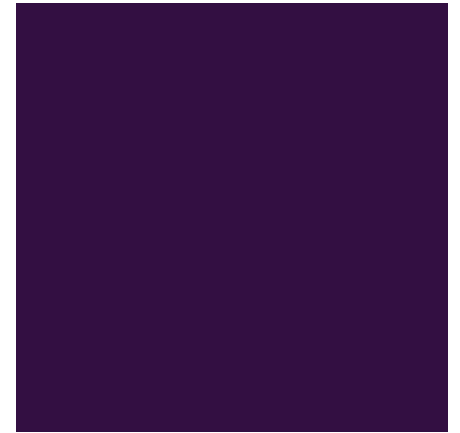
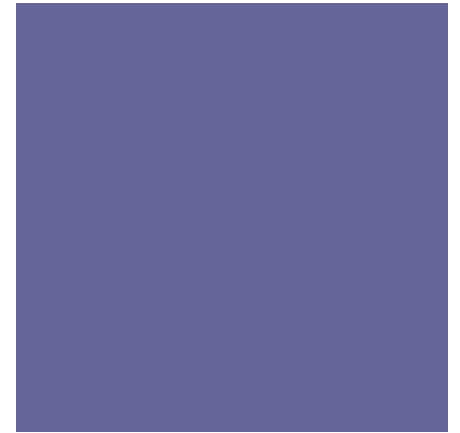




Metric System & Scientific Notation





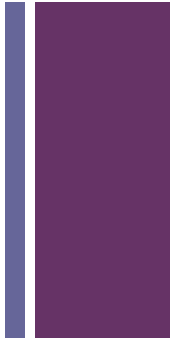
What Americans Are Used To



- The English Standard System
 - Inches and gallons and pounds (oh my!)
- Many different units
 - Inches, feet, yards, miles, ...
 - Ounces, cups, pints, quarts, gallons, ...
- Many conversion factors
 - 12 inches in a foot
 - 5280 feet in a mile
 - 16 ounces in a pound
- Fractional units
 - $\frac{1}{4}$ inch, $\frac{1}{2}$ gallon, $\frac{3}{4}$ pound, ...



Why use the METRIC SYSTEM?

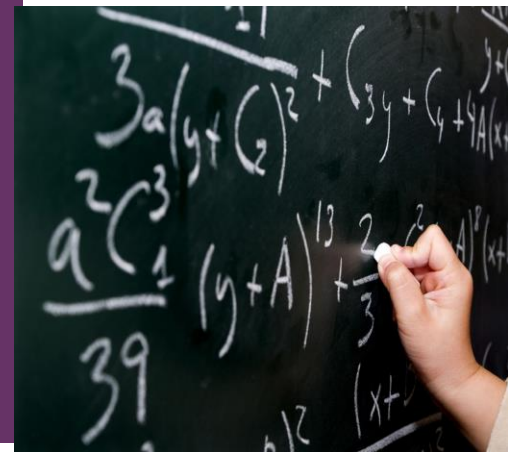
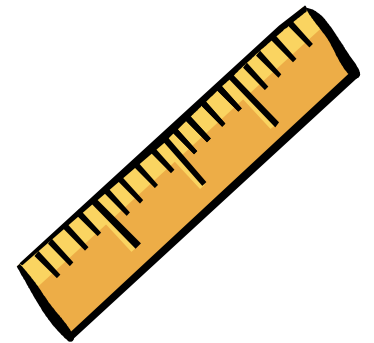
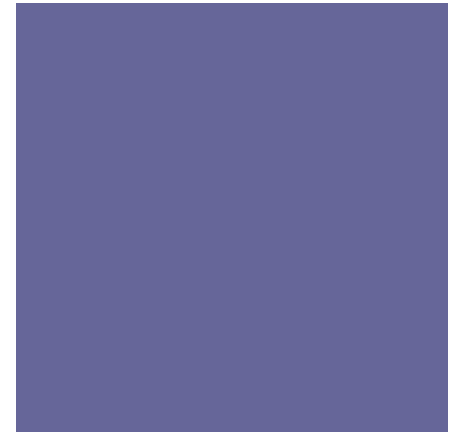


+ *Take this test,*
Add the following:

