Unit 2 Notes

Scientific Notation

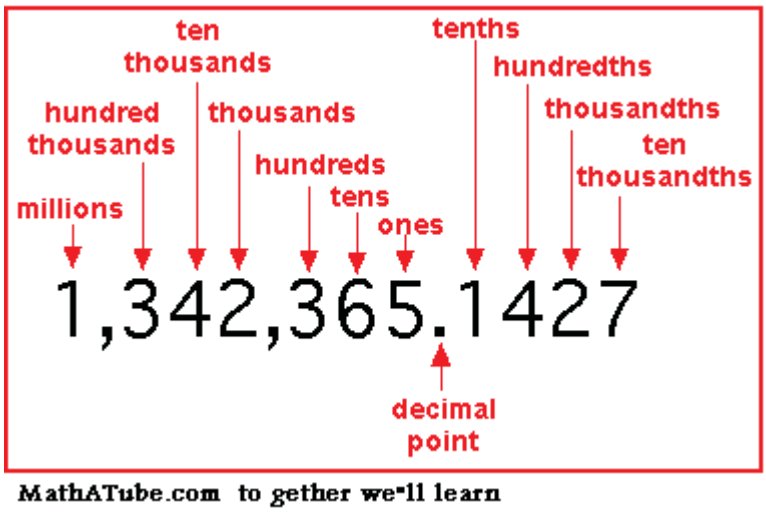
Name: _____

Unit 2 Checklist

P.S. #2.1	_____	P.S. #2.2	_____
P.S. #2.3	_____	P.S. #2.4	_____
P.S. #2.5	_____	P.S. #2.6	_____
Quiz #2 Corrections	_____		

Tentative Schedule

Day	Date	Topic	Assignment
	Thurs. 9/18	Test #1	Watch Video #2.1 with Notes – Understanding Scientific Notation
1	Fri. 9/19 Mon. 9/20	P.S. #2.1	Watch Video #2.2 with Notes – Adjusting Numbers in Scientific Notation
2	Tues. 9/23	P.S. #2.2	Watch Video #2.3 with Notes – Multiply and Divide Numbers in Scientific Notation
3	Wed. 9/24 Thurs. 9/25	P.S. #2.3	Watch Video #2.4 with Notes – Add and Subtract Numbers in Scientific Notation
4	Fri. 9/26	P.S. #2.4	Finish P.S. #2.4 and Study for Quiz
5	Mon. 9/29 Tues. 9/30	**Quiz #2**	Watch Video #2.5 with Notes – Word Problems Scientific Notation
6	Wed. 10/1	P.S. #2.5	P.S. #2.5
7	Thurs. 10/2 Fri. 10/3	P.S. #2.6	P.S. #2.6
8	Mon. 10/6	Activity	Review for Test #2
9	Tues. 10/7 Wed. 10/8	**Test #2**	



Notes 2.1 - Understanding Scientific Notation

What is the point of using scientific notation?

It is very helpful when expressing extremely large and extremely small numbers

Any number can be written in scientific notation by expressing it in two parts: a coefficient A where $1 \le A < 10$, and a power of 10 where the exponent is an integer.

$A \qquad 10^n$

Tell whether each number is written correctly in scientific notation. If it is incorrectly written, state the reason.

1.) A horse-chestnut has a diameter of about $2 \cdot 10^0$ centimeters.

yes

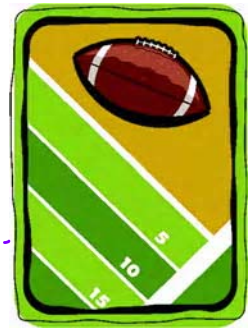
2.) Neptune is about $4.488 \cdot 10^9$ kilometers from the sun.

yes

3.) The approximate wavelength of infrared light is $0.01 \cdot 10^{-5}$ meter.

no-the coefficient is too small

4.) A football field (excluding zones) is $10 \cdot 10^1$ yards long.



no-the coefficient is too large.

Write each number in scientific notation.

5.) 427.7

$4.277 \cdot 100$

$4.277 \cdot 10^2$

6.) 0.007

$7 \cdot \frac{1}{1000}$

$7 \cdot 10^{-3}$

7.) 8562.1

$8.5621 \cdot 1000$

$8.5621 \cdot 10^3$

8.) 0.06

$6 \cdot \frac{1}{100}$

$6 \cdot 10^{-2}$

Write each number in standard form.

9.) $7.1 \cdot 10^3$

$7.1 \cdot 1000$

7100

10.) $8.12 \cdot 10^{-3}$

$8.12 \cdot \frac{1}{1000}$

0.00812

11.) $9 \cdot 10^4$

$9 \cdot 10000$

90,000

12.) $2.5 \cdot 10^{-2}$

$2.5 \cdot \frac{1}{100}$

0.025

Identify the greater number in each pair of numbers. Justify your reasoning.

