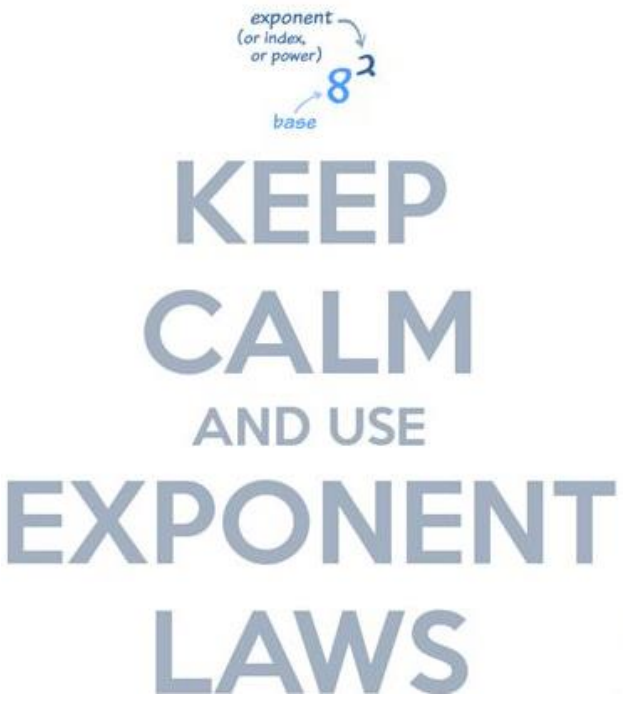

Unit Two

Standards:

8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.

8.EE.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.

8.EE.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. Interpret scientific notation that has been generated by technology.

Name: _____Period: _____

Lesson #16 Exponential Notation

In general, for any number $\boldsymbol{x}$ and any positive integer $\boldsymbol{n}$,

$$x^n = \underbrace{(x \cdot x \cdots x)}_{n\ times}$$

The number x^n is called x raised to the n^{th} _____, n is the _____ of x, and x is the _____.

When any base is raised to a power, use _____ to evaluate.

Write each of the following in expanded form and evaluate:

1. $2^3 =$

2. $(-4)^3 =$

3. $-(3)^4 =$

4. $10^6 =$

5. $-12^2 =$

6. $-(-5)^5 =$

7. $\left(\frac{1}{2}\right)^6 =$

8. $-\left(\frac{3}{4}\right)^3 =$

9. $\left(-\frac{2}{3}\right)^4 =$

10. $\left(\frac{7}{10}\right)^2 =$

11. $3^5 =$

12. $-(-7)^4 =$

13. $\left(-\frac{2}{3}\right)^3 =$

14. $-\left(-\frac{7}{4}\right)^2 =$

Thinking about negative numbers:

15. When a negative number is raised to an even power will the result be positive or negative? Give an example.

16. When a negative number is raised to an odd power will the result be positive or negative. Give an example.

HW #16 Exponential Notation

Evaluate each of the following:

1. $2^4 =$

2. $(-3)^5 =$

3. $-(5)^3 =$

4. $-\left(\frac{1}{3}\right)^4 =$

5. $\left(-\frac{2}{5}\right)^3 =$

6. $-\left(-\frac{3}{2}\right)^5 =$

Lesson #17 Product of Powers

Write the following in expanded form then simplify each.

1. $4^2 \times 4$

2. $10^3 \times 10^5$

3. $7^6 \times 7^2$

4. $9^3 \times 9^5 \times 9$

5. $\left(\frac{2}{3}\right)^4 \times \left(\frac{2}{3}\right)^3$

6. $\left(\frac{1}{4}\right)^5 \times \left(\frac{1}{4}\right)$

7. $m^2 \cdot m^6$

8. $w^3 \cdot w^2$

9. $z^5 \cdot z^3 \cdot z$

10. $3^7 \times 6^2 \times 3^3 \times 6^5$

11. $12^3 \times 5 \times 12^4 \times 5^6$

12. $x^2y^3 \cdot xy^5$

Product of Power Rule: _____

_____

Now with variables and coefficients:

$$(12x^2)\left(\frac{1}{4}x^3\right) = 3x^5$$

Multiply any integer bases without exponents and use the Product of Powers rule to multiply like variable bases.

