

Name: _____

Monday 3/16/20

Ms. Streffacio

Class: _____

I can:

Do Now (3 minutes to complete):

Write out your rules for exponents:

Product Rule	$y^a \times y^b$
Quotient Rule	$\frac{z^a}{z^b}$
Power to Power Rule	$((x)^a)^b$
Zero Product Rule	b^0
Negative Rule	$\frac{x^3}{x^4}$

Teacher Model (10 minutes) You Watch, Listen, Copy:

$$\frac{x^3 x^{-5}}{x^4}$$

$$\frac{((2x^2)(y^3))^4}{(x^3 y^4)^3}$$

$$\frac{y^{12}}{y^{-7}} \cdot \frac{y^{10}}{y^{23}}$$

Check for Understanding- Did you understand the Model? (2 minutes) Teacher will check!

Simplify: $\frac{32^{-1}}{32^6}$. Write your answer with a positive exponent.

Show your work.

The expression is a quotient of powers.



Solution: _____

We Do Together (10 minutes):

Jude incorrectly simplified the expression $\left(\frac{1}{2}\right)^2 \times \frac{1}{2} \times \left(\frac{1}{2}\right)^3$, as shown below.

$$\left(\frac{1}{2}\right)^2 \times \frac{1}{2} \times \left(\frac{1}{2}\right)^3 = \left(\frac{1}{8}\right)^6 = \frac{1}{262,144}$$

Describe the mistake that Jude made.

Answer

Correctly simplify the expression.

$$\left(\frac{1}{2}\right)^2 \times \frac{1}{2} \times \left(\frac{1}{2}\right)^3$$

Final Check for Understanding before I send you to Independent Practice! Teacher will Check (4 minutes):

Which expression is equivalent to $(3^4 \cdot 5^4)^{-3}$?

- A $\frac{1}{15^5}$
- B 15^{-48}
- C $\frac{1}{15^{12}}$
- D 15^5

Tania chose **B** as the correct answer. How did she get that answer?

Remember the order of operations. Simplify the expression within the parentheses first.



Independent Practice (on your own):

What value of n makes the following equation true?

$$\frac{4^8}{(4^2)^{-3}} \div 4^4 = 4^n$$

Show your work.

Answer: $n =$ _____

Josh examines the expression $\frac{5^{-m}}{5^m}$, where m is greater than 0.

He claims that the expression has a value equal to 1 because it simplifies to 5^0 , and any integer to the 0 power is 1.

Is Josh correct? Explain why or why not.

Jacob thinks that 3^5 is $5 \cdot 5 \cdot 5$, or 125. Explain what Jacob is doing wrong.

Margo's dad offers to give her 5¢ on Sunday. Then for each day of the week, he offers to give her 5 times the amount from the previous day. How much will he give her on Saturday? Write an expression to show how much Margo's dad gives her on Saturday.

Is 2^4 equal to $2 \cdot 4$? Explain.

A bacterium cell splits into 2 cells every hour. Write and evaluate an exponential expression to find how many cells there will be in 6 hours. Then use your answer to help you find the number of hours it will take for there to be 1,024 cells.

Show your work.

Solution:

The population of California is about 39 million. Is this greater than or less than 10^7 ? Explain.

Write each of the numbers 1, 8, 27, 64, and 125 as a base raised to the third power.

$$1 = \square^3 \qquad 8 = \square^3 \qquad 27 = \square^3$$
$$64 = \square^3 \qquad 125 = \square^3$$

The exponential expression 2^8 has a value of 256. Write two other exponential expressions that have a value of 256. Explain how you got your answers. (Begin by writing out 2^8 as the product of 2s.)

Simplify: $(7^5)^6$. Write your answer using an exponent.

Simplify: $(6^3)(9^3)$. Write your answer using an exponent.

Is the statement $(3^5)^4 = (3^4)^5$ true? Explain your reasoning.

Simplify: $(7^5)(4^5)$. Write your answer using an exponent.

Explain in words how to simplify: $(153^2)^7$.

Is the statement $(10^5)(4^5) = 14^5$ true? Explain your reasoning.

