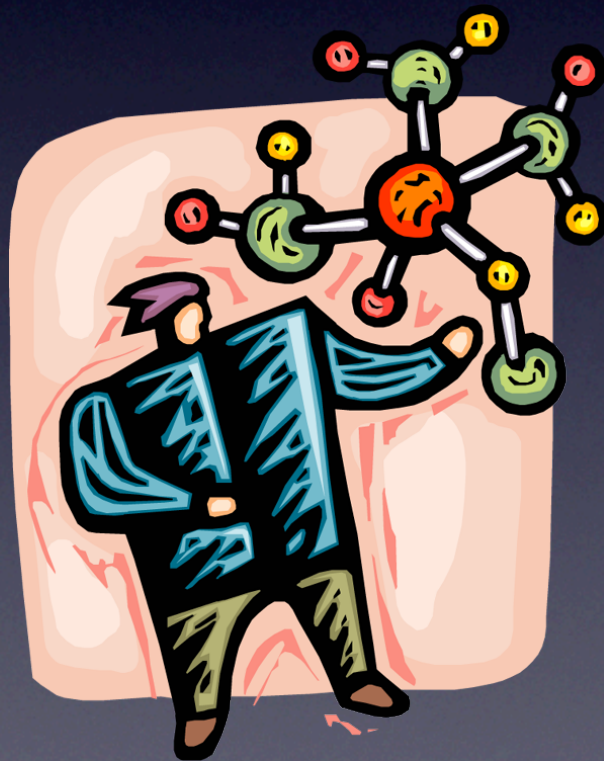


The Power of Scientific Notation



*Douglas Gilliland
The Physical Science Series*



Math Review!

Multiplying by 10's



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 =$$



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 =$$

Multiply $\times 10$ = move the decimal 1 place to the right.



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 =$$



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 =$$

Multiply $\times 100$ = move the decimal 2 places to the right.



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 = 2,345.6 \text{ cm}$$

Multiply $\times 100$ = move the decimal 2 places to the right.



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 = 2,345.6 \text{ cm}$$

Multiply $\times 100$ = move the decimal 2 places to the right.

$$23.456 \text{ cm} \times 1,000 =$$



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 = 2,345.6 \text{ cm}$$

Multiply $\times 100$ = move the decimal 2 places to the right.

$$23.456 \text{ cm} \times 1,000 =$$

Multiply $\times 1000$ = move the decimal 3 places to the right.



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 = 2,345.6 \text{ cm}$$

Multiply $\times 100$ = move the decimal 2 places to the right.

$$23.456 \text{ cm} \times 1,000 = 23,456. \text{ cm}$$

Multiply $\times 1000$ = move the decimal 3 places to the right.



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 = 2,345.6 \text{ cm}$$

Multiply $\times 100$ = move the decimal 2 places to the right.

$$23.456 \text{ cm} \times 1,000 = 23,456. \text{ cm}$$

Multiply $\times 1,000$ = move the decimal 3 places to the right.

$$23.456 \text{ cm} \times 1,000,000 =$$



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

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Multiply $\times 100$ = move the decimal 2 places to the right.

$$23.456 \text{ cm} \times 1,000 = 23,456. \text{ cm}$$

Multiply $\times 1,000$ = move the decimal 3 places to the right.

$$23.456 \text{ cm} \times 1,000,000 =$$

Multiply $\times 1,000,000$ = move the decimal 6 places to the right.



Math Review!

Multiplying by 10's

$$23.456 \text{ cm} \times 10 = 234.56 \text{ cm}$$

Multiply $\times 10$ = move the decimal 1 place to the right.

$$23.456 \text{ cm} \times 100 = 2,345.6 \text{ cm}$$

Multiply $\times 100$ = move the decimal 2 places to the right.

$$23.456 \text{ cm} \times 1,000 = 23,456. \text{ cm}$$

Multiply $\times 1,000$ = move the decimal 3 places to the right.

$$23.456 \text{ cm} \times 1,000,000 = 23,456,000. \text{ cm}$$

Multiply $\times 1,000,000$ = move the decimal 6 places to the right.



Math Review!

Dividing by 10's



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 =$$



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 =$$

Divide by 10 = move the decimal 1 place to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 =$$



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 =$$

Divide by 100 = move the decimal 2 places to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.



Math Review!

Divide by 10's

23

The sole purpose of this zero is to draw attention to the decimal point.

2.3456 cm

Divide by

at 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 =$$



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 =$$

Divide by 1000 = move the decimal 3 places to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 = 0.023456 \text{ cm}$$

Divide by 1000 = move the decimal 3 places to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 = 0.023456 \text{ cm}$$

Divide by 1000 = move the decimal 3 places to the left.

A zero is needed
as a placeholder
to move the decimal



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 = 0.023456 \text{ cm}$$

Divide by 1000 = move the decimal 3 places to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 = 0.023456 \text{ cm}$$

Divide by 1000 = move the decimal 3 places to the left.

$$23.456 \text{ cm} / 1,000,000 =$$



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 = 0.023456 \text{ cm}$$

Divide by 1000 = move the decimal 3 places to the left.

$$23.456 \text{ cm} / 1,000,000 =$$

Divide by 1,000,000 = move the decimal 6 places to the left.



Math Review!

Dividing by 10's

$$23.456 \text{ cm} / 10 = 2.3456 \text{ cm}$$

Divide by 10 = move the decimal 1 place to the left.

$$23.456 \text{ cm} / 100 = 0.23456 \text{ cm}$$

Divide by 100 = move the decimal 2 places to the left.

$$23.456 \text{ cm} / 1,000 = 0.023456 \text{ cm}$$

Divide by 1000 = move the decimal 3 places to the left.

$$23.456 \text{ cm} / 1,000,000 = 0.000023456 \text{ cm}$$

Divide by 1,000,000 = move the decimal 6 places to the left.

Scientific Notation



Scientific Notation



Scientific Notation is a shorthand way of writing very large or very small measurements using the base power of ten.

Scientific Notation



Scientific Notation is a shorthand way of writing very large or very small measurements using the base power of ten.

