Pre-Algebra Unit #5: Exponents and Scientific Notation

Resources: Big Ideas Chapter 10
Common Core Standards: 8.EE.1; 8.EE.3; 8.EE.4

Number	Learning Targets	Common Core Standard	Resources
1	I can write and evaluate expressions using exponents.	8.EE.1	10.1
2	I can use exponent rules to find a power of a power.	8.EE.1	10.2
3	I can use exponent rules to simplify expressions involving the quotient of powers.	8.EE.1	10.3
4	I can evaluate expressions involving zero and negative integer exponents.	8.EE.1	10.4
5	I can identify, write and compare numbers in scientific notation.	8.EE.3; 8.EE.4	10.5
6	I can convert scientific notation to standard form.	8.EE.3; 8.EE.4	10.6
7	I can add, subtract, multiply and divide numbers written in scientific notation.	8.EE.3; 8.EE.4	10.7

My Practice:

Number	Pre-test:	Exit slip scores	Day #2 Homework	Extra Targeted Practice	Post-test:
1	_____/2				_____/6
2	_____/4				_____/6
3	_____/2				_____/4
4	_____/4				_____/8
5	_____/6				_____/11
6	_____/3				_____/6
7	_____/4				_____/12

My Final Pretest Score: _____ /25 **My Final Pretest Percent** _____ %

My Final Posttest A Score: _____ /_____ **My Final Posttest Percent:** _____%

My Final Posttest B Score: _____ /_____ **My Final Posttest Percent:** _____%

Unit 5: Exponents Extended Homework

This homework is designed to expand your thinking and practice mathematical explanations. You need to show an attempt on every problem as well as an explanation of your thinking.

You may use a calculator when applicable.

10.1 Exponents Extended Homework

Complete #27 and #28 from the online textbook from section 10.1 (pg. 415)

27.)

28.)

10.2 Product of Powers Property Extended Homework

Complete #29 and #31 from the online textbook from section 10.2 (pg. 421)

29.)

31.)

10.3 Quotient of Powers Property Extended Homework

Complete #29 and #30 from the online textbook from section 10.3 (pg. 427)

29.)

30.)

10.4 Zero and Negative Exponents Extended Homework

Complete #28 and #34 from the online textbook from section 10.4 (pg. 433)

28.)

34.)

10.5 Reading Scientific Notation Extended Homework

Complete #29 and #32 from the online textbook from section 10.5 (pg. 441)

29.)

32.)

10.6 Writing Scientific Notation Extended Homework

Complete #27 and #29 from the online textbook from section 10.6 (pg. 447)

27.)

29.)

10.7 Operations in Scientific Notation Extended Homework

Complete #29 and #31 from the online textbook from section 10.4 (pg. 453)

29.)
31.)

Section 10.1: Exponents Teacher Notes

POD:

1.) $12 \div 3 - 1 \cdot 2 + 1$

3

2.) $20 - 3[(5 + 2) - 1]$

2

Objective: Students will write and evaluate expressions using integer exponents.

Vocabulary:

Power: product of repeated factors

Example: $5 \cdot 5 \cdot 5 = 5^3$ ← exponent

↑ base

Examples: Write each product using exponents

1.) $4.5 \cdot 4.5 \cdot x \cdot x \cdot x$ $= 4.5^2x^3$	2.) $(-7) \cdot (-7) \cdot (-7) \cdot y \cdot y$ $= (-7)^3y^2$

Simplify. Show your work!

3.) $-5^2 = -5 \cdot 5 = -25$	4.) $(-5)^2 = -5 \cdot -5 = 25$
5.) $-2^3 = -2 \cdot 2 \cdot 2 = -8$	6.) $(-2)^3 = -2 \cdot -2 \cdot -2 = -8$

Order of Operations: P E MD AS

- P = Parentheses (work inside grouping symbols)
  - for example: parentheses ( ), brackets [ ], or fraction bars --
- E = Exponents
- MD = Multiplication and Division **in order from LEFT to RIGHT**
- AS = Addition and Subtraction **in order from LEFT to RIGHT**

Order of operations:

