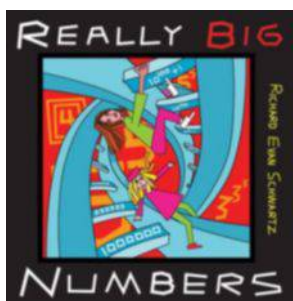


MAKING MATH COUNT: Exploring Math through Stories

Mathical
Books for Kids from Tots to Teens

Great stories are a wonderful way to get young people of all ages excited and interested in mathematics. Now, there's a new annual book prize, *Mathical: Books for Kids from Tots to Teens*, to recognize the most inspiring math-related fiction and nonfiction books that bring to life the wonder of math in our lives. This guide will help you use this 2015 Mathical award-winning title to inspire curiosity and explore math in daily life with the youth you serve.

For more great books and resources, including STEM books and hands-on materials, visit the First Book Marketplace at www.fbmarketplace.org.



REALLY BIG NUMBERS

written and illustrated by Richard Evan Schwartz

Did you know you can cram 20 billion grains of sand into a basketball? Mathematician Richard Evan Schwartz leads readers through the number system by creating these sorts of visual demonstrations and practical comparisons that help us understand how big REALLY big numbers are. The book begins with small, easily observable numbers before building up to truly gigantic ones.

GRADES
6-8
WINNER

KEY MATH CONCEPTS

Really Big Numbers focuses on:

- Connecting enormous numbers to daily things familiar to students
- Estimating and comparing
- Having fun playing with numbers and puzzles

Making comparisons and breaking large quantities into smaller, easily understood components can help students learn in ways they never thought possible. This book emphasizes the importance of finding ways to connect new concepts to existing knowledge.

The Mathical: Books for Kids from Tots to Teens book prize, presented by the Mathematical Sciences Research Institute (MSRI) and the Children's Book Council (CBC) recognizes the most inspiring math-related fiction and nonfiction books for young people of all ages. The award winners were selected by a diverse panel of mathematicians, teachers, librarians, early childhood experts, authors and others.



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TALK AND ASK QUESTIONS AS YOU READ

Before reading

Think about reading this book a little each day. Introduce the book to your students by explaining that the goal isn't to finish the book quickly, but to understand something new and have fun each time you read it.

Really Big Numbers encourages readers to visualize common objects in order to understand enormous quantities. Get students ready to think this way. **ASK:** *Give an example of something in the room that there is only one of. What is something there are exactly two of? What is something in the room of which there are more than 50 but less than 150? Is there something in this room that there are more than a million of?*

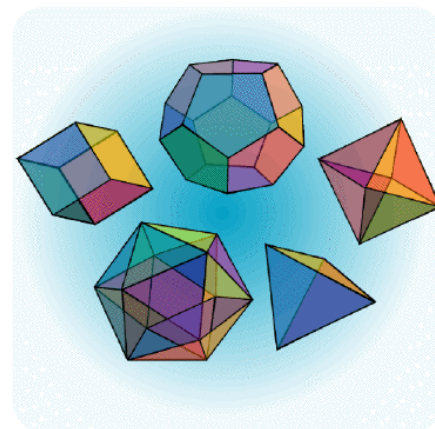
While you're reading

Before showing each page to students, ask them to estimate the size of a described magnitude. Wait on each page while students attempt to visualize each step of numerical and abstract growth. For example, on page 39, **ASK:** *About how many hairs do you think monkeys have on their heads? More than 1,000? More than 10,000?* (The answer is about 100,000.)

Draw connections after you read

This book uses colorful illustrations and comparisons to explain complex mathematical ideas. **ASK:** *Did the pictures and comparisons help you understand the math concepts? Why or why not? What else can pictures and comparisons help us understand?*

The author tells us that some of the ideas might be tough but to stay with them as long as we can. **ASK:** *When you face a tough problem, what do you do to figure it out? How do you feel? What makes problems easier to solve?*



*Illustration courtesy of New South Wales
Department of Education and Communities,
<http://www.curriculumsupport.education.nsw.gov.au/primary/mathematics/>*



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Really Big Numbers uses fun illustrations to help students understand huge amounts. This activity will give students a hands-on opportunity to do the same.