What is the value of x in the equation $(5^x)^5 = 5^{35}$? Explain.

Nicholas says that $(2^6)(2^6)$ equals 2^{12} and also equals 4^6 . Do you agree? Explain your reasoning.

Use the properties of exponents to write an equivalent expression that is a product of distinct primes, each raised to an integer power.

$$\frac{10^5 \cdot 9^2}{6^4} =$$

$$\text{Compute: } 3^3 \times 3^2 \times 3^1 \times 3^0 \times 3^{-1} \times 3^{-2} =$$

$$\text{Compute: } 5^2 \times 5^{10} \times 5^8 \times 5^0 \times 5^{-10} \times 5^{-8} =$$

$$\text{Compute for a nonzero number, } a: a^m \times a^n \times a^l \times a^{-n} \times a^{-m} \times a^{-l} \times a^0 =$$

For Exercises 5–10, write an equivalent expression, in exponential notation, to the one given, and simplify as much as possible.

Exercise 5

$$5^{-3} =$$

Exercise 6

$$\frac{1}{8^9} =$$

Exercise 7

$$3 \cdot 2^{-4} =$$

Exercise 8

Let x be a nonzero number.

$$x^{-3} =$$

Exercise 9

Let x be a nonzero number.

$$\frac{1}{x^9} =$$

Exercise 10

Let x, y be two nonzero numbers.

$$xy^{-4} =$$

$$\frac{y^{12}}{y^{12}} =$$

$$9^{15} \cdot \frac{1}{9^{15}} =$$

$$(7(123456.789)^4)^0 =$$

$$2^2 \cdot \frac{1}{2^5} \cdot 2^5 \cdot \frac{1}{2^2} = \frac{2^2}{2^2} \cdot \frac{2^5}{2^5}$$

$$\frac{x^{41}}{y^{15}} \cdot \frac{y^{15}}{x^{41}} = \frac{x^{41} \cdot y^{15}}{y^{15} \cdot x^{41}}$$

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8.EE.1

1. Determine if each expression is equivalent to $\frac{7^6}{7^3}$.

Choose Yes or No for each expression.

a. $(7^9)(7^{-6})$ ☐ Yes ☐ No

b. $7^{-8} \div 7^{-11}$ ☐ Yes ☐ No

c. $(7^5)(7^3) \div 7^4$ ☐ Yes ☐ No

d. $7^{-3} \times 7^6$ ☐ Yes ☐ No

e. $(7^3)^0$ ☐ Yes ☐ No

2. Which statement is true about the value of $(6^{-n})(6^n)$?

A For $n < 0$, the value of the expression is greater than 1.

B For $n > 0$, the value of the expression is 0.

C For all n , the value of the expression is less than 1.

D For all n , the value of the expression is 1.

3. Which expressions are equivalent to $13^6 \div \frac{(13^9)(13^{-4})}{13^{-2}}$?

Choose all that apply.

A $\frac{1}{(-13)^0}$

B $(-1)^4$

C $(-1)^7$

D 1^{13}

E $\frac{1}{13^{-1}}$

4. Look at the equations below. Tell whether each equation is *True* or *False*.

a. $3^5 \cdot 3^7 = 3^{35}$

☐ True ☐ False

b. $(6^3 \cdot 3^3)^2 = 18^6$

☐ True ☐ False

c. $7^{-6} \cdot \frac{1}{7^4} = \frac{1}{7^{10}}$

☐ True ☐ False

d. $4^4 \cdot 4^2 = 4^6$

☐ True ☐ False

e. $\frac{13^{-4}}{13^4} = 13^0$

☐ True ☐ False

f. $(2^3 \cdot 8^3)^0 = 16^9$

☐ True ☐ False

5. Tyler simplified the expression $5^4 \cdot 5^{-9}$. All of his work except his answer is shown below.

$$\begin{aligned} 5^4 \cdot 5^{-9} &= 5^{4+(-9)} \\ &= 5^{-5} \\ &= ? \end{aligned}$$

Which expression is the correct answer for Tyler's work?