7.) $-2^2 + (3 - 9)^2$ $-4 + (-6)^2$ $-4 + 36 = \mathbf{32}$	8.) $-3^3 + (-3)^3$ $-27 + -27 = \mathbf{-54}$
9.) $3(-2^2 - 5)^2$ $3(-4 - 5)^2$ $3(-9)^2$ $3(81) = \mathbf{243}$	10.) $(-5)^2 - 2^3 + 4(1 - 3)^3$ $25 - 8 + 4(-2)^3$ $25 - 8 + 4(-8)$ $25 - 8 + -32$ $17 + -32 = \mathbf{-15}$

Name _____ Date _____

10.1 Exponents Homework Day 1

Write the product using exponents.

1. $\frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3}$

2. $(-1.2) \cdot (-1.2) \cdot (-1.2)$

3. $\frac{1}{5} \cdot \frac{1}{5} \cdot x \cdot x \cdot x$

4. $10 \cdot 10 \cdot (-n) \cdot (-n) \cdot (-n)$

Evaluate the expression.

5. -1^6

6. -5^4

7. $(-3)^4$

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

Evaluate the expression.

9. $-2^2 + (-3)^2 - 4$

10. $(-5^2 - 5 \cdot 4) \div 5$

11. $(-4)^2 - 2^2 + 4(1 - 3)^3$

12. $-3^2 + (4 - 7)^2$

Name _____

Section 10.1 Exponents Handout Day 2

Rewrite using exponents.

1.) $2 \cdot 2 \cdot 2 \cdot x \cdot x$

2.) $-3.5 \cdot -3.5 \cdot -3.5$

1.) _____

2.) _____

Simplify.

3.) $(-2)^3 + 3 - 4$

4.) $|-2 - 5|^2 + (-1)^3$

3.) _____

4.) _____

5.) $-6^2 - 2^3 + 2$

6.) $2(2 - 5)^2 + (-3)^2 - 3^3$

5.) _____

6.) _____

7.) $(-2)^2 - 3^3 - 4$

8.) $2(-3^2 - 1)^2$

7.) _____

8.) _____

9.) Why will you get some of your answers wrong if you only use PEMDAS in the exact order that they are written?

10.) Describe the difference between -3^4 and $(-3)^4$

Section 10.2 Product of Powers: Teacher Notes

POD: Solve.

1.) $-2^3 - 3^2 \cdot (-3)^2$ $= -89$

2.) $-2^2 + (-2)^2$ $= 0$

Objective: Students will be able to multiply powers with the same base and find a power of a power.

Rule for multiplying powers with the same base: Add the exponents.

Why does this work???

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

Examples: Multiplying Powers with the Same Base

1. $2^4 \cdot 2^5 = 2^{4+5} = 2^9$
2. $\left(-\frac{1}{2}\right)^3 \cdot \left(-\frac{1}{2}\right)^6 = \left(-\frac{1}{2}\right)^9$
3. $-2x \cdot y^3 \cdot 4y^5 \cdot x^2 = -8x^3y^8$
4. $3x \cdot y^4 \cdot 5y^6 \cdot 2x^3 = 30x^4y^{10}$

Rule for finding a power of a power: Multiply the exponents.

Why does this work???

$(2^2)^3 = (2^2) \cdot (2^2) \cdot (2^2) = (2 \cdot 2) \cdot (2 \cdot 2) \cdot (2 \cdot 2) = 2^6 = 64$

Examples: Finding a Power of a Power

5. $(2^2)^5 = 2^{2 \cdot 5} = 2^{10} = 1024$
6. $(c^5)^4 = c^{5 \cdot 4} = c^{20}$

Examples: Finding a Power of a Product

7. $(-3x^2)^3 = -27x^6$
8. $(-4x^3)^4 = 256x^{12}$
9. $(3xy)^2 = 9x^2y^2$
10. $(3g^4)^3 \cdot 2g^6 = 27g^{12} \cdot 2g^6 = 54g^{18}$
11. $(-3wz)^2(-w^3) = 9w^2z^2(-w^3) = -9w^5z^2$
12. $-2x^2 \cdot (-4xy^5)^2 = -2x^2 \cdot 16x^2y^{10} = -32x^4y^{10}$

Name _____ Date _____

10.2 Exponents and Multiplication Homework Day 1

Simplify the expression. Write your answer as a power.