NAME THAT POLYGON

ACTIVITY

MATERIALS

- White board/chalkboard or large sheet of paper
- Marker or chalk
- Timer
- Paper and pencil for each student
- OPTIONAL: Index cards

1. Brainstorm

- Invite students to brainstorm as many shapes as they can in one minute. Draw the shapes on the board/paper.
- Identify which shapes are polygons and have students explain why.

2. Drawing polygons

- Challenge students to draw a polygon with as many sides as possible in 10 seconds.
- Repeat this several times so each student has multiple polygons.

3. Name that polygon!

- Using basic patterns for naming polygons (see next page), have students name the shapes they drew. They can do this individually or in small groups.
- You could write the different roots on individual index cards and have students put together the names of their polygons by combining the cards. Or, you can write the different roots on the board for students to see.

A **polygon** is a two-dimensional figure formed by three or more straight sides that meet only at their endpoints to make a closed path. The sides must not cross.



- 3 = triangle
- 4 = quadrilateral
- 5 = pentagon
- 6 = hexagon
- 7 = heptagon
- 8 = octagon
- 9 = nonagon or enneagon
- 10 = decagon
- 11 = hendecagon
- 12 = dodecagon
- 13 = triskaidecagon
- 14 = tetradecagon
- 15 = pentadecagon
- 16 = hexadecagon
- 17 = heptadecagon
- 18 = octadecagon
- 19 = enneadecagon

Polygons with up to 12 sides have special names.



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For polygons with 20 to 99 sides:

Pattern	Example – 38-sided polygon
Start with the root for the tens-place digit	<u>3</u> 8 → 30 30 = <i>tricon</i> ta
If there's a non-zero ones-place digit, add "kai" (meaning "and" in Greek).	<i>kai</i>
Add the root for the ones-place digit.	3 <u>8</u> → 8 8 = <i>oct</i> a
Always add "gon" to the end. <i>Gon</i> is the Greek root of <i>gonia</i> , which means "angled shape."	- <i>gon</i>
Put it all together.	<i>tricontakai</i> octagon

Tens-place digit root	Ones-place digit root
20 = icsa	1 = hena
30 = tricon	2 = di
40 = tetra	3 = tri
50 = penta	4 = tetra
60 = hexa	5 = penta
70 = hepta	6 = hexa
80 = octa	7 = hepta
90 = enne	8 = octa
	9 = ennea

4. Review and make connections

For polygons with 100 to 999 sides:

- Although students may not have been familiar with how to name polygons, they were able to create and name new and interesting shapes. *ASK: What would you have called your shape without knowing how to name polygons properly? Why is it important for us to follow a pattern? Was it easy or hard to name your polygons? Why or why not?*
- Challenge students to build on their knowledge. The pattern for naming polygons with 100 to 999 sides is very similar to naming polygons with 20 to 99 sides. Pick a number between 100 and 999 and have students name the shape. *ASK: Was this easier or harder than naming the shapes you drew? Why or why not?* Emphasize how students can use something they've done before to tackle problems that seem harder.

Pattern	Example – 531-sided polygon
Start with the root for the 100s-place if it's greater than 1; use hecta if it is equal to 1	<u>5</u> 31 → 5 5 = <i>penta</i>
Add <i>hecta</i>	<i>hecta</i>
Add the root for the tens-place digit	<u>5</u> 31 → 30 30 = <i>tricon</i> ta
If there's a non-zero ones-place digit, add "kai" (meaning "and" in Greek).	<i>kai</i>
Add the root for the ones-place digit.	5 <u>3</u> 1 → 1 1 = <i>hena</i>
Always add "gon" to the end. <i>Gon</i> is the Greek root of <i>gonia</i> , which means "angled shape."	- <i>gon</i>
Put it all together.	<i>pentahectatri</i> contakai- <i>henagon</i>

100s-place digit root
1 = hecta
2 = di
3 = tri
4 = tetra
5 = penta
6 = hexa
7 = hepta
8 = octa
9 = ennea



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