

Multiplying and Dividing in Scientific Notation

Part 1: Multiplying in Scientific Notation

PROCEDURE: To multiply numbers in scientific notation, multiply the decimal numbers. Then *add* the exponents of the powers of 10. Place the new power of 10 with the decimal in scientific notation form. If your decimal number is greater than 10, count the number of times the decimal moves to the left, and add this number to the exponent.

SAMPLE PROBLEM: Multiply (2.6×10^7) by (6.3×10^4) .

Step 1: Multiply the decimal numbers.

$$2.6 \times 6.3 = 16.38$$

Step 2: Add the exponents.

$$7 + 4 = 11$$

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

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

Step 4: Because the new decimal number is greater than 10, count the number of places the decimal moves to put the number between 1 and 10. Add this number to the exponent. In this case, the decimal point moves one place, so add 1 to the exponent.

$$1\overset{\curvearrowright}{6}.38 \times 10^{11} \rightarrow 1.638 \times 10^{12}$$

Try It Yourself!

- Follow the steps in the Sample Problem carefully to complete the following equations.

Multiplying with Scientific Notations

Problem	New decimal	New exponent	Answer
<i>Sample problem:</i> $(4.4 \times 10^6) \times (3.9 \times 10^4)$	$4.4 \times 3.9 = 17.16$	$6 + 4 = 10$	1.716×10^{11}
a. $(2.8 \times 10^8) \times (1.9 \times 10^4)$			
b. $(1.3 \times 10^9) \times (4.7 \times 10^{-5})$			
c. $(3.7 \times 10^{15}) \times (5.2 \times 10^7)$			
d. $(4.9 \times 10^{24}) \times (1.6 \times 10^5)$			

- The mass of one hydrogen atom is 1.67×10^{-27} kg. A cylinder contains 3.01×10^{23} hydrogen atoms. What is the mass of the hydrogen?
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Multiplying and Dividing in Scientific Notation, continued

Part 2: Dividing in Scientific Notation

PROCEDURE: To divide numbers in scientific notation, first divide the decimal numbers. Then *subtract* the exponents of your power of 10. Place the new power of 10 with the decimal in scientific notation form. If the resulting decimal number is less than 1, move the decimal point to the right and decrease the exponent by the number of places that the decimal point moved.

SAMPLE PROBLEM: Divide (1.23×10^{11}) by (2.4×10^4) .

Step 1: Divide the decimal numbers.

$$1.23 \div 2.4 = 0.5125$$

Step 2: Subtract the exponents of the powers of 10.

$$11 - 4 = 7$$

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

$$0.5125 \times 10^7$$

$$(1.23 \times 10^{11}) \div (2.4 \times 10^4) = 5.125 \times 10^6$$

Step 4: Because the decimal number is not between 1 and 10, move the decimal point one place to the right and decrease the exponent by 1.

$$0.5125 \times 10^7 \rightarrow 5.125 \times 10^6$$

3. Complete the following chart:

Dividing with Scientific Notation

Problem	New decimal	New exponent	Answer
<i>Sample problem:</i> $(5.76 \times 10^9) \div (3.2 \div 10^3)$	$5.76 \div 3.2 = 1.8$	$9 - 3 = 6$	1.8×10^6
a. $(3.72 \times 10^8) \div (1.2 \times 10^5)$			
b. $(6.4 \times 10^{-4}) \div (4 \times 10^6)$			
c. $(3.6 \times 10^4) \div (6 \times 10^5)$			
d. $(1.44 \times 10^{24}) \div (1.2 \times 10^{17})$			

4. The average distance from Earth to the sun is 1.5×10^{11} m. The speed of light is 3×10^8 m/s. Approximately how long does it take for light to travel from the sun to Earth?
