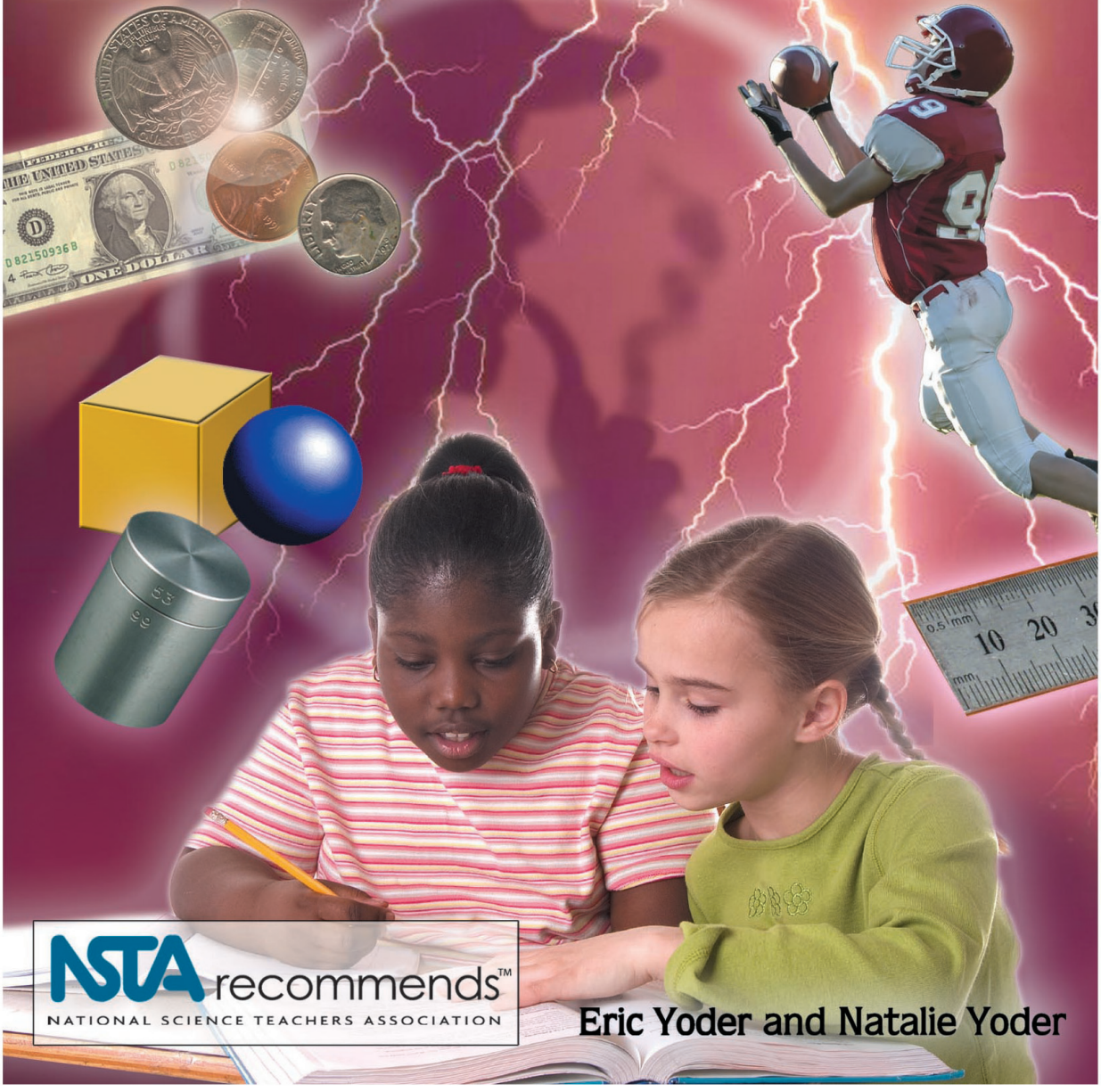
One Minute Mysteries

65 Short Mysteries You Solve With MATH!



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NATIONAL SCIENCE TEACHERS ASSOCIATION

Eric Yoder and Natalie Yoder

DISCOVER WHY EVERYONE LOVES
ONE MINUTE MYSTERIES:
65 SHORT MYSTERIES YOU SOLVE WITH MATH!

