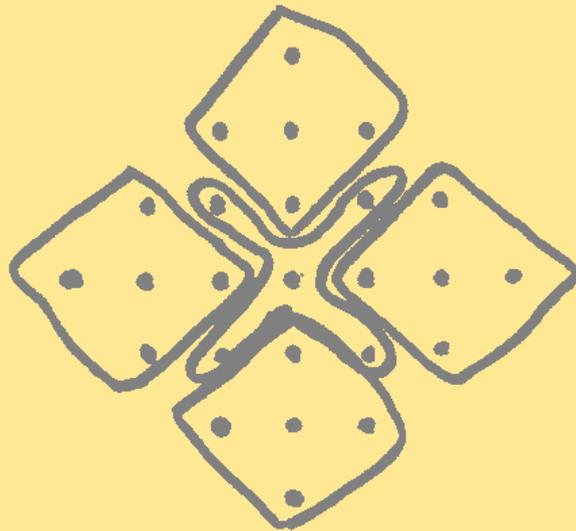
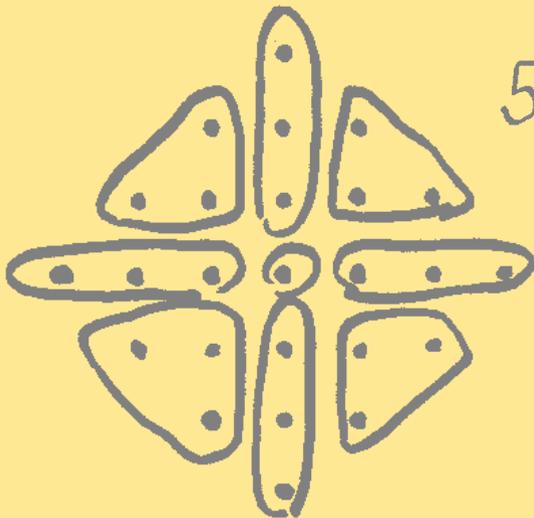


# Minilessons

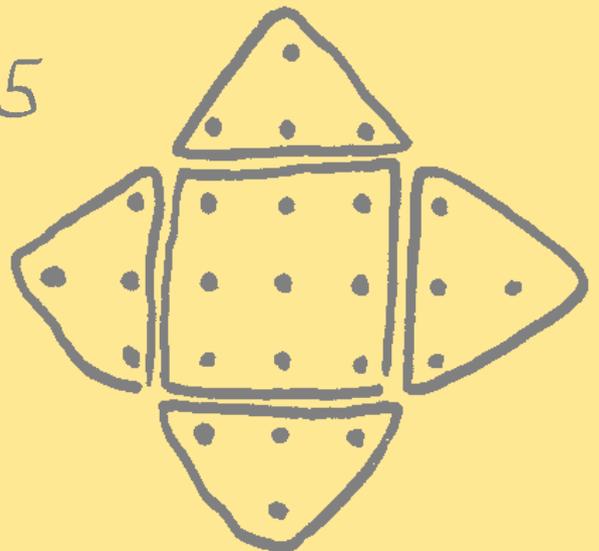
## for Math Practice



$$5 \times 5 = 25$$



$$(8 \times 3) + 1 = 25$$



$$(4 \times 4) + 9 = 25$$

# Minilessons for Math Practice

GRADES 3-5

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# Minilessons for Math Practice

GRADES 3-5

**Rusty Bresser**

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**Math Solutions Publications**  
Sausalito, CA



**Math Solutions Publications**

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## A Message from Marilyn Burns

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# Introduction: Redefining Practice

Teachers have always known that their students require opportunities to practice the things they have learned. Opportunities for practice are particularly important in mathematics. When children learn a new skill or concept in math without having had the time to put that new idea into practice, they tend to forget what they've learned.

Traditionally, practice has been synonymous with drill. The teacher models or introduces a procedure or math fact and then gives students worksheets full of problems so that they can “practice” over and over. The objective of this form of practice has often been memorization rather than understanding.

The purpose of *Minilessons for Math Practice, Grades 3–5* is to broaden the notion of what it means to provide students with practice in mathematics. Instead of focusing just on facts, procedures, and memorization, the goal of this book is to give students ongoing experiences that will help them practice math concepts, skills, and processes so that they may deepen their understanding of mathematics and apply what they've learned to new problem situations.

Another goal of the book involves broadening classroom opportunities to do mathematics. There is limited time in the school day dedicated solely to math. This book looks at ways to insert mathematics throughout the students' day. *Minilessons for Math Practice* offers ideas for quick activities that can be used in various contexts.

In addition, a goal of this book is to broaden the mathematics curriculum. Most teachers are required to use a district-adopted curriculum and have little extra time for supplemental materials. The activities in this book can be used with any existing math program to help students meet local, state, and national math standards.

## Features of This Book

There are several key features in *Minilessons for Math Practice*. One is that the activities in it take little or no preparation. They are easy to implement. And the activities take only five to fifteen minutes to teach. Throughout the day teachers find themselves transitioning their students from one activity to another, from one place to another, or from one subject to another. These transitional times require teachers to focus the attention of their students so they can move smoothly through shifts in the day. The activities in this book convert these transitional times into rich mathematical events.

