6.1 Properties of Exponents DAY THREE

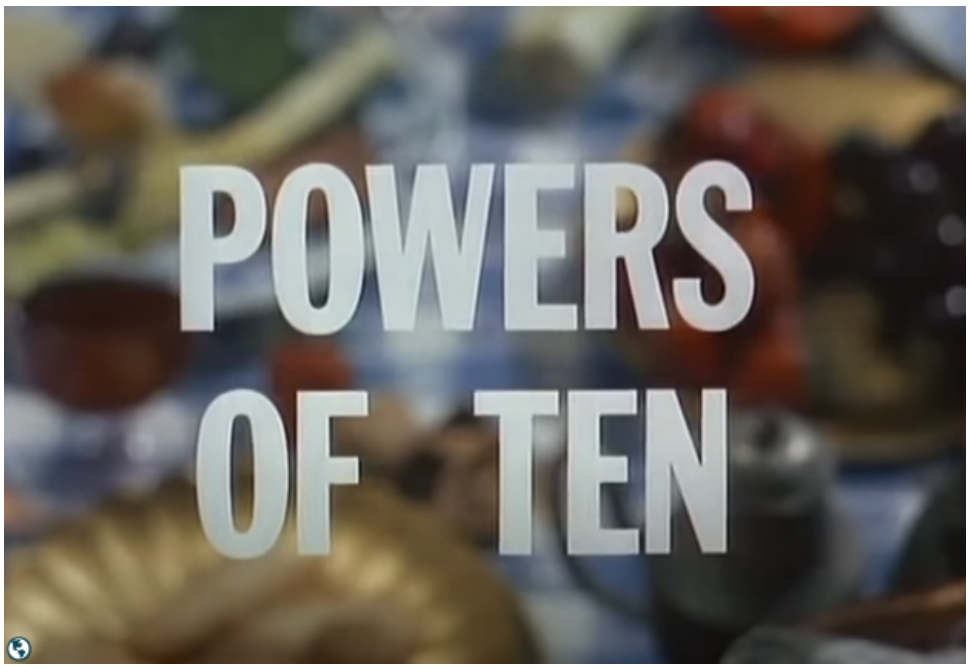
Warm-up: review of scientific notation

a) If the exponent is negative, which direction does the decimal move?

Left

b) When your calculator does scientific notation it gives you an E or EE. What does this stand for in your scientific notation?

x 10



How to relate real-life problems to the "Powers of 10"

https://www.fastcompany.com/1662461/how-to-apply-eamess-legendary-powers-of-10-to-real-life-problems

Writing Numbers in Scientific Notation

When the number is greater than or equal to 1, use a positive exponent.	$84{,}000 = 8.4 \times 10^{4}$ *The decimal point moves 4 places.*
When the number is less than 1, use a negative exponent.	$0.0783 = 7.83 \times 10^{-2}$ *The decimal point moves 2 places.*

Examples: Write each number in scientific notation.

1) 58,927

← 4

5.8927×10^{4}

2) 0.000487

→ 4

4.87×10^{-4}

3) 0.000059

→ 5

5.9×10^{-5}

4) 13,300

← 4

1.33×10^{4}

Practice: Write each number in scientific notation.

1) 1,304,000,000

← 9

1.304×10^{9}

2) 0.000028

→ 5

2.8×10^{-5}

3) 6,730,000

← 6

6.73×10^{6}

4) 0.0417

→ 2

4.17×10^{-2}

Examples: Write each number in standard notation.

1) 4×10^5

400,000

2) 8.3×10^{-4}

0.00083

3) 2.97×10^{-2}

0.0297

4) 8.456×10^7

84,560,000

Practice: Write each number in standard notation.

1) 1.8499×10^9

1,849,900,000

2) 3.582×10^{-6}

0.000003582

3) 6.41×10^3

6,410

4) 9.06×10^{-5}

0.0000906

EXAMPLES: Circle the BEST answer.

1) 8×10^5 is 2/20/200/2,000 times as great as 4×10^2.

400

2) 4×10^{-5} is 0.02/0.2/2/20 times as great as 2×10^{-4}.

$2 \cdot 10^{-1} = .2$

$\frac{4 \cdot 10^{-5}}{2 \cdot 10^{-4}}$ 10^{-5--4}

3) The mass of a proton is about 1.7×10^{-24} g. The mass of a neutron is about the same as a proton. The nucleus of an atom of carbon has 6 protons and 6 neutrons. The mass of the nucleus is about 2×10^{-26} units. Circle the best choice for the units this measurement is given in: g/kg/tons

PRACTICE: Circle the BEST answer.

1) 9×10^{10} is 30/300/3,000/30,000 times as great as 3×10^{7}.

$\frac{9 \cdot 10^{10}}{3 \cdot 10^{7}} = 3 \cdot 10^{3} = 3000$

2) 4×10^{-12} is 0.00001/0.0001/10/1000 times as great as 4×10^{-8}.

