The Metric System
Vocab: SI, units, prefixes

WarmUp: What metric unit would you use to measure the following things?

1. Arm length
2. Mass of a piece of gum
3. Distance traveled by birds
4. Width of a human hair
5. Mass of a human liver
6. Volume of blood in a body
7. Temperature of a human body
8. Your body mass
9. Volume of water in a lake

Historical Background

- In the early days, each scientist used their own local system of units.

Historical Background

- This created much confusion because anytime scientists wanted to share information with one another they lost a great deal of time figuring out conversions between the different systems.

Thus the **Metric System** was formed.

I. The Metric System

- The metric system is a universal, standardized form of measurement that is used by all scientists around the world.

- In 1975 and 1988 the U.S. passed laws for using the metric system in trade and commerce.

The official name of the metric system is:

Systeme International d'unites (SI)

Advantages of the Metric System

1. It allows us to understand each others work and duplicate each others experiments in order to check our results.

2. The SI system is based on number…

10

The Base Units

- The metric system uses a specific base unit for each type of measurement:

  - **Length = meter, m**
  - **Mass = gram, g**
  - **Time = second, s**
  - **Volume = liter, L**
  - **Temperature = kelvin, K**

Table 4 SI Base Units

Quantity Measured	Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Intensity of light	candela	cd

The Prefixes

- The metric system also uses the exact same prefixes for all of the base units.

Prefix	Abbreviation	Factor
• Kilo –	k	1000
• Hecto –	h	100
• Deca –	da	10
• – Base	L/m/g	1
• Deci –	d	0.1
• Centi –	c	0.01
• Milli –	m	0.001

An Acronym to Help…

- Kilo
- Hecto
- Deca
- Base (Meter/Liter/Gram)
- Deci
- Centi
- Milli

- King
- Henry
- Died
- By
- Drinking
- Chocolate
- Milk

Thus making the combinations of the prefixes and bases rather simple:

a) Centi + meter = Centimeter

b) Kilo + liter = Kiloliter

c) Deca + gram = Decagram

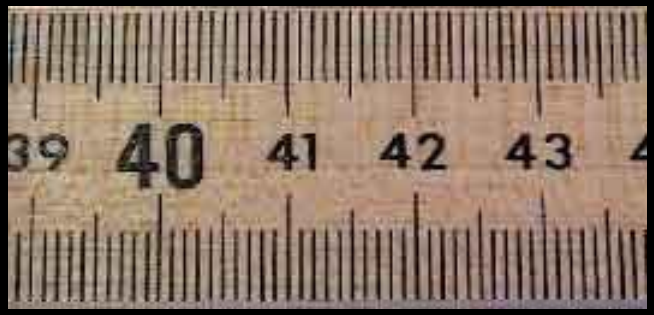
II. Metric Conversions

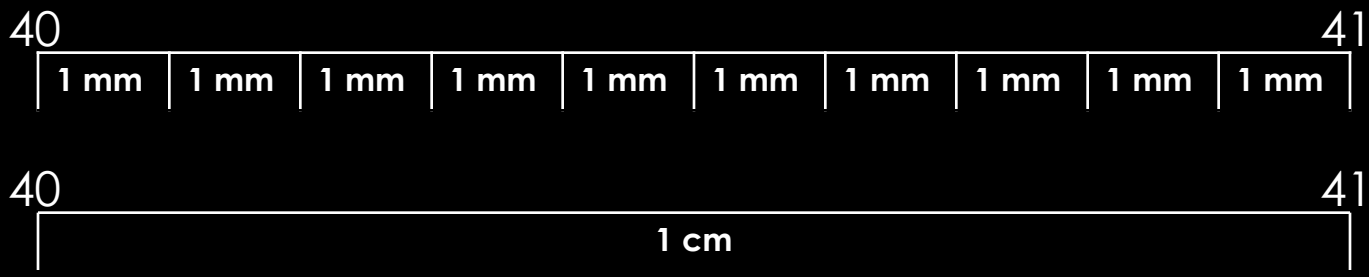
- Since metrics are based the on the power of **10** each "step" is either:

