Lydia and Samantha both taught fifth grade and wanted to be sure that their students were well prepared for attending middle school the next year. Their district had just published a new framework based on the national math standards, and the district testing program was new as well. Lydia and Samantha weren’t sure how these changes should impact their math teaching. What was important to think about for their instruction? What preparation would the students need for the new test?

Janice had different questions about the upcoming year. She had been teaching fourth grade for five years and had just been reassigned to first. She liked math and knew the fourth-grade math curriculum well, but she hadn’t taught first graders since her student teaching assignment. She felt she needed to get a handle on the year’s goals and a better sense of what first graders could do.

Tom was concerned about another issue. This year he wanted to focus on his students’ attitudes toward math. He worried about those students each year who seemed to have already come to hate math, and he wanted to think about what he could do for them. He was thinking about what sorts of field trips might help his students see math as relevant and enjoyable.

As these teachers’ concerns demonstrate, there are many aspects to consider when preparing for a year of math teaching. Taking an overall look at them is valuable for identifying issues you want to be sure to address with your instructional program.

**What’s the best way to get a handle on all the math I need to teach during the year?**

Having an overall sense of where you’re heading mathematically for the year is important. Each grade level has its own specific goals, and you need to look at the big picture of what students in your class should understand and be able to do by the end
of the year. It’s hard as a new teacher, or as a teacher new to a particular grade, to have a clear vision of this. You may have some memory about what it was like to have been a student yourself in the grade level you’re teaching, but relying on your memory is risky. And, of course, your perspective was much different then. We recommend that you don’t rely on just one source for looking at the math content for the year but that you take advantage of resources in several categories. Each will offer you a different perspective that will help shape your thinking.

One category of resources includes national and state standards. We know that these documents won’t give you the help you need for planning daily lessons, but they can provide information about math teaching and learning that’s valuable for seeing where in the larger picture your specific grade-level concerns fit. Also, national and state standards provide useful information for communicating with students and parents about what’s important in learning math. (See page 2–3 for a nutshell view of the national standards.)

Next check your district guidelines about what your students should learn and the specific grade-level expectations. Districts use different names to describe these guidelines—math framework, curriculum guide, teaching and learning standards, student learning objectives, performance standards, and so on. It’s also possible that your district hasn’t compiled a specific document but is relying on the guidance of the state standards. Check with your district for a copy of your state standards, or check your state department’s Web site.

A third category of resources includes the instructional materials provided by your district for teaching math. Especially if you’re new to teaching math, these will probably give you the most help for charting the year’s instruction. They outline lessons and help you gather your thoughts and prepare the materials needed for teaching. As you gain more experience teaching math, you’ll probably do what most teachers do and supplement your instructional materials with ideas you’ve gleaned from colleagues, workshops, other materials, your own experiences, and feedback from your students about lessons you’ve tried.

2

What’s important to know about the national math standards?

Our current national math standards, titled *Principles and Standards for School Mathematics*, are published by the National Council for Teachers of Mathematics. Released in April 2000, our standards are built on several important ideas:

- Learning math is essential for students.
- All students can learn mathematics, not just those with a “gift for math.”

2 SO YOU HAVE TO TEACH MATH?
• Learning math means more than memorizing facts and performing procedures and includes thinking, reasoning, and applying skills to problem-solving situations.

• Students learn math by being actively involved in making sense of concepts and skills.

The document begins by addressing six guiding principles: equity, curriculum, teaching, learning, assessment, and technology. The rest of the document focuses on ten standards—five content standards and five process standards.

**Content Standards**

Standard 1. Number and Operation

Standard 2. Patterns, Functions, and Algebra

Standard 3. Geometry and Spatial Sense

Standard 4. Measurement

Standard 5. Data Analysis, Statistics, and Probability

The five content standards define the mathematics students must learn. They’re the heart of what we teach. Although they’re organized into five separate standards, it’s important to remember that there are overlaps among the content areas. Number appears in all areas of math. Learning about measurement, statistics, and probability helps learning about number. Spatial sense plays an important role in patterns, functions, and algebra. The five standards together provide you a way to be sure that your math program is addressing the full breadth of mathematics that your students should know.

**Process Standards**

Standard 6. Problem Solving

Standard 7. Reasoning and Proof

Standard 8. Communication

Standard 9. Connections

Standard 10. Representation

While the content standards are the heart of the curriculum, the process standards are essential to keep it pumping. They describe the processes students use to learn and apply mathematics. In important ways, the two sets of standards are inseparable. The process standards provide the vehicles for bringing the content of the math curriculum to life and making it accessible to children.

Following a general description of each standard in the document are elaborations in four grade-level sections: K–2, 3–5, 6–8, and 9–12. These sections provide more specific information along with suggestions for classroom instruction.
Since my instructional materials give me the direction I need for planning day-to-day lessons, why do I need to give attention to national or state standards?

It’s true that national and state math standards, and even your district standards, don’t give you the specific planning help you need to face your students each day. But they do provide an overall structure of math teaching and learning that can guide your thinking as you make your daily instructional plans.