In 2011 the population
of the Earth will reach
7,000,000,000 people.

That is:



In 2011 the population
of the Earth will reach
7,000,000,000 people.



That is:

7×10 people

In 2011 the population
of the Earth will reach
7,000,000,000 people.



That is:

7×10^9 people

In 2011 the population
of the Earth will reach
7,000,000,000 people.



That is:

Coefficient

7 x 10⁹ people

In 2011 the population of the Earth will reach 7,000,000,000 people.



That is:

Coefficient



7 x 10⁹ people



Base

In 2011 the population of the Earth will reach 7,000,000,000 people.



That is:

Diagram illustrating the scientific notation 7×10^9 people:

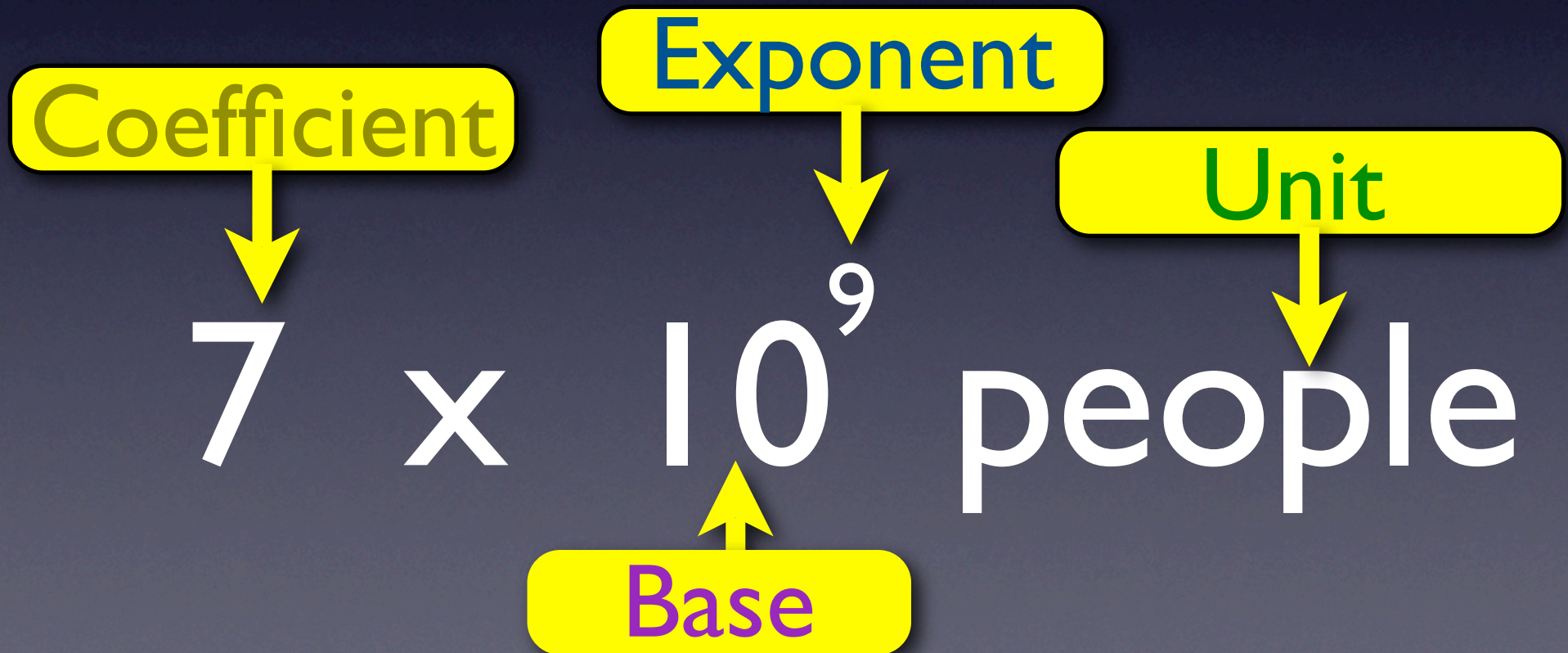
- Coefficient:** 7
- Exponent:** 9
- Base:** 10

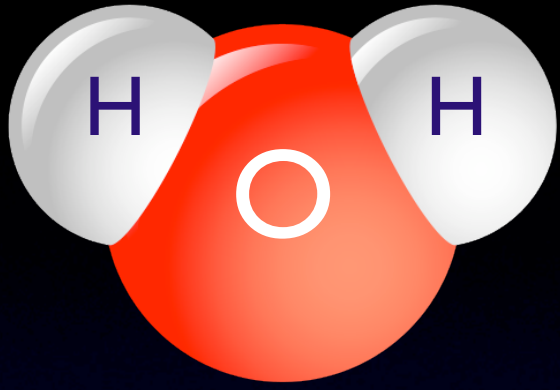
7×10^9 people

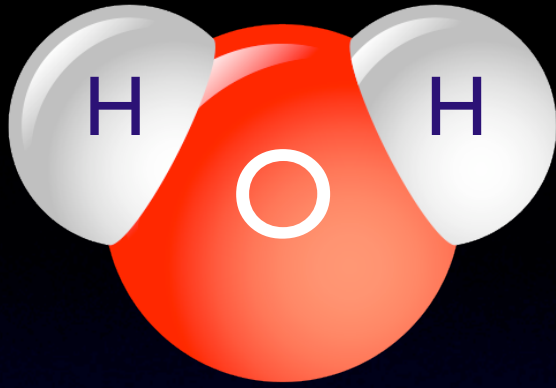
In 2011 the population of the Earth will reach 7,000,000,000 people.



That is:

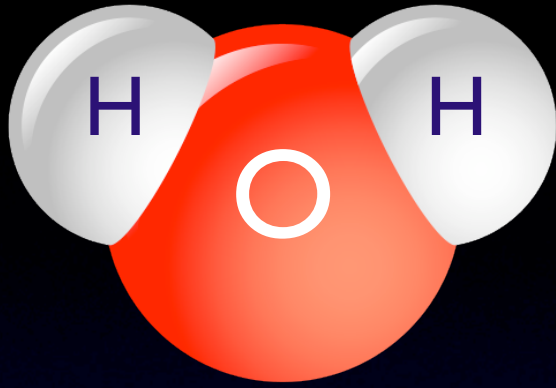






The number of molecules in 18 mL of water is 602 sextillion water molecules.