10 times larger or **10** times smaller

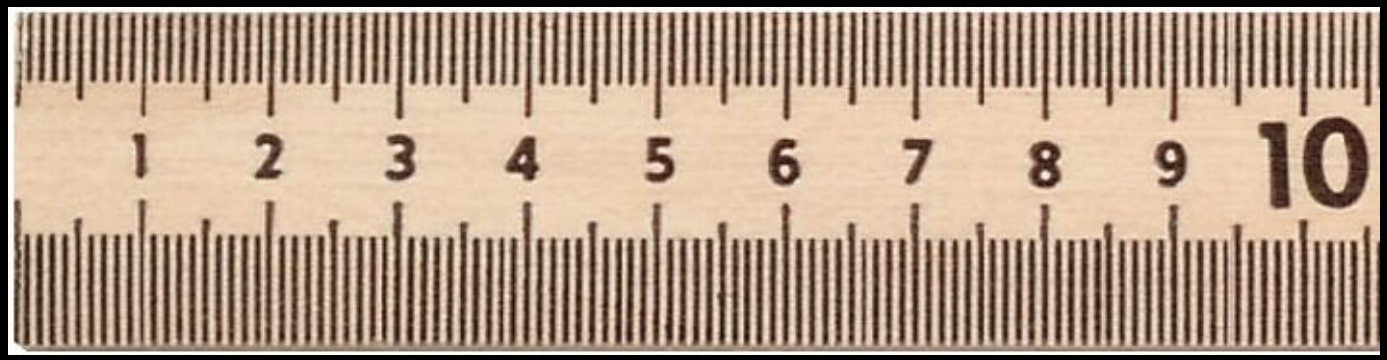
Kilo 1000	Hecto 100	Deca 10	Base Units **meter** **gram** **Liter**	Deci .1	Centi .01	Milli .001

For example, centimeters are larger than millimeters so it takes more millimeters to equal the same length in centimeters.





- One of the lines is a millimeter.



------ Ten of those lines makes a centimeter.

---------- 100 lines = decimeter

1000 lines = a meter

By how much do we multiply between steps as we get larger?

- Now try these problems:

a) 1 liter = ____ deciliters = ____ centiliters

b) 2 grams = ____ dekagrams = ____ hectograms = ____ kilograms

kilo	hecto	deca	meter liter gram	deci	**centi**	**milli**

Students, write your response!

- An easy way to move within the metric system is by moving the decimal point one place for each "step" desired.

Example: change liters to centiliters

1 liter = 10 deciliters = 100 centiliters

(so you move the decimal 2 times to the right)

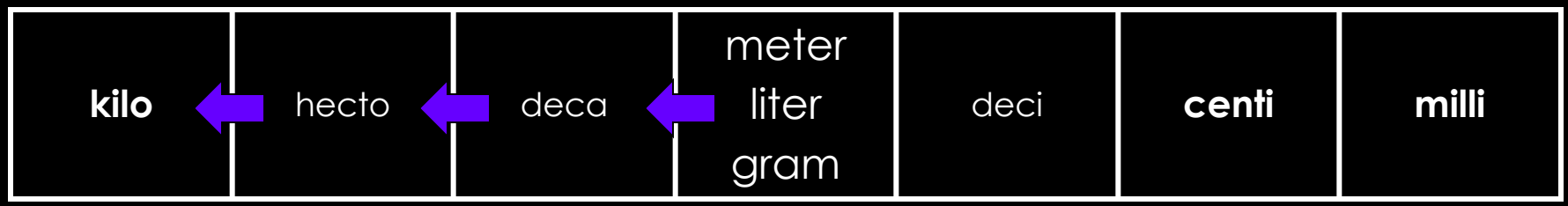
kilo	hecto	deca	meter liter gram	→ deci →	**centi**	**milli**

- Now let's try the second example this time moving the decimal to the left.

