Scientific Notation Notes

Scientific notation is a short way to write very large or very small numbers.

It is written as the product of a number between 1 and 10 and a power of 10.

TO CONVERT A NUMBER INTO SCIENTIFIC NOTATION:

- **Create a number between 1 and 10 by moving the decimal to the left.**
- **Count the number of spaces the decimal moved to determine the exponent of 1**

EXAMPLE: **$3{,}346{,}000{,}000. = 3.346 \times 10^9$**

The decimal moved 9 places # between 1 & 10 power of ten

Add zeros as needed for place holders.

TO CONVERT A NUMBER INTO STANDARD FORM:

- **Move the decimal to the right the number of spaces indicated by the exponent.**

EXAMPLE: **: $1.312 \times 10^6 = 1{,}312{,}000$**

The decimal moved 6 places to the RIGHT. Add zeros as needed for place holders.

Scientific Notation Practice

Write each number in scientific notation.

1. **890,000,090** _____

2. **605,000** _____

3. **706,079** _____

Write in standard form.

4. **8.3×10^5** _____

5. **9.43×10^3** _____

6. **7.002×10^1** _____

7. **What is 4,100,000 in scientific notation?** _____

8. **What is 23,070,000 in scientific notation?** _____

9. **Mt. Everest rises 54,768 feet in the air while Mt. Rushmore stretches a mere 8,976 feet. What is the difference in the height of these two mountains expressed in scientific notation?**_____

10. **The Great Salt Lake covers about 45,800 mi^2. Lake Tahoe covers about 7,725 mi^2. What is the total area covered expressed in scientific notation?**
_____

Integer Notes

Integers are the set of whole numbers and their opposites. Do not forget to include 0.

Opposites –Two exact numbers with different signs are opposites, so if an integer is positive its opposite will be negative and if a number is negative its opposite will be positive.
Ex.
1) –8 and 8
2) 25 and –25
3) 100 and –100
4) –2004 and 2004

Absolute Value - It's the distance from zero. Any number in absolute value form will always be positive!
EX.
1) | –5 | = 5
2) | 5 | = 5

Representing Integers in word problems.

1.) The city of New Orleans, Louisiana, is 8ft. below sea level. (–8)
2.) In Miami, Florida, the average temperature is 83°. (83)
3.) John made a $65.00 with drawl yesterday. (-63)
4.) Sally deposited $75.00 on Monday. (75)

Adding integers with the Same Sign:

When the signs are the same, (- plus - = -) or (+ plus + = +), just add like you always have and keep the sign.

Ex.
1) -10 + -5 = -15
2) -16 + -3 = -19
3) 14 + 15 = 29

Adding integers with Different Signs:

When adding integers with different signs, subtract and take the sign of the largest number (pretending they are in absolute value form).

Ex.
1) –9 + 5 = -4
2) 13 + -8 = 5
Subtracting Integers

When subtracting integers, "ATO" or Add The Opposite.

Steps
1) Write the problem.
2) Leave the number in front of the subtraction sigh ALONE!!
3) Change the subtraction sigh to an addition sign.
4) Change the integer after the new + sign to its opposite form.
5) Follow the rules for addition.

Multiplying and Dividing Integers:
If there is an even number of negative integers, the answer is positive and multiply and divide as usual.
-8 X -8 = 64
-2 X -2 X -2 X -2 = 16

If there is an odd set of negative integers, the answer is negative and multiply and divide as usual.

-1 X -1 X -1 = -1 (3 negatives = odd= negative)

$$\frac{-18}{3} = -6$$ **(1 negative = odd = negative)**

Integer Practice

1. **-3 + 8 = _____**

2. **-6 + (-6) = _____**

3. **-3 – 9 = _____**

4. **-8 –(- 9) = _____**

5. **19 – 34 = _____**

6. **-35 ÷-7 = _____**

7. **23 ● -2 = _____**

8. **-66 ÷ -2 = _____**

9. **-6(-9)(-5)(-7) = _____**

10. **-1(-1)(-1)(-1) = _____**

11. **Which is the highest elevation?_____**
    - **A. 200 m below sea level**
    - **B. 100 m below sea level**
    - **C. 300 m above sea level**
    - **D. 100 m above sea level**

12. **Name an integer that would represent a debt of 6 dollars._____**

13. **Which is the warmest?**

    - **F. –20 ^{o}C**
    - **G. –6 ^{o}C**
    - **H. 0 ^{o}C**
    - **J. 7 ^{o}C**

Ratio Notes

A comparison of two numbers represented by division.
There are three ways to write a ratio:

a) a colon 2:3
b) a fraction 2/3
c) using the word "to" 2 to 3

You can also reduce ratios to lowest terms.
Do not change a ratio that appears to be an improper fraction to a mixed number.
These are not fractions but ratios so maintain the correct order.