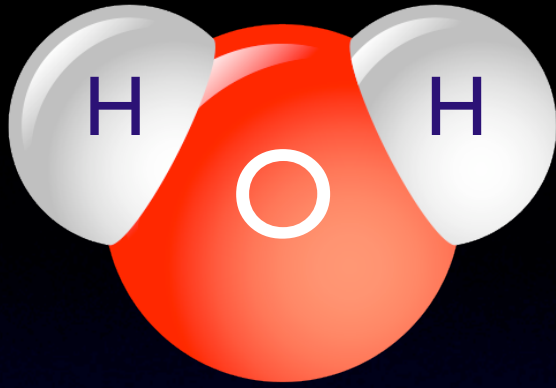




The number of molecules in 18 mL of water is 602 sextillion water molecules.



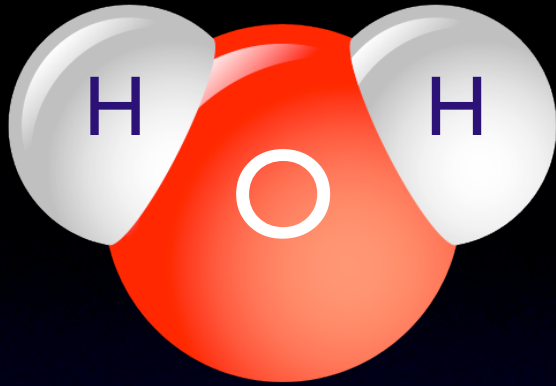
6 02,000,000,000,000,000,000,000 molecules



The number of molecules in 18 mL of water is 602 sextillion water molecules.



6 02,000,000,000,000,000,000,000 molecules

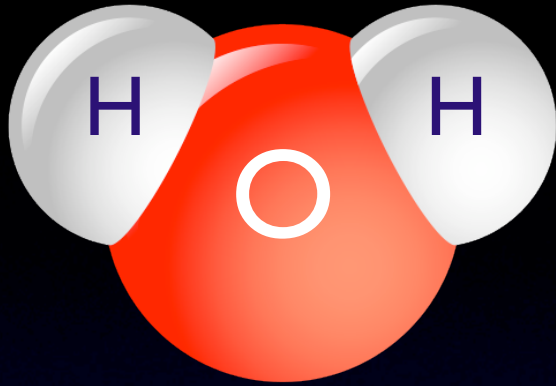


The number of molecules in 18 mL of water is 602 sextillion water molecules.



6 02,000,000,000,000,000,000,000 molecules

Make the number between 1 and less than 10.

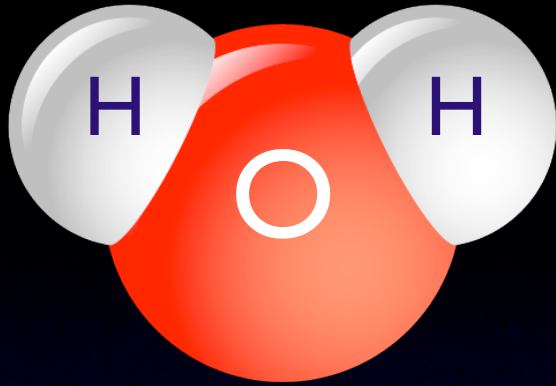


The number of
molecules in
18 mL of water is
602 sextillion
water molecules.



6.02,000,000,000,000,000,000,000 molecules

Make the number between 1 and less than 10.



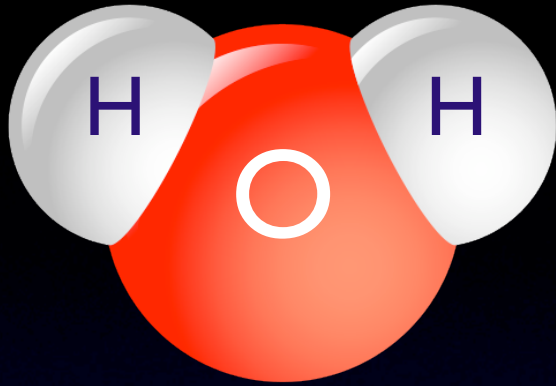
The number of molecules in 18 mL of water is 602 sextillion water molecules.



6.02,000,000,000,000,000,000 molecules

Make the number between 1 and less than 10.

23 places



The number of molecules in 18 mL of water is 602 sextillion water molecules.

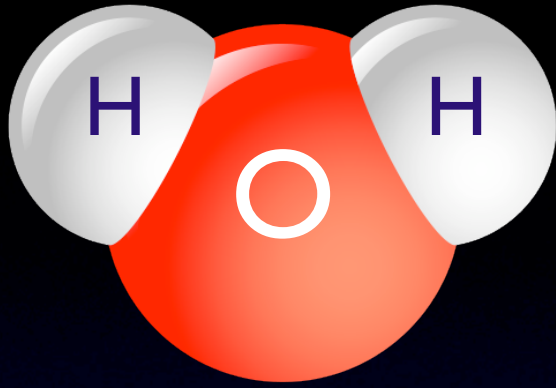


6.02,000,000,000,000,000,000,000 molecules

Make the number between 1 and less than 10.

23 places

To get the decimal back to its original location you must **multiply** by ten 23 times.



The number of molecules in 18 mL of water is 602 sextillion water molecules.