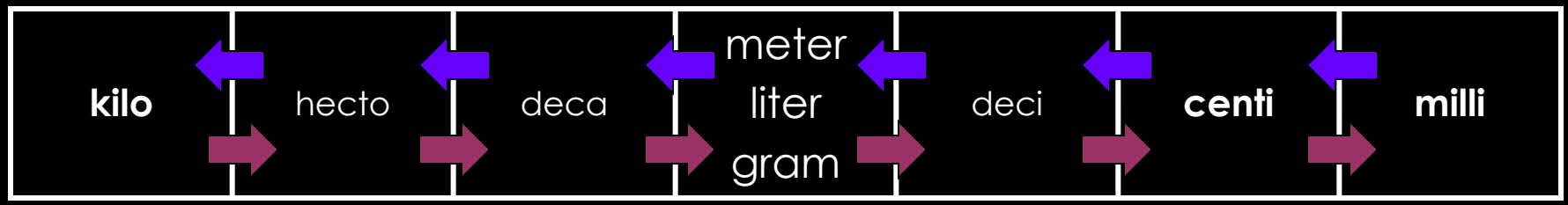
Example: change grams to kilograms

2 grams = 0.2 dekagrams = 0.02 hectograms = 0.002 kilograms

(so you move the decimal 3 times to the left)



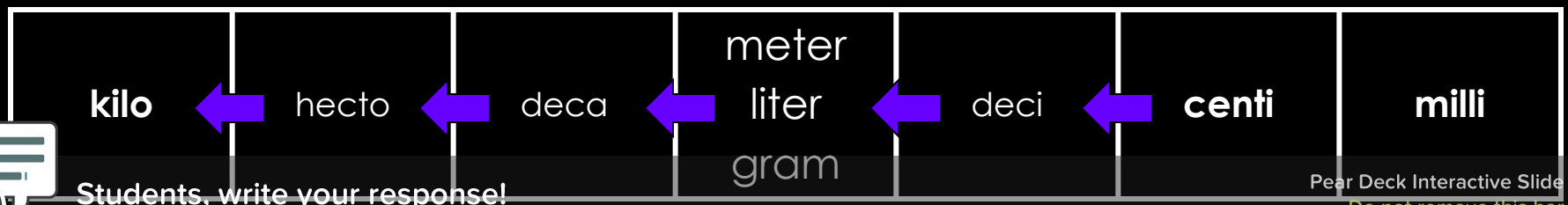
- If you move to the left in the diagram, move the decimal to the left
- If you move to the right in the diagram, move the decimal to the right



- Now try another one.

Example: change centimeters to kilometers.

