finally figured out that 102 people attended Lily Laceby's party. The children then turned to paper and pencil to check our work.

This *Night Noises* lesson illustrates several important benefits of using children's books for teaching math. It connects a basic skill—mental addition—to a "real-life" example and encourages different ways to arrive at answers. It supports communication in math class by asking students to explain their thinking. Lastly, recording their strategies helps children make the connection between their reasoning and mathematical symbols. ■

Marilyn Burns is the founder of Math Solutions Professional Development, dedicated to improving K–8 math instruction. Ideas for using these and other books appear in her Math, Literature, and Nonfiction series. For information, visit www.mathsolutions.com.

MORE GREAT BOOKS

Here is a starter selection of the many read alouds that are suitable for math lessons:

Kindergarten

A Pig Is Big, by Douglas Florian (Greenwillow, 2000).
What Is Square? by Rebecca Kai Dotlich (Harper Festival,1999).
Benny's Pennies, by Pat Brisson (Dell, 1993).

Grade One

98, 99, 100! Ready or Not, Here I Come! by Teddy Slater (Cartwheel, 1999).
The Shape of Things, by Dayle Ann Dodds (Candlewick, 1994).
Ten Sly Piranhas: A Counting Story in Reverse, by William Wise (Dial, 1993).

Grade Two

What's a Pair? What's a Dozen?, by Stephen Swinburne (Boyds Mills, 2000).
Stay in Line, by Teddy Slater (Cartwheel, 1996).
Only One, by Marc Harshman (Penguin, 1993).

Grade Three

512 Ants on Sullivan Street, by Carol Losi (Cartwheel, 1997).
The Greedy Triangle, by Marilyn Burns (Scholastic, 1995).
One Hundred Hungry Ants, by Elinor J. Pinczes (Houghton Mifflin, 1993).

Grades Four, Five, and Six

If You Hopped Like a Frog, by David M. Schwartz (Scholastic, 1999).
A Million Fish... More or Less, by Patricia C. McKissack (Random House, 1996).
Roman Numbers I to MM: Numerabilia Romana Uno Ad Duo Mila, by Arthur Geisert (Houghton Mifflin, 1996).

Literature-Math Connection—*Moira's Birthday*

A Lesson for Grades 3–5

Susan Westfried, Math Coach, PS 193 Queens, New York

Featured in *Math Solutions Online Newsletter,* Issue 34

Lesson Objective

Collect and use data to solve a problem.

Use collected data to develop statistical concepts of mean, median, and mode.

References

- *Moira's Birthday,* by Robert Munsch (Annick, 1992)

Materials

- Book: *Moira's Birthday*
- Small, square sticky notes (2-by-2-inch), at least 1 per student
- Snap Cubes—approximately 100–150 (maybe more if your class is larger than 25)
- Large sheets of newsprint, 1 sheet for each group of 4 students
- Chart markers for each group of 4

Reviewed Vocabulary

data, mean, median, mode

Summary of the Book *Moira's Birthday*

This book, written by Robert Munsch, is a birthday story created for Moira Green, a girl who lives in Hay River in the Northwest Territories. She asked him to create a new birthday story for her birthday party. In the story, Moira wanted to invite all the students, grades K through 6, to her birthday party. Neither of her parents thought this was a good idea and limited her to six kids. She went to school and invited six, but friends who were not invited begged to be included. By the end of the day, all of the students in grades K through 6 had been included in the birthday invitation. Of course, Moira did not tell her parents because she thought they would be upset. On the day of the party, kids began to arrive, two hundred in all, quickly filling up the house. Moira's mother worried about the food. Moira told her not to worry because she knew what to do.

Moira called a pizza place and ordered two hundred pizzas. The owner told Moira that was too many and he could only send ten. Moira also called a bakery to order two hundred birthday cakes. The baker also responded that the order was too big and he could only send over ten cakes. The ten pizzas and ten cakes arrived and were quickly devoured by the two hundred kids who came to the party. Still hungry, the kids at the party left to get more food to bring back to Moira's house. After several hours, they all showed up with food that they promptly ate, leaving Moira with the problem of a messy house, which she solved using the presents kids had brought for her birthday. After all the kids left, the remainder of her orders were delivered and dumped on her front lawn—190 cakes and 190 pizzas.

The story provides the context for thinking about the problems that Moira had with her birthday.

It also provides a context for collecting and using information to estimate how much pizza to order for a birthday party of two hundred kids. The data collected provides a context to introduce the concept of average using mean, median, and mode.

Lesson Outline

Focus or Warm-Up

1. Introduce the book *Moira's Birthday* to the class. Provide background information about the author and the story.

2. Read the book. When finished, pose this question: "What was Moira's problem?"

   Possible student responses:

   She ordered too much food.
   She ordered too much cake.
   Too many people came to her party.
   She ordered too much pizza.

Introduction

3. Focus on the problem of too much pizza. Use these and other questions to launch a class discussion about Moira's pizza order:
   - How many pizzas did Moira order?
   - How do you think she decided on that number?
   - Was it a reasonable number? Explain your thinking.
   - What ideas do you have for what she could have done to decide on a more reasonable number of pizzas?
   - How many slices of pizza would it take to feed our class? How could we find out? How many pizzas would that be? How many slices do you usually find in a pizza?
   - How can we use information like this from our class to make an estimate of how many pizzas would feed two hundred kids at a birthday party?

4. Following this discussion, let students know that you will help them collect and organize information about slices of pizza that they eat and use that information to learn about some new math ideas and to solve Moira's problem.