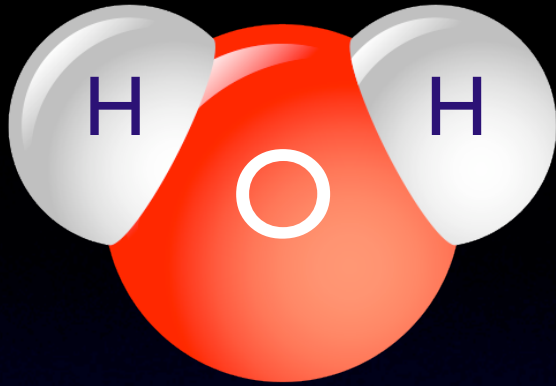
6.02,000,000,000,000,000,000,000 molecules

Make the number between 1 and less than 10.

23 places

To get the decimal back to its original location you must **multiply** by ten 23 times.

6.02×10^{23} molecules



The number of molecules in 18 mL of water is 602 sextillion water molecules.



6.02,000,000,000,000,000,000,000 molecules

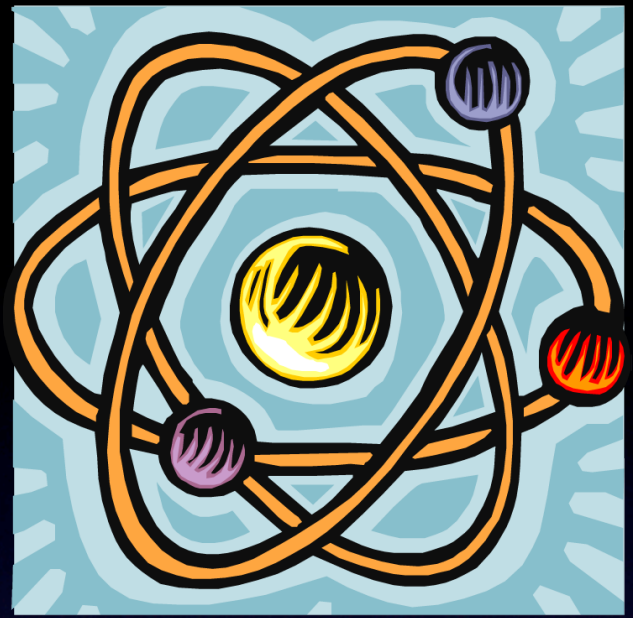
Make the number between 1 and less than 10

23 places

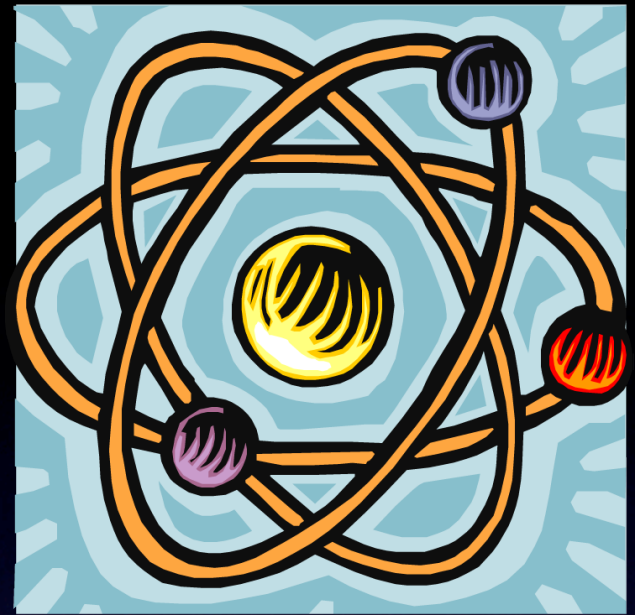
To get the decimal back to its original position, you must multiply by ten 23 times

A positive exponent means you have to multiply times 10 to get back to your original value.