13.) $5.6 \cdot 10^2$ and $2.1 \cdot 10^3$

Larger exponent means it was multiplied by ten one more time.

14.) $3.4 \cdot 10^{-1}$ and $1.1 \cdot 10^{-1}$

Same exponent - so look at the coefficient - which is larger.

Notes 2.2 - Adjusting Numbers to Scientific Notation

Find the products or the quotients below.

1.) $5.83 \cdot 10$

58.3

2.) $489 \cdot 100$

48900

3.) $102.4 \cdot 1000$

102,400

4.) $3.89 \div 10$

0.389

5.) $93.5 \div 100$

0.935

6.) $2.935 \div 1000$

0.002935

Rewrite each number below so it is in scientific notation.

7.) 18.5

$1.85 \cdot 10^{1}$

8.) 957.3

$9.573 \cdot 10^{2}$

9.) .081

$8.1 \cdot 10^{-1}$

10.) 0.077

$7.7 \cdot 10^{-2}$

Rewrite each of the numbers below so they are written in scientific notation.

11.) $45.7 \cdot 10^{8}$

$4.57 \cdot 10^{1} \cdot 10^{8}$ (Add exponents when multiplying.)

$4.57 \cdot 10^{9}$

12.) $0.085 \cdot 10^{5}$

$8.5 \cdot 10^{-2} \cdot 10^{5}$

$8.5 \cdot 10^{3}$

13.) $5821 \cdot 10^{-7}$

$5.821 \cdot 10^{3} \cdot 10^{-7}$

$5.821 \cdot 10^{4}$

14.) $0.000353 \cdot 10^{-4}$

$3.53 \cdot 10^{-4} \cdot 10^{-4}$

$3.53 \cdot 10^{-8}$

Notes 2.3 – Multiplying and Dividing Numbers in Scientific Notation

Rewrite each of the following examples as a product of a coefficient and 10^3.

1.) $3.7 \cdot 10^5$

$3.7 \cdot 10^2 \cdot 10^3$

$370 \cdot 10^3$

2.) $4.1 \cdot 10^2$

$4.1 \cdot 10^{-1} \cdot 10^3$

$0.41 \cdot 10^3$

Steps to Multiplying Numbers in Scientific Notation	Steps to Dividing Numbers in Scientific Notation
1. Multiply the coefficients.	1. Divide the coefficients.
2. Add the exponents.	2. Subtract the exponents.
3. Adjust the result to scientific notation.	3. Adjust the result to scientific notation.

3.) $(43 \cdot 10^9) \cdot (7 \cdot 10^4)$

$301 \cdot 10^{13}$

$3.87 \cdot 10^2 \cdot 10^{13}$

$3.87 \cdot 10^{15}$

Steps

1) 43 × 7 = 301

2) 9+4 = 13

4.) $(5.1 \cdot 10^{-8}) \cdot (2.5 \cdot 10^3)$

$12.75 \cdot 10^5$

$1.275 \cdot 10^1 \cdot 10^5$

$1.275 \cdot 10^6$

Steps

1) 5.1 × 2.5 = 255, 1020, 12.75

2) −8+3 = −5

5.) $\frac{230 \cdot 10^8}{5 \cdot 10^{-4}}$

$46 \cdot 10^{12}$

$4.6 \cdot 10^1 \cdot 10^{12}$

$4.6 \cdot 10^{13}$

Steps

1) 5 ⟌ 230 = 46; −20, 30, −30, 0

2) 8 − −4, 8+4 = 12

6.) $\frac{3.75 \cdot 10^9}{5.2 \cdot 10^2}$

$0.721 \cdot 10^7$

$7.21 \cdot 10^{-1} \cdot 10^7$

$7.21 \cdot 10^6$

Steps

1) 5.2 ⟌ 3.7500 = 0.721; 364, 110, 104, 60, 52, 8 …

2) 9 − 2 = 7

Notes 2.4 - Adding and Subtracting Numbers in Scientific Notation

Steps to Adding or Subtracting Numbers in Scientific Notation

1. Readjust the numbers so the exponents are equal.
2. Add or subtract the coefficients.
3. Adjust the result to scientific notation.

