

# 07 Exponents (Scientific Notation)

Content Area: **Mathematics**  
Course(s):  
Time Period: **Week1**  
Length: **1 Week**  
Status: **Published**

## **Stage 1: Desired Results**

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### **Unit Overview/ Rationale**

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In this unit students will write numbers in both standard form and scientific notation. They will multiply and divide powers with the same base and numbers in scientific notation. Students will use scientific notation to describe and compare distances.

### **Standards & Indicators**

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Common Core: Mathematics, Common Core: Grade 8 Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

MA.8.8.EE.A.1

Know and apply the properties of integer exponents to generate equivalent numerical expressions.

MA.8.8.EE.A.3

Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

MA.8.8.EE.A.4

Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

### **Big Ideas - Students will understand that...**

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- Scientific Notation is a brief way to write very large or very small numbers.
- To multiply a number by  $10^n$ , when  $n > 0$ , you move the decimal point to the right. When  $n < 0$ , you move the decimal point to the left.
- To write number  $10^n$  without an exponent, when  $n > 0$ , you write 1 followed by  $n$  zeros.
- Exponential notation with positive exponents is mathematical shorthand for repeated multiplication.
- A positive exponent tells how many times the base is used as a factor.
- When you simplify an expression that contains a power be sure to follow the order of operations.
- To multiply two powers with the same base, you keep the common base and add the exponents to find the new exponent.
- To divide two powers with the same base, you keep the common base and subtract the exponents to find the new exponent.
- A zero exponent on a nonzero base means the power has a value of 1.
- To simplify a power with a negative exponent, write the reciprocal of the power and change the sign of the exponent.

### **Essential Questions - What provocative questions will foster inquiry and transfer of learning**

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- When may it be more efficient to use scientific notation?
- How can I use laws of exponents to simplify expressions?
- How can I use laws of exponents to compare the magnitude of numbers?

## **Content - Students will know...**

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Scientific Notation

## **Skills - Students will be able to...**

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- To write numbers in standard form and scientific notation.
- To multiply powers with the same base.
- To multiply numbers written in scientific notation and choose units with scientific notation.
- To divide powers with the same base and to simplify expressions with negative exponents.
- To divide and compare numbers written in scientific notation.

## **Stage 2: Assessment Evidence**

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### **Assessment**

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## **Stage 3: Learning Plan**

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### **Learning Activities**

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Activities:

Students will write numbers in standard form and scientific notation.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to write numbers in standard form and scientific notation.

Example:

Write  $6.1 \times 10^{-6}$  in standard form

Sample Solution:

0.0000061

Activities:

Students will multiply powers with the same base.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to multiply powers with the same base.

Example:

Simplify the expression  $-8x \cdot x^3$

Sample Solution:

$-8x^4$

Activities:

Students will multiply numbers written in scientific notation and choose units with scientific notation.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to multiply numbers written in scientific notation and choose units with scientific notation.

Example:

Write the product of  $(9.3 \times 10^2)(6 \times 10^{-9})$  in scientific notation.

Sample Solution:

$$5.58 \times 10^{-6}$$

Activities:

Students will divide powers with the same base and to simplify expressions with negative exponents.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to divide powers with the same base and to simplify expressions with negative exponents.

Example:

Simplify the expression  $5^{-4}$

Sample Solution:

$$1/625$$

Activities:

Students will divide and compare numbers written in scientific notation.

Formative Assessment:

Teacher observation of student work in small-group and independent practice.

Closure:

Students will be asked to divide and compare numbers written in scientific notation.

Example:

Write the quotient of  $(3.6 \times 10^9)/(2.4 \times 10^3)$

Sample Solution:

$1.5 \times 10^6$

## **Resources**

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Prentice Hall Course 3 Mathematics Common Core

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Chapter 6