400,000 centimeters = ____4____ kilometers

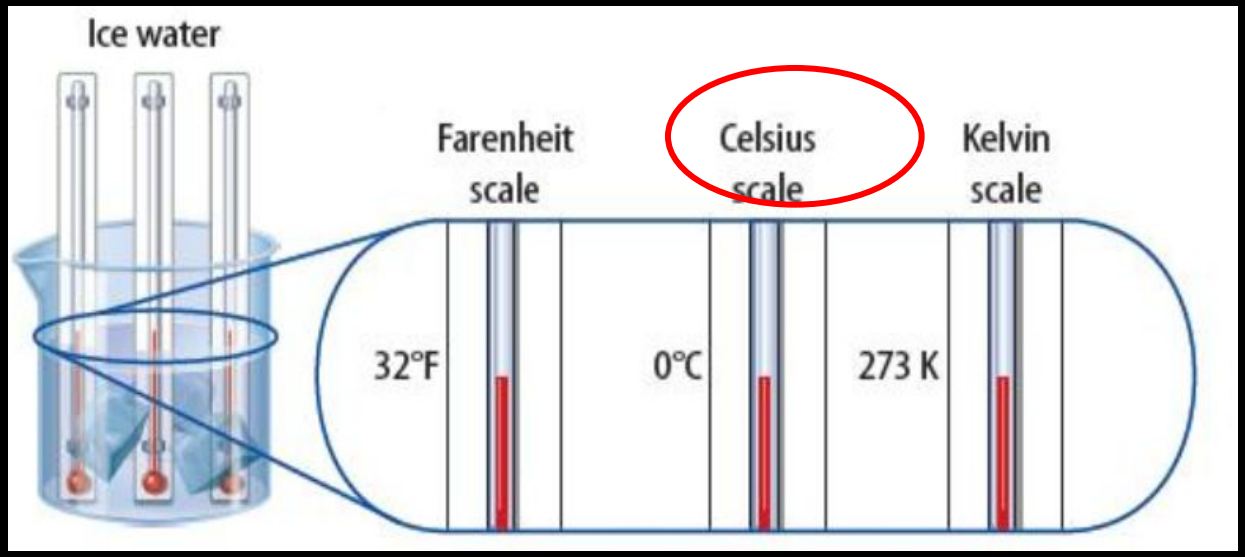


Students, write your response!

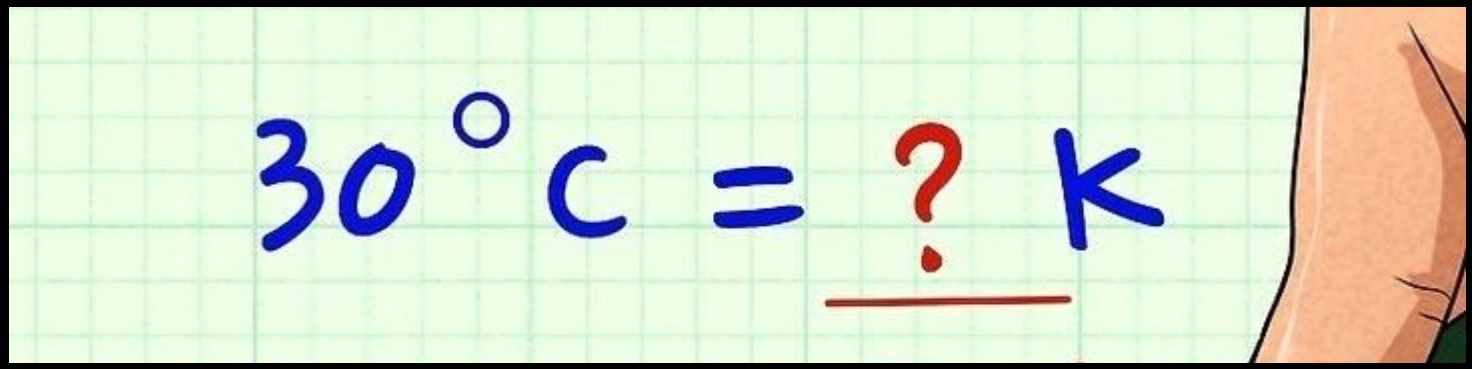
Temperature

The SI unit of temperature is the kelvin (K).

- Zero on the Kelvin scale (0 K) is the coldest possible temperature, also known as absolute zero.
- Absolute zero is equal to -273°C which is 273° below the freezing point of water.