Another important feature is that all of the activities can be repeated. For example, many of the games in the book can be played throughout the year to give students ongoing practice with numbers and operations. *Looking at Data* can be repeated simply by changing the survey question so that students can continue to practice analyzing data as the year progresses. For *Guess My Rule*, you need only to offer students different numbers to compare. Or you might shift the *Guess My Rule* content area by presenting polygons, in order to give students continued experience with two-dimensional shapes, even after your unit on geometry is over.

The lessons in *Minilessons for Math Practice* focus on questioning and classroom discussion. While the activities in the book are engaging and fun, they become mathematically loaded when the teacher spotlights the key mathematical concepts and skills. This spotlight becomes a focal point for the students when the teacher asks challenging questions and helps students develop their own ways to express their thinking using mathematical language.

## Organization of the Activities

The twenty-seven activities in this book offer experiences in all of the content areas important to mathematics: number, measurement, geometry, data analysis and probability, and algebra. As well, the lessons model how to develop several important math processes: problem solving, reasoning and proof, communication, connections, and representation.

See the contents chart following this introduction to identify activities that fit the content area of choice. Since many of the activities address more than one content area, the content area of focus for each vignette is highlighted in the chart with a bold X. Other potential content connections are noted with a small x.

The activities in the book each have eight components:

1. the content area(s)
2. materials
3. time
4. an overview of the activity and an explanation of the mathematics involved
5. step-by-step teaching directions
6. a list of key questions to ask students during the lesson
7. a brief vignette from the classroom that describes how we taught the activity
8. ideas for extending the activity throughout the year

## Getting Started

The activities provided in this book have been field-tested in diverse classroom settings. They typically take fifteen minutes or less. However, when introducing the activities to your students, you might find you need more time. In some cases it makes sense to budget a thirty- to forty-five-minute time slot for the first presentation of an activity. Much of the decision will depend on your students' prior experience and your goals for the session. Once you've made the initial time investment, the activities should run smoothly in a five- to fifteen-minute time slot for the rest of the year.

The lessons in *Minilessons for Math Practice* are language rich, allowing students to develop, organize, and explain their thinking. However, the ability to communicate mathematical ideas is a skill that develops over time. Your initial discussions with your students might be briefer and less profound than you had anticipated. Don't be discouraged. Over time, with good questions and a safe environment, students will become more confident and more competent in discussing their mathematical thinking. This is especially true for English language learners.

The key questions listed before each vignette and the descriptions of classroom interactions within the vignette give examples of activity structures that maximize participation and develop mathematical thinking and language. Notice that we use different types of questions throughout the activities. Some questions focus students on specific solutions, while other questions focus students on multiple approaches, strategies, or techniques.

Since the activities are designed primarily for whole-class settings, we gave special thought to meeting the needs of diverse learners. The activities need to be accessible to all students while also being rich enough to engage all students at deep mathematical levels. Throughout the book, the

vignettes model ways to encourage participation by all students and ways to help students develop the language and communication skills necessary for math talk.

We encourage you to use the book flexibly and adapt the activities to best meet your instructional goals and your students' needs. You might use the activities to supplement your current unit of study in mathematics. Alternatively, you might use some activities in *Minilessons for Math Practice* to keep past math studies fresh in your students' minds. Another option is to use activities as previews or introductions to upcoming units of study.

We recognize that classroom teachers face more and more challenges each year as they struggle to help their students meet local, state, and national standards and perform well on standardized tests. We hope that the activities in this book will support you in these efforts and we encourage you to use the book in ways that best meet the needs of your students.

However you choose to use the book, we hope you find effective and fun ways to engage your students mathematically. We also hope this book helps open your students' minds to math throughout each day and throughout the school year.

# Contents Chart

<b>Activity</b>	<b>Chapter</b>	<b>Number and Operations</b>	<b>Algebra</b>	<b>Geometry</b>	<b>Measurement</b>	<b>Data Analysis and Probability</b>
Number Talks	1	X				
Ballpark Estimation	2	X			x	
Clear the Board	3	X				
Coin Riddle	4	X		x		
Comparing Fractions	5	X				
Coordinate Tic-Tac-Toe	6		X			
Digit Place	7	X				
Dot Clusters	8	X		x		
Estimate and Measure	9	x			X	X
Estimation Jar	10	X				
Function Machine	11	x	X			
Guess My Number	12	X				
Guess My Rule	13	X		x		
How Far Away?	14	X				x
Looking at Data	15				x	X
Number Strings	16	X				
Odd Number Wins	17	X				
Over or Under	18	X			x	
Personal Numbers	19	X				
Race for Twenty	20		X			
Target 100/Target 0	21	X				
Tell Me All You Can	22	X				
Twenty Questions	23	X		x		
What Comes Next?	24		X			
What Page Are We On?	25	X				x
Whole-Class Pig	26	x				X
Your Choice Tic-Tac-Toe	27			X		



# Number Talks

1



## Overview

In this simple, yet powerful activity, students solve a computation problem presented by the teacher. After students solve the problem mentally, a class discussion ensues. The teacher asks questions and records students' thinking on the board. This activity fuels mathematical thinking and computational fluency.