INTERNATIONAL BEST BOOKS AWARD FINALIST
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"A wonderful resource to provide real-life math problems to students. … provides insights into how math can be applied in the real world. Intriguing, useful, and challenging!"

Awarded the highly regarded "**NSTA RECOMMENDS**" by the National Science Teachers Association, the world's largest organization promoting excellence in science teaching.

Authors featured on **SCIENCE FRIDAY**, the weekly science talk show on public radio stations nationwide.

Recommended by ***Science News*** magazine of the Society for Science and the Public.

Endorsed by Learning Magazine: "…helps kids understand why they need the skills they learn in math class."

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HOT TOY FOR 2010: "Math can help solve real-life dilemmas, this collection of puzzles for young adults illustrates."

★★★★ Reviewers gave the book **four out of five stars** and proclaimed that "this is a book children will enjoy as they learn math skills."

★★★★ "I never dreamed this book would dramatically impact my daughter's approach to a subject she dislikes. It has been quickly promoted from fun extra to a top-ranked resource! "

Outstanding Product

One Minute Mysteries: 65 Short Mysteries You Solve With Math!
Eric Yoder and Natalie Yoder
ISBN-13: 978-0-9678020-0-8 ▪ ISBN-10: 0-9678020-0-8
E-Book ISBN 10: 0-9700106-5-6
Paperback ▪ Ages 10 to 14 ▪ 8.5" x 5.5" ▪ 176 pages ▪ $9.95

Bridging the gap between the blackboard and the blacktop

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Supporting and Articulating Curriculum Standards

The content in all *Science, Naturally!* books align with both the Common Core State Standards and thr Next Generation Science Standards. The content in *Science, Naturally!* books also correlate directly with the math and science standards laid out by the Center for Education at the National Academies. The articulation of the standards met by each mystery is available at www.ScienceNaturally.com.

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1 Heavy Toll

"A speeding ticket? What?" Suzy's father said as he opened the day's mail.

"What's the matter, Daddy?" Suzy asked.

"Well, Suzy, this ticket says that we were speeding on the toll road we took when we were driving back from the state science fair last weekend," he explained.

As drivers entered the road they got a receipt showing the time and exit number. The exit numbers were also mileage markers. When they got off the road, drivers had to pay different amounts depending on how far they went.

"Are you sure they're right?" Suzy asked. "What does it say?"

"Well, it says that we got on at exit 64 at 12:13 p.m., then got off the road at exit 148 at 1:33 p.m.," he said. "And it says the speed limit was 55 miles an hour—I thought it was 65. How can they know if we were speeding?" he asked. "I didn't see any police cars."

"It's too bad, but they're right," Suzy said.

"How do you know?" he asked.

3 Pancake Mix-up

"Mooommm!" Meg yelled from the kitchen. "Can you please come down here?"

Meg's family and two other families had rented a house at a ski resort for a long weekend. Each family was going to cook and clean up for one of the three days. It was the morning of Meg's family's day.

While Meg's mother finished getting dressed, Meg went into the kitchen and started preparing the pancake mix. They had brought individual-sized serving packages of mix. They also had several boxes of cereal and bread to make toast, but everyone had said they wanted pancakes.

"I'll be there in a minute, Meg. What's the problem?" her mother called.

"I have everything ready to make the pancakes. But each of these packages needs two-thirds of a cup of milk, and there's no two-thirds measuring cup in this kitchen," Meg called. "All they have is a three-fourths measuring cup. Can I just estimate?"

"Not if you want the pancakes to be any good," her mother replied.

"Never mind," Meg said a moment later. "I have the solution."

"What did you do?" her mother asked as she walked into the kitchen.