1. $2^3 \cdot 2^2$

2. $9^6 \cdot 9^8$

3. $x^2 \cdot 3y^4 \cdot -2x \cdot y^2$

4. $7g \cdot -2h \cdot -h^2 \cdot g^4 \cdot 3$

5. $-4d^5f^3 \cdot -3d^6 \cdot -f^8$

6. $3y^5 \cdot 4x \cdot -9y^2 \cdot -x^6$

Simplify the expression.

7. $(4n)^2$

8. $(-2w)^5$

9. $\left(\frac{1}{3}p\right)^4$

10. $6x^7 \cdot 3xy^8 \cdot (-2x^4y)^3$

11. $3x^7y^3 \cdot (-4xy^9)^2$

12. $(-3y^4)^3 \cdot (-2y^8)^4$

13. Is $3^2 \cdot 4^2 = 12^4$? Evaluate each side of the equation to explain your answer.

Name: _____ Units: _____ Date: _____

Section 10.2: Exponents and Multiplication Handout Day 2

Simplify each expression

1.) $-7x^6 \cdot 5x^8$	2.) $3y^2 \cdot 2y^3$	3.) $-5d^5 \cdot 6c^2 \cdot d^3 \cdot -c^5$
4.) $x^3 \cdot -y^5 \cdot y^2 \cdot x^4$	5.) $-2m^3n^7 \cdot m^5n^4 \cdot 3mn$	6.) $(-2b)^4$
7.) $6x^7 \cdot 4x^{12}$	8.) $(3^2)^4 \cdot 3^5$	9.) $(-3x^4)^2 \cdot 2x^7$
10.) $(3mn)^2$	11.) $(-2xy)^3 \cdot (-x^2)^4$	12.) $(-6x^7)^2 \cdot -4x^{12}$

Section 10.3: Quotient of Powers Property
Teacher Notes

POD: Simplify each fraction.

1.) $\frac{15}{20}$ $= \frac{3}{4}$

2.) $\frac{12}{18}$ $= \frac{2}{3}$

3.) $\frac{24}{32}$ $= \frac{3}{4}$

Objective: Students will be able to divide powers with the same base and simplify expressions involving the quotient of powers.

Rule for dividing powers with the same base: Subtract the exponents.

Why does this work?

$\frac{2^6}{2^4} = \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2} = 2^2$

Examples: Divide Powers with the Same Base

1.) $\frac{2^9}{2^5} = 2^{9-5} = 2^4$

2.) $\frac{x^5}{x^4} = x^{5-4} = x$

Examples: Simplifying an Expression

3.) $\frac{3^4 \cdot 3^2}{3^3} = \frac{3^6}{3^3} = 3^3$

4.) $\frac{a^{10}}{a^6} \cdot \frac{a^7}{a^4}$

$a^4 \cdot a^3 = a^7$

5.) $\frac{x^{15}}{x^3 \cdot x^5} = \frac{x^{15}}{x^8} = x^7$

6.) $\frac{5^9}{5^4} \cdot \frac{5^5}{5^2}$

$5^5 \cdot 5^3 = 5^8$

7.) $\frac{24x^2y}{8xy} = 3x$

8.) $\frac{x^{15}y^9}{x^8y^3} = x^7y^6$

Zero Exponents: $a^0 = 1$ (For any nonzero number)

Why is $a^0 = 1$?

$10^3 = 1000$
$10^2 = 100$
$10^1 = 10$
$10^0 = ??$ ⟶ **10^0 has to be 1 based on the pattern**
10^{-1} 0.1
$10^{-2} = 0.01$

Examples:

9.) $7^0 = 1$

10.) $7x^0$ (the x turns into a 1)
$7 \cdot 1 = 7$

Challenge Problem:

Explain in writing why a number to the zero power is one.

Name _____ Date _____

10.3 Quotient of Powers Property Homework Day 1

Simplify the expression. Write your answer as a power.