13. $(-3x^4)(5x^2)$

14. $\left(\frac{1}{2}z^3\right)(18z)$

15. $\left(\frac{3}{2}m^5\right)(8m^2)$

16. $\left(\frac{2}{3}n^8\right)\left(\frac{3}{4}n\right)$

17. $(3a^2b)(\frac{1}{2}a^4b)$

18. $\frac{2}{3}(9v^4w^5)(4v^2w^3)$

19. A square has sides with measurements of 4x. Write an expression that represents the area of the square.

20. A rectangle has sides with measurements of 7xy and $9x^2y$. Write an expression that represents the area of the rectangle.

HW #17 Product of Powers

Simplify each of the following according to the Product of Powers Rule (Express each answer with positive exponents).

1. $5^3 \times 9^2 \times 9^5 \times 5$

2. $xy^2 \cdot xy^4$

3. $m^3n^5 \cdot m^4n^8$

4. $(4x^3y)(12x^3y^4)$

5. $\frac{3}{4}(2a^4b^5)(12a^3b)$

6. $(15v^2w)(\frac{1}{3}v^4w^2)$

7. A square has sides with measurements of $3xy^2$. Write an expression that represents the area of the square.

8. A rectangle has sides with measurements of $\frac{1}{2}x$ and $36x$. Write an expression that represents the area of the rectangle.

Lesson #18 Quotient of Powers

Write the following in expanded form then simplify.

1. $\frac{9^5}{9^2}$

2. $\frac{10^3}{10^6}$

3. $\frac{n^7}{n^3}$

4. $\frac{3^4 \cdot 5^2}{3^3 \cdot 5^5}$

5. $\frac{7^5 \cdot 12}{12^2 \cdot 7^6}$

6. $\frac{m^4 n^5}{m^5 n^3}$

Quotient of Powers Rule: _____

_____

Now with coefficients and variables:

Divide the **coefficients** and subtract the exponents of all **like bases**.

10. $\frac{12m^7n^2}{4m^5n^3}$

11. $\frac{14x^4y^7}{21x^5y^3}$

12. $\frac{-120xy^3}{5x^3y^2}$

13. $\frac{25a^3b}{40ab^4}$

14. $\frac{-18m^5n^2}{24m^3n^6}$

15. $\frac{96x^8y^3}{8x^3y^3}$

Word Problems:

16. A rectangle has an area of $72a^2b^3$ square inches. The width is 6ab inches. Find the length.

17. A garden has an area of $132x^3y^4$ square centimeters. The length is $12x^2y$ centimeters. Find the width.

HW #18 Quotient of Powers

Simplify each according to the Quotient of Powers Rule (Write all answers with positive powers):

1. $\frac{3^6}{3^4}$

2. $\frac{x^9}{x^3}$

3. $\frac{5^6 \cdot 12^3}{12^2 \cdot 5^3}$

4. $\frac{x^8 y^2}{x^4 \cdot y^5}$

5. $\frac{96a^3b^5}{4a^5b^3}$

6. $\frac{15m^4n^5}{20mn^3}$

7. A football field has an area of $288x^4y^5$ square feet. The length is $16x^2y^3$ feet. Find the width.

Lesson #19 Power of Powers

Write the following in expanded form then simplify each.

1. $(3^4)^2$

2. $(5^2)^3$

3. $(12^3)^4$

4. $\left(\left(\frac{2}{3}\right)^4\right)^3$

5. $(x^2)^5$

6. $(m^3)^3$

7. $(3 \cdot 4^3)^2$

8. $(6^2 \cdot 10)^3$

9. $(x^2y^3)^2$

10. $(5^2 \cdot 8)^3 \cdot (5 \cdot 8^4)^2$

11. $(x^3y)^4 \cdot (xy^3)^2$

Power to power rule: _____

_____

Now with coefficients and variables:

12. $(12xy^3)^2$

13. $(-3a^2\,b)^4$

14. $(-2m^2n^4)^5$

15. $\left(\frac{1}{2}m^3n^4\right)^2$

16. $\left(\frac{3}{4}r^2s^3\right)^3$

17. $\left(\frac{2}{3}x^2y^5\right)^4$

Word Problems:

18. The sides of a square are labeled as $7x^2y$. Given that $A = s^2$ write an expression that represents the area of the square.