"If we got on the road at 12:13 and got off at 1:33, that means we were on the road for one hour and 20 minutes, or 80 minutes," Suzy explained. "Since the exit numbers are mileage markers, the distance between exits 64 and 148 is 84 miles—148 minus 64. That means we went 84 miles in 80 minutes—that's more than one mile per minute, which is more than 60 miles per hour. So we were speeding, since the speed limit was 55 miles per hour."

"To figure it out exactly," she added, "84 miles divided by 80 minutes makes 1.05 miles per minute. Multiplying 1.05 miles per minute by 60 minutes in an hour to get miles per hour means we averaged 63 miles per hour."

"Well, we were going less than that for some of the time," her father said.

"Yes, but to average 63 miles an hour, we must have been going faster than that at other times," she said. "I hope that ticket isn't too expensive."

"I did some math. It's a question of least common multiples," Meg told her mother. "First, I figured out how many times you'd have to fill each kind of measure to reach a whole number. With the three-fourths measuring cup, to reach a whole number you'd need to use the measure four times. Four times three-fourths is twelve-fourths, which reduces to three. So filling that measure four times gives us three cups of milk.

"Each package of mix required two-thirds of a cup of milk. If we had a two-thirds measuring cup, you would need to fill it three times to get a whole number. Three times two-thirds is six-thirds, which reduces to two. So, filling a two-third measuring cup three times would give us two cups of milk," she continued.

"All I had to do then was find the least common multiple of three and two—the smallest number that is a multiple of both. That's six. Since I would need to fill the three-fourths measuring cup four times to get three cups, I would need to fill it twice that many times, eight times, to get six cups. I did that and put the milk in the bowl. And since three fillings of a two-thirds measuring cup would give us two cups, to get six cups I would need three times that many, or nine, to get the right amount of mix. So I added nine packages of the mix. I hope everyone's hungry!"

10 Cover Up

As a birthday present to her little sister Laura, Miranda had promised to paint the inside of the family playhouse for her.

Years before, their father had painted the walls and floor pink, Miranda's favorite color. But since Laura was the one who mainly used it now, and her favorite color was blue, she wanted the pink covered up.

Miranda measured the inside of the playhouse. The two longer sides were 10 feet long and 6 feet high, and the ends were 6 feet long and 6 feet high. Above that was the inside of the roof, which didn't need to be painted. Her father warned her that covering up the pink would require two coats of paint.

Later at the hardware store, Laura chose a shade of blue that she liked.

"Okay, here's a can that says it will cover 520 square feet," Miranda said. "Each longer side of the playhouse is 60 square feet—10 times 6—so together they would be twice that, or 120 square feet. The ends are 36 square feet each—6 times 6—so together they would be twice that, or 72 square feet. And 120 plus 72 is 192 square feet. Painting that twice means I need to cover 384 square feet in total—two times 192. So a can that covers 520 square feet will be enough."

Since she was paying for it out of her own money, Miranda didn't want to buy too much.

"That's enough to cover the walls, but don't forget you have to paint the floor, too," her father said.

"Oops! I didn't measure the floor," Miranda said.

"Should we drive back home to measure it?" Laura asked. "Or should you just buy an extra can of paint to be sure you have enough?"

23 Getting a Lift

Jada and Michelle's school was closed for a winter teacher training day, so their parents decided to take a day off from work to take the family skiing. They were glad to see when they got there that there were no lines at the chair lifts.

The two girls were good skiers, so they headed to the part of the mountain with the black diamond trails, the hardest ones. Three lifts started next to each other and ran up the mountain, to a spot on the top leading to many different trails.

"Let's try to get in as many runs as we can," Jada said.

They looked at a sign to decide which lift to use. The Sheer Drop lift had four seats per chair and its capacity was 1,200 skiers an hour. The Hang onto Your Hat lift was a two-seat lift with a capacity of 800 skiers an hour. The White Cliffs lift was a three-seat lift that could move 900 skiers an hour. The sign said each had the same number of chairs.

"Where do you think should we go?" Michelle asked.

