

THE *M*ath with a *L*augh SERIES

You Can't Keep Slope Down



& Other Skill-Building
Math Activities

GRADES 8-9

Faye Nisonoff Ruopp & Paula Poundstone

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To Charlie & Marcus,
for making my life infinitely joyful.

—*Faye*

To Toshia, Alley & Thomas E,
without whom nothing adds up. Thank you.

—*Paula*

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Preface

When we first decided to collaborate on a mathematics book, we had in mind the creation of problems to be done during the summer. Schools have a long tradition of assigning summer reading; many teachers ask for parallel assignments in mathematics so that students do not lose ground over the summer months. Doing math in the summer—what a thought! Of course, many students will wonder why anyone would create math problems for vacation time. Believe it or not, we're sympathetic to that feeling. And that's why we've created a set of problems that we hope will be different from those found in standard textbooks—different in tone and style, but not in content. These problems are intentionally silly and humorous so students can laugh and be serious about the mathematics, all at the same time!

There has actually been some analysis of the benefits of humor in mathematics classrooms. In the December 2004/January 2005 edition of *Mathematics Teaching in the Middle School*, George and Janette Gadanidis and Alyssa Huang state,

There are several benefits to using humor in the mathematics classroom (Cornett 1986, 2001; Dyer 1997; Martin and Baksh 1995; Medgyes 2002; Wischnewski 1986):

- Humor helps create a more positive learning environment. It helps reduce barriers to communication and increase rapport between teacher and students.
- Humor helps gain students' attention and keep their interest in a classroom activity.
- By reducing stress and anxiety, humor helps improve comprehension and cognitive retention.
- Humor improves students' attitudes toward the subject.
- Humor helps communicate to students that it is okay for them to be creative; to take chances; to look at things in an offbeat way; and perhaps, even make mistakes in the process.

- Humor can help students see concepts in a new light and increase their understanding.
- The use of humor is rewarding for the teacher, knowing that students are listening with enjoyment. (10 [5]:245)

Although designed for use in the summer, these problems can also serve as a supplement to the curriculum during the academic year, as math to do at home with parents, as well as for skills reinforcement. Students need a change of pace and environment at times. These problems were created to provide entertaining contexts while keeping the mathematics content targeted and sound. The problems can be used as assessments, assignments, additional practice, or extra credit, as well as summer work. In addition, you will note as you scan the problems that there is a good deal of reading involved, making them an excellent tool for students to practice reading in context. We assume, then, that these materials could also be used for reading practice with students.

We ended up with a series of three books, one each for grades 4 and 5, 6 and 7, and 8 and 9. The content for these grade-level books is based on the focus areas identified in state and national standards. These areas, however, may vary from school to school. You may therefore choose to use problems from different grade-level books to accommodate your needs. Our goal was to make the materials as flexible as possible.

Whenever we look at mathematics materials, we tend to be curious about the authors, wanting to know who they are and why they wrote the materials at hand. So we've each included a short piece about ourselves, since we think our story is one that may both surprise and entertain you.

From Faye Nisonoff Ruopp

Paula Poundstone was a student of mine in the 1970s at Lincoln-Sudbury Regional High School in Sudbury, Massachusetts. Paula would say that she was never very good at math; I would say quite the contrary. I saw potential. Paula went on to be a highly successful comedian after she graduated, and we have remained close over the past thirty-two years. Paula now has her own children who are studying mathematics, and at times, I get calls (some of them late at night) about how to do some of the math problems they get in school. Once Paula told me that she made up stories for the problems to make them easier for her children to understand. Given her comedic talents, these stories turned out to be gems. And that's when the idea of collaborating on these books occurred to us. So now, after thirty-two years, she and I can proudly say that she has written a math book with her math teacher, an accomplishment

that makes us both smile. We've come full circle, and we think this book is symbolic, in many ways, of the special relationships that students and teachers form, of the humanity that characterizes the study of mathematics, and of the belief that all students can learn and enjoy doing mathematics—and even smile through it all!