A 5^5

B $\frac{1}{5^5}$

C $\frac{1}{5^{-5}}$

D 5

6. A cylinder and a cone have congruent heights and radii. What is the ratio of the volume of the cone to the volume of the cylinder?

A 1 : 1

B 1 : 3

C 1 : 6

D 1 : 9

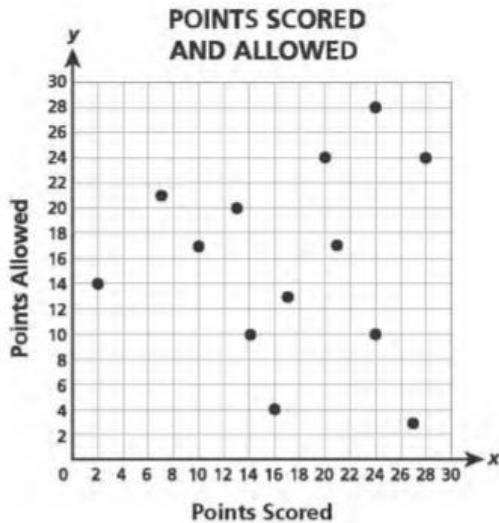
7. Which of the equations listed below are linear equations?

Equation I: $C = 2\pi r$

Equation II: $A = \pi r^2$

Equation III: $V = \frac{4}{3}\pi r^3$

- A equation I only
B equation II only
C equations I and III
D equations II and III
8. The scatter plot below shows the points scored and the points allowed by the Bulldogs football team for several games.



Which association (correlation) best describes the data?

- A no association (correlation)
B positive association (correlation)
C negative association (correlation)
D nonlinear association (correlation)
9. Simplify.

$$5^{-8} \times 5^4$$

- A $\frac{1}{5^4}$
B $\frac{1}{5^{32}}$
C -5^2
D -5^{12}

12. A certain human red blood cell has a diameter of 0.000007 meters. Which expression represents this diameter, in meters, in scientific notation?

A 7×10^{-6}

B 7×10^{-5}

C 7×10^6

D 7×10^5

13. What is the value of n in the equation shown below?

$$2^2 \times 2^n = (2^4)^3$$

A 5

B 6

C 10

D 12

14. Which expression is equivalent to $2^2 \cdot \frac{2}{2^4}$?

A 2^{-2}

B 2^{-1}

C 2^6

D 2^7

15. What is the value of the expression $\frac{3^{-3} \times 3^8}{3^6}$?

A. $\frac{1}{81}$

C. 3

B. $\frac{1}{3}$

D. 81

16. Which exponential expression is equal to $2^{-5} \cdot 2^8$?

A $\frac{2^2}{2^{-1}}$

B $(2^3)^{-1}$

C $\frac{2^{-2}}{2^{-1}}$

D $(2^{-1})^3$

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Do Now (3 minutes to complete):

Write 0.0000003105 in scientific notation. Explain how you found your answer.

Show your work.

Is the number between 0 and 1 or is it greater than 1? What does that tell you about the number in scientific notation?



Solution: _____

Teacher Model (10 minutes) You Watch, Listen, Copy:

Earth is about 1.5×10^8 kilometers from the Sun, while the planet Neptune is almost 4.5×10^9 kilometers from the Sun. The distance from Neptune to the Sun is about how many times the distance from Earth to the Sun?

Check for Understanding- Did you understand the Model? (2 minutes) Teacher will check!

The average masses of several insects or animals are shown in the table. The average mass of a hummingbird is about how many times the average mass of a housefly?

Insect or Animal	Average Mass (g)
Ant	4×10^{-3}
Bee	1×10^{-1}
Housefly	1.2×10^{-2}
Ruby-throated hummingbird	3.6

We Do Together (10 minutes):

The population of the United States is about 3.2×10^8 .
The population of the United States is about 80 times
the population of Oregon. Write the population of
Oregon in scientific notation.

Final Check for Understanding before I send you to Independent Practice! Teacher will Check (4 minutes):

The mass of Earth's moon is about 7×10^{22} kilograms.
The mass of Jupiter is about 1.89×10^{27} kilograms. The
mass of Jupiter is about how many times the mass of
Earth's moon?

