NAME Key

Scientific Notation

Scientific Notation - a method of expressing very large and very small quantities.

Examples...

6.2×10^{5} 1.278×10^{12} 9.84×10^{-8} 8.914×10^{-20}

Circle the two numbers above that you think are really small. What is making them small?

The negative exponent

Numbers written in scientific notation include three parts...

1. The first number is a number between 1 and 10. (including 1)
2. The operation is multiplication.
3. The last number is a power with base 10.

For each of the following, decide if it is written in scientific notation. If it is not, state why.

1. 8.1×10^{-3} Yes
2. 0.78×10^{12} No, not between 1 and 10
3. $4.34 + 10^{8}$ No, should be • (mult.)
4. 13.2×10^{-20} No, not between 1 and 10
5. 6.124×10^{32} Yes
6. 2.1×10^{212} Yes
7. 3.9×6^{10} No, should be a 10
8. 11.2×10^{52} No, not between 1 and 10
9. 9.73×10^{-14} Yes

In order to convert a number to "scientific notation", use the steps written below...

1. Decide where the decimal point should go to make the number fall between 1 and 10. Write that number down.
2. Now count the number of spaces it takes to move the decimals back to it's original spot. This number becomes the exponent on your power of ten.
3. Finally decide if the exponent should be positive or negative.
   *If you had to move left, it will be negative.
   *If you had to move right, it will be positive.

Now let's try some examples together...

10. 365,000 — 3.65×10^{5}

11. 0.000000076 — 7.6×10^{-8}

12. 6,725,000 — 6.725×10^{6}

13. 0.000000356 — 3.56×10^{-7}

Which problems above ended up with a negative exponent?

The small numbers

Which problems above ended up with a positive exponent?

The large numbers

When using scientific notation, numbers less than one have a negative *exponent.*
Numbers greater than or equal to one have a positive *exponent.*

Now you try...

12. The weights of various sea creatures are shown in the table. Write each weight in scientific notation.

Sea Creature	**Blue Whale**	**Whale Shark**	**Eel**	**Minnow**
Weight (lbs) – Standard Notation	250,000	41,200	133.25	0.95
Weight (lbs) – Scientific Notation	2.5×10^{5}	4.12×10^{4}	1.3325×10^{2}	9.5×10^{-1}

13. An estimate of the world's population in 2010 was 6,880,000,000. Write the world's population in scientific notation.

6.88×10^{9}

Did you have a positive or negative exponent? Why?

Positive; it was a large #.

To translate from scientific notation to standard notation, you can move the decimal point the number of places indicated by the exponent.

When the exponent is positive, move ___→___.

When the exponent is negative, move ___←___.

Let's try some together...

1st, predict if the number will be really big or really small. Then write each number in standard notation...

14. 4.18549×10^{12}

Big

4,185,490,000,000

15. 2.568×10^{-6}

Small

.000002568

16. 9.24×10^{8}

Big

924,000,000

Comparing numbers in scientific notation.

17. The approximate weight of a whale shark is 4×10^4 pounds. The approximate weight of a common dolphin is 2×10^2 pounds. How many times as great as the weight of the whale shark is the weight of the dolphin?

Hints:

First compare the values between 1 and 10.

The "4" in 4×10^4 is 2 times as great as the "2" in 2×10^2.

Next compare the powers of 10.

10^4 is $\frac{100}{10^2}$ times as great as 10^2.

Circle the most reasonable answer.

The weight of the whale shark is 2 / 20 / (200) / 2000 times as great as the weight of the dolphin.

18. Scientists captured and released a whale shark that weighted about 6×10^5 units.
Circle the best choice for the units this measurement is given in: ounces / (pounds) / tons

Explain your choice.

Pounds is the "best choice"

ounces - would be too small of a unit thereby making the sci-not. have a really large exponent.

tons - would be too large of a unit thereby making the sci-not have a really small exponent.