Scientific Notation

Summary

This lesson will strengthen students' understanding of scientific notation.

Main Core Tie

Mathematics Grade 6

Strand: EXPRESSIONS AND EQUATIONS (6.EE) Standard 6.EE.1

Materials

- *Number Notation Table*
- *Planet Table*
  3" x 5" cards
  Stopwatch
- *Number Cards*

Background for Teachers

Students were introduced to the concept of exponents in fifth grade.
Scientific notation is writing a number as the product of a number (greater than or equal to 1 and less than 10) and a power of ten. We use scientific notation because numbers can be hard to work with when they have so many zeros. Scientists use scientific notation as a simpler way to write these numbers.

Intended Learning Outcomes

1. Demonstrate a positive learning attitude toward mathematics.
2. Become mathematical problem solvers.
3. Reason mathematically.

Instructional Procedures

Invitation to Learn
Mercury is about 35 million miles from the sun.
Have students estimate how long they think it would take to write 35 million numerically (35,000,000). Write down estimation.
Have each student (or one student) write out 35,000,000. Time to see how long it takes.
Instructional Procedures

Give each student a *Number Notation Table* .
As a class (teacher directed), complete the first few lines together. Discuss what pattern can be seen.
Have class finish chart individually or in groups. Discuss what pattern can be seen.
Demonstrate how to change 35,000,000 (the distance Mercury is from the sun) into scientific notation (3.5 x 10 7).
Discuss how the number was changed and compare the pattern they discovered to the number. What is happening? Students will most likely assume that the exponent matches the number of zeroes. However, the exponent (power of ten) matches the number of places the decimal point moves (e.g., 1,000 = 1 x 10 3. The decimal moves three places to the left.). Change 3.5 x 10 7 back to standard form.
Compare 1 x 10 7 to 3.5 x 10 7 Emphasize again that the exponent (power of ten) matches the

number of places the decimal point moves.
Give more examples as needed.
2.87 x 10 2 = 287
3.982 x 10 4 = 39,820
5.843 x 10 5 = 584,300
1.457 x 10 5 = 145,700
5.47 x 10 6 = 5,470,000
38,700 = 3.87 x 10 4
16 billion = 1.6 x 10 10
2,137,000 = 2.137 x 10 6
493,000,000,000 = 4.93 x 10 11
4,382,000,000,000 = 4.382 x 10 12
Have each student (or one student) write out 35,000,000, using scientific notation (3.5 x 10 7). Time to see how long it takes. (This shows that scientific notation is an efficient way to write large numbers.)
Give each student two 3" x 5" cards. Have each student write a self-selected (large) number in standard form on one card, and the equivalent number in scientific notation on the second card. Collect all the cards.

To play the game, use half of the pairs of cards to play one round of the game (since you now have twice as many cards as students).
Tape one card to each student's back, making sure that you use both the standard and scientific notation form cards of each number selected.

Have students find the person with the equivalent number. They may attempt to identify the number by asking "yes" or "no" questions only. The round continues until all students have found their "partner." You may want to play a second round using the remaining cards.

Extensions

Just as a positive exponent designates how many spaces the decimal moves to the left, a negative exponent denotes how many spaces a decimal moves to the right. Although the concept of negative exponents is not in the sixth grade core curriculum, the study of microorganisms could be used to introduce the concept.
Use *Number Cards* to create a human problem: Give a card to each student and have them stand to create a number (e.g., 2.87). Assign one student to be the decimal point. Have the "decimal point" move to the correct spot to form the number (2.87).

Family Connections

Students time a family member writing a number both in standard form and scientific notation and record the difference.
Students search for a large number in a newspaper article and write the number in scientific notation.

Assessment Plan

Informal assessment includes observation of students as they complete the *Number Notation Table*. Class discussion and discovery is another form of assessment.
Formal assessment includes completed *Number Notation Tables* with correct scientific notation and standard forms.

Bibliography

Research Basis

Hatfield, M., Edwards, N., Bitter, G., & Morrow, J. (2000). *Mathematics Methods for Elementary and Middle School Teachers*. New York, NY. John Wiley & Sons Inc.
This resource includes the NCTM Principles and Standards for School Mathematics 2000, as well as the newest NAEP data and findings from the TIMSS. The book emphasizes considerations regarding cultural diversity and includes a CD-ROM with vignettes of real classroom situations to help the reader study teaching practices as they occur naturally in the classroom.

Authors

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