5. Ask each student to decide how many slices of pizza he or she might eat at a party like Moira's (or maybe have them consider how many slices their mom might let them eat). Have each student write his or her number of slices on a sticky in writing large enough to be seen across the room. Guide students in posting their data from smallest to largest along one section of the board, like the following example.

   0 0 1 1 1 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 4 4 4 5 5 6

6. Using the data lined up in order from smallest to largest, pose the following question:
   - What one number do you think is the best to tell about how many slices of pizza each person inour class might eat? Be ready to explain your reasons for choosing that number.

After listening to students' ideas, let them know that mathematicians also have ways to determine a number to use that would best tell about how many slices of pizza each person in your class might eat, in fact, they have three ways that you'll talk about today. As you introduce those ways, link them to the ideas students have shared.

Median

Let students know that mathematicians sometimes use the median in a set of data to solve problems. Ask students how they could figure out which response is in the middle of the set of pizza slices data posted on the board. Label the middle piece of data with the word *median.*

0 0 1 1 1 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 4 4 4 5 5 6

↑

median

Let students know that mathematicians would call this the median in your set of data and that it can be found by ordering the data from smallest to largest and determining the data point that's in the middle of the sequence. Mathematicians sometimes use the median in a set of data to make some estimates about a group. Pose this question:

- What estimates could be made about our group using the median in this set of data?

Mode

Mathematicians also use the mode to make estimates about a group. Pose the following question about the data:

- What number of slices would describe the amount of pizza most of you would eat?
  Call this the *mode,* the most common number of slices.

Ask students for their ideas on how the data could be reorganized to easily show the number of slices chosen most often. Reorganize the data and label the mode. For example

			3			
			3			
			3			
			3			
			3			
			3			
			3			
			3			
		2	3			
	1	2	3	4		
	1	2	3	4	5	
0	1	2	3	4	5	6

↑

mode

- What do you notice about the numbers we identified as the mode and the median?
- Do you think the median and mode in a set of data will always be the same?
  We'll keep that question in mind as we continue working with data and finding the median and mode.
- Was it a reasonable number? Explain your thinking.

Mean

Let students know they are going to work as a class to figure out how many slices of pizza each person would get if they evenly distributed the number of pieces represented by your data.

Ask each student to take Snap Cubes to represent his or her number of slices of pizza. So if someone chose zero pieces of pizza, he or she would have zero cubes; if someone chose three pieces of pizza, then he or she would have three cubes. Ask everyone to stand and pair up with someone who has a different number of cubes. In pairs, have students make a stack of all cubes from the partnership. Then they should take the cubes and split them into two equal stacks of cubes or as near equal as possible. Continue the process of pairing up with partners having a different number of cubes, combining the cubes, and then splitting them into equal or near equal stacks. Continue the pairing and splitting until everyone has the same or almost the same number of cubes. In this example, students would have either two or three cubes after the process of pairing and sharing.

Pose the question:

- What can this process tell us about the approximate number of slices of pizza we'd need for each person in our class?

Let students know that they just went through a process of evenly distributing cubes in the group to represent evenly distributing slices of pizza. You may want to model the process mathematicians would use to find the mean number of slices: adding up all the numbers of slices students reported (in this case, 75) and dividing by the number of students in the group (in this case, 27), which would give 2.7777 slices or a number of slices between 2 and 3.

7. Follow up with these questions:
   - How many of you ended up with the number of slices of pizza that you wanted, represented by the cubes?
   - How many of you didn't?
   - Who ended up with more slices or more pizza than you wanted?
   - If we took slices of pizza that people didn't want and gave them to those who didn't have as much as they wanted, do you think we'd end up with a group of kids who got enough pizza?

8. After taking a look at the data and these three statistical benchmarks in the data (mean, median, and mode), ask the following questions:
   - We found that the median of our data was three, the mode was three, and the mean was between two and three. What does this tell you about the number of pieces per person we might use to make a prediction about the amount of pizza we might eat as a class?
   - What did you notice about the numbers that represented the mean, median, and mode in this situation about pizza? As we collect data for other situations, we'll look to see how the mean, median, and mode compare.

Exploration

9. Distribute the newsprint and markers. Pose the following problem for students to work on as a group of four:

    How could we use what we've found out about our class and the number of slices we'd eat to make a better prediction about the following problem:

    What is a reasonable number of pizzas Moira could have ordered to feed the 200 kids at her birthday party?

10. Let students know that in their problem solutions, they need to include the following:

    - Statement of the problem to solve
    - Explanation of the solution process using words, diagrams, and/or symbols
    - Statement of the answer to the problem

    Also, let students know they should be prepared to share their strategies with the class in a whole-class discussion.

11. While observing students at work, decide on a general order you will use to ask students to share their solutions, providing a scaffolded discussion for students that supports access for all students to the variety of ways the problem has been solved. You may want to alert groups that you will ask to present early in the discussion.

Summary

12. Call students together for a class discussion of their solutions to the problem. The goal of the discussion is to reach a common understanding of the problem and its solution and to see how solutions compare and how approaches to solving the problem are the same and different. As each group presents, classmates should listen with the following questions in mind:

    - How does this group's solution compare with ours?
    - How is the approach the same as ours? Different?
    - What questions do I have about their work?

13. In the course of discussion, revisit the ideas of mean, median, and mode, and help students identify how they used those ideas in their problem solutions.

Find more classroom lessons online at *mathsolutions.com/teachers.*