1. $\frac{3^8}{3^6}$

2. $\frac{10^{11}}{10^3}$

3. $\frac{(-4)^5}{(-4)^4}$

4. $\frac{(5.6)^{15}}{(5.6)^9}$

5. $\frac{p^{13}}{p^{11}}$

6. $\frac{(-0.7)^{25}}{(-0.7)^{12}}$

Simplify the expression. Write your answer as a power.

7. $\frac{6^3 \cdot 6^7}{6^4}$

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

9. $\frac{(-0.5)^8 \cdot (-0.5)^5}{(-0.5)^6 \cdot (-0.5)^2}$

10. $\frac{m^{14}}{m^{10}} \cdot \frac{m^5}{m^2}$

Simplify the expression.

11. $\frac{5^4 \cdot n^4}{5^2}$

12. $\frac{x^5 \cdot z^4}{x^2 \cdot z^2}$

13. $\frac{c^6 \cdot d^{10} \cdot 2^6}{d^5 \cdot 2^3}$

14. $\frac{a^{12}b^8}{a^{10}b^5}$

Name _____ Date _____

10.3 Quotient of Powers Property Homework Day 2

Simplify the expression. Write your answer as a power.

1. $\dfrac{(-1000)^{13}}{(-1000)^{8}}$

2. $\dfrac{t^{21}}{t^{19}}$

Simplify the expression. Write your answer as a power.

3. $\dfrac{11^{7} \cdot 11^{10}}{11^{4} \cdot 11^{2}}$

4. $\dfrac{2.5^{8} \cdot 2.5^{3}}{2.5 \cdot 2.5^{4}}$

5. $\dfrac{(-7.9)^{15} \cdot (-7.9)^{9}}{(-7.9)^{12} \cdot (-7.9)^{7}}$

6. $\dfrac{b^{35}}{b^{20}} \cdot \dfrac{b^{15}}{b^{10}}$

Simplify the expression.

7. $\dfrac{4^{8} \cdot m^{7} \cdot n^{4}}{4^{5} \cdot m^{2}}$

8. $\dfrac{r^{12} \cdot s^{7} \cdot t^{9}}{r^{9} \cdot s^{3}}$

9. $\dfrac{p^{18}q^{11}}{p^{10}q^{8}}$

10. $\dfrac{3^{5}a^{17}b^{21}}{3^{4}a^{15}b^{12}}$

11. $\dfrac{a^{3}b^{4}5^{4}}{5b^{2}}$

12. $\dfrac{5^{12}c^{10}d^{2}}{5^{9}c^{9}}$

13. The sound intensity of a normal conversation if 10^{6} times greater than the quietest noise a person can hear. The sound intensity of a jet at takeoff is 10^{14} times greater than the quietest noise a person can hear. How many times more intense is the sound of a jet at takeoff than the sound of a normal conversation?

14. Find the value of x that makes: $\dfrac{8^{3x}}{8^{2x+1}} = 8^{9}$

Section 10.4: Negative Exponents
Teacher Notes

POD: Simplify the expression.

1.) $\frac{m^{10}n^7}{m^2n^6}$ = m^8n

2.) $\frac{5^{12}c^{10}}{5^9c^8}$ = 5^3c^2 or $125c^2$

Objective: Students will be able to evaluate expressions involving numbers with zero and negative numbers as exponents.

Negative Exponents:

$\frac{3^2}{3^4} = 3^{2-4} = 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$	Why??? $\frac{\cancel{3}\cdot\cancel{3}}{\cancel{3}\cdot\cancel{3}\cdot 3\cdot 3} = \frac{1}{3^2}$

****Negative Exponents mean fractions (NOT negative numbers!!)****

Rules for using negative exponents:

1.) **Move** the base with the negative exponent to the opposite side of the fraction bar
2.) **Rewrite** the base without the negative exponent - make it a positive!

OR

1.) **Subtract** the exponents.
2.) If it is negative, put the variable on the bottom and make it positive.
3.) If it is positive, keep it on top.