1.) $(2.45 \cdot 10^7) + (3.8 \cdot 10^8)$ – exp: 7

$2.45 \cdot 10^7 + 3.8 \cdot 10^1 \cdot 10^7$

$2.45 \cdot 10^7 + 38 \cdot 10^7$

$40.45 \cdot 10^7$

38.00
+ 2.45
40.45

$4.045 \cdot 10^1 \cdot 10^7 = \boxed{4.045 \cdot 10^7}$

2.) $(2.456 \cdot 10^5) + (6.0034 \cdot 10^8)$ – exp: 8

$2.456 \cdot 10^3 \cdot 10^8 + 6.0034 \cdot 10^8$

$.002456 \cdot 10^8 + 6.0034 \cdot 10^8$

6.003400
+.002456
6.005856

$\boxed{6.005856 \cdot 10^8}$

3.) $(1.4 \cdot 10^{-5}) - (5.67 \cdot 10^{-6})$ – exp: -5

$1.4 \cdot 10^5 - 5.67 \cdot 10^{-1} \cdot 10^{-5}$

$1.4 \cdot 10^5 - 0.567 \cdot 10^{-5}$

$0.833 \cdot 10^{-5}$

$8.33 \cdot 10^{-1} \cdot 10^{-5}$

$\boxed{8.33 \cdot 10^{-6}}$

13 9 10
1.400
0.567
.833

4.) $4.801 \cdot 10^3 - 2.2 \cdot 10^7$ – exp: 7

$4.801 \cdot 10^{-4} \cdot 10^7 - 2.2 \cdot 10^7$

$.0004801 \cdot 10^7 - 2.2 \cdot 10^7$

$\boxed{-2.1995199 \cdot 10^7}$

1 9 9 9 9 9 10
2.2000000
- 0.0004801
2.1995199

Notes 2.5 - Word Problems with Scientific Notation

Determine operation first.

1.) The outer wall of a large tourist attraction in Cambodia is about $1.1 \cdot 10^3$ meters long and $8.1 \cdot 10^2$ meters wide. Find the approximate area enclosed by the outer wall.

operation: mult.

$A = l \cdot w$

$= (1.1 \cdot 10^3)(8.1 \cdot 10^2)$

$= \boxed{8.91 \cdot 10^5}$

1.1
8.1
11
880
8.91

2.) The planet Mercury has an approximate mass of $3.3 \cdot 10^{23}$ kilograms. Mars has a mass of about $6.4 \cdot 10^{23}$ kilograms. How many times as great as the mass of Mercury is the mass of Mars? Round the coefficient to the nearest tenth. Operation: division

$$\frac{6.4 \cdot 10^{23}}{3.3 \cdot 10^{23}}$$

$1.93 \cdot 10^{0} \rightarrow (=1)$

$1.93 \cdot 1 = 1.93 \approx 1.9$

$6.4 \div 3.3 = 1.93\ldots$ (33, 310, 297, 130)

1.9 times larger

3.) Ocean is $6.4 \cdot 10^{7}$ square miles. The area of the Arctic Ocean is about $5.4 \cdot 10^{4}$ square miles.

a.) Find the approximate sum of the areas of the two oceans. (add)

$6.4 \cdot 10^{7} + 5.4 \cdot 10^{4}$

$6.4 \cdot 10^{7} + 5.4 \cdot 10^{-3} \cdot 10^{7}$

$6.4 \cdot 10^{7} + 0.0054 \cdot 10^{7}$

$6.4000 + 0.0054 = 6.4054$

$6.4054 \cdot 10^{7}$ mi²

b.) About how much larger is the area of the Pacific Ocean than the area of the Arctic Ocean?

$6.4 \cdot 10^{7} + 5.4 \cdot 10^{4}$

$6.4 \cdot 10^{7} - 5.4 \cdot 10^{-3} \cdot 10^{7}$

$6.4 \cdot 10^{7} - 0.0054 \cdot 10^{7}$

$6.4000 - 0.0054 = 6.3946$

$6.3946 \cdot 10^{7}$ mi² larger

*Pacific is much larger than Arctic.

4.) A blue whale has a mass of about 190,000,000 grams. The mass of a whale shark is approximately $2.6 \cdot 10^{4}$ kilograms. → 190,000 Kg = $1.9 \cdot 10^{5}$ Kg

a.) What is the approximate sum of the masses of the blue whale and whale shark?

$1.9 \cdot 10^{5} + 2.6 \cdot 10^{4}$

$1.9 \cdot 10^{5} + 2.6 \cdot 10^{-1} \cdot 10^{5}$

$1.9 \cdot 10^{5} + 0.26 \cdot 10^{5}$

$2.16 \cdot 10^{5}$ Kg

b.) Given that the mass of white rhinoceros is about 4,850 kilograms, find the combined mass of the three animals.

$2.16 \cdot 10^{5} + 4.850 \cdot 10^{3}$

$2.16 \cdot 10^{5} + 4.850 \cdot 10^{-2} \cdot 10^{5}$

$2.16 \cdot 10^{5} + .0485 \cdot 10^{5}$

$2.2085 \cdot 10^{5}$ Kg