Show your work.

How can the parts
of each number
help you to
compare?



Solution: _____

Independent Practice (In designated groups or on your own):

The area of the Pacific Ocean is about 1.56×10^8 square
kilometers. The area of the East China Sea is about
 1.2×10^6 square kilometers. Tell whether each statement
is *True* or *False*.

- a. The area of the Pacific Ocean is
about 15,600,000 square kilometers. ☐ True ☐ False
- b. The area of the Pacific Ocean is
about 130 times the area of
the East China Sea. ☐ True ☐ False
- c. The area of the East China Sea
is about 130 times the area
of the Pacific Ocean. ☐ True ☐ False
- d. The area of the East China Sea
is about 1,200,000 square kilometers. ☐ True ☐ False

How do you compare
numbers in scientific
notation?



Marcus studies two plant cells in biology class. One cell measures 8×10^{-4} centimeter across. The other cell measures 2×10^{-3} centimeter across. Marcus wants to know how many times greater in size the larger cell is.

He compares the sizes of the cells using these steps:

1. Divide the whole number factors: $8 \div 2 = 4$
2. Divide the powers of 10: $10^{-3} \div 10^{-4} = 10^1 = 10$
3. Multiply the products: $4 \times 10 = 40$

He concludes that the larger cell is 40 times greater in size than the smaller cell.

Is Marcus's solution process and conclusion correct? Explain.

Jane says that multiplying a decimal by 100 is the same as multiplying the decimal by three factors of 10. Is Jane correct? Explain your answer.

Complete the equations.

a. $0.004 \times 100 = 0.004 \times 10^2 =$ _____

b. $0.4 \times 1,000 = 0.4 \times$ _____ $=$ _____

c. $600 \div 100 = 600 \div 10^2 =$ _____

d. $0.6 \div$ _____ $= 0.6 \div 10^1 =$ _____

Yara multiplies and divides a certain number by the same power of 10. The product she gets is 40,000 and the quotient she gets is 0.000004. Find Yara's number and the power of 10 she used. Explain your reasoning.

The number 0.003 written in scientific notation is 3×10^{-3} . Why is the exponent negative?

Is 4.23×10^{-5} greater than 1 or less than 1? Explain how you know.

The total area of Rhode Island is about 1.5×10^3 square miles. The total area of Georgia is about 6×10^4 square miles. The total area of Georgia is about how many times the total area of Rhode Island?

The total area of Ohio is about 4.5×10^4 square miles.
The total area of Ohio is about how many times the total area of Rhode Island?

Which is greater, 9×10^{-2} or 3×10^{-4} ? How many times greater is the number you chose than the other number? Explain your reasoning.

The total area of Kansas that is covered by water is about 5×10^2 square miles. The total area of Alaska that is covered by water is about 9.5×10^4 square miles. The total water area of Alaska is about how many times the total water area of Kansas?

Show your work.

Solution: _____

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8.EE.3

1. Kevin moved from a city to a small town. The population of the city is 6×10^5 , which is about 15 times as great as the small town. Which expression could represent the approximate population of the small town?

A 4×10^3
B 4×10^4
C 9×10^5
D 9×10^6
2. Ellentown College has approximately 3×10^3 students and Pengrove University has approximately 30,000 students. How many times as much is the number of students at Pengrove University as the number of students at Ellentown College?

A 1
B 10
C 30
D 100
3. Bianca and Nick are both musicians who sell their songs online. During the same year, Bianca sold 8×10^5 downloads of her songs and Nick sold 4×10^6 downloads of his songs. How many times as much is the number of songs that Nick sold than the number of songs that Bianca sold?

A 2
B 5
C 20
D 40
4. A certain human red blood cell has a diameter of 0.000007 meters. Which expression represents this diameter, in meters, in scientific notation?

A 7×10^{-6}
B 7×10^{-5}
C 7×10^6
D 7×10^5

5. A school club had a T-shirt sale to raise money. After the sale, an inventory showed that 108 blue T-shirts and 96 green T-shirts had been sold. The sizes of these T-shirts included 60 small, 86 medium, and 58 large. Which table correctly represents these data?