19. The sides of a cube are 4ab. Given that $V = s^3$ write an expression that represents the volume of the cube.

HW #19 Power of Powers

Simplify each according to the Power of Powers Rule (Write all answers with positive powers):

1. $(3^4)^3$

2. $(12^4)^3$

3. $(5 \cdot 7^2)^4$

4. $(x^4y^3)^5$

5. $(5x^3y)^3$

6. $\left(\frac{5}{2}r^2s^3\right)^4$

7. The sides of a square are labeled as $6x^3y^2$. Given that $A = s^2$ write an expression that represents the area of the square.

Lesson #20 Negative Exponents

Complete the following table, look for patterns.

x^n	x^{-3}	x^{-2}	x^{-1}	x^0	x^1	x^2	x^3
2^n	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8

What is the relationship between the positive powers and negative powers? _____

_____

_____

As shown in the table $2^3 = 8$, how would $\frac{1}{8}$ be written in exponential form? _____

Complete the table below:

x^n	x^{-3}	x^{-2}	x^{-1}	x^0	x^1	x^2	x^3
3^n				1		9	27
5^n							
10^n						100	1,000

We know that an exponent result in repeated multiplication, yet when we have negative exponent it results in a smaller number. What does the negative exponent imply?

_____

Give an equivalent expression for each of the following, either in standard form or with an exponent.

1. 9^{-2}

2. 6^{-3}

3. 2^{-6}

4. 5^{-4}

5. 7^{-2}

6. 4^{-3}

7. 12^{-2}

8. 8^{-4}

9. x^{-4}

10. y^{-5}

HW #20 Negative Exponents

Give an equivalent expression for each of the following, either in standard form or with an exponent.

1. 7^{-2}

2. 4^{-5}

3. 6^{-3}

4. 11^{-2}

5. 12^{-3}

6. 8^{-4}

7. 3^{-5}

8. 9^{-3}

Lesson #21 Negative Exponents

In general, for any number $\boldsymbol{x}$ and any negative integer $\boldsymbol{n}$,

$$x^{-n} = \underbrace{\left(\frac{1}{x} \cdot \frac{1}{x} \cdots \frac{1}{x}\right)}_{n\ times}$$

Given the rule above, write the following in expanded form and evaluate the following:

1. 8^{-1}
2. 2^{-5}
3. 6^{-1}

4. 4^{-3}
5. 10^{-2}
6. 3^{-4}

In general, for any number $\boldsymbol{x}$and any negative integer $\boldsymbol{n}$,

$$\frac{1}{x^{-n}} = \underbrace{(x \cdot x \cdots x)}_{n\ times}$$

Given the rule above, write the following in expanded form and evaluate the following:

7. $\frac{1}{12^{-1}}$
8. $\frac{1}{6^{-3}}$
9. $\frac{1}{15^{-2}}$

10. $\frac{1}{5^{-4}}$
11. $\frac{1}{14^{-2}}$
12. 8. $\frac{1}{8^{-4}}$

In general, for any numbers $\boldsymbol{x}$ and y, and any negative integer $\boldsymbol{n}$,

$$\left(\frac{x}{y}\right)^{-n} = \underbrace{\left(\frac{y}{x} \cdot \frac{y}{x} \cdots \frac{y}{x}\right)}_{n\ times}$$

Given the rule above, write the following in expanded form and evaluate the following:

13. $\left(\frac{2}{5}\right)^{-1}$

14. $\left(\frac{2}{3}\right)^{-4}$

15. $\left(\frac{4}{3}\right)^{-3}$

16. $\left(\frac{1}{5}\right)^{-2}$

17. $\left(\frac{3}{8}\right)^{-4}$

18. $\left(\frac{1}{10}\right)^{-6}$

HW #21 Negative Exponents

Write each in expanded form and evaluate.