1.) $g^{-5}y^2 = \frac{y^2}{g^5}$	2.) $\frac{2^6}{2^8} = \frac{1}{2^2} = \frac{1}{4}$
3.) $w^3y^{-4} = \frac{w^3}{y^4}$	4.) $\frac{b^{-2}c^3}{b^4c} = \frac{c^2}{b^6}$
5.) $x^{-3}y^{-2} = \frac{1}{x^3y^2}$	6.) $8^{-2}\cdot a^7 = \frac{a^7}{8^2}$ or $\frac{a^7}{64}$

7.) $\frac{x^2y^{-3}}{x^3y^{-1}} = \frac{1}{xy^2}$	8.) $\frac{x^{-1}y^3}{x^5y^{-4}} = \frac{y^7}{x^6}$
9.) $\frac{3^{-2}\cdot k^0}{k^{-6}} = \frac{k^6}{3^2}$ **or** $\frac{k^6}{9}$	10.) $\frac{1}{5^7}\cdot\frac{1}{5^{-4}} = \frac{5^4}{5^7} = \frac{1}{5^3}$ **or** $\frac{1}{125}$
11.) $\frac{-16g^{-4}h^8}{4g^{-2}h^{-5}k^{-2}} = \frac{-4h^{13}k^2}{g^2}$	12.) $\frac{15x^{-4}y^{-3}z^{-8}}{30x^2y^{-8}} = \frac{y^5}{2x^6z^8}$

Name _____ Date _____

10.4 Negative Exponents Homework Day 1

Evaluate the expression.

1. 3^{-4}

2. 32^{0}

3. $\frac{8^3}{8^5}$

4. $\frac{(-9)^4}{(-9)^7}$

5. $5^{-12} \cdot 5^{12}$

6. $\frac{1}{4^{-5}} \cdot \frac{1}{4^8}$

7. $6^{-1} \cdot 6^{-2}$

8. $\frac{2^6}{2^{-8} \cdot 2^{10}}$

Simplify. Write the expression using only positive exponents.

9. $8x^{-3}$

10. $5^{-3} \cdot m^6$

11. $\frac{7p^5}{p^{-1}}$

12. $\frac{10t^{-5}}{t^{-2}}$

13. $\frac{15d^4}{3d^9}$

14. $6w^{-2} \cdot 4w^2$

Name: _____ Units: _____ Date: _____

10.4 Negative Exponents Homework Day 2

Simplify each fraction. Get rid of any negative exponents!!

1.) $\frac{a^3b}{ab^4}$	2.) $\frac{m^5n^6}{mn}$	3.) $\frac{w^2z^9}{w^4z^3}$
4.) $\frac{a^6b^4}{a^3b^{-2}}$	5.) $\frac{10c^{-2}d^{11}}{15c^8d^{-5}}$	6.) $\frac{m^{-3}n^{-4}}{m^2n^{-9}}$
7.) $\frac{-8ab^{-6}}{10a^{-3}b}$	8.) $\frac{p^{-2}s^{-9}}{p^6s^{-11}}$	9.) $\frac{c^2d^{-3}}{c^3d^{-1}}$
10.) $\frac{a^3b^2c^{-4}}{a^{-2}b^5c^{-9}}$	11.) $-5j^{-4}k^3$	12.) $x^{-4}yz^{-7}$

Section 10.5: Reading Scientific Notation
Teacher Notes

POD: Simplify.

1.) $\frac{5b^{-2}}{b^3}$ $= \frac{5}{b^5}$

2.) $\frac{x^3y^3}{x^9y^{-4}}$ $= \frac{y^7}{x^6}$

Objective: Students will be able to identify numbers written in scientific notation, write numbers in standard form, and compare numbers in scientific notation.

Vocabulary:

1.) **Scientific Notation**- when a number is represented as a product of a factor and a power of 10. (A way to write large or small numbers)
2.) **Standard Form**- the way we generally write numbers

Is the number written in scientific notation?

1.) 5.9×10^{-6}	2.) 0.9×10^{8}	3.) 13×10^{-2}
Yes	No, the factor is less than 1.	No, the factor is more than 10.