NUMBER OF T-SHIRTS SOLD

A

Color	Small	Medium	Large
Blue	60	86	58
Green	60	86	58

NUMBER OF T-SHIRTS SOLD

B

Color	Small	Medium	Large
Blue	34	46	28
Green	26	40	30

NUMBER OF T-SHIRTS SOLD

C

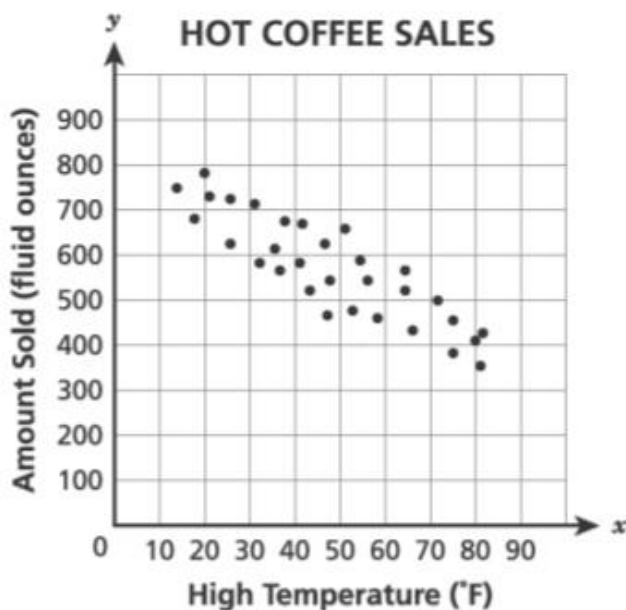
Color	Small	Medium	Large
Blue	30	43	29
Green	30	43	29

NUMBER OF T-SHIRTS SOLD

D

Color	Small	Medium	Large
Blue	26	40	30
Green	34	46	28

The owner of a coffee shop compared the amount of hot coffee per day, in fluid ounces, sold and the daily high temperature, in degrees Fahrenheit, per day. Her data are shown in the scatter plot below.



If these data are modeled by the line $y = -5.9x + 850$, which statement **best** describes a valid prediction the owner could make?

- A For each temperature increase of 10°F , the shop can expect to sell about 60 fluid ounces more hot coffee.
- B For each temperature decrease of 10°F , the shop can expect to sell about 6 fluid ounces more hot coffee.
- C On a day with a high temperature of 0°F , the shop can expect to sell about 145 fluid ounces of hot coffee.
- D On a day with a high temperature of 0°F , the shop can expect to sell about 850 fluid ounces of hot coffee.

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Date: Friday 3/20/20 (Mr. Cristiano's Bday)

Ms. Streffacio

Class: _____

I can:

Do Now (3 minutes to complete):

Use the information in the table to solve the problem.

Orbiting Body	Approximate Distance from the Sun (in miles)
Mercury	36,300,000
Mars	142,000,000
Neptune	2,800,000,000
Pluto	3,670,000,000

Show your work.

Write each distance in scientific notation.

Mercury _____

Mars _____

Neptune _____

Pluto _____

Neptune is about how many times as far from the Sun as Mars is from the Sun?

Solution: _____

Teacher Model (10 minutes) You Watch, Listen, Copy:

The mass of Earth is approximately 5.97×10^{24} kilograms. The mass of Venus is approximately 4,870,000,000,000,000,000,000 kilograms. What is the difference between the approximate masses, in kilograms, of Earth and Venus? Express your answer in scientific notation.

Show your work.

Check for Understanding- Did you understand the Model? (2 minutes) Teacher will check!

Determine the difference in the populations of Texas and North Dakota. In 2012, Texas had a population of about 26 million people, and North Dakota had a population of about 6.9×10^4 .

We Do Together (10 minutes):

Toshi and Owen need to add 4.9×10^9 and 4.1×10^7 . Toshi says they must use the expression $(490 \times 10^7) + (4.1 \times 10^7)$. Owen says they must use the expression $(4.9 \times 10^9) + (0.041 \times 10^9)$. Are neither, one, or both students correct? Explain.

