Exponents

Overview: Scientists use exponents all the time to write very large or very small numbers in a very short space. It's like shorthand for long numbers. It's also easier to work with large numbers in exponential form.

Materials

- Pencil
- Paper

Activity: Can you write a hundred thousand?_____

To write such a number, we have to know the number of zeros a hundred has, and how many zeros you'll find after the 1 in one thousand.

> One hundred = 100 (2 zeros)

> One thousand = 1,000 (3 zeros)

So one hundred thousand is a 1 with 2 + 3 = 5 zeros after the 1: 100,000. To write this number in exponential form, write a "10" with a "5" as a superscript like this: $100,000 = 10^5$

Here is another question: Would you rather have a million billion dollars, or a billion million dollars?

Let's take a look: a million billion is written like this:

> 1 million = 1,000,000 which is a 1 followed by six zeros = 10^6

> 1 billion = 1,000,000,000 which is a 1 followed by nine zeros = 10^9

1 million billion is a 1 followed by 6 + 9 = 15 zeros: 1,000,000,000,000,000 otherwise known as one quadrillion, and scientists write this as 10^{15}.

1 billion million is a 1 followed by 9 + 6 = 15 zeros, which is exactly the same as a million billion. So you'll take either one!

Exercises

Write out each number long-ways (with all the zeros written out):

1. A thousand million
2. A thousand billion
3. Ten million
4. A hundred billion

Write the exponential form (ten and a superscript) of the following numbers

5. A thousand million
6. A thousand billion
7. Ten million
8. A hundred billion

Determine the exponents of the following number if written in the form; "ten and a superscript."

9. 10,000,000,000
10. 100

Answers to Exercises: Exponents

1. 1,000,000,000
2. 1,000,000,000,000
3. 10,000,000
4. 100,000,000,000,
5. 10^9
6. 10^{12}
7. 10^7
8. 10^{11}
9. 10
10. 2