Start with simple problems that students can solve fairly easily. The focus at the beginning is on helping students explain their thinking and communicate clearly. Both of these tasks are challenging, especially for English language learners. As students develop their communication skills, you can gradually present more challenging problems. The teacher's role during number talks is to help students clarify their thinking and connect their mathematical ideas to the appropriate symbols and notation. This means that teachers need to ask probing questions and translate informal discussions into formal mathematical vocabulary and notation. These teaching skills develop over time with practice. It's as important for teachers to practice number talks as it is for students.

## Activity Directions

1. Write a computation problem horizontally on the board or an overhead transparency (e.g.,  $27 \times 2 =$ ).
2. Tell students to solve the problem mentally and pay attention to the way they solved it.
3. After a few moments, count aloud to three and have the students tell their answer in a whisper voice.
4. When the correct answer has been established, have individual students share their solution strategies.
5. Record students' strategies on the board using appropriate mathematical notation.

## CONTENT AREA

Number and Operations

## MATERIALS

- optional: overhead projector

## TIME

ten minutes

### Key Questions

- How did you solve the problem?
- Where did you start?
- Did anyone do it a different way?

## From the Classroom

I started a number talk with Robin Gordon's fourth graders. As this was the first number talk I'd done with them, I decided to introduce a fairly simple equation. This way, we'd be able to focus on the communication aspect instead of getting too bogged down in the computation. After the students understood the focus and mechanics of the whole-class number talk, I planned to present them with more challenging problems to solve and discuss.

"OK," I told the students, "I'm going to write a problem on the overhead. Your job is to solve the problem mentally. What do I mean by that?"

"Do it in your head," Gregory responded.

"Right," I agreed. "You're going to look at the problem and then solve it mentally, in your brain. There are actually two things your brain will be doing. Not only are you going to solve the problem, but you're also going to pay attention to how you solved it so we can have a conversation about it."

"Oh," I added, "there's one more thing. When you think you know the answer, please don't shout it out. We want to make sure everyone has time to think and solve the problem without being interrupted or told the answer. OK?"

I looked seriously at the students to convey the importance of this rule. I waited for eye contact and nods. Then I wrote on the transparency:

$$27 \times 2 =$$

I gave the students a full thirty seconds to think about the problem. After a more than ample pause, I spoke to the class. "Thanks for controlling yourselves and not shouting out the answer," I complimented. "Thumbs up if you think you know the answer."

Everyone showed me an upturned thumb. Instead of having all the students vie to be the one to say the answer, I employed the choral response approach. That way everyone would get to share.

"Well, it looks like a lot of you have an answer. Here's what we're going to do," I explained. "I'm going to count to three. When I say, 'Three,'

you're going to say the answer in a whisper voice. Ready? One. Two. Three."

To my surprise, I heard three or four different answers. I realized we needed to resolve that dispute before moving ahead with the number talk.

"Hmm," I told the class. "I heard several different answers. Take a minute or two to talk to your neighbors about what you think the answer is and why. Maybe that will help us agree on the correct answer."

I gave the students a few minutes to talk to each other. As they were discussing the problem, I prompted various groups with questions like "What do you think the answer is?" "Can you explain your thinking to your partners?" and "How can you prove that?" When I heard them reaching a consensus, I asked for their attention.

"OK," I said. "We'll try the same thing again. I'll count to three and you say the answer in a whisper voice. One. Two. Three."

"Fifty-four," the class responded in unison.

"Yes," I agreed. "Now for the interesting part. Who is willing to tell how you solved the problem?"

Many students raised their hands. I called on Jonquil.

"I pictured it vertically," she told us. "Twenty-seven plus twenty-seven."

"So you turned this multiplication problem into an addition problem. You knew twenty-seven times two is the same as twenty-seven plus twenty-seven. Like this?" I asked as I wrote on the overhead.

*Jonquil*

$$\begin{array}{r} 27 \\ + 27 \\ \hline \end{array}$$

"Yes," Jonquil replied. "And I did seven plus seven equals fourteen, so I wrote down the four and put the one on top of the two."

"Is this really a one?" I asked the class.

"No, it's a ten," Ricardo reminded us.

I am always a stickler about clarifying the value of digits when discussing arithmetic problems. Using proper terminology helps intermediate-grade students solidify their place-value foundations. Students often need to be reminded that face value is not necessarily place value. In this case, the one Jonquil carried was not really a one, but a ten.

"So what did you do with that ten?" I asked Jonquil.

"I added it to the two twenties. That made fifty and I already had the four, so it equaled fifty-four," she explained.

I recorded Jonquil's answer and asked if any students had thought of it differently. Many hands were raised. I called on Ricky.

"I split the twenty-seven into a twenty and a seven. Then I added the twenties and the sevens."