Rules for writing numbers in **SCIENTIFIC NOTATION to STANDARD FORM:**

1.) If the exponent is POSITIVE, move the decimal point that many places to the RIGHT.
2.) If the exponent is NEGATIVE, move the decimal point that many places to the LEFT.
3.) Fill in zeroes in any empty places.

Examples:

4.) 8.9×10^{5}	5.) 5.9×10^{-6}	6.) 1.06×10^{-4}
890,000	0.0000059	0.000106

Rules for **COMPARING** numbers written is scientific notation:

1.) Compare the exponents:
   a. If the exponents are DIFFERENT, the number with the larger exponent is the larger number.
   b. If the exponents are EQUAL, compare the decimal parts.

Examples:

7.) 5.006×10^3 ____ 1.47×10^3 $5.006 \times 10^3 > 1.47 \times 10^3$	8.) 1.3×10^{-4} ____ 2.7×10^{-5} $1.3 \times 10^{-4} > 2.7 \times 10^{-5}$

An object with a lesser density than water will float. An object with a greater density than water will sink. Water has a density of 1.0×10^3. Decide if the following objects will sink or float.

9.) Brick's density: 1.84×10^3 It will sink because the density is more than water's density. $(1.0 \times 10^3 < 1.84 \times 10^3)$	10.) Apple's density: 6.41×10^2 It will float because the density is less than water's density. $(1.0 \times 10^3 > 6.41 \times 10^2)$

Name _____ Date _____

10.5 Reading Scientific Notation Homework Day 1

Tell whether the number is written in scientific notation. Explain.

1. 14×10^8

2. 2.6×10^{12}

3. 4.79×10^{-8}

4. 3.99×10^{16}

5. 0.15×10^{22}

6. 6×10^3

Write the number in standard form.

7. 4×10^9

8. 2×10^{-5}

9. 3.7×10^6

10. 4.12×10^{-3}

11. 7.62×10^4

12. 9.908×10^{-6}

13. Light travels at 3×10^8 meters per second.

a. Write the speed of light in standard form.

b. How far has light traveled after 5 seconds?

14. Describe how the value of a number written in scientific notation changes when you increase the exponent by 1.

15. A googol is 1.0×10^{100}. How many zeros are in a googol?

Name _____ Date _____

10.5 Reading Scientific Notation Homework Day 2

Tell whether the number is written in scientific notation. Explain.

1. 62.9×10^{14}

2. 9.897×10^{-15}

3. 0.451×10^{-12}

Write the number in standard form.

4. 8×10^{6}

5. 9×10^{-2}

6. 2×10^{3}

7. 5.3×10^{-4}

8. 1.2×10^{8}

9. 9.876×10^{-4}

10. The table shows the surface temperatures of five stars.

Star	Betelgeuse	Bellatrix	Sun	Aldebaran	Rigel
Surface Temperature (°F)	6.2×10^{3}	3.8×10^{4}	1.1×10^{4}	7.2×10^{3}	2.2×10^{4}

a.) Which star has the highest surface temperature?

b.) Which star has the lowest surface temperature?

11. The average distance from Earth to the Sun is about 1.5×10^{11} meters. The average distance from Earth to the Moon is about 3.84×10^{8} meters.

a. Write the distance from Earth to the Sun in standard form.

b. Write the distance from Earth to the Moon in standard form.

c. Which is closer to Earth, the *Sun* or the *Moon*?

Section 10.6: Writing Scientific Notation
Teacher Notes

POD: Write the number in standard form.

1.) 2.7×10^{-4} = **0.00027**

2.) 9.725×10^{6} = **9,725,000**

Objective: Students will be able to write large and small numbers in scientific notation.

Rules for writing numbers in **STANDARD FORM to SCIENTIFIC NOTATION:**

1.) Move the decimal point until there is only one digit (1-9) to the left of the decimal point.
2.) If you moved the decimal point to the LEFT, the exponent is POSITIVE.
3.) If you moved the decimal point to the RIGHT, the exponent is NEGATIVE.
4.) Remove unnecessary zeros from your final answers. (Ex: 1.50000 = 1.5)

Examples:

1.) 683 6.83×10^{2}	2.) 0.0021 2.1×10^{-3}	3.) 434.2×10^{5} 4.342×10^{7}
4.) 0.3658×10^{-9} 3.658×10^{-10}	5.) 0.000506 5.06×10^{-4}	6.) 54,500,000 5.45×10^{7}

Rules for **ORDERING** numbers written is scientific notation:

1.) Rewrite each number in **SCIENTIFIC NOTATION.**
2.) Compare the exponents, and then the decimal values if exponents are the same.
3.) Rewrite your answer using the **original** numbers.