1. 5^{-4}

2. $\left(\frac{1}{8}\right)^{-2}$

3. $\left(\frac{3}{2}\right)^{-3}$

4. $\frac{1}{4^{-5}}$

5. 7^{-4}

6. $\frac{1}{6^{-3}}$

7. $\frac{1}{2^{-8}}$

8. $\left(\frac{5}{6}\right)^{-2}$

Lesson #22 Simplifying Expressions with Negative Exponents

Simplify each of the following. Express your answer with positive exponents.

1. $3^5 \cdot 3^{-9}$

2. $6^3 \cdot 6^{-5}$

3. $10^2 \cdot 10^{-6}$

4. $x \cdot x^{-4}$

5. $\frac{8^5}{8^7}$

6. $\frac{5^{-3}}{5^3}$

7. $\frac{2^3}{2^9}$

8. $\frac{x^{-2}}{x^4}$

9. $\frac{7^{-3}}{7^{-2}}$

10. $\frac{4^{-5}}{4^{-1}}$

11. $\frac{6^2}{6^{-4}}$

12. $\frac{x^3}{x^{-7}}$

13. $\left(\frac{3}{4}x^3y\right)\left(\frac{1}{3}x^{-5}y^2\right)$

14. $\left(\frac{2}{3}m^4n^{-1}\right)(5m^{-7}n^3)$

15. $\left(\frac{1}{2}r^{-2}s\right)(3r^{-1}s^4)$

16. $\frac{24x^3y^8}{30x^5y^4}$

17. $\frac{36m^3n^{-2}}{18m^{-1}n^4}$

18. $\frac{12rs^2}{45r^{-2}s^5}$

HW #22 Simplifying Expressions with Negative Exponents

Simplify each of the following. Express your answer with positive exponents.

1. $4^2 \cdot 4^{-5}$

2. $7 \cdot 7^{-6}$

3. $\frac{5^2}{5^6}$

4. $\frac{9^{-4}}{9^2}$

5. $\frac{2^{-5}}{2^3}$

6. $\frac{3^{-2}}{3^{-4}}$

7. $\left(\frac{1}{4}r^{-3}s\right)(10r^{-2}s)$

8. $\frac{16x^2y^5}{20x^6y}$

9. $\left(\frac{3}{2}m^2n^{-1}\right)\left(\frac{2}{5}m^{-5}n^4\right)$

10. $\frac{35v^2w^{-1}}{14v^3w^{-1}}$

Lesson #23 Powers of Ten and Place Value

Complete the following place value table:

	ones	tens	hundreds	thousands	ten – thousands	hundred – thousands	millions
Power of 10			10^2				
Standard Form		10					

	tenths	hundredths	thousandths	ten – thousandths	hundred – thousandths	millionths
Power of 10		10^{-2}				
Standard Form Fraction						$\frac{1}{1{,}000{,}000}$
Standard Form Decimal				0.0001		

Use the chart above to write the following numbers as shown in #1 in expanded form with powers of ten then using exponents:

1. 400 = **4 X 100** **4 X 10^2**
2. 50,000 = _____ _____
3. 20 = _____ _____
4. 9,000,000 = _____ _____
5. 3 = _____ _____
6. 700, 000 = _____ _____
7. 0.6 = _____ _____
8. 0.08 = _____ _____

If you add the numbers together from problems 1 – 6, you get 9,750,423.68. The expanded form of that number is:

$(9 \times 10^{6}) + (7 \times 10^{5}) + (5 \times 10^{4}) + (4 \times 10^{2}) + (2 \times 10^{1}) + (3 \times 10^{0}) + (6 \times 10^{-1}) + (8 \times 10^{-2})$

Write the following numbers in expanded form as shown above:

9. 450.819 =

10. 2,096.74 =

11. 706,295.03 =

12. 1,004,205.87 =

HW # 23 Powers of 10

Write the following as the product of a whole number and a power of ten.

1. 40,000 =

2. 90,000,000 =

3. 0.006 =

4. 0.000008 =

Write the following in expanded form with powers of ten.

5. 47,008.25 =

6. 108,799.003 =

7. 875.0096 =

8. 7,500,294.6 =

Lesson #24 Scientific Notation

A number can be written in scientific notation to shorten the number and make it easier to work with.