$\frac{4 \cdot 10^{-12}}{4 \cdot 10^{-8}} = 1 \cdot 10^{-12 - -8} = 1 \cdot 10^{-4} = 0.0001$

3) The air distance between Los Angeles, California, and New York City, New York, is about 3.9×10^{3} units. Circle the best choice for the units this measurement is given in: cm / m / km

$3.9 \times 10^{3} = 3900$

Example: Evaluate the expression. Write your answer in scientific notation and standard form.

1) $(3 \times 10^{2})(1.5 \times 10^{-5})$

$3 \cdot 1.5 \cdot 10^{2} \cdot 10^{-5}$

$4.5 \cdot 10^{-3}$

0.0045

2) $\frac{(6.4 \times 10^{7})}{(1.6 \times 10^{5})} = 4 \cdot 10^{2}$

400

Practice: Evaluate the expression. Write your answer in scientific notation and standard form.

1) $(6.1 \times 10^{-3})(8 \times 10^{9})$

48.8×10^{6}

$(4.88 \cdot 10^{1})(10^{6})$

$4.88 \cdot 10^{7}$

$48,800,000$

2) $\frac{(3.9 \times 10^{-5})}{(7.8 \times 10^{-8})} = \frac{1}{2} \cdot 10^{-5 - -8}$

$0.5 \cdot 10^{3}$

$(5 \cdot 10^{-1}) \cdot 10^{3}$

$5 \cdot 10^{2}$

500

Prefix	Power	Decimal	Name
yotta	10^{24}	1,000,000,000,000,000,000,000,000	septillion
zetta	10^{21}	1,000,000,000,000,000,000,000	sextillion
exa	10^{18}	1,000,000,000,000,000,000	quintillion
peta	10^{15}	1,000,000,000,000,000	quadrillion
tera	10^{12}	1,000,000,000,000	trillion
giga	10^{9}	1,000,000,000	billion
mega	10^{6}	1,000,000	million
kilo	10^{3}	1,000	thousand
(none)	10^{0}	1	one
milli	10^{-3}	.001	thousandth
micro	10^{-6}	.000 001	millionth
nano	10^{-9}	.000 000 001	billionth
pico	10^{-12}	.000 000 000 001	trillionth
femto	10^{-15}	.000 000 000 000 001	quadrillionth
atto	10^{-18}	.000 000 000 000 000 001	quintillionth
zepto	10^{-21}	.000 000 000 000 000 000 001	sextillionth
yocto	10^{-24}	.000 000 000 000 000 000 000 001	septillionth

E+24

E+21

E+18

....

E-18

E-21

E-24

Write each number using calculator notation.

a) 7.5×10^{5} 7.5E5

b) 3×10^{-7} 3E-7

c) 2.7×10^{13} 2.7E13

Write each number using scientific notation.

a) 4.5E-1 $4.5 \cdot 10^{-1}$ 0.45

b) 5.6E12 $5.6 \cdot 10^{12}$

c) 6.98E-8 $6.98 \cdot 10^{-8}$

Real-Life Application Example

In 2012, on average, about 9.46×10^{-1} pound of potatoes was produced for every 2.3×10^{-5} acre harvested. How many pounds of potatoes on average were produced for each acre harvested? Write your answer in scientific notation and in standard form.

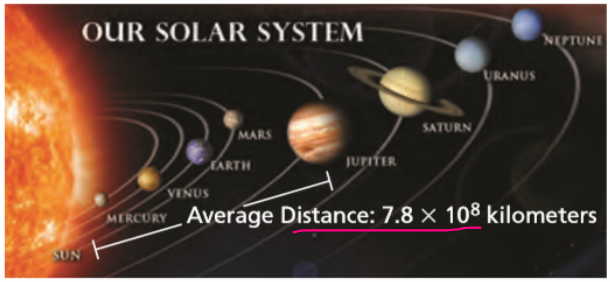
$\frac{9.46 \cdot 10^{-1} \text{ lbs}}{2.3 \cdot 10^{-5} \text{ acre}}$

10^{-1+5}

$4.113 \cdot 10^{4}$

Real-Life Application Practice:

The speed of light is approximately 3×10^{5} kilometers per second. How long does it take sunlight to reach Jupiter? Write your answer in scientific notation and in standard form.



$d = r \cdot t$

$\frac{d}{r} = t$

$\frac{7.8 \times 10^{8}}{3 \times 10^{5}}$

2.6×10^{3}

2600 sec

Real-life Application Practice AGAIN:

A byte is a unit used to measure a computer's memory. The table shows the numbers of bytes in several units of measure.

Unit	kilobyte	megabyte	gigabyte	terabyte
Number of bytes	2^{10}	2^{20}	2^{30}	2^{40}

a) How many kilobytes are in 1 terabyte? 2^{30}

$2^{10} \cdot 2^{3}$ $2^{10} \cdot \square = 2^{40}$

b) How many megabytes are in 16 gigbytes?

$16 \cdot 2^{10} = 16{,}384$

c) Another unit used to measure a computers memory is a bit. There are 8 bits in a byte. How can you convert the number of bytes in each unit of measure given in the table to bits? Can you still use a base of 2? Explain.

2^3

$2 \cdot 2 \cdot 2$

6.1 Day Three Assignment

Scientific Notation Practice Worksheet