

Scientific Notation: Small Numbers

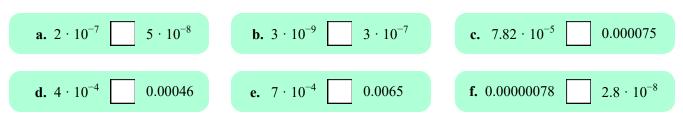
When writing very small numbers in scientific notation, the exponent is negative. Recall that negative exponent does not signify a negative number, but a *fraction*: a reciprocal of the corresponding power of ten with a positive exponent. For example, $10^{-4} = \frac{1}{10^4} = \frac{1}{10,000}$. As a decimal, this is 0.0001. **Example 1.** To write 0.00034 in scientific notation, we need to use 3.4 as the decimal that is multiplied by a power of ten. (Why?) Now note in which place the digit 3 is: it is in ten-thousandths place, which is the *fourth* digit after the decimal point. This means we use $\frac{1}{10,000} = \frac{1}{10^4} = 10^{-4}$ as the power of ten. So, $0.00034 = 3.4 \cdot 10^{-4}$. **Example 2.** To write $7.64 \cdot 10^{-6}$ in decimal notation, we note that the digit 7 has to be in the place indicated

Example 2. To write $7.64 \cdot 10^{-6}$ in decimal notation, we note that the digit 7 has to be in the place indicated by the power of ten, which means 7 will be in the millionths place. The other digits will follow. The millionths place is the sixth decimal digit after the decimal point. So, $7.64 \cdot 10^{-6} = 0.00000764$.

1. Write the numbers given in scientific notation in decimal notation, and vice versa.

Scientific Notation	Decimal notation	Scientific Notation	Decimal notation
$3 \cdot 10^{-5}$			0.000002388
	0.0008	$8.2\cdot 10^{-4}$	
	0.00000203		0.0000000308
$6.108 \cdot 10^{-8}$		$4.539 \cdot 10^{-7}$	

- 2. Eric said that 7.61 \cdot 10⁻⁹ has a total of nine zeros, like this: 0.0000000761. Is he correct?
- 3. Compare the numbers, writing < or > in the box. How can you tell which of them is greater, without writing them in decimal notation?



4. Write in order from smallest to greatest: $5.6 \cdot 10^7 \quad 10^{-6} \quad 0.0003 \quad 10^8 \quad 6 \cdot 10^7 \quad 0.00002 \quad 9 \cdot 10^{-7}$