A number is written correctly in scientific notation if it is expressed as a decimal number that is ($1 \leq d < 10$) _____ and _____by a power of ten.

$$d \times 10^n$$

The exponent tells us the _____ of the number. A larger power of ten results in a larger number, just as a smaller power of ten results in a smaller number.

$$d \times 10^5 > d \times 10^{-3}$$

When you have a negative exponent, the result will be a _____ number.

To write a number in scientific notation:

1. Determine the _____ of the non –zero digit furthest to the left, this will be the _____ used in the new format.
2. Rewrite the number by removing the original decimal and placing it after the non-zero digit _____. All zeroes that act as place holders at the end of a _____ or at the beginning of a _____ should be removed.
3. Write the _____ of the number found in step two and the power of ten found in step one.

Write the following in scientific notation:

1. 6,240
2. 509,000
3. 8,001,000

4. 9,178,000,000

5. 309,000,000

6. 195,099,000,000

7. The US has a national debt of $19,644,976,398,582. Use Scientific Notation to round this amount to the nearest trillion.

8. 0.007

9. 0.108

10. 0.000065

11. 0.00008701

12. 0.00000005632

13. 0.00000100078

14. The mass of a proton is 0.000000000000000000000000016726178. Use Scientific Notation to make this number easier to read.

HW #24 Scientific Notation

Write the following in scientific notation:

1. 5,980,000

2. 120,600,000

3. 85,090,000,000

4. 78,900,000,000,000

5. The Earth is made of 5,502,532,127,000,000 square feet. Use Scientific Notation and express this number rounded to the nearest hundred trillion.

6. 0.0007903

7. 0.02107

8. 0.00000030897

9. 0.000000000025031

10. The mass of a dollar bill is 0.002202643 pounds. Use Scientific Notation to express the number rounded to the nearest millionth.

Lesson #25 Scientific Notation

Complete the following:

$5 \times 10 =$ _____	$5 \times 10^{-1} =$ _____	$2.4 \times 10 =$ _____
$\times 10 =$ _____	$\times 10^{-1} =$ _____	$\times 10 =$ _____
$\times 10 =$ _____	$\times 10^{-1} =$ _____	$\times 10 =$ _____
$\times 10 =$ _____	$\times 10^{-1} =$ _____	$\times 10 =$ _____
$\times 10 =$ _____	$\times 10^{-1} =$ _____	$\times 10 =$ _____

$2.4 \times 10^{-1} =$ _____	$1.99 \times 10 =$ _____	$1.99 \times 10^{-1} =$ _____
$\times 10^{-1} =$ _____	$\times 10 =$ _____	$\times 10^{-1} =$ _____
$\times 10^{-1} =$ _____	$\times 10 =$ _____	$\times 10^{-1} =$ _____
$\times 10^{-1} =$ _____	$\times 10 =$ _____	$\times 10^{-1} =$ _____
$\times 10^{-1} =$ _____	$\times 10 =$ _____	$\times 10^{-1} =$ _____

Write the following in standard form:

1. 8×10^{4}
2. 8.5×10^{6}
3. 8.39×10^{5}

4. 7.01×10^{7}
5. 3.005×10^{8}
6. 2.098×10^{6}

7. 4×10^{-2}

8. 4.6×10^{-4}

9. 4.61×10^{-1}

10. 5.03×10^{-3}

11. 1.008×10^{-4}

12. 3.08051×10^{-5}

Word Problem:

13. A class of students is asked to place the followings numbers in order from least to greatest. Which Student is correct and why?

Lisa	**Lucas**
5.72×10^{-3}	5.724×10^{-4}
5.724×10^{-4}	5.72×10^{-3}
5.8×10^{-2}	5.81×10^{-3}
5.81×10^{-3}	5.8×10^{-2}
5.814×10^{-2}	5.814×10^{-2}

_____

_____

_____

_____

HW #25 Scientific Notation

Write the following numbers in standard form:

1. 1.25×10^{3}

2. 9.0075×10^{6}

3. 8.6002×10^{8}

4. 3.01529×10^{10}

5. 3.5×10^{-4}

6. 9.001×10^{-2}

7. 7.56×10^{-6}

8. 9×10^{-3}

Write the following in order from least to greatest:

1.25×10^{-3}, 1.28×10^{-4}, 1.2×10^{-4}, 1.255×10^{-3}, 1.3×10^{-4}

Lesson #26 Multiplying and Dividing Numbers in Scientific Notation

Sometimes when multiplying and dividing a number will not be written correctly in scientific notation. Be sure to rewrite it so it does!