Examples: Order from LEAST to GREATEST

7.) 12.36×10^{3}, 1.3×10^{5}, 0.124×10^{5} 1.236×10^{4}, 1.3×10^{5}, 1.24×10^{4} 12.36×10^{3}, 0.124×10^{5} 1.3×10^{5}	8.) 0.56×10^{8}, 0.06×10^{8}, 5.2×10^{8} 5.6×10^{7}, $6. \times 10^{6}$, 5.2×10^{8} 0.06×10^{8}, 0.56×10^{8} , 5.2×10^{8}

Challenge Problem:
Write one-hundred fifty nine ten-millionths in Scientific Notation.

Name _____ Date _____

10.6 Writing Scientific Notation Homework Day 1

Write the number in scientific notation.

1. 4,200,000

2. 0.038

3. 600,000

4. 0.0000808

5. 0.0007

6. 29,010,000,000

Order the numbers from least to greatest.

7. $6.4 \times 10^8, 5.3 \times 10^9, 2.3 \times 10^8$

8. $9.1 \times 10^{-3}, 9.6 \times 10^{-3}, 9.02 \times 10^{-3}$

9. $7.3 \times 10^7, 5.6 \times 10^{10}, 3.7 \times 10^9$

10. $1.4 \times 10^{-5}, 2.01 \times 10^{-15}, 6.3 \times 10^{-2}$

11. A patient has 0.0000075 gram of iron in 1 liter of blood. The normal level is between 6×10^{-7} gram and 1.6×10^{-5} gram. Is the patient's iron level normal? Write the patient's amount of iron in scientific notation.

12. How do you know whether a number written in standard form will have a positive or negative exponent when written in scientific notation?

Name _____ Date _____

10.6 Writing Scientific Notation Homework Day 2

Write the number in scientific notation.

1. 350,000

2. 0.0004

3. 0.000000000527

4. 12,500,000

5. 1,900,000,000

6. 0.0000001

7. 5,000,000,000,000

8. 0.00006524

Order the numbers from least to greatest.

9. 3.6×10^8, 6.3×10^8, 3.26×10^8

10. 9.8×10^{-12}, 1.23×10^{-11}, 5.05×10^{-13}

11. 6.18×10^7, 5.6×10^{-7}, 6.8×10^7

12. 4.81×10^{-5}, 4.27×10^{-5}, 4.7×10^{-5}

13. The number of stars in the Milky Way Galaxy has been approximated to be between 200 billion and 400 billion. Write these numbers in scientific notation.

14. The ångström is a unit of length defined to be 0.0000000001 meter. Write this number in scientific notation.

Section 10.7: Operations in Scientific Notation
Teacher Notes

POD: Write each number in scientific notation.

1.) 5,430,000 2.) 0.00004

5.43×10^6 4×10^{-5}

Objective: Students will be able to add, subtract, multiply and divide numbers written in scientific notation.

Adding or Subtracting with scientific notation

1.) Numbers must have the same power of 10.
2.) If they have different powers of 10, you can rewrite the numbers (they don't have to be in traditional scientific notation).
3.) Add or subtract the numbers
4.) **Write your final answer in scientific notation!**

1.) $(8.72 \times 10^3) - (4.6 \times 10^3)$ Subtract: $8.72 - 4.6 = \mathbf{4.12 \times 10^3}$	2.) $(9.7 \times 10^6) + (6.7 \times 10^5)$ Rewrite: $(9.7 \times 10^6) + (0.67 \times 10^6)$ Add: $9.7 + 0.67 = 10.37 \times 10^6$ $= \mathbf{1.037 \times 10^7}$

Multiplying with Scientific Notation

1.) Multiply whole numbers
2.) ADD exponents
3.) Make sure final answers are in S.N.

