

# Lesson Part 1

Let's review how to convert  
between...

Standard Form  Scientific Notation

980,000,000

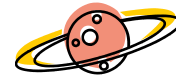


$9.8 \times 10^8$

0.000079



$7.9 \times 10^{-5}$



# 1

## Scientific Notation –

- It's a short cut way of writing really big numbers and really small numbers.
- A number written in Scientific Notation is made up of 3 parts:

Scientific Notation Format

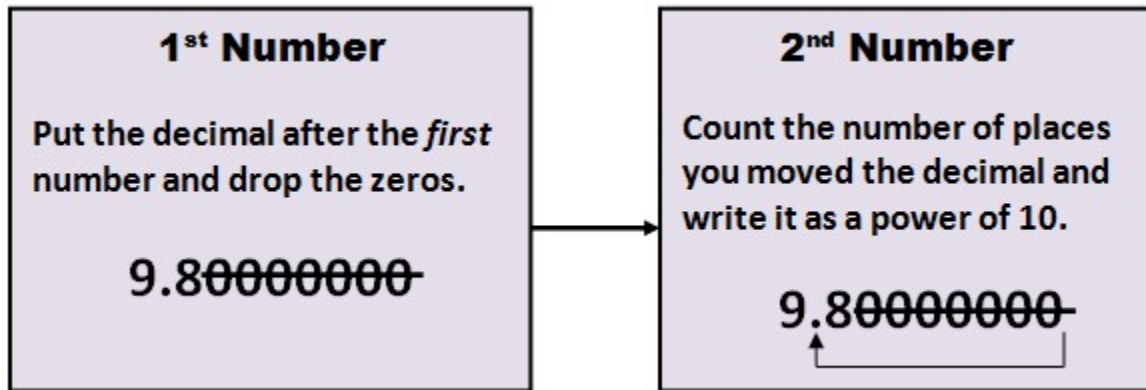
$$6.01 \times 10^6$$

{ A number greater than or equal to 1, but less than 10  
 ×  
 A power of 10

# 2

## Writing a LARGE number in Scientific Notation

**980,000,000**



9.8

×

10<sup>8</sup>

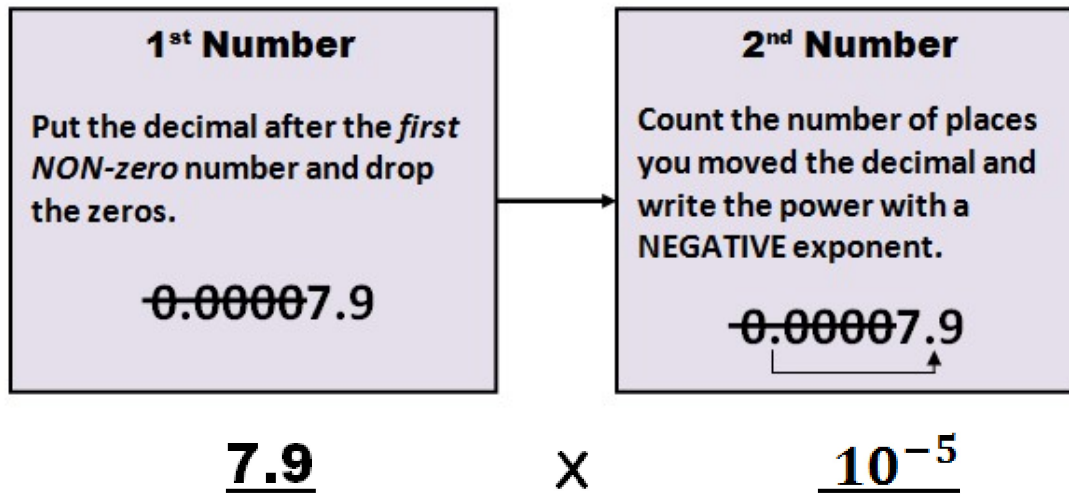
You try! Write in Scientific Notation form: 6,300,000 = \_\_\_\_\_ × \_\_\_\_\_