Try the following:

1. $24.8 \times 10^{8} = 2.48 \times 10^{\square}$
2. $36.5 \times 10^{7} = 3.65 \times 10^{\square}$
3. $917.83 \times 10^{12} = 9.1783 \times 10^{\square}$
4. $825.31 \times 10^{6} = 8.2561 \times 10^{\square}$
5. $0.584 \times 10^{9} = 5.84 \times 10^{\square}$
6. $0.1183 \times 10^{10} = 1.183 \times 10^{\square}$
7. $0.03629 \times 10^{5} = 3.629 \times 10^{\square}$
8. $0.00258 \times 10^{6} = 2.58 \times 10^{\square}$

Multiplying Numbers In Scientific Notation:

A shooting star travels at a rate of 300,000 mph for 600 hours. How many miles did it travel?

* Distance = rate x time

Rewrite each of the numbers above in scientific notation.

_____ x _____ = _____

(rate) (time) (distance)

Describe below how you can easily multiply numbers written in scientific notation.

1. $(1.5 \times 10^{6})(6 \times 10^{3})$
2. $(2.4 \times 10^{12})(4 \times 10^{-4})$

3. $(3.2 \times 10^{-5})(2.8 \times 10^{-3})$

4. $(1.5 \times 10^{6})(6 \times 10^{3})$

5. $(6.8 \times 10^{-8})(1.12 \times 10^{2})$

6. $(4.09 \times 10^{9})(3 \times 10^{5})$

Dividing Numbers In Scientific Notation:

A rocket travels 7,200,000 miles in 8,000 hours. How fast does the rocket travel?

* Rate = Distance ÷ time

Rewrite each of the numbers above in scientific notation.

_____÷_____ = _____

(Distance) (time) (rate)

Describe below how you can easily divide numbers written in scientific notation.

7. $(8.4 \times 10^{12}) \div (3 \times 10^{5})$

8. $(7.2 \times 10^{18}) \div (6 \times 10^{6})$

9. $(9.6 \times 10^{12}) \div (8 \times 10^{5})$

10. $(8.75 \times 10^{18}) \div (2.5 \times 10^{6})$

11. $(6.48 \times 10^{11}) \div (4 \times 10^{-5})$

12. $(4.872 \times 10^{-9}) \div (2.4 \times 10^{-3})$

HW #26 Multiplying and Dividing Numbers in Scientific Notation

Try the following. Make sure the results are written correctly in Scientific Notation:

1. $(2.9 \times 10^{3})(3.0 \times 10^{-3})$

2. $\frac{7.50\ x\ 10^{4}}{2.5\ x\ 10^{3}}$

3. $(2.55 \times 10^{-2})(3.00 \times 10^{-3})$

4. $\frac{6.80\ x\ 10^{-5}}{3.40\ x\ 10^{-8}}$

5. $(4 \times 10^{2})(2.5 \times 10^{-5})$

6. $\frac{5.25\ x\ 10^{6}}{1.5\ x\ 10^{4}}$

7. $(1.28 \times 10^{-3})(5 \times 10^{-1})$

8. $\frac{9.8\ x\ 10^{2}}{1.4\ x\ 10^{-5}}$

Lesson #27 Scientific Notation Word Problems with Multiplication and Division

Procedure:

1. _____ the problem.
2. _____ whether the questions should be solved by doing multiplication or division.
3. _____ the problem by multiplying or dividing the base numbers and by applying laws of exponents to the powers of 10.
    - When multiplying, _____ the exponents.
    - When dividing, _____ the exponents.
4. Be sure that your answer is correctly written in _____, with only _____ digit to the left of the decimal.

Calculate each answer using Scientific Notation without a calculator!