Think about when you plan to drive someplace you’ve never been. Specific directions help, and the more detailed they are, the smoother your trip is likely to be. But if the directions call for getting off at a particular exit or turning at a specific corner, and road construction requires an alternate route, you’re better prepared when you have a broader sense of where you’re going. In that case, it’s also beneficial to have a general map of the area. In the same way, you can think of standards as broad road maps that provide a context for specific instructional choices.

When you make lesson plans, your attention to specifics is important for lessons to go smoothly. Making lesson plans calls for thinking through a variety of details—choosing the right materials, organizing the students, presenting directions, setting expectations for the students, providing for students who finish more quickly than others, and so on. However, along with working out these logistic details, it’s also important to understand the key math ideas the lesson addresses and where these ideas fit into students’ overall math learning. Standards can help with that.

Perhaps an example would be useful to illustrate these ideas. Empty the Bowl is an activity that you might enjoy trying with your students. We’ve used it with primary children as well as with older students. The activity gives primary children practice with addition, helps children develop their number sense, and provides a way to introduce them to ideas about probability. For older students, probability ideas and analyzing statistics become the focus of the activity.

Here’s a plan for teaching Empty the Bowl:

1. Explain the activity: Put 12 cubes or tiles into a small plastic bowl (such as a margarine tub) and then roll a die. The number on the die tells how many tiles to remove. Continue until the bowl is empty.

2. Model with a volunteer how the students will work in pairs. You roll the die and remove the tiles; the volunteer student records the number rolled. To prompt the students’ thinking, after each roll ask the class how many tiles still remain in the bowl.

3. Explain to the class that when only a few tiles remain, it’s not necessary to go out exactly. If you roll a 5, for example, and only two tiles remain, you can remove them.
4. Tell the students that when the bowl is empty, partners should add the recorded numbers. With your volunteer, add the numbers for your game. Point out that if you went out exactly, the total will be 12; if the last roll was larger than the number of tiles left, the total will be more.

5. Before students pair up to work, ask: What’s the fewest number of rolls it would take to empty the bowl? Discuss. Then ask: What’s the most number of rolls it would take to empty the bowl? Discuss. List the numbers from 2 through 12 on a class chart and ask: Is it possible to empty the bowl in all of these numbers of rolls? Discuss, and have children give possible rolls that would result in each total number of rolls.

6. Tell the students that they are to play five rounds and then record with a tally mark next to the appropriate number on the class chart how many rolls it took on each round to empty the bowl. Record a tally mark for the game you modeled. If you think it’s needed, model another game. (See Figure 1–1.)

7. Finally, tell the students that if time remains when they have played and recorded five tally marks, they should play more rounds and continue recording tally marks.

8. After all students have played and recorded, discuss the results on the class chart. Ask students how the class results compare to their individual results.

Empty the Bowl, along with providing numerical experience, provides the opportunity to introduce or reinforce several important ideas about probability and statistics:

![Rolls to Empty the Bowl](image)

1–1. Students use a class chart to record how many rolls in each round it took them to empty the bowl.
1. Some events are more likely than others, while some events are equally likely.
2. It’s possible to measure the likelihood of events.
3. A sample set of data can be useful for predicting an outcome.
4. Larger sample sizes of data are more reliable than smaller samples.
5. Sometimes an experiment produces data that do not match a theory about probability.

The plans for Empty the Bowl ask students to consider several questions: Why are 2 and 12 the fewest and most numbers of rolls it can take to empty a bowl? Is it possible to empty the bowl in all numbers of rolls from 2 through 12? What do you think the data will show after all students record tally marks? Do you think it’s more likely for some numbers of rolls to come up than others? Why? Suppose you had to go out exactly, so that if you had two tiles left and rolled a 5, you couldn’t play. How would that change the results on the class chart? What would be the most number of rolls needed in this version? How does the larger sample of the class data compare with students’ individual trials? The important ideas about probability and statistics in the previous list not only justify the activity but also guided the selection of these questions.

Thinking about important math goals can also help you think of extensions for your lessons. For example, you could have primary children repeat the activity with 20 items in the bowl. Older students could try the activity a second time using the rule of having to go out exactly and then compare the data from the two versions. You might think of other ideas to extend this lesson.

What’s important for me to think about when planning instruction?

You should consider three aspects when getting organized for successful lessons: planning, preparing, and management. We realize that there are overlapping issues to these aspects, but we think it’s helpful to think of them separately.

Planning first. We think of this more or less as a script for teaching a lesson. In order for lessons to run smoothly, you need to think about your presentation—the explanations you’ll offer, the questions you’ll pose to stimulate students’ thinking, and the assignment you’ll give to groups or individuals. It may help you to make written notes about the sequence of your lesson so you have an actual script that you can refer to during instruction. We do this often. (See the instructions for Empty the Bowl on page 4.) Reread your notes to check on the clarity of the explanations, questions, and directions. Do you think they’re crystal clear? Will they promote reasoning?

Preparing next. While planning gives a lesson structure, preparing calls for thinking hard about the mathematics underlying the lesson. How does the topic connect to