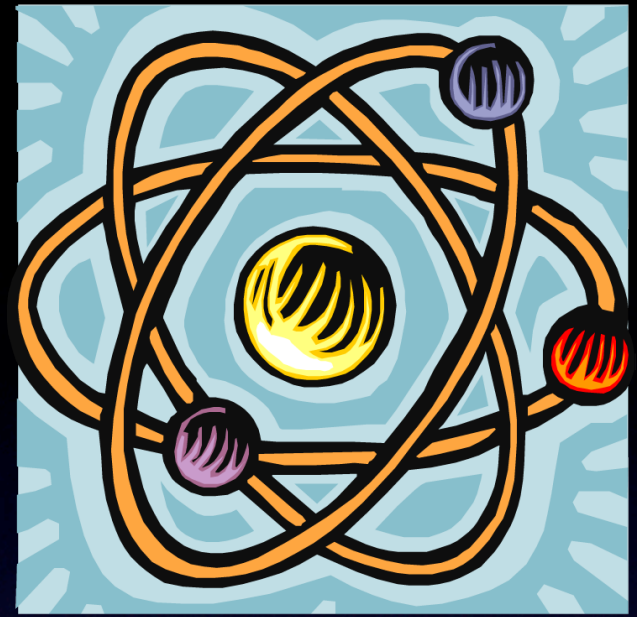
6.02×10^{23} molecules



Mass of a carbon atom

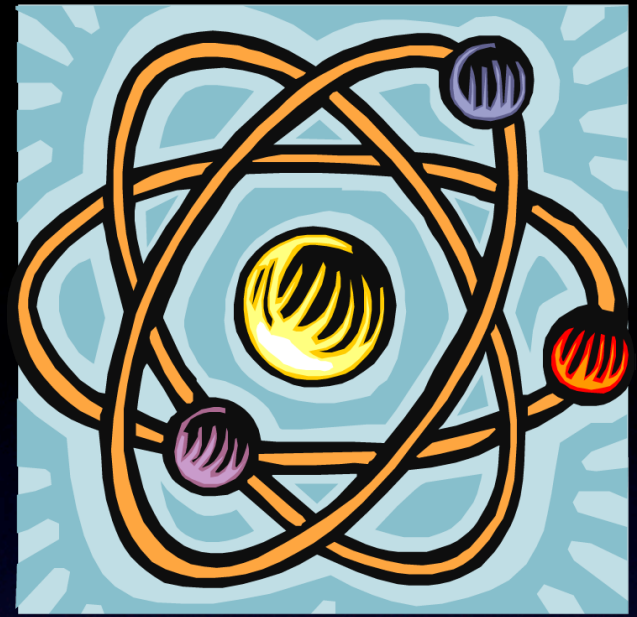


Mass of a carbon atom



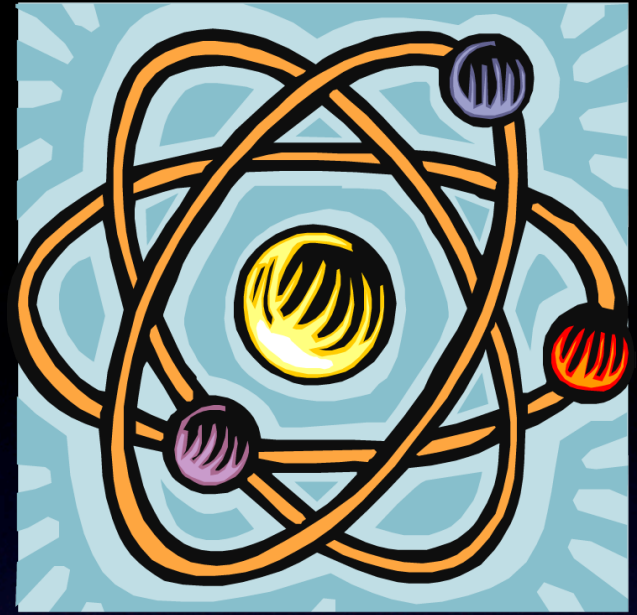
0 000,000,000,000,000,000,000,02 01g

Mass of a carbon atom



0.000,000,000,000,000,000,000,020 g

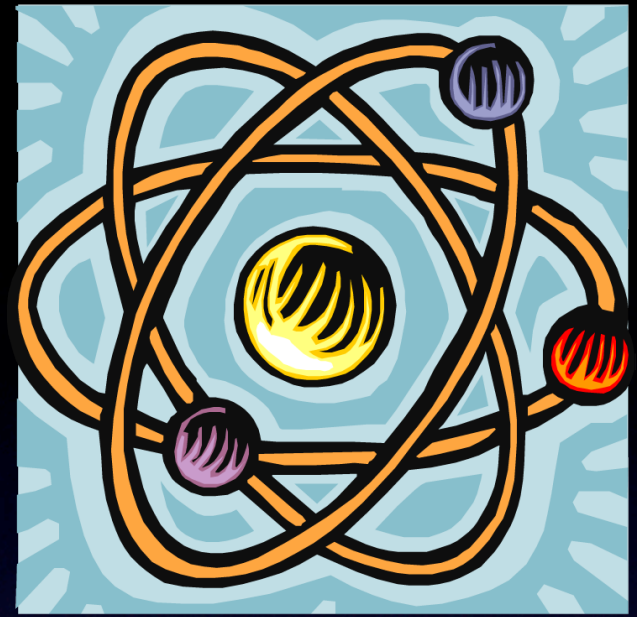
Mass of a carbon atom



0.000,000,000,000,000,000,000,020 g

Make the number between 1 and less than 10.

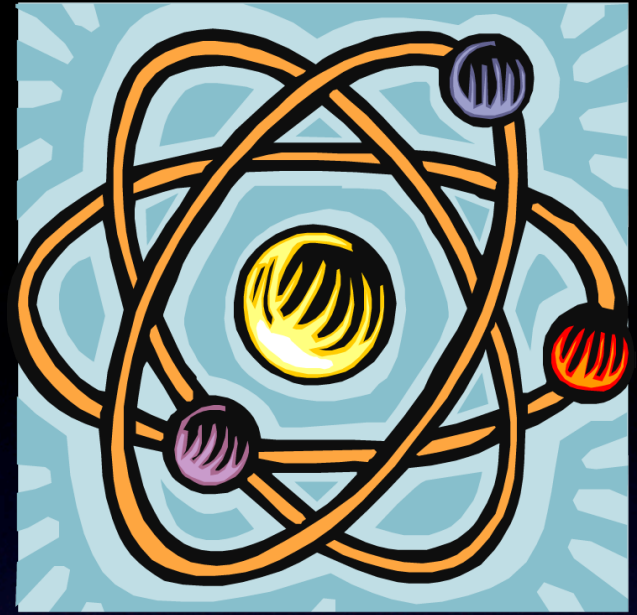
Mass of a carbon atom



0 000,000,000,000,000,000,000,000,02.0 g

Make the number between 1 and less than 10.

Mass of a carbon atom

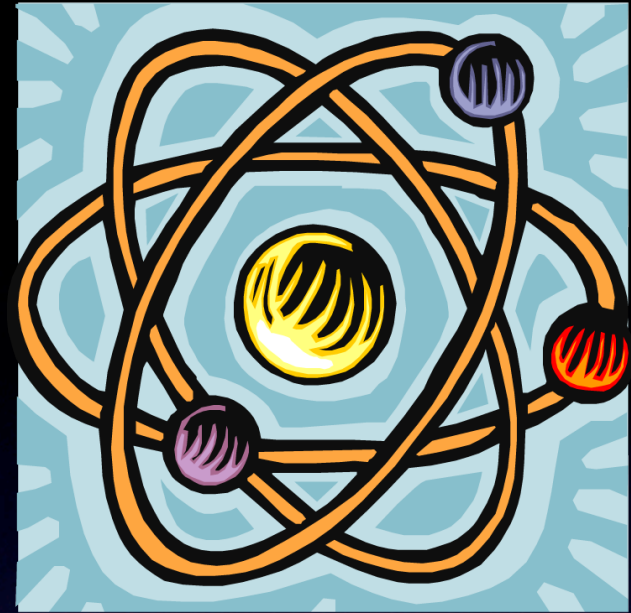


0 000,000,000,000,000,000,000,02.0 g

Make the number between 1 and less than 10.