Reduce 12 to 10 to lowest terms.

Example 1: $\frac{12}{10} = \frac{6}{5}$

Example 2: There are 5 blue marbles, 3 orange marbles, and 6 red marbles in a bag. What is the ratio of red marbles to orange marbles? Write in lowest terms.

6 to 3

Reduced: 3 to 1

Ratio Practice

1) **Kristen studies dance 4 days a week, practices soccer 2 days a week, and rehearses with the school band 3 days a week. What is the ratio of the number of days she rehearses with the school band to the number of days she practices soccer and studies dance?**

2) **There are 7 red hats, 2 blue hats, and 9 black hats. What is the ratio of blue hats to all of the hats?**

3) **A math class consists of 17 boys and 11 girls. Find the ratio of boys to the entire class.**

4) **Using the chart below write the ratio that represents 6^{th} graders that went on the first field trip to the total number of 7^{th} grade students that participated on the field trip. Reduce to lowest terms.**

6th Grade	**75**	**87**
7^{th} Grade	**97**	**106**

Fraction Notes

Adding & Subtracting Fractions:

To add or subtract fractions, you MUST have a common denominator. You add or subtract the numerators and the denominator remains the same.

Example: $\frac{3}{4}+\frac{3}{4}=\frac{6}{4}$

Now, you must always simplify a fraction into lowest terms by reducing the fraction. 2 divides evenly into both the numerator of 6 and the denominator of 4, so $\frac{6}{4}=\frac{6\div 2}{4\div 2}=\frac{3}{2}$ **OR you can write** $\frac{3}{2}$ **as** $1\frac{1}{2}$**.**

Example: $\frac{4}{7}-\frac{2}{14}$

In order to subtract, you must have a common denominator. The common denominator will always be the Least Common Multiple of the two denominators. The LCM of 7 and 14 is 14. $\frac{4}{7}=\frac{4x2}{7x2}=\frac{8}{14}$ **so, the new problem is** $\frac{8}{14}-\frac{2}{14}$**.**

$\frac{8}{14}-\frac{2}{14}=\frac{6}{14}$ **and** $\frac{6}{14}$ **can be simplified by reducing both the 6 and the 14 by 2.**

$\frac{6}{14}=\frac{6\div 2}{14\div 2}=\frac{3}{7}$**.**

Mixed Numbers:

In order to add or subtract a mixed number, you must first convert the mixed numbers to improper fractions. You then get a common denominator and perform the operation.

Example: $1\frac{1}{2}+2\frac{2}{7}$

$1\frac{1}{2}$ **as an improper fraction is** $\frac{3}{2}$ **and** $2\frac{2}{7}$ **as an improper fraction is** $\frac{16}{7}$**. The problem now reads** $\frac{3}{2}$ **+** $\frac{16}{7}$**. Now, we must find a common denominator. The common denominator between 2 and 7 is 14, so we must change the denominators to 14.** $\frac{3}{2}=\frac{3x7}{2x7}=\frac{21}{14}$ **and** $\frac{16}{7}=\frac{16x2}{7x2}=\frac{32}{14}$ **so we now have the problem reading** $\frac{21}{14}+\frac{32}{14}$ **=** $\frac{53}{14}$**. The answer is** $\frac{53}{14}$ **which cannot be reduced but can be written back as a mixed number as** $3\frac{11}{14}$**.**

Multiplying Fractions:

- To multiply fractions, multiply their numerators AND their denominators.

- When multiplying mixed or whole numbers first rewrite them as improper fractions. Then use the rule for multiplying fractions.

- Remember to always reduce your products to lowest terms.

- The word "*of*" means to multiply.

Examples:

1) $\frac{5}{6} \times \frac{4}{5} = \frac{20}{30} = \frac{2}{3}$ 2) $8 \times \frac{1}{6} = \frac{8}{1} \times \frac{1}{6} = \frac{8}{6} = 1\frac{2}{6} = 1\frac{1}{3}$

3) $1\frac{1}{3} \times 2\frac{1}{3} = \frac{4}{3} \times \frac{7}{3} = \frac{28}{9} = 3\frac{1}{9}$

Dividing Fractions and Mixed Numbers:

- Two numbers are RECIPROCALS if their product is 1.