1. The United States Debt is approximately 16,000,000,000,000 and the population of the United States is approximately 400,000,000 people. If each person is equally responsible for the national debt, how much does each person owe?

2. Our national debt increases by approximately 4,000,000,000 per day. How much does the national debt increase per year?

3. A rectangle has length of 3,250,000 centimeters and a width of 200,000 centimeters. Find the area of the rectangle.

4. A rectangle has an area of 96,400,000 centimeters and a width 4,000,000 centimeters. Find the length of the rectangle.

5. The temperature halfway to the Sun from Mercury is approximately 1,800 °C and Scientists theorize that it may be up to 26,000 times hotter at the center of the Sun. Approximately how hot is it at the center of the Sun?

6. Each shrimp weighs approximately 0.00027 grams and a shrimp company can bring in over 8,370,000 grams of shrimp per year. Approximately how many shrimp is this?

7. A Blue Whale can eat 300,000,000 krill in a day, which is about 6,300,000,000 mg worth of food. About how much does each krill weigh?

8. McDonald's has about 2,100,000 managers and each makes and average of $39,000 per year. How much money does McDonald's spend on managers each year?

HW#27 Scientific Notation Word Problems with Multiplication and Division

Calculate each answer using Scientific Notation.

1. The circumference of the earth at the equator is approximately 25,000 miles and a commercial jet cruises at a rate 500 mph. Express each of the numbers in scientific notation, then determine how long it will take the jet to fly around the earth at that speed ($t = d \div r$).

2. The state of Colorado is 612,000 meters east to west and 451,000 meters north to south. Write each of these numbers in scientific notation, then calculate the approximate area of Colorado. Express your answer in scientific notation ($A = lw$).

3. The speed of light is 300,000,000 meters/second. If the sun is 150,000,000,000 meters from earth, how many seconds does it take light to reach the earth?

4. The area of the Pacific Ocean is 60,680,000 square miles. The area of the Atlantic Ocean is 29,600,000 square miles. How many times greater is the area of the Pacific Ocean than the Atlantic Ocean?

Lesson #28 Simplifying Ratios in Scientific Notation

When a question asks what part of a number is another number, it is asking for a _____. With scientific notation you would want to simplify the ratio as much as possible and write the numbers in _____.

Try the following:

1. What part of 3.6×10^7 is 1.5×10^6?

2. What part of 7.5×10^6 is 2.5×10^4?

3. What part of 1.2×10^4 is 9×10^3?

4. What part of 1.6×10^6 is 6.4×10^5?

Word Problems:

5. The population of New York is approximately 2×10^7 people. The population of the United States is approximately 3×10^8 people. What part of the Unites States population lives in New York? Express your answer as a ratio and a percent.

6. Snapchat is valued at $\$8.4 \times 10^8$. If the CEO and cofounder of Snapchat, Evan Spiegel makes $\$1.4 \times 10^6$ per year, what part of the company's value is he earning?

7. Mr. Bills made $\$1.08 \times 10^5$ last year. $\$2.52 \times 10^4$ was paid toward his mortgage. How much of his salary went towards paying for his house?

8. There are approximately 1.14×10^7 drivers in New York. Last year there were 2.5×10^5 car accidents reported. Assuming that each driver was in no more than one accident, approximately what percentage of drivers were in an accident last year?

HW #28 Simplifying Ratios in Scientific Notation

Write each ratio in simplest form.

1. What part of 9×10^5 is 2.7×10^3?

2. What part of 7.2×10^6 is 1.2×10^2?

3. The population of Colorado is 5.2×10^6 people, while the United States population is approximately 3.14×10^8 people. What part of the United States population resides in Colorado?

4. A survey was conducted to see how people spend the majority of their money. 2×10^5 people were surveyed and 1.6×10^4 said that they spend most of their money on food. What part of the total number of people surveyed is this?

Lesson #29 Adding and Subtracting with Scientific Notation

In order to add or subtract numbers written in Scientific Notation, the numbers must have the same _____.

If the given numbers have the same _____, simply add the _____ and keep the power of ten the same.

If the given numbers do not have the same _____, you will need to rewrite them so they do.