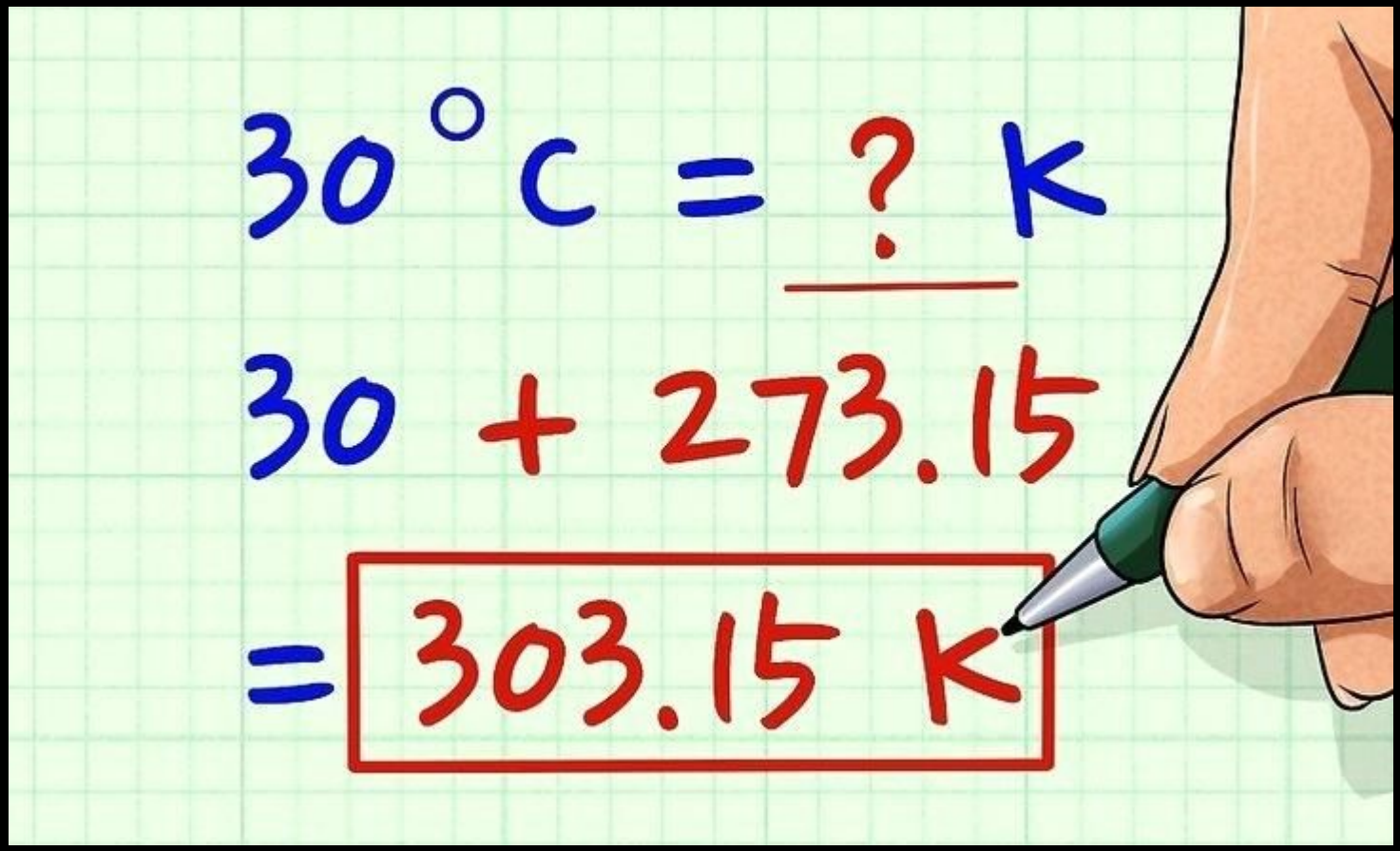


Converting between Kelvin and Celsius



Kelvin is always 273 greater than Celsius. What's the answer?

Converting between Kelvin and Celsius



Draw or type 2 things you learned in today's lesson:

1

2

Students, draw anywhere on this slide!

Metric Summary

- Base units in the metric system are the meter, liter, gram
- Prefixes can be used with many of the base units
- The Metric system is based on the power of 10
- For conversions within the metric system, each "step" is 1 decimal place to the right or left

kilo	hecto	deca	meter liter gram	deci	**centi**	**milli**