Unit 7: Exponents and Scientific Notation **Name:**

Lesson 1: Exponent Review

What does it mean when we write 2^{42}? How many times larger is 2^{45} than 2^{42}?

What does it mean when we write $\left(\frac{1}{2}\right)^{42}$? Which is greater, $\left(\frac{1}{2}\right)^{42}$ or $\left(\frac{1}{2}\right)^{45}$?

Lesson 2: Multiplying Powers of Ten

How can you rewrite $10^{15} \cdot 10^{5}$ with a single exponent without expanding all of the factors?

What is the rule for multiplying two powers of 10 together into a single power of 10?

Lesson 3: Powers of Powers of Ten

How would you write $10^{4} \cdot 10^{4} \cdot 10^{4}$ using exponents instead of repeated multiplication?

Why do you multiply exponents when you write a power to a power with a single exponent? Give an example.

Lesson 4: Dividing Powers of Ten

How can you write $\frac{10^{36}}{10^{12}}$ with a single exponent?

It is a common mistake for students to divide the exponents instead of subtracting them. Explain why the answer is not 10^{3}.

Why do we define $10^{0} = 1$?

Lesson 5: Negative Exponents with Powers of Ten

How would you write 2,796 as a sum with powers of 10?

How would you write 0.2796 as a sum with powers of 10?

How is 10^{3} related to 10^{-3}?

Lesson 6: What about Other Bases?

How do 2^3 and 2^{-3} relate to 10^3 and 10^{-3}?

How is $(-3)^4$ different from -3^4?

Do you agree that $3^5 \cdot 4^3 = 12^8$? Why or why not?

Lesson 7: Practice with Rational Bases

Decide whether each of the following statements is true or false. Explain why.

Equation	T or F?	Why?
$2^5 \cdot 2^3 = 2^{15}$		
$\frac{3^5}{3^2} = 3^3$		
$\frac{6^5}{3^2} = 2^3$		

Lesson 8: Combining Bases

Is it possible to write $4^5 \cdot 5^5$ with a single exponent?

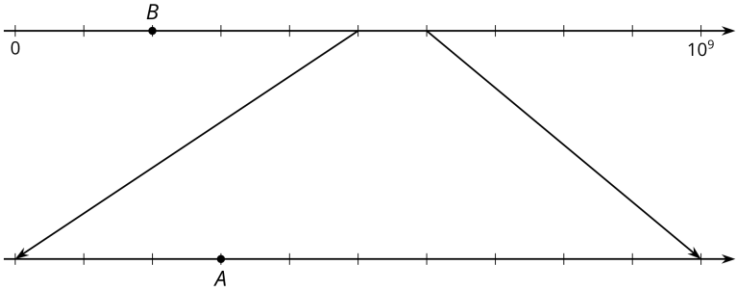
Is it possible to write $4^3 \cdot 5^5$ with a single exponent?

Lesson 9: Describing Large & Small Numbers Using Powers of Ten

Rewrite 123 billion three different ways, using words, multiplication, and powers of ten.

Rewrite 0.000000000789 three different ways, using words, multiplication, and powers of ten.

Lesson 10: Representing Large Numbers on the Number Line



Describe point B as a multiple of a power of ten, and as a value.

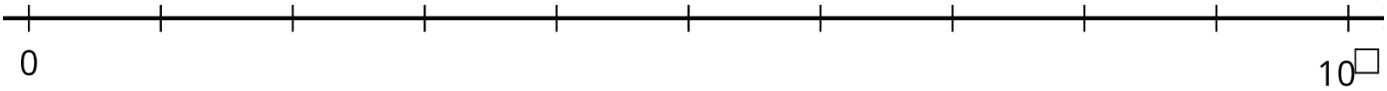
Describe point A as a multiple of a power of ten, and as a value.

Lesson 11: Representing Small Numbers on the Number Line

Write as a multiple of a power of ten: 0.00000000004

Write as a decimal: 2.6×10^{-11}

Decide on a power for the rightmost power of 10 so that the previous numbers fit on the number line. Then plot both numbers on the number line.



Lesson 12: Applications of Arithmetic with Powers of Ten

When is an estimate acceptable when dealing with very large or very small numbers? When is a precise answer needed?

What words in a problem tell you what operation to use?

Lesson 13: Definitions of Scientific Notation

In scientific notation, the first factor must be between _____ and _____.

The second factor must be _____ raised to an _____ power.

The symbol ____ is used to show multiplication.

Circle any of the following that are in correct scientific notation. If not, rewrite the same value in correct form.

0.89×10^{-4} 3.8×10^{5} 11×10^{11} 8×10^{-3} 24×10^{-6}

Lesson 14: Multiplying, Dividing, and Estimating with Scientific Notation

Estimate how many times larger 8.2×10^{5} is than 4.3×10^{-2}.

Estimate the value of the product of 2.8×10^{3} times 3.1×10^{6}. Then find the actual value.

Lesson 15: Adding and Subtracting with Scientific Notation

There are two methods you can use to add or subtract numbers in scientific notation.

- Write both numbers as _____ of the _____ power of ten.
- Write both numbers in _____ form with zeroes acting as placeholders when needed.

Find the sum or difference, using each method once. Write your answer in scientific notation.

$(6.7 \times 10^{3}) + (9.5 \times 10^{5})$ $(7.8 \times 10^{7}) - (4.2 \times 10^{5})$