23

Mass of a carbon atom



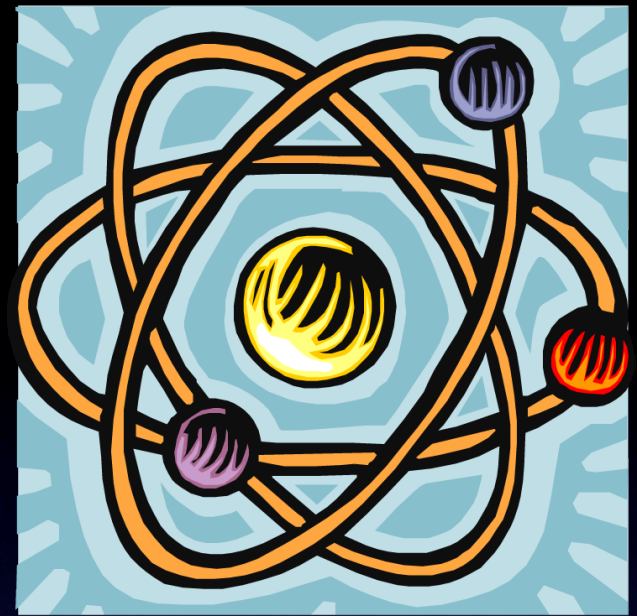
0 000,000,000,000,000,000,000,000,02.0 g

Make the number between 1 and less than 10.

23

To get the decimal back to its original location you must **divide** by ten 23 times.

Mass of a carbon atom



0 000,000,000,000,000,000,000,000,000,000,000,000,000,000,02.0 g

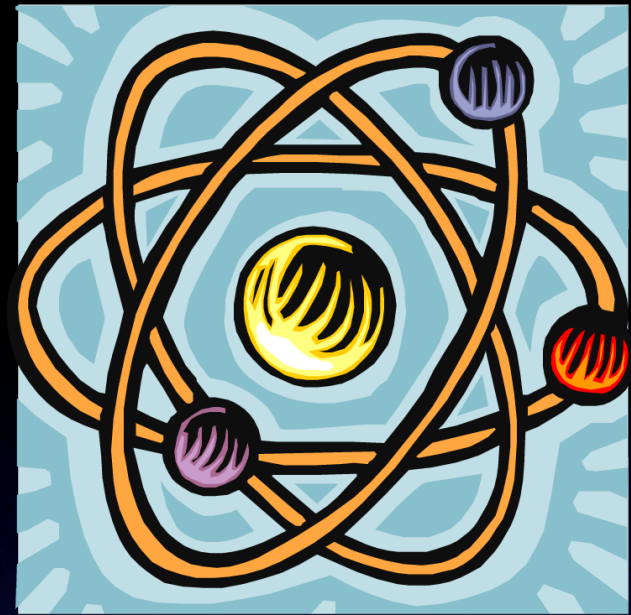
Make the number between 1 and less than 10.

23

To get the decimal back to its original location you must **divide** by ten 23 times.

$$2.01 \times 10^{-23} \text{ grams}$$

Mass of a carbon atom



0 000,000,000,000,000,000,000,000,02.0 | g

Make the number between 1 and less than 10. ↑

23

To get the decimal back to its original place,
must **divide** by ten 23 times

A negative exponent means you have to divide by 10 to get back to your original value.

2.01 × 10⁻²³ grams

How would you put 6 cm
in scientific notation?

$6 \times 10^?$ cm



How would you put 6 cm
in scientific notation?

6×10^0 cm



How would you put 6 cm
in scientific notation?

$$6 \times 10^0 \text{ cm}$$



This means you would multiply 6
times 10 zero times (which equals 6).

Take out your calculators!