"Neither," Miranda said. "Since we know the two longer sides of the playhouse are 10 feet long and the ends are 6 feet long, the floor must be a 6 foot by 10 foot rectangle, meaning its area is 60 square feet. Painting that twice means I have to cover another 120 square feet. So I need to cover 504 square feet—384 plus 120—in total. That means one can will still be enough."

"Sheer Drop. It moves the fastest—it carries 1,200 skiers an hour versus 900 and 800 for the other two," Jada said.

"It carries the most skiers but that doesn't mean it moves the fastest," Michelle said. "Since there are no lines at the lifts, and all three lifts have the same number of chairs and start and end next to each other, the question is how frequently a lift drops off groups of skiers–in other words, how fast a chair gets from the bottom of the mountain to the top.

"Now, the Sheer Drop lift has four seats per chair and it has a capacity of 1,200 skiers an hour, meaning it makes 300 drops an hour—1,200 divided by four," Michelle said. "And the White Cliffs lift is a three-seat lift that can drop off 900 skiers per hour, meaning it also makes 300 drops per hour—900 divided by three. The Hang onto Your Hat lift can drop off 800 skiers an hour and has two seats per chair, meaning it makes 400 drops an hour—800 divided by two. So the Hang onto Your Hat lift will get us to the top the fastest."

32 Ace of Clubs

Natalie and her father had been taking golf lessons. They were hitting the ball pretty well, so they thought it was time to go out and play their first real round of golf.

On the first hole, they hit their drives down the fairway.

"This marker says we're 150 yards out from the green, Daddy," Natalie said when they reached his ball.

"Okay, the instructor said 150 yards is how far I hit with a six-iron," her father said, pulling out that club. He took a practice swing that was interrupted when his hat flew off back toward the tee, making Natalie laugh.

He hit the shot the way he usually did, but it landed 30 yards short of the green. "I could have sworn he told me I hit six-irons 150 yards," he said.

The next hole ran parallel to that one, but going the other way. After their drives, Natalie's father was once again about 150 yards from the green. "Let's see, the instructor said there's about a 15-yard difference in how far different clubs send the ball, and the lower the number of the club the farther the ball goes. So if I hit the six-iron 120 yards like I did on the last hole, I'll need to use the longer club that will hit it 30 more yards. That means a four-iron," he said.

"I wouldn't do that if I were you, Daddy," Natalie said.

"Why not?" he asked.

35 Cutting Corners

"Who wants to take drinks to the older boys?" Brandon's father asked.

Voices called out: "Me! No, me! Me! I want to!"

Many of the players on Brandon's soccer team had older brothers on the team that had just finished the first half of their game. Brandon's team was going to play a game on the same field afterward, and his father, the coach, suggested that the entire team come early to watch the older kids play.

It was a hot day, so Brandon's team was behind a corner of the field in the shade. One of the parents had brought a case of sports drinks for both teams to share. The older team was going off to the opposite corner of the field, where there was also shade.

"We don't need everybody to go," Brandon's father said. "Ali, Jacob, Christian, Luis and Brandon, how about you take an armload of bottles each?"

I might as well be polite and go around the outside of the field, Brandon said to himself. But then he saw the others cutting across the middle.

"Race you!" Jacob called and they all started running as fast as they could. Brandon continued around the outside of the field and got to the older team last.

"I know I'm faster than them," Brandon said to his older brother Victor as they handed out the drinks. "How did they beat me?"

"On the first hole you hit a shot that normally would travel about 150 yards," she said. "That shot was into the wind. You hit a good shot, but it still only went 120 yards. So, the wind reduced the distance of your shot by 30 yards, or a fifth.

"On this hole, we're going the opposite direction, meaning the wind is behind us. So the wind will add about one-fifth to the distance of your shot. So hit the club that normally makes the ball go about 120 yards, and let the wind push it. Since you usually hit the six-iron 150 yards, and each higher numbered club sends the ball 15 yards less, you should use an eight-iron."

Victor said, "You were running faster than them—I could see that—but they had less distance to cover. A straight line is always the shortest distance between two points."