Math with Scientific Notation

1

Prefixes You Must Know

Power of 10	Exponent	Prefix	Symbol	Common Name
9	10^9	giga	G	billion
6	10^6	mega	M	million
3	10^3	kilo	k	thousand
2	10^2	hecto	h	hundred
1	10^1	deca	da	ten
-1	10^{-1}	deci	d	tenth
-2	10^{-2}	centi	c	hundredth
-3	10^{-3}	milli	m	thousandth
-6	10^{-6}	micro	µ	millionth
-9	10^{-9}	nano	n	billionth

2

Time to Forget Henry

- King Henry Did Usually Drink Chocolate Milk.. but that's for kids.

KING HENRY'S
CHOCOLATE 1% *Low Fat*
MILK

3

Scientific Notation

- A number in scientific notation looks like...

$$4.25 \times 10^3 \text{ m}$$

- Number
  - Must start with an integer from 1 to 9
  - 0.21×10^2 isn't quite right

- Power of 10

- Units
  - one of the most important parts

4

Easier to Read

300,000,000.m/s

- the speed of light is 300,000,000 meters each second

- Find the decimal

- Move the decimal - count how far it goes

- Use that for the exponent

5

Which is Easier to Read?

300,000,000 m/s   or..

3×10^8 m/s

6

Easier to Read

0.0000065 m

- Really small numbers work too
- Find the decimal
- Move the decimal - count how far it goes
- This time, the exponent is negative

7

Which is Appropriate?

0.0000065 m or..

6.5×10^{-6} m or..

6.5 μm

8

Not as Far To Go

$8500. \times 10^6$ g

- This number isn't quite in scientific notation
- Find the decimal
- Move the decimal & count how far it goes
- Change the exponent by that much

9

8500×10^6 g

- You moved the decimal **3** times
- The number "**looks**" *smaller*
- The exponent must become bigger by **3**

8.5×10^9 g

8.5 Gg 8.5×10^6 kg

10

Change these into the required power of ten
(does not require scientific notation)

(10^3)	38,600 m	38.6 km
(10^3)	1,450 g	1.4 kg
(10^6)	540,000 Watts	0.54 MW
(10^{-3})	0.0253 s	25.3 ms

16

Changing the Prefix

17

Conversions
powers of 10

- How many centimeters are in 6.8 meters?
- $1 \text{ m} = 1 \times 10^2 \text{ cm}$
  - (or $1 \text{ cm} = 1 \times 10^{-2} \text{ m}$)
- $6.8 \text{ m} = 6.8 \times 10^2 \text{ cm}$
  - and you can say 680 if you'd prefer

18

Two steps

- How many cm are in 5 km?
- Work with each prefix
  - $1 \text{ km} = 1 \times 10^3 \text{ m}$
  - $1 \text{ cm} = 1 \times 10^{-2} \text{ m}$
  - the two are 5 places apart

19

Watch Directions!

- Decision: How many cm are in 5 km?
- is it 5×10^5 or 5×10^{-5}
  - a lot or only a part of one?
- 500,000 or 0.00005
- 5×10^5 cm in 5 km

20

Math with Exponents

21

Multiplication

- What is 640,000 times 20,000?
- $(6.4 \times 10^5) \times (2 \times 10^4)$
  - multiply the values $(6.4 \times 2 = 12.8)$
  - Add the exponents $5 + 4 = 9$
- state your answer 12.8×10^9

22

Division

- $(6.4 \times 10^5) / (2 \times 10^4)$
- divide the values $(6.4 / 2 = 3.2)$
- subtract the exponents $5 - 4 = 1$
- state your answer 3.2×10^1
  - Unless you MUST use scientific notation, simplify your answer to 32

23

Practice

$(7.2 \times 10^4) \times (3 \times 10^3)$	21.6×10^7	2.16×10^8
$(4.2 \times 10^5) \times (6 \times 10^{-2})$	25.2×10^3	2.52×10^4
$(6.3 \times 10^4) / (3 \times 10^3)$	2.1×10^1	2.1×10^1
$(4.8 \times 10^5) / (6 \times 10^{-2})$	0.8×10^7	8.0×10^6

24

What is...
1 dollar plus 1 dime?

- Is it **2** of **anything**?
- 1.10 dollars
- 11 dimes
- How do you get these answers?

25

Addition

- $(6.4 \times 10^5) + (2 \times 10^4)$
- Pick one to change
- $(64 \times 10^4) + (2 \times 10^4)$
- 66×10^4
  - or 6.6×10^5

Practice

$(3.5 \times 10^4) - (2.8 \times 10^3)$	3.22×10^4
$(5 \times 10^6) + (0.51 \times 10^8)$	5.6×10^7
$(6.0 \times 10^{-3}) + (5.0 \times 10^{-4})$	6.5×10^{-3}
$(5.0 \times 10^9) + (3.0 \times 10^{-1})$	$5,000,000,000.3$

Does that last one seem strange to solve?