



Did you know the Earth is 93,000,000 miles from the sun?

Did you know that fingernails grow at a rate of 0.00286 inches per day?



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.

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.

↳ # larger than 1

Example: 62,500 becomes 6.25×10^4 .

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
 2.56×10^8

2. 0.0036 SMALL
 3.6×10^{-3}

3. 68,092,000 BIG
 6.8092×10^7

4. 0.444 SMALL
 4.44×10^{-1}

5. 0.0000589 SMALL
 5.89×10^{-5}

6. 90,800 BIG
 9.08×10^4

7. 1,368,500,000
 1.3685×10^9

8. 0.00027
 2.7×10^{-4}

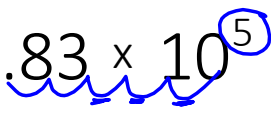
9. 0.07070700
 7.0707×10^{-2}

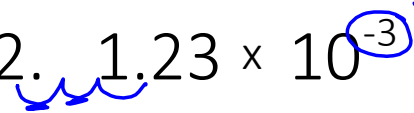
10. 674,000
 6.74×10^5

Changing from Scientific Notation to Decimal Form Standard Notation

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 ^{BIG}

 283000


12. 1.23×10^{-3} ^{SMALL}

 .00123


Practice


13. 5.6×10^0
 5.6

15. 4.9×10^4 ^{4 spaces right}

 49,000

17. 1.045×10^7

 10,450,000

14. 8×10^{-1} ^{1 space left}

 .8

16. 9.2×10^{-8} ^{8 spaces left}

 .000000092

18. 8.4×10^{-6}

 .0000084

Evaluating Expressions in Scientific Notation

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

$$\begin{aligned} & (1.4 \times 7.6) (10^4 \times 10^5) \\ & 10.64 \times 10^9 \\ & \underline{1.064 \times 10^1 \quad \times 10^9} \\ & 1.064 \times 10^{10} \end{aligned}$$

You try!

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

$$\begin{aligned} & (2.3 \times 1.8) (10^3 \times 10^{-5}) \\ & 4.14 \times 10^{-2} \end{aligned}$$

Evaluating Expressions in Scientific Notation

$$\begin{aligned}
 \frac{1.2 \times 10^{-1}}{4.8 \times 10^{-4}} &= \frac{1.2}{4.8} \times \frac{10^{-1}}{10^{-4}} && \text{subtract} \\
 &= .25 \times 10^{-1-(-4)} \\
 &= .25 \times 10^3 \\
 &= \underbrace{2.5 \times 10^{-1}} \times 10^3 \\
 &= 2.5 \times 10^2
 \end{aligned}$$

You try!

$$\begin{aligned}
 20. \quad \frac{5.2 \times 10^3}{1.3 \times 10^1} &= \frac{5.2}{1.3} \times \frac{10^3}{10^1} \\
 &= 4 \times 10^2
 \end{aligned}$$

Evaluating Expressions in Scientific Notation

$$\begin{aligned}
 (4 \times 10^{-2})^3 &= 4^3 \times (10^{-2})^3 \\
 &= 64 \times 10^{-6} \\
 &= 6.4 \times 10^1 \times 10^{-6} \\
 &= 6.4 \times 10^{-5}
 \end{aligned}$$

You try!

$$\begin{aligned}
 21. \quad (5 \times 10^{-4})^2 &= 5^2 \times (10^{-4})^2 \\
 &= 25 \times 10^{-8} \\
 &= 2.5 \times 10^1 \times 10^{-8} \\
 &= 2.5 \times 10^{-7}
 \end{aligned}$$