Many teachers hope to make mathematics playful and friendly for their students. I would like to extend the opportunity to parents as well. In thinking about my experiences as a parent doing mathematics together with my son, Marcus (who has far surpassed my mathematical abilities, I am proud to admit), I recall fondly the times when we sat down together to tackle a tough problem and the car rides when I posed problems such as “We've decided you can go to bed a half hour later each year. At some point you won't be going to sleep at all. How old will you be then?” He worked on that problem for an hour on our way to Vermont one weekend, not knowing anything about fractions. I also recall when he was about five, I asked him, “What would happen if you subtracted six from two?” His response: “You would get four in minus land!” His connection of mathematics to some fantasy world of negative numbers reminds me how important it is for children to experience their own inventions and perceptions of how mathematics makes sense to them. Likewise, Paula's fantasy contexts, rooted in humor and humanity, enable us to laugh while at the same time thinking hard about how the mathematics works.

From Paula Poundstone

How come math makes people cry? You'd think, of all subjects, history would be the tear jerker. But I cried over math when I was a kid. My mother used to cry when I asked her to help me. My high school math teacher and coauthor of this book, Faye Ruopp, kept a box of tissues on her desk, and if she ran out, class had to be canceled.

I can remember, when I was a kid, I'd get a word problem, something like: “Mary had four apples. She shared two of them with Joe. How many does she have left?”

Although I could calculate the remaining apples, I mostly wanted to know more about Mary and Joe and would often include that curiosity in my homework. Were they just friends? How did Mary get the apples? Why couldn't Joe take care of himself? What is it with Joe? Was that even his real name?

So when my own daughters were so frustrated and intimidated by their elementary school math assignments that they, too, followed the time-honored tradition of shedding buckets of tears over the wonderful world of math, I began to write personalized practice problems for them. Not surprisingly, once the problems seemed less

serious, they relaxed a bit and much of the drama slipped away. We have also spent the last few summers doing a page or two of math each day and, no duh, both girls took a huge leap in their math ability as a result. I think the main thing is that it increased their confidence so they hit the ground running in the fall. We've saved lots of money on tissues and I'm hoping you will too.

I think the idea of our writing a book of these kinds of problems came from Ms. Ruopp. She had called me because she was going over her grade book from 1976 and noticed I still had some assignments missing. We got talking and I told her about doing math with my kids and the next thing you know...

And so we offer you these problems in the spirit of improving understanding and increasing rapport with your audience. We hope that when your students do these problems, they will smile and perhaps even laugh, and come to realize that mathematics can be fun and challenging and enlightening, all at once!

Acknowledgments

From Faye

My first memories of mathematics come from my paternal grandfather, Morris Nisonoff, who was a butcher in Jamesburg, New Jersey. He could add a column of numbers faster than anyone I know. I found that fascinating. My gratitude goes to him, then, for making calculations seem fun and accessible. To my own father, I express my love and gratitude for spending time doing math problems with me as a young child many mornings before I went to school. He thought a great way to start the day was to tackle two-digit multiplication! As an accountant, he too had a knack for working with numbers that transferred to both me and my sister, as we each eventually became mathematics teachers. My father, mother, and grandfather taught me the importance of doing mathematics at home with children, and the key role parents play in creating a positive disposition toward math. To that end, doing math with my own son, Marcus, has been a highlight of my parenting. I thank him, especially for continuing a tradition of math study as an applied mathematics major at Yale. His positive and joyful approach to mathematics mirrors his approach to life—how he makes me smile!

I would also like to acknowledge my past and present students, who taught me what it means to come to understand mathematics, and what it means to struggle with a subject that for many is formidable. Their spirit, humanity, diligence, and enthusiasm are continually inspiring. Teaching them has been a gift.

To my friends and family and colleagues in education who encouraged me to write this series, I thank you for your support and faith in this project. You will see yourselves in some of the problems we've created, and we hope they make you laugh.

I would like to thank Ellen Lubell for her impeccable legal expertise and advice in addressing the contractual issues, and for her support as a friend and confidante.

I extend my deepest gratitude to Leigh Peake at Heinemann, who had the vision and courage to support the initial idea for this project. I am indebted to her for her continued influence on the series. A special thanks to Michael Kline for his artistic genius in

creating the cartoon illustrations, capturing the essence of the problems and adding to the spirit of the contexts. I also want to thank Abby Heim and Beth Tripp for their care, expertise, and mathematical acuity in editing the series.

Alec Marshall, former chair of the mathematics department at Lincoln-Sudbury Regional High School, hired me for my first teaching position. I continue to be deeply grateful to him for his inspiration as a master teacher and also as an extraordinary human being.

Dr. Peter Braunfeld, Professor Emeritus at the University of Illinois, gave me my first National Science Foundation grant in mathematics professional development when he was a program officer in 1992. I am profoundly grateful to him for making me keenly aware that mathematics as a human endeavor and mathematics as an intellectual pursuit are not mutually exclusive.