1 yd, 2 feet, 3- $\frac{1}{4}$ in

+ *1 foot, 11- $\frac{3}{16}$ in*

+ *2 feet, 5- $\frac{1}{2}$ in*



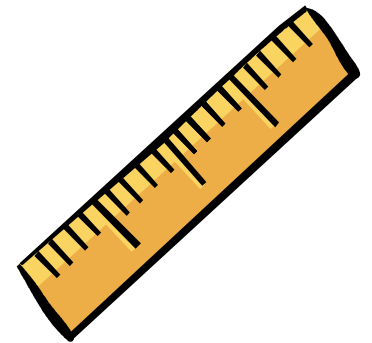
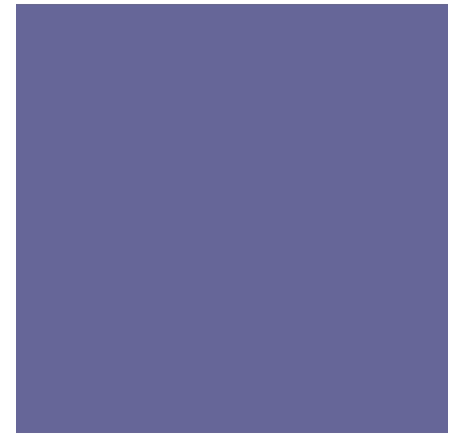
+ Now...add these:

1.607 meters

+ *0.589 meters*

+ *0.749 meters*

+ *3.216 meters*



+ *TA - DAAAA!!!*

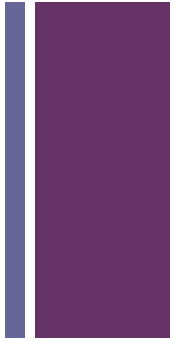
*The sums are
actually EQUAL to
one another !*

6 yards, 2 feet, 2-9/16 inches

6.161 meters



+ *Just as English is the worldwide language of business, the metric system (SI) is the world's common language of measurement.*



*Since SI uses decimals, it
is based on powers of*

10

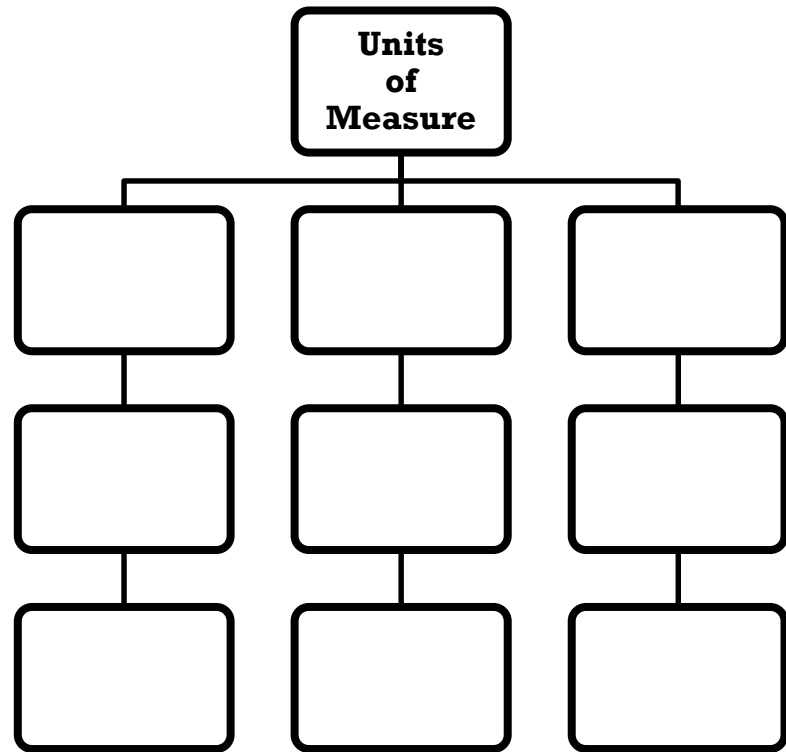


Metric System



- The metric system is based on a base unit that corresponds to a certain kind of measurement

- Length = meter
- Volume = Liter
- Mass = gram





Metric System



- The three prefixes that we will use the most are:
 - Kilo= 1000
 - centi = $1/100$ (one hundredth)
 - milli= $1/1000$ (one thousandth)

- How do you remember all of them?