Final Check for Understanding before I send you to Independent Practice! Teacher will Check (4 minutes):

Paul says that $(3.14 \times 10^5) + (2.53 \times 10^4) = 5.67 \times 10^5$. Is Paul correct? Explain.

Independent Practice (In designated groups or on your own):

Evaluate $\frac{(7.3 \times 10^6) + (2.4 \times 10^7)}{(4 \times 10^4)}$.

Show your work.

Answer _____

In October 2009, there were approximately 5×10^7 members of a website. In January 2013, there were approximately 2×10^8 members. How many more members were there in January 2013 than in October 2009? Write your answer in scientific notation.

There were _____ more members in January 2013 than in October 2009.

Stalactites are cone-shaped formations that hang from the ceilings of underground caverns. Stalactites can grow at the rate of about 0.005 inch per year. At this rate, what is the length of a stalactite that grows for 7.5×10^4 years?

Show your work.

Solution _____

A company spends a total of \$64,500,000 on salaries for its workers. If the company has 1.5×10^3 workers, what is the average salary per worker?

Show your work.

Solution _____

Why is it unnecessary to make the exponents the same before multiplying numbers expressed in scientific notation?

Use the information in the table to solve the problem.

Country	Estimated Population
China	1,390,000,000
Germany	82,700,000
Martinique	405,000

Write each population in scientific notation.

China _____

Germany _____

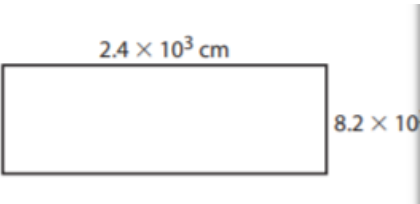
Martinique _____

The population of Germany is about how many times the population of Martinique? Explain your reasoning.

A scientist uses 2.8×10^{12} cells in one experiment, which is 2,000 times the number of cells she uses in a second experiment. Write the number of cells the scientist used in her second experiment in scientific notation. Explain your answer.

Find the perimeter of the rectangle in scientific notation.

Show your work.



The area of the Southern Ocean is about 7.85×10^6 square miles. The difference between the areas of the Indian Ocean and the Southern Ocean is about 1.865×10^7 square miles. Explain how to find the area of the Indian Ocean. Then find the area.

Is the value of $(1.7 \times 10^4) \times (2.1 \times 10^{-8})$ greater than 1 or between 0 and 1? Explain your reasoning.

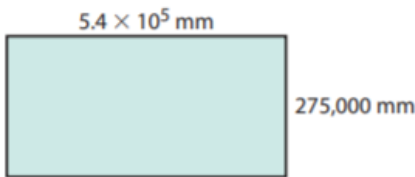
The thickness of a U.S. penny is 5.98×10^{-2} inch. What is the height of a stack of 2.5×10^4 pennies?

Show your work.

Solution: _____

The speed of light is about 1.86×10^5 miles per second. How many miles will light travel in 4,200,000 seconds?

Find the area of the rectangle in scientific notation.



A container at a paper clip factory holds 2.1×10^3 pounds of paper clips. There are 9.6×10^5 paper clips in the container. Find the approximate weight of each paper clip in ounces. (1 pound = 16 ounces)

Show your work.

A glass marble factory produces 4.5×10^4 marbles in 1,800 minutes. What is the factory's unit rate of production in marbles per minute? Write the answer in scientific notation.

Show your work.

Which operation do you need to use to solve this problem?



Solution: _____

Evaluate: $\frac{(5.6 \times 10^6) - 340,000}{2 \times 10^3}$

Show your work.

A computer performs a calculation in 2.5×10^{-5} seconds to solve a math problem.
How long does the computer need to calculate the solutions to 3×10^6 math problems?

Write your answer in standard form.

Show your work.

Answer: _____ seconds

Consider the expression $\frac{(6.2 \times 10^{17}) + (1.2 \times 10^{15})}{(4 \times 10^{-6})}$.

Part A

Evaluate the expression. Write your answer in scientific notation.

Show your work.

Answer: _____

Part B

Describe **two** different ways to use the properties of exponents to rewrite the numerator of the expression.