800,300 = \_\_\_\_\_ × \_\_\_\_\_



### Writing a SMALL number in Scientific Notation

**0.000079**



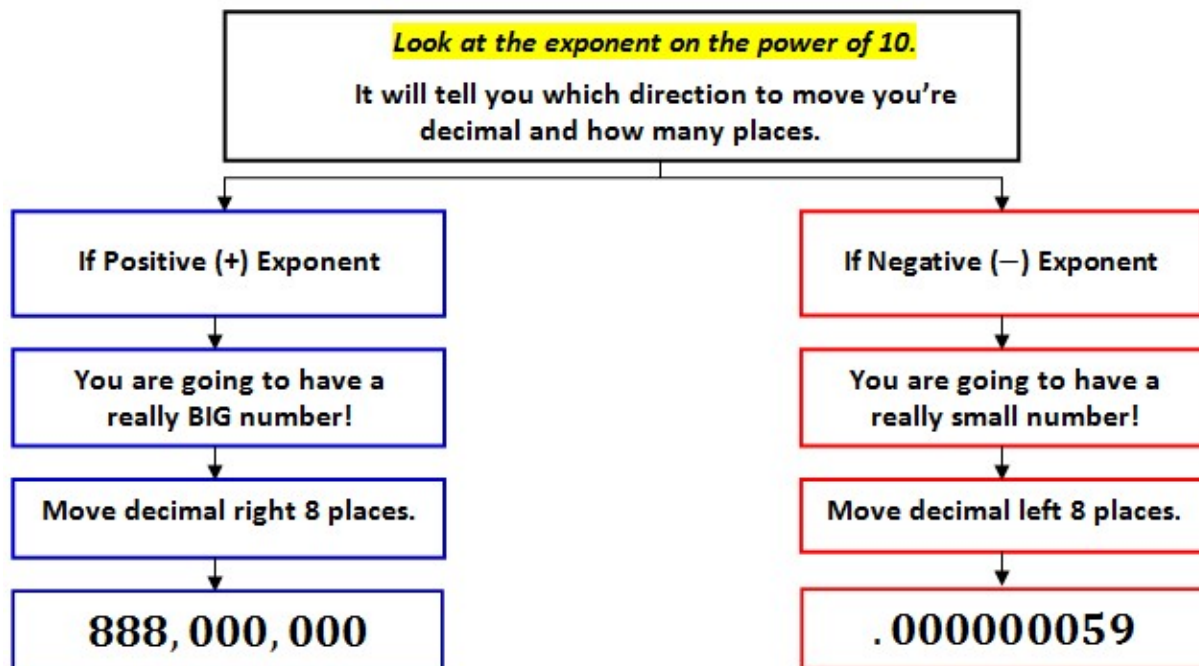
You try! Write in Scientific Notation form: 0.00000056 = \_\_\_\_\_ × \_\_\_\_\_  
 .003001 = \_\_\_\_\_ × \_\_\_\_\_



### Changing Scientific Notation back to Standard Form

**8.88 × 10<sup>8</sup>**

**5.9 × 10<sup>-8</sup>**



You Try! Write in Standard Form: 1.69 × 10<sup>5</sup> = \_\_\_\_\_  
 2.3 × 10<sup>-4</sup> = \_\_\_\_\_

## Lesson Part 2

# Performing Operations with Scientific Notation

(+, −, ×, ÷)

**Examples:**  $(5.79 \times 10^7) + (1.416 \times 10^8)$

$$(5.3 \times 10^5) - (2.2 \times 10^2)$$

$$(2.6 \times 10^7) \times (6.3 \times 10^4)$$

$$(1.3 \times 10^{11}) \div (2.4 \times 10^4)$$

**Multiplying in Scientific Notation**

Step 1: Multiply the decimal numbers.

Step 2: Then *add* the exponents of the powers of 10.

Step 3: Place the new power of 10 with the decimal in scientific notation form.

Step 4: IF the number is not in scientific form, you need to move the decimal so that it is behind the first digit and count the number of places the decimal moves.

If the decimal moves left, increase the exponent by the number of moves.

If the decimal moves right, decrease the exponent by the number of moves.

← *Increase exponent,*      → *Decrease exponent*

**Example**

$$(2.6 \times 10^7) \times (6.3 \times 10^4)$$

Step 1: Multiply the decimal numbers.  $2.6 \times 6.3 =$

Step 2: Add the exponents.

$7 + 4 =$

Step 3: Put the new decimal number with the new exponent in scientific notation form.

$$16.38 \times 10^{11}$$

Step 4: IF the number is not in scientific form, you need to move the decimal so that it is behind the first digit and count the number of places the decimal moves.

If the decimal moves left, increase the exponent by the number of moves.

If the decimal moves right, decrease the exponent by the number of moves.

← *Increase exponent,*      → *Decrease exponent*

In this case, the decimal point moves one place left, so add 1 to the exponent.

$$16.38 \times 10^{11} = 1.638 \times 10^{12}$$

**Guided Practice** a.  $(2.5 \times 10^7) \times (3 \times 10^3) =$  \_\_\_\_\_

**You Try!** b.  $(4.4 \times 10^6) \times (3.9 \times 10^4) =$  \_\_\_\_\_

## Operations with Scientific Notation

### Dividing

#### Dividing in Scientific Notation

Step 1: Divide the decimal numbers.

Step 2: Then *subtract* the exponents of the powers of 10.

Step 3: Place the new power of 10 with the decimal in scientific notation form.

Step 4: IF the number is not in scientific form, you need to move the decimal so that it is behind the first digit and count the number of places the decimal moves.

If the decimal moves left, increase the exponent by the number of moves.

If the decimal moves right, decrease the exponent by the number of moves.

← *Increase exponent,*      *→ Decrease exponent*

**Example**  $(1.23 \times 10^{11}) \div (2.4 \times 10^4)$

Step 1: Divide the decimal numbers.

$$1.23 \div 2.4 = \boxed{\phantom{00}}$$

Step 2: Subtract the exponents.  $11 - 4 =$

$$\boxed{\phantom{00}}$$

Step 3: Put the new decimal number with the new exponent in scientific notation form.

$$\boxed{.5125 \times 10^7}$$

Step 4: IF the number is not in scientific form, you need to move the decimal so that it is behind the first digit and count the number of places the decimal moves.

