SCIENTIFIC NOTATION

Scientific notation is a shorter method for writing very large and very small numbers.

93,000,000 is written 9.3×10^{7} in *scientific notation*.

$1 \leq \# < 10$ always a base of 10

The constant (9.3) must be *greater than or equal to 1 and less than 10*.

The power is always written with a base of 10 and an exponent *expressing the number of places the decimal was moved*.

Big numbers have an exponent that is *positive*.

bigger than 1

Example: 62,500 becomes 6.25×10^{4}.

# of times the decimal point moves

Small numbers have an exponent that is *negative*.

smaller than 1

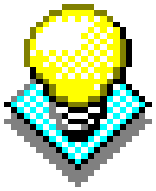
Example: 0.0247 becomes 2.47×10^{-2}.

Remember to move the decimal so the coefficient is greater than 1 and less than 10.

Practice

Write the following numbers in scientific notation.

1. 256,000,000 — big → pos. exp — 2.56×10^{8}
2. 0.0036 — small → neg. exp — 3.6×10^{-3}
3. 68,092,000 — pos. — 6.8092×10^{7}
4. 0.444 — neg. — 4.44×10^{-1}
5. 0.0000589 — 5.89×10^{-5}
6. 90,800 — 9.08×10^{4}
7. 1,368,500,000 — 1.3685×10^{9}
8. 0.00027 — 2.7×10^{-4}
9. 0.07070700 — 7.0707×10^{-2}
10. 674,000 — 6.74×10^{5}



QUESTIONS TO THINK ABOUT...

How do you know that a number written in scientific notation will be a really big or a really small number?

When do you write a negative exponent when converting to scientific notation?

When do you write a positive exponent when converting to scientific notation?

Changing from Scientific Notation to Decimal Form

When the exponent is positive, move the decimal to the right.
When the exponent is negative, move the decimal to the left.
The exponent tells you how many places to move it.

Examples

11. 2.83×10^{5} move right

2.83000

283,000

12. 1.23×10^{-3} move left

.001.23

.00123

Practice

13. 5.6×10^{0}

5.6

15. 4.9×10^{4}

49,000

17. 1.045×10^{7}

10,450,000

14. 8×10^{-1} left

.8

16. 9.2×10^{-8}

.000000092

18. 8.4×10^{-6}

.0000084

Evaluating Expressions in Scientific Notation

$(1.4 \times 10^4)(7.6 \times 10^5)$

$(1.4 \times 7.6)(10^4 \times 10^5)$ assoc. prop.

10.64×10^9

$1.064 \times 10^1 \times 10^9$

1.064×10^{10}

You try!

19. $(2.3 \times 10^3)(1.8 \times 10^{-5})$

$(2.3 \times 1.8)(10^3 \times 10^{-5})$

4.14×10^{-2}

Evaluating Expressions in Scientific Notation

$$\frac{1.2 \times 10^{-1}}{4.8 \times 10^{-4}}$$

$\frac{1.2}{4.8} \times \frac{10^{-1}}{10^{-4}}$

$.25 \times 10^{3}$

$2.5 \times 10^{-1} \times 10^{3}$

2.5×10^{2}

You try!

20. $$\frac{5.2 \times 10^{3}}{1.3 \times 10^{1}}$$

$\frac{5.2}{1.3} \times \frac{10^{3}}{10^{1}}$

4×10^{2}

Evaluating Expressions in Scientific Notation

$(4 \times 10^{-2})^3$

$4^3 \times (10^{-2})^3$

64×10^{-6}

$6.4 \times 10^1 \times 10^{-6}$

6.4×10^{-5}

You try!

21. $(5 \times 10^{-4})^2$

$5^2 \times (10^{-4})^2$

25×10^{-8}

$2.5 \times 10^1 \times 10^{-8}$

2.5×10^{-7}