Placing Scientific Notation on your Calculator



Placing Scientific Notation on your Calculator



Placing Scientific Notation on your Calculator

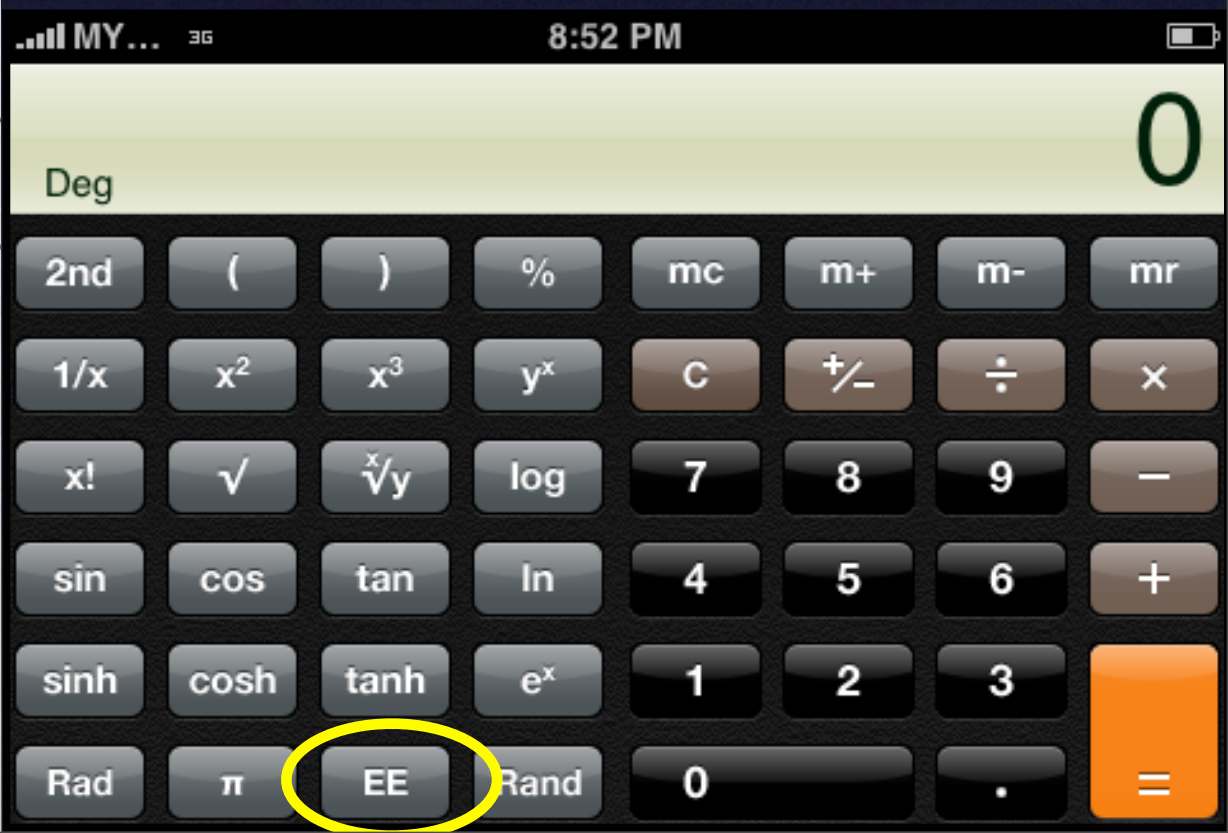


Placing Scientific Notation on your Calculator





Placing Scientific Notation on your Calculator





ion

2ND

QUIT
MODE

INS
DEL



A-LOCK
ALPHA

LINK
X,T,θ,n

LIST
STAT

TEST A
MATH

ANGLE B
APPS

DRAW C
PRGM

DISTR
VARS
CLEAR

MATRIX D
x⁻¹

SIN⁻¹ E
SIN

COS⁻¹ F
COS

TAN⁻¹ G
TAN
π H

√ I
x²

EE J
,

{ K
(

} L
)
e M
÷

10^x N
LOG

u O
7

v P
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w Q
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[R
x

e^x S
LN

L4 T
4

L5 U
5

L6 V
9
] W
-

RCL X
STO

4

5

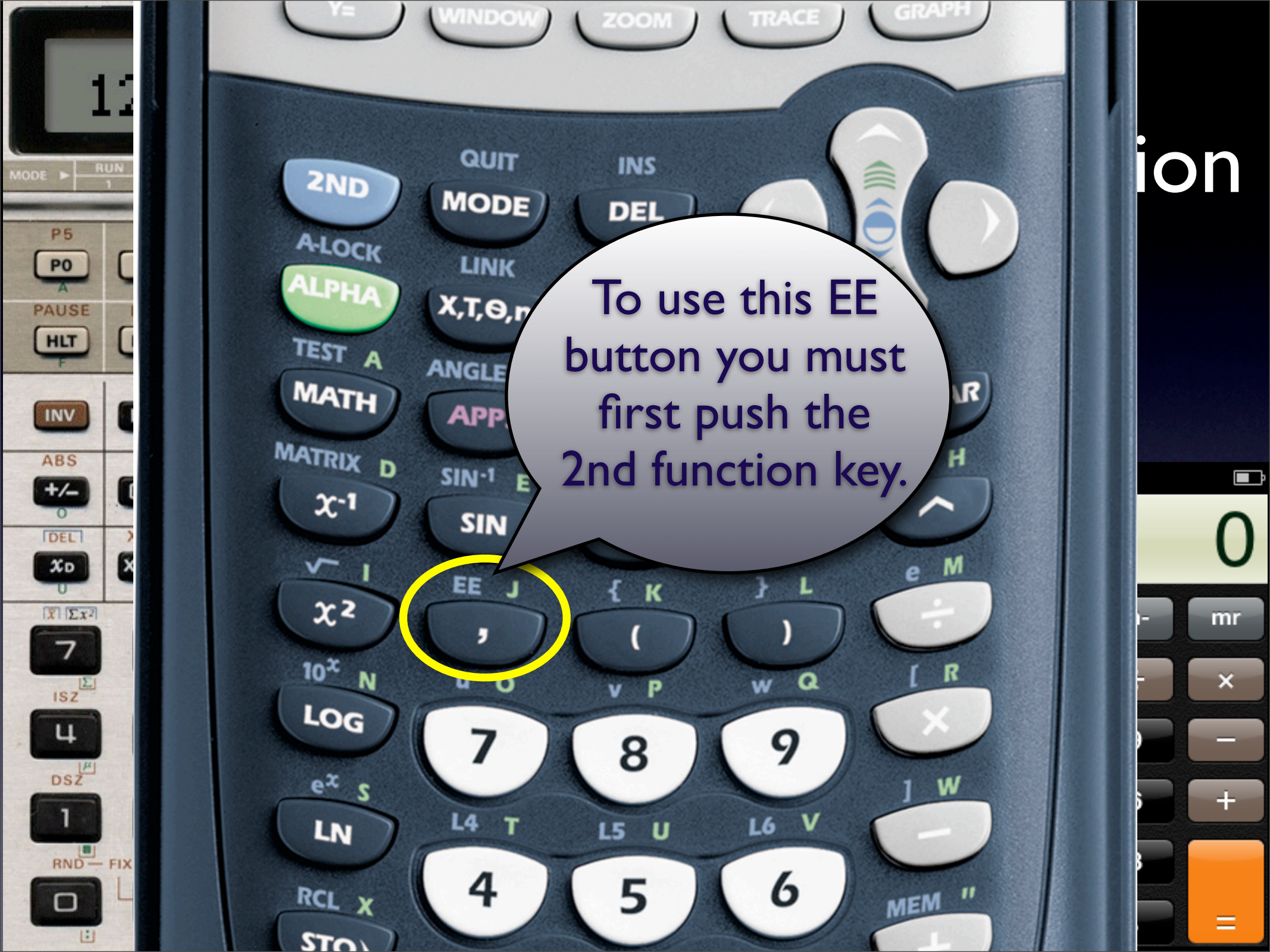
6
MEM
"