Metric System



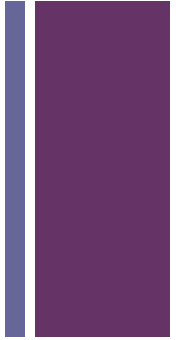
- These prefixes are based on powers of 10. What does this mean?
 - From each prefix every “step” is either:
 - 10 times larger
 - or
 - 10 times smaller

Kilo (1000)	Hecto (100)	Deca (10)	<u>Base Units</u> meter gram liter	deci (1/10)	centi (1/100)	milli (1/1000)
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Metric System - LENGTH

- So if you needed to measure length you would choose meter as your base unit
 - Length of a tree branch
 - 1.5 meters
 - Length of a bus
 - 15 meters





Metric System - LENGTH

- But what if you need to measure a longer distance, like from your house to school?
- Let's say you live approximately 10 miles from school
 - 10 miles = 16093 meters
- 16093 is a big number, but what if you could add a prefix onto the base unit to make it easier to manage:
 - 16093 meters = 16.093 kilometers (or 16.1 if rounded to 1 decimal place)





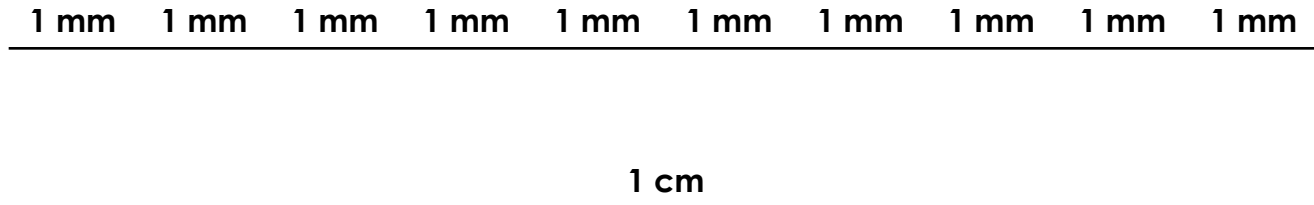
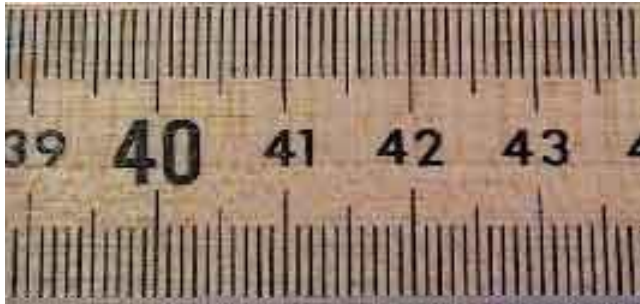
Metric System



- Centimeters are 10 times larger than millimeters so it takes more millimeters for the same length

1 centimeter = 10 millimeters

Example not to scale



The End of a Ruler

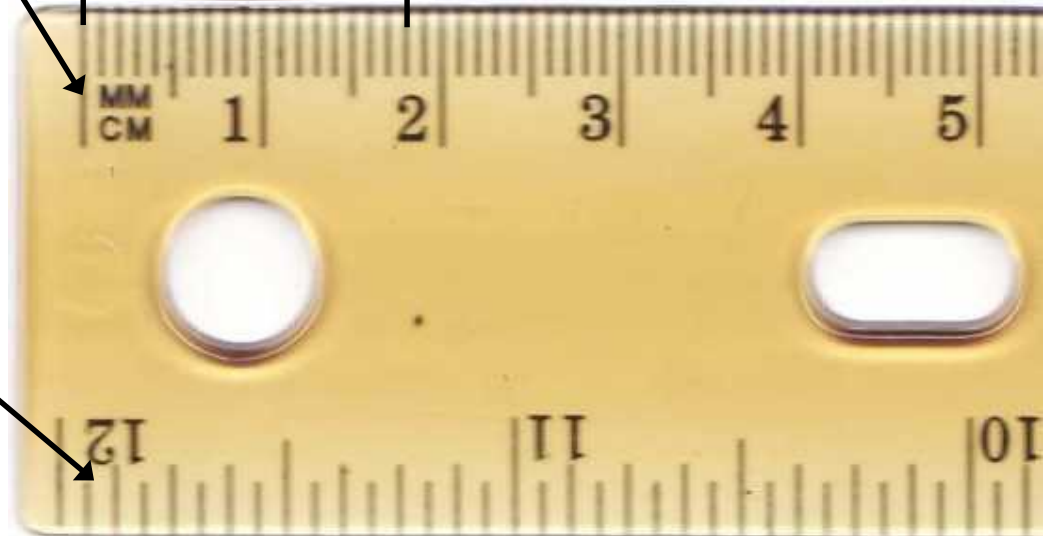
18 mm or 1.8 cm



So, how wide is the dime?

The little MM and CM stand for millimeters and centimeters

Down here are the inches. Yes, I know they're upside down.