And of course, my heartfelt thanks goes to my coauthor, Paula Poundstone, whose comic genius continues to inspire me. Beyond her creativity and sense of humor, she is a remarkable human being and a fabulous mother. Collaborating with Paula on this project has been infinitely rewarding—we laughed so much more than we thought we would! She has proven herself to be the mathematician I always knew she was.

And finally, I want to thank my husband, Charlie, for his unconditional support and calming influence throughout this project. As Paula's high school biology teacher, he also appreciated her amazing talent and encouraged our collaboration. This project never would have happened without him.

From Paula

The fact that I have been a part of the creation of a math book defies the laws of probability. Simple mathematical reasoning tells us that there must have been some other important factors that made this improbability possible.

I'd like to thank Leigh Peake at Heinemann for her kind support and skill. Someday I hope to remove a thorn from her paw.

I thank Abby M. Heim for making my part make sense.

I greatly appreciate the technical support of my assistant, Carmen Cannon, and that of my friend, Gordon McKee.

I will always be in the debt of my manager, Bonnie Burns, for clearing the path for me for thirteen years.

Faye Nisonoff Ruopp has been my friend, teacher, and mentor for thirty-three years. My admiration and appreciation of her grows exponentially each day. Without Faye, who knows what n would equal?

You Can't Keep Slope Down

Slope was fifteen years old in 1863. He had been raised in Cambridge, Massachusetts, by his loving parents, who were professors at Harvard University but were tragically killed the year before when a shelf full of calculus textbooks collapsed on them. It might not have been fatal had the textbooks not been the teacher's editions, which are extra heavy. Lying beneath the stack of books, Slope's father used his last bit of strength to reach for the writing materials that he carried in his shirt pocket, which often caused him to drip ink as he walked. He dipped his quill into his inkwell and ruefully wished someone had invented the ballpoint pen during his lifetime. Inside the cover of a calculus textbook that had struck him in the temple only moments before, he weakly penned,

Slope, go live out west with Aunt Bessie and Uncle Cliff. Make your life greater than the sum of its parts by adding to the lives of others. Choose happiness. We love you. Be a good math student.

Your Loving Father

PS: Don't write in textbooks. This was a rare exception.

Slope, who was named after part of a linear equation, had made it his business to follow his father's final instructions as best as he could. He was warmly welcomed into his aunt and uncle's home. He learned to milk cows and helped out by milking the cow at the aging Widow



Friccus' place each morning, and he studied math in his every free moment. His specialty became—you guessed it—

finding slope. Slope became the fastest slope finder in the West, or certainly within a large area.

A. He could find the slope of the line $y = -3x + 7$ in a flash. Can you?

B. Slope attended the local one-room schoolhouse out West. Orientation day was very short. Some kids thought he was a bit weird. He didn't know how to rope a calf, he thought guns were dangerous, and he dripped ink everywhere he went.

One day, right in the middle of their Modern Art Studies class while they were studying Whistler, an outlaw kicked the schoolroom door in and strode into the room.

"I'm a fixin' to steal your schoolmarm's money!" he roared, waving his gun about.

"You're joking," said Ms. Bonn, the teacher. "Teachers don't get paid well at all, especially when you consider the value of their contribution to society. You couldn't even buy a bullet with what's in my purse."

"Oh, really?" said the outlaw, looking dumbstruck. Then, rallying, he said, "Then I'll take you."

He made a quick grab for Ms. Bonn, but not before Slope could leap between the two of them, shouting, "Not so fast! I challenge you to find the slope of this figure here," holding up a line graph that luckily he'd just plotted, "and if you can't find it before I do, you'll get out and leave us alone, Outlaw."

"Why you lily-livered... you sidewindin'... you ol'... what did you say?" the outlaw sputtered, eyeing Slope dangerously through narrowed eyes, but apparently forgetting all about his gun.

“Find the slope of this figure faster than me or get out,” repeated Slope.

Meanwhile, Antoine, who was a good math student himself, but a bit more practical, snuck out the back and ran for the sheriff. Slope purposely took his time finding the slope, so the outlaw was still clucking and puffing with frustration, turning the figure upside down and sideways, trying to figure its slope, when the sheriff arrived to haul him away. Slope was a hero.

What was the slope of this figure?