Example: $\frac{1}{5} \times \frac{5}{1} = 1$

To divide fractions, take the reciprocal or "flip" the second fraction and follow the rules for multiplication.

Example: $\frac{1}{5} \div \frac{4}{9} = \frac{1}{5} \times \frac{9}{4} = \frac{9}{20}$

If there are mixed or whole numbers change them to improper fractions.

Examples:

$9 \div \frac{1}{3} = \frac{9}{1} \times \frac{3}{1} = \frac{27}{1} = 27$

$1\frac{1}{4} \div 1\frac{1}{2} = \frac{5}{4} \div \frac{3}{2} = \frac{5}{4} \times \frac{2}{3} = \frac{10}{12} = \frac{5}{6}$

Practice - Adding

Solve and reduce to lowest terms.

1) $\frac{8}{10} + \frac{4}{5}$

2) $\frac{7}{12} + \frac{2}{3}$

3) $\frac{3}{5} + \frac{2}{3}$

4) $4\frac{1}{3} + 3\frac{1}{5}$

5) One math textbook is ¾ of an inch thick. Another math textbook is 5/8 of an inch thick. How much shelf space will the two books take up?

6) Josh found 2/3 of a sheet cake in the kitchen. He had 2/7 of a sheet cake left over on the table. How much total sheet cake does he still have altogether?

Practice – Dividing

Solve and reduce to lowest terms.

1) $\frac{7}{12} - \frac{1}{6} =$

2) $\frac{5}{7} - \frac{1}{3}$

3) $\frac{1}{5} - \frac{1}{4}$

4) $6 - 2\frac{3}{4}$

5) Mary has $2\frac{3}{4}$ **cups of milk. If she drinks** $1\frac{1}{4}$ **cups, how much did she have left over?**

Practice - Multiplying

Solve and reduce to lowest terms.

1) $\frac{8}{11} \times \frac{4}{5}$

2) $\frac{7}{12} \times \frac{2}{3}$

3) $6 \times \frac{2}{3}$

4) $4\frac{1}{3} \times 3\frac{1}{5}$

5) A math textbook is ¾ of an inch thick. How many of these books will fit on a shelf that is 24 inches wide?

6) Josh found 2/3 of a sheet cake in the kitchen. He ate ½ of it. What fraction of the whole cake did he eat?

Practice – Dividing

Solve and reduce to lowest terms.

1) $\frac{1}{5} \div \frac{5}{6} =$

2) $\frac{5}{7} \div \frac{2}{3}$

3) $\frac{1}{5} \div 2\frac{1}{4}$

4) $6 \div 2\frac{3}{4}$

5) One batch of Mary's pancake recipe takes $2\frac{3}{4}$ cups of milk. If he makes 3 batches of his recipe, how many cups of milk will she need?

Notes: Compare, Order, and Round Decimals

EQUIVALENT DECIMALS: two decimals that name the same amount.

EXAMPLE: .4 and .40

TO COMPARE DECIMALS:

1) Write the numbers below each other so the decimals points line up.
2) Add zeros to the right hand side of the number so each number has the same number of digits after the decimal.
3) Starting at the left side of the number, compare each place value (the tenths digit of one number to the tenths digit of the other number, hundredths to hundredths, etc). The number with the first smaller digit is the smaller number.

EXAMPLE: Compare .128 and .13

1) Line the decimal points up .128
.13<u>0</u> *2) Add a zero to the thousandths place so each number has three digits.*

3) The digits in the tenths place are the same, so compare the digits in the hundredths place. The 2 is smaller than the 3, so .128 is less than .130.

ANSWER: .128 < .13 *Notice how the numbers are written in their original format (.13 not .130)*

* REMEMBER: < = less than > = greater than
The larger side of the symbol (< or >) should face the larger number.

PRACTICE

Compare:
1) .0145 and .0136 2) 2.17 and 2.199 3) .102 and .120

TO ORDER DECIMALS:

Use the same steps as comparing. Find the smallest number, write it down, and continue comparing the rest of the numbers.

EXAMPLE: Order from least to greatest: .5, .251, .316. and .25

1) Line the decimal points up.

.500
.251
.316
.250

2) Add zeros so each number has the same number of digits.

3) Compare the digits in each place value. Since 2 is smaller than 3 or 5, you know that .251 and .250 are the smallest two numbers. Compare the hundredths place of .251 and .250. Both have a 5, so move to the thousandths place. Since 0 is smaller than 1, you know that .250 is smaller than .251. Go back and compare .500 and .316. Since 3 is smaller than 5, you know that .316 is smaller than .500.