Metric System - MASS



- So if you needed to measure mass you would choose gram as your base unit
 - Mass of a piece of bubble gum
 - 3 grams
 - Mass of a box of Kleenex
 - 90 grams

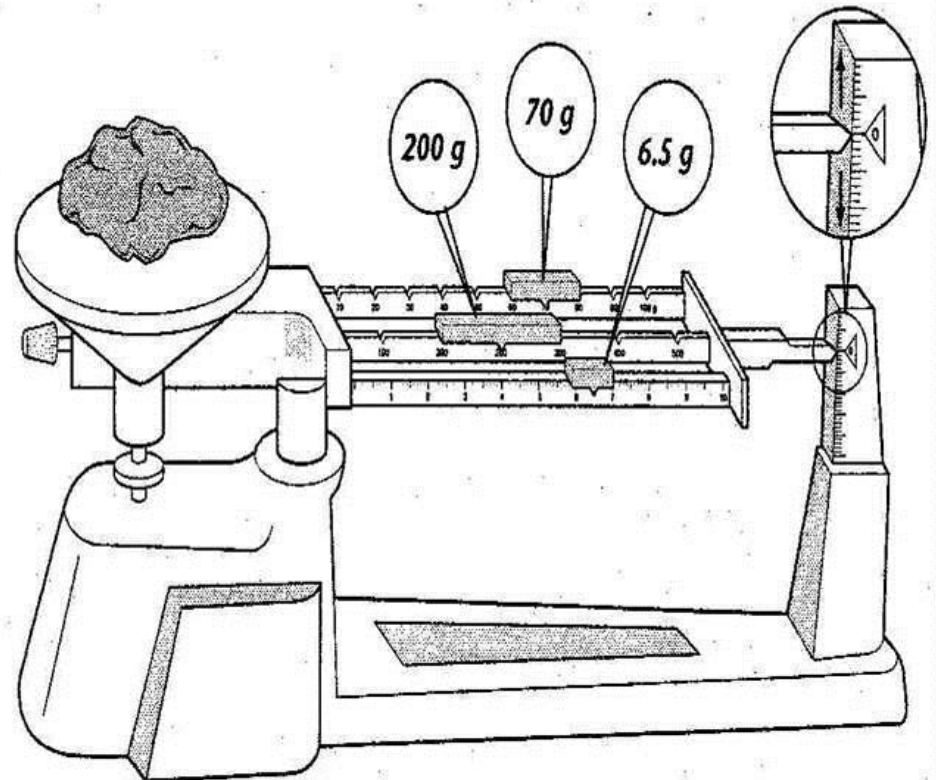
- But what if you need to measure a larger mass, the mass of Mrs. Menghini?
 - Let's say Mrs. Menghini's mass is approximately 120 pounds
 - 120 pounds = 54,545 grams
 - 54545 is a big number, but what if you could add a prefix onto the base unit to make it easier to manage:
 - 54545 grams = 54.5 kilograms (kg)



Mass:

Basic metric unit: Gram

Instrument:
Triple Beam Balance





Metric System - VOLUME



- So if you needed to measure volume you would choose Liter as your base unit
 - Volume of a goldfish
 - 9 grams

- But what if you need to measure a smaller volume?
 - Let's say a goldfish has a volume of 0.3 ounces
 - 0.03 ounces = 0.0089 liters
 - 0.0089 liters is a really small number, but what if you could add a prefix onto the base unit to make it easier to manage:
 - 0.0089 liters = 8.9 milliliters (mL)



For geometric shapes, volumes can be calculated



For odd shapes, there are no formulas, so another method for finding volume must be used.

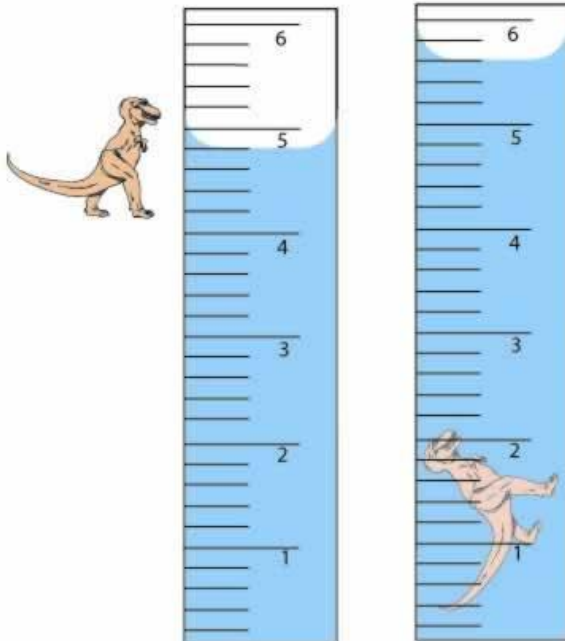




Volume:

