Suggested Internet Sources
Periodically, Internet Resources are updated on our web site at www.LibraryVideo.com
• mathforum.org/
  This Drexel University site offers a multitude of math problems, lesson plans, math resources and a question/answer section for students and teachers.
• mtn.merit.edu/resources/math/powers_and_roots.html
  The Michigan Teacher Network has compiled three sites, supported by their state standards, that are designed to aid students in practicing power and roots, exponents and scientific notation.

Suggested Print Sources

Zeros: Multiplying & Dividing by 10,100, 1000
Grades 4–6

Review and practice of math concepts is an essential component in maintaining prior knowledge and problem-solving skills. This series reinforces important skills taught in grades 4–6 through the use of animated characters and an engaging storyline.

In each episode, students will become Special Agents to assist Top Secret Agent Matt Mattics in solving two sets of math problems focusing on a core math concept. Paper and pencil need to be ready as your students record their answers to these math questions (between 7–16 total problems). Each question allows students a certain time limit for answers. Students will check their answers and score points that will qualify them as Cadet, Secret Agent or Master Spy.

Please note that this series was produced in Great Britain, where some terminology and phrases might be different than in the United States. For example, the word “naught” is sometimes used for zero as in 0.2 (naught point two) and “maths” is used for math.
Secret Mission
Dr. Strangeglove has invented a Math Muddler machine that will confuse all mental math problem-solvers. It is up to Matt Mattics and his Special Agents to solve two sets of review questions on place value using zeros in order to save the world. In the first set of problems, students must multiply numbers by 10, 100, or 1000. In the second set of problems, students are asked to divide numbers by 10, 100, or 1000.

Background Knowledge & Strategies
In order to handle this secret mission, students must have a firm understanding of place value, multiplication and division. Revisit the concepts of multiplication as repeated addition and division as making equal groups. Students must be familiar with patterns of multiplication and division, including the “power of ten.” Multiplication and division tables and charts should be made available for student use while viewing this episode. Prepare your Special Agents by using the following sample problems.

Set A: 85 x 100 =

Strategies:
• Use repeated addition.
• Solve as a multiplication algorithm.
• Look for a pattern using multiples of 1 and 10.
• Use a shortcut for multiplying by any power of ten. Count the zeros in 100. Place those two zeros after 85.

Answer: 8,500

Question & Answer Key for Set A (Answers appear in bold)
1. 80 x 10 = 800
2. 750 x 10 = 7,500
3. 3,500 x 10 = 35,000
4. 65 x 100 = 6,500
5. 950 x 100 = 95,000
6. 5,500 x 100 = 550,000
7. 55 x 1,000 = 55,000
8. 600 x 1,000 = 600,000

Set B: 46,000 ÷ ? = 460

Strategies:
• Solve as a division algorithm 46,000 ÷ 460 =
• Since the answer has the same beginning numbers (460) as the dividend (46,000), you know that the divisor will be a power of ten — either 10, 100, 1,000 or 10,000. Use a shortcut when dividing by any power of ten. Place the answer on top of the dividend:

46,000 ÷ ? = 460

Count the zeros that are left over in the dividend. Place those two zeros after 1 to make the correct power of ten.

Answer: 100

Question & Answer Key for Set B (Answers appear in bold)
1. 5,000 ÷ 100 = 50
2. 8,500 ÷ 10 = 850
3. 74,000 ÷ 100 = 740
4. 80,000 ÷ 100 = 800
5. 6,300 ÷ 10 = 630

Vocabulary
The following words are included for teacher reference and for use with students to refresh and extend the subject matter in the show.

digit — A symbol used to write numbers.
dividend — The number in a division sentence being divided. In 10 ÷ 2 = 5, 10 is the dividend.
divisor — The number in a division sentence by which the dividend is divided. In 10 ÷ 2 = 5, 2 is the divisor.
exponent — A number that tells how many times another number is used as a factor. For example, in 10^4, 4 is the exponent, and it means that 10 is to be multiplied by itself 4 times, or 10 x 10 x 10 x 10.
multiple — The product of a number and any other number. In 5 x 2 = 10, 10 is a multiple of 5.
period — A three-digit group of numbers separated from other groups by a comma.
place value — The value given to the place a digit has in a number.
power of ten — A number that is formed by multiplying ten by itself a particular number of times. For example, 10^4 is read as “ten to the fourth power” and is equal to 10,000.
product — The result of multiplying two or more factors. In 5 x 2 = 10, 10 is the product.
quotient — The result of dividing. In 10 ÷ 2 = 5, 5 is the quotient.

Follow-Up Discussion & Activities
• Place value concepts are essential building blocks for handling large numbers and future math concepts. Encourage students to practice their place value skills with Jefferson Lab’s Place Value Game at education.jlab.org/placevalue/index.html
• Students can enjoy learning about place value and multi-digit numbers in Big Numbers by Edward Packard (Millbrook Press, 2000). Have students write their own big numbers and practice reading them with a partner.
• Have students make a table of the powers of ten to help with large numbers and scientific notation. Have them make columns to represent the ways to read and write a power of ten. For example, 10^4 = 10 x 10 x 10 x 10 = 10,000 = 10 thousands.
• Once students have mastered the pattern of multiplying and dividing by the power of ten, challenge them to use even larger powers of ten in multiplication and division sentences. For example, if 231 x 1,000 = 231,000 then 231 x 100,000 = 23,100,000. Students can write down one of their challenge problems, exchange with another student, and solve.