

Notes Scientific Notation

What Is Scientific Notation?

Scientific notation is a way of expressing numbers using powers of 10. Using scientific notation helps keep track of decimal places in very large or very small numbers and makes it easier to do arithmetic with them.

When a number is expressed in scientific notation, it is written as the product of a factor and a power of 10. The factor must be a number that is equal to or greater than 1 but less than 10. Look at these two examples:

Written in scientific notation, 2,300,000,000 is 2.3×10^9 .

Written in scientific notation, 0.00000000034 is 3.4×10^{-10} .

How Do You Convert Between Scientific and Standard Notation?

Numbers written in regular place-value form are in **standard notation**. For example, the numbers 34,285 and 5.7 are both in standard notation.

Scientific to Standard Notation

To change a number from scientific to standard notation, move the decimal point the number of places shown in the exponent of 10.

- If the exponent of 10 is positive, the number in standard notation will be greater than or equal to 10. Move the decimal point to the right.

$$2.35 \times 10^5 = 235,000.$$

1 2 3 4 5

- If the exponent of 10 is negative, the number in standard notation will be less than 1. Move the decimal point to the left.

$$7.05 \times 10^{-5} = 0.0000705$$

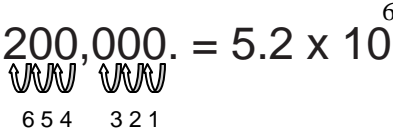
5 4 3 2 1

Standard to Scientific Notation

To change a number from standard to scientific notation, move the decimal point until the number is greater than or equal to 1 and less than 10. The exponent of 10 is the number of places you moved the decimal point.

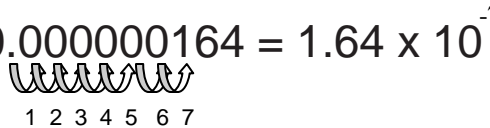
- If the number is greater than or equal to 10, move the decimal point to the left. Make the exponent positive.

$$5,200,000. = 5.2 \times 10^6$$



- If the number is less than 1, move the decimal point to the right. Make the exponent negative.

$$0.000000164 = 1.64 \times 10^{-7}$$



Write 17,800 in scientific notation.

- The number 17,800 is greater than 10. Move the decimal point to the left until you have a factor that is greater than or equal to 1 but less than 10.
- Move the decimal point four places to the left so the factor is 1.78.
- Since the decimal point was moved four places to the left, the exponent of 10 is 4, so write 10^4 .
The number 17,800 written in scientific notation is 1.78×10^4 .