Basic metric unit: Liter

Instrument: graduated cylinder



Graduated Cylinder



Metric System



- For each “step” to right,
you are multiplying by 10

- For each “step” to the left,
you are dividing by 10

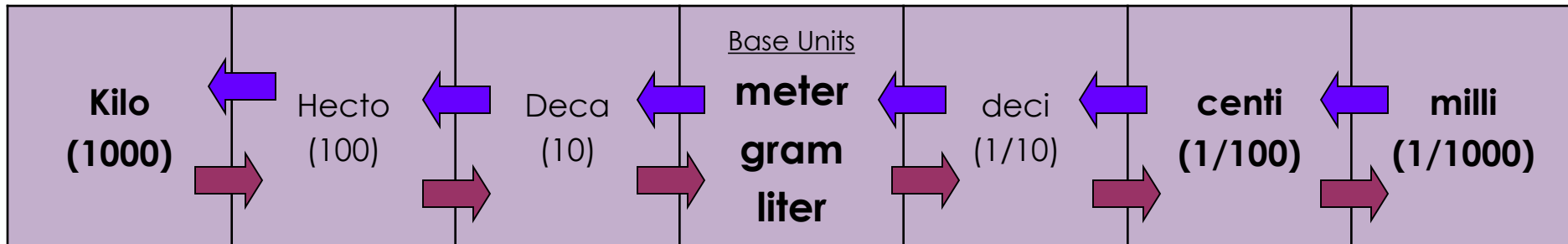
Kilo (1000)	Hecto (100)	Deca (10)	<u>Base Units</u> meter gram liter	deci (1/10)	centi (1/100)	milli (1/1000)
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Metric System



- 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**



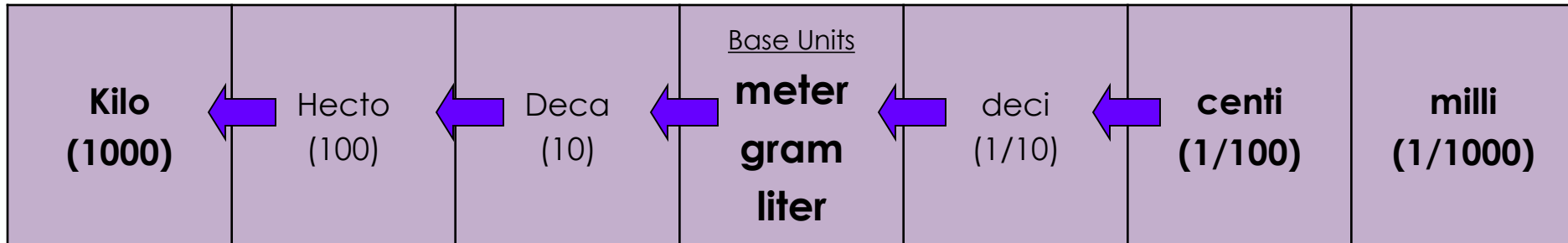


Metric System



- Now let's start from centimeters and convert to kilometers

400000 centimeters (cm) = _____ kilometers (km)



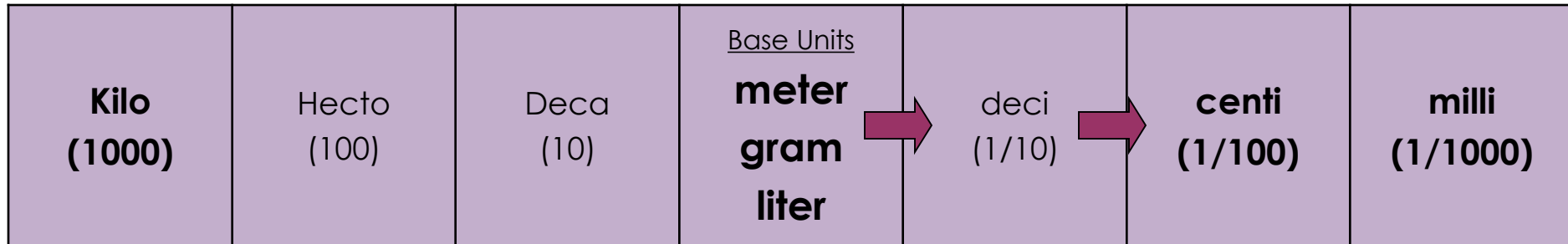


Metric System



- Now let's start from meters and convert to centimeters

5 meters (m) = _____ centimeters (cm)