If the decimal moves left, increase the exponent by the number of moves.

If the decimal moves right, decrease the exponent by the number of moves.

← *Increase exponent,*      *→ Decrease exponent*

$$\begin{array}{c} \phantom{.} \\ \uparrow \\ .5125 \times 10^7 = \end{array} \boxed{5.125 \times 10^6}$$

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**Guided Practice** a.  $(5.76 \times 10^9) \div (3.2 \times 10^3) =$  \_\_\_\_\_

**You Try!** b.  $(3 \times 10^7) \div (8 \times 10^4) =$  \_\_\_\_\_

## Operations with Scientific Notation

### Adding or Subtracting

When you are asked to add or subtract two numbers expressed in scientific notation you need to be a little more careful. Both powers of ten must be the same.

#### Adding or Subtracting in Scientific Notation

Step 1: If needed, use what you know about the below rule to make adjustments so that the powers of ten are the same.

← *Increase exponent,*      *Decrease exponent* →

Step 2: Add or subtract the decimal numbers as asked.

Step 3: Place the power of 10 with the decimal in scientific notation form.

Step 4: IF the number is not in scientific form, you need to move the decimal so that it is behind the first digit and count the number of places the decimal moves.

If the decimal moves left, increase the exponent by the number of moves.

If the decimal moves right, decrease the exponent by the number of moves.

← *Increase exponent,*      *Decrease exponent* →

**Example**  $(4.4 \times 10^3) + (7.1 \times 10^3)$

Step 1: If needed, make adjustments so that the powers of ten are the same.

Both are the same.

No adjustments needed.

$10^3$

Step 2: Add or subtract the decimal numbers as asked.

$$4.4 + 7.1 =$$

$11.5$

Step 4: Place the power of ten with the decimal in scientific notation form.

$11.5 \times 10^3$

Step 4: IF the number is not in scientific form, you need to move the decimal so that it is behind the first digit and count the number of places the decimal moves.

If the decimal moves left, increase the exponent by the number of moves.

If the decimal moves right, decrease the exponent by the number of moves.

← *Increase exponent,*      *Decrease exponent* →

$$\underset{\uparrow}{11.5} \times 10^3 = 1.15 \times 10^4$$





Name: \_\_\_\_\_

## Operations with Scientific Notation

obj. 8.EE.A.3,

Period: \_\_\_\_\_

8.EE.A.4

Try These! Simplify each of the following.

### Multiply

1)  $(1.75 \times 10^{20}) \times (6.01 \times 10^{14})$

### Divide

2)  $(1.488 \times 10^{11}) \div (3 \times 10^2)$

- 3) A typical dwarf sperm whale, the planet's smallest whale species, weighs about  $3 \times 10^2$  pounds. A blue whale, the planet's largest whale, might weigh  $4.5 \times 10^5$  pounds. How many times heavier is the blue whale than the dwarf sperm whale?

### Add or Subtract

4)  $(5.79 \times 10^7) + (1.836 \times 10^8)$

5)  $(3.6 \times 10^4) - (2.5 \times 10^2)$

### Challenging!



6)  $120 + (3 \times 10^4)$

7)  $17 + (5.2 \times 10^{-2})$

- 8) Michelle used a calculator to multiply the following numbers  $(1.8 \times 10^{21}) \times (8 \times 10^2)$ . Her calculator displayed the answer below. What do you think her calculator is displaying?

1.44E24
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Try These! Simplify each of the following.

**Multiply**

1)  $(1.75 \times 10^{20}) \times (6.01 \times 10^{14})$

**Answer:**  $1.05175 \times 10^{35}$

**Divide**

2)  $(1.488 \times 10^{11}) \div (3 \times 10^2)$

**Answer:**  $4.96 \times 10^8$

- 3) A typical dwarf sperm whale, the planet's smallest whale species, weighs about  $3 \times 10^2$  pounds. A blue whale, the planet's largest whale, might weigh  $4.5 \times 10^5$  pounds. How many times heavier is the blue whale than the dwarf sperm whale?

**Answer:**  $4.96 \times 10^8$  times larger

**Add or Subtract**

4)  $(5.79 \times 10^7) + (1.836 \times 10^8)$

**Answer:**  $2.415 \times 10^8$

5)  $(3.6 \times 10^4) - (2.5 \times 10^2)$

**Answer:**  $3.575 \times 10^4$

**Challenging!**



6)  $120 + (3 \times 10^4)$

**Answer:** 30,120 or  $(3.0120 \times 10^4)$

7)  $17 + (5.2 \times 10^{-2})$

**Answer:** 17.052 or  $(1.7052 \times 10^1)$

- 8) Michelle used a calculator to multiply the following numbers  $(1.8 \times 10^{21}) \times (8 \times 10^2)$ . Her calculator displayed the answer below. What do you think her calculator is displaying?

1.44E24

**Answer:**  $1.44 \times 10^{24}$