To rewrite a number in Scientific Notation, with a different power of ten consider the following:

- If the decimal number increases, the power of ten _____**.**

  Example:

  $2.48 \times 10^6 = 24.8 \times 10^5$

- If the decimal number decreases, the power of ten _____**.**

  Example:

  $3.15 \times 10^8 = 0.315 \times 10^9$

Try the following:

1. $4.782 \times 10^5 =$ _____ $\times 10^6$

2. $3.961 \times 10^7 =$ _____ $\times 10^9$

3. $2.5 \times 10^{-6} =$ _____ $\times 10^{-5}$

4. $1.74 \times 10^{-5} =$ _____ $\times 10^{-3}$

Rewrite the following numbers so that they have the same exponent, then add or subtract.

5. $1.68 \times 10^9 + 3.99 \times 10^8$

6. $9.763 \times 10^{10} + 4.8 \times 10^7$

7. $2.98 \times 10^{6} - 5.3 \times 10^{5}$

8. $7.02 \times 10^{12} - 9.37 \times 10^{10}$

9. $7.5 \times 10^{-4} + 1.24 \times 10^{-5}$

10. $3.005 \times 10^{-2} - 9 \times 10^{-4}$

11. The population of the United States is approximately 3.189×10^{8} people, Canada's is about 3.516×10^{7}, Alaska's is about 7.367×10^{5} and Mexico's is about 1.223×10^{8}. Determine the approximate population of North America.

12. There are approximately 3.236×10^{8} cubic kilometers of water in the Atlantic Ocean and 1.386×10^{9} cubic kilometers in all the oceans combined. If the Atlantic Ocean dried up how much water will be left?

HW #29 Adding and Subtracting with Scientific Notation

Show your work for each of the following questions. Answers should be written in Scientific Notation.

1. $3.275 \times 10^5 + 5 \times 10^3$

2. $4.18 \times 10^{-3} + 7 \times 10^{-4}$

3. $2.09 \times 10^8 - 5.98 \times 10^6$

4. $1.004 \times 10^{-2} - 8.6 \times 10^{-4}$

5. The population of New York is 1.957×10^7 people. The population of New York City is 8.337×10^6? How many NY state residents do not live in the city?

Lesson #30 Mixed Scientific Notation Problems

Complete the following with your group. Check in with a teacher before moving onto the next problem.

1. $2.89 \times 10^{-2} + 3.8 \times 10^{-3}$

2. $7.208 \times 10^{8} - 3.6 \times 10^{6}$

3. $(5.12 \times 10^{-3})(3 \times 10^{-4})$

4. $\frac{4.8\ x\ 10^{5}}{3\ x\ 10^{-2}}$

Work on the following problems with your partners.

5. A conservative estimate of the number of stars in the universe is 6×10^{22}. The average human can see about 3,000 stars at night with his naked eye. About how many times more stars are there in the universe, compared to the stars a human can actually see? Express your answer in Scientific Notation.

6. The average person takes about 3 x 10^4 breaths per day. If the average American lives about 78 years (or about 28,000 days), how many total breaths will a person take in his/her lifetime? Express your answer in Scientific Notation.

7. All planets revolve around the sun in elliptical orbits. Uranus's furthest distance from the sun is approximately 3.004×10^9 km, and its closest distance is approximately 2.749×10^9 km. Using this information, what is the **average** distance of Uranus from the sun?

8. The estimated world population in 2011 was 7×10^9. Of the total population, 682 million of those people were left-handed. Approximately what percentage of the world population is left-handed according to the 2011 estimation?

HW #30 Mixed Scientific Notation Problems

1. $7.5 \times 10^{-4} + 4.206 \times 10^{-2}$

2. $3.109 \times 10^{9} - 5.6 \times 10^{7}$

3. $(1.278 \times 10^{-2})(5 \times 10^{3})$

4. $\frac{3.6\ x\ 10^{6}}{4\ x\ 10^{-1}}$

5. Here are the masses of the so-called inner planets of the Solar System.

Mercury:	3.3022×10^{23} kg	Earth:	5.9722×10^{24} kg
Venus:	4.8685×10^{24} kg	Mars:	6.4185×10^{23} kg

What is the **average** mass of all four inner planets? Write your answer in scientific notation.