Examples

3.) $(4 \times 10^4)(6 \times 10^6) = 4 \times 6 \times 10^4 \times 10^6$
$= 24 \times 10^4 \times 10^6$ (Multiply 4 and 6)
$= 24 \times 10^{10}$ (Add exponents)
$= 2.4 \times 10^1 \times 10^{10}$ (Write 24 as 2.4×10^1)
$= 2.4 \times 10^{11}$ (Add exponents)

4.) $(7.1 \times 10^{-8})(8 \times 10^4) = 7.1 \times 8 \times 10^{-8} \times 10^4$
$= 56.8 \times 10^{-8} \times 10^4$ (Multiply 7.1 and 8)
$= 56.8 \times 10^{-4}$ (Add exponents)
$= 5.68 \times 10^1 \times 10^{-4}$ (Write 5.68 as 5.68×10^1)
$= 5.68 \times 10^{-3}$ (Add exponents)

Dividing with scientific notation

1.) Divide whole numbers

2.) SUBTRACT exponents

3.) Make sure your final answer is in Scientific Notation.

Examples

5.) $\frac{2.04x10^{-1}}{2x10^{-2}}$ = $1.02 \times 10^{-1+2}$ 1.02×10	6.) $\frac{9.45x10^{6}}{2.1x10^{3}}$ = $4.5 \times 10^{6-3}$ 4.5×10^{3}
7.) $\frac{8.1x10^{-2}}{9x10^{2}}$ = $0.9 \times 10^{-2-2}$ 0.9×10^{-4} 9×10^{-5}	

<u>Challenge Question</u>:

Explain in writing two different methods you can do to check your quotient for problem 6 above. Do not include redoing the problem over again. Think of other methods of checking.

Name _____ Date _____

10.7 Operations in Scientific Notation Homework Day 1

Find the sum or difference. Write your answer in scientific notation.

1. $(2 \times 10^4) + (7.2 \times 10^4)$

2. $(3.2 \times 10^{-2}) + (9.4 \times 10^{-2})$

3. $(6.7 \times 10^5) - (4.3 \times 10^5)$

4. $(8.9 \times 10^{-3}) - (1.9 \times 10^{-3})$

Find the product or quotient. Write your answer in scientific notation.

5. $(6 \times 10^8) \times (4 \times 10^6)$

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

7. $(8 \times 10^3) \div (2 \times 10^2)$

8. $(2.34 \times 10^5) \div (7.8 \times 10^5)$

9. How many times greater is the radius of a basketball than the radius of a marble?

Radius = 1.143×10^1 cm

Radius = 5×10^{-1} cm

Name _____ Date _____

10.7 Operations in Scientific Notation Homework Day 2

Find the sum or difference. Write your answer in scientific notation.

1. $(2 \times 10^4) + (5 \times 10^4)$

2. $(3.5 \times 10^{-3}) + (1 \times 10^{-3})$

3. $(8.3 \times 10^{-5}) - (4.4 \times 10^{-5})$

4. $(7.2 \times 10^9) - (5.8 \times 10^9)$

Find the product or quotient. Write your answer in scientific notation.

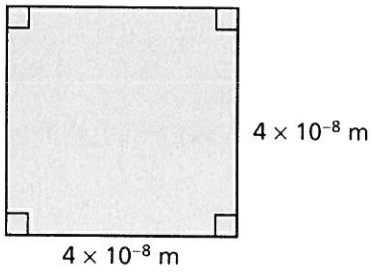
5. $(1 \times 10^5) \times (4 \times 10^2)$

6. $\frac{8 \times 10^5}{4 \times 10^5}$

7. $(2 \times 10^{-4}) \times (3 \times 10^7)$

8. $(9 \times 10^7) \div (3 \times 10^2)$

Find the area of the figure. Write your answer in scientific notation.

9. 

10. The table shows the volumes of the two largest giant sequoia trees. Which tree has the greatest volume? How much greater is its volume than the other tree?

Tree Name	Volume (cubic feet)
General Sherman	5.25×10^4
Washington	4.785×10^4