ANSWER: .25, .251, .316, .5. Notice how they are written in their original format.

PRACTICE

1. Order from least to greatest: .054, .15, .0045, .050

2. Order from greatest to least: .9, .894, .92, .901

RULES FOR ROUNDING:

1. Underline the digit to be rounded. Circle the digit to the right.
2. Round the underlined digit up if the circled digit is 5 or greater. If the circled digit is 4 or less, the underlined digit does not change.
3. Rewrite the number only to the place of the underlined digit.

EXAMPLE: Round 3.26 to the nearest tenth.

3 . 2⑥ *Underline 2 since you are rounding to the tenths place.*

Circle the 6 which is the digit to the right of the tenths place

Since the 6 is greater than or equal to 5, you would round the underlined digit up.

ANSWER: 3.3.

PRACTICE

Round to the nearest hundredth:

1) 4.3897 2) .796 3) 4.0097

Notes: Adding and Subtracting Decimals

TO ADD OR SUBTRACT DECIMALS:

1) Write the problem vertically. Line up the decimals directly beneath each other. Write a decimal at the end of whole numbers.
2) Write ending zeros so all the numbers have the same number of places after the decimal.
3) Add or subtract the decimals just as you would whole numbers.
4) Bring the decimal point from the problem straight down.

ADDITION EXAMPLE: *2.321 + 1.05*

Rewrite vertically	*2.321*	(Addend)
Add ending zero	*+ 1.050*	(Addend)
	3.371	(Sum)

*The numbers you add together are termed ADDENDS. The answer is the SUM.

SUBTRACTION EXAMPLE: *10 – 2.55*

Rewrite vertically	*10.00*	*Add decimal and zeros*
	- 2.55	
	7.45	

PRACTICE

1) 4.32 - 2.543

2) .028767 + 3.45

3) 16.008 - .236

4) 2.98 - .0042

Notes: Multiplying Decimals

TO MULTIPLY DECIMALS:

1) Write the problem vertically.
2) Multiply the factors as you would a whole number.
3) Count the total decimal places in the factors.
4) Look at the product and count over from the right the same number of places. Put your decimal point there.

EXAMPLE:

$$\begin{array}{rl} .54 & \text{(two decimal places)} \\ \underline{\times\ 3} & \text{(no decimal places)} \\ 1.62 & \text{(count from the right over two places)} \end{array}$$

* The product of two numbers less than one is less than each factor. Use this fact to double check your answer!

EXAMPLE:

$$\begin{array}{rl} .7 & \text{(.7 is less than 1.0)} \\ \underline{\times .4} & \text{(.4 is less than 1.0)} \\ .28 & \text{(.28 is less than .7 and less than .4)} \end{array}$$

The following symbols indicate multiplication: x, • , (), ()()

EXAMPLE: 3 x 4, 3 • 4, 3 (4), (3)(4)

In word problems, "of" generally means multiply.

EXAMPLE: What is .25 of 4? Answer: .25 x 4 = 1

PRACTICE

1) .62
x .48

2) 0.05
x 1.2

3) 1.4 • 2.8 =

4) (.6)(1.2) =

5) 3 (1.1) =

6) What is .3 of 12

Notes: Dividing Decimals

Reminder:

3 ← ***quotient***

divisor → 6)18 ← ***dividend***

TO DIVIDE DECIMALS:

1) Make the divisor a whole number by moving the decimal to the right end of the number. *If your divisor is already a whole number, you don't need to move anything.*
2) Move the decimal in the dividend the same number of spaces you moved your decimal in the divisor.
3) Put the decimal point in the quotient directly above the new location of the decimal point in the dividend.
4) Divide the numbers. Make sure to keep your place values straight!

EXAMPLE: $1.3\overline{)22.568}$ (Move the decimal one place to the right in both the divisor and the dividend.)

17.36 (Notice how the decimals are directly above each other.)

The problem now becomes: $13\overline{)225.68}$

13

95

91

46

39

78

78

0

You may need to add zeros to the end of the dividend to move the decimal over the correct number of spaces.

EXAMPLE: $.25\overline{)125}$

500.

ANSWER: $.25\overline{)125.00}$ *(Add two zeros so you can move the decimal over two places.)*

**Remember: Division by zero is undefined.

PRACTICE

1) $.32\overline{)64.32}$

2) $.42\overline{)126}$

3) $4.1\overline{).082}$

4) $18 \div .09$