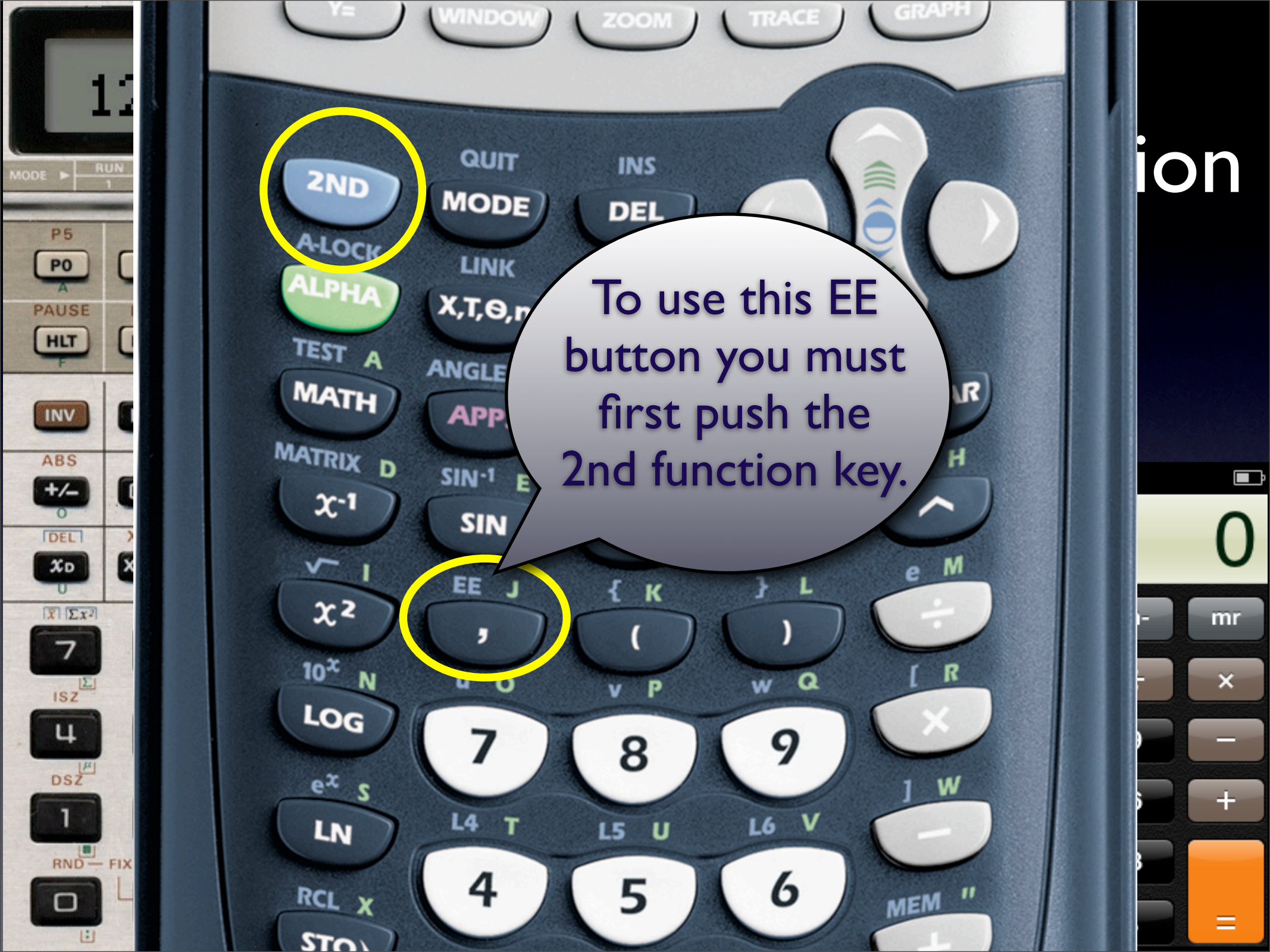
ion





To use this EE button you must first push the 2nd function key.

ion



ion

To use this EE button you must first push the 2nd function key.

0

mr

x

-

+

=

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)
3. Push your EE (or EXP) key.

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)
3. Push your EE (or EXP) key.
4. Type in the exponent (34)

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)
3. Push your EE (or EXP) key.
4. Type in the exponent (34)
5. Push the multiplication sign.

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)
3. Push your EE (or EXP) key.
4. Type in the exponent (34)
5. Push the multiplication sign.
6. Type in the coefficient (5.6)

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)
3. Push your EE (or EXP) key.
4. Type in the exponent (34)
5. Push the multiplication sign.
6. Type in the coefficient (5.6)
7. Push your EE (or EXP) key.

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)
3. Push your EE (or EXP) key.
4. Type in the exponent (34)
5. Push the multiplication sign.
6. Type in the coefficient (5.6)
7. Push your EE (or EXP) key.
8. Type in the exponent (16)

How would you do this:

$$6.3 \times 10^{34} \text{ km} \times 5.6 \times 10^{16} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (6.3)
3. Push your EE (or EXP) key.
4. Type in the exponent (34)
5. Push the multiplication sign.
6. Type in the coefficient (5.6)
7. Push your EE (or EXP) key.
8. Type in the exponent (16)
9. Push the equals sign.

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

1. Clear your calculator.

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (5.2)

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (5.2)
3. Push your EE (or EXP) key.

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (5.2)
3. Push your EE (or EXP) key.
4. Type in the exponent (-12) using +/- key.

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (5.2)
3. Push your EE (or EXP) key.
4. Type in the exponent (-12) using +/- key.
5. Push the multiplication sign.

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (5.2)
3. Push your EE (or EXP) key.
4. Type in the exponent (-12) using +/- key.
5. Push the multiplication sign.
6. Type in the coefficient (5.6).

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6. Type in the coefficient (5.6).
7. Push your EE (or EXP) key.

How would you do this:

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6. Type in the coefficient (5.6).
7. Push your EE (or EXP) key.
8. Type in the exponent (-9) using +/- key.

How would you do this:

$$5.2 \times 10^{-12} \text{ km} \times 5.6 \times 10^{-9} \text{ km}$$

1. Clear your calculator.
2. Type in the coefficient (5.2)
3. Push your EE (or EXP) key.
4. Type in the exponent (-12) using +/- key.
5. Push the multiplication sign.
6. Type in the coefficient (5.6).
7. Push your EE (or EXP) key.
8. Type in the exponent (-9) using +/- key.
9. Push the equals sign.

Any Questions?

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Worksheet on the back of the Keynote is due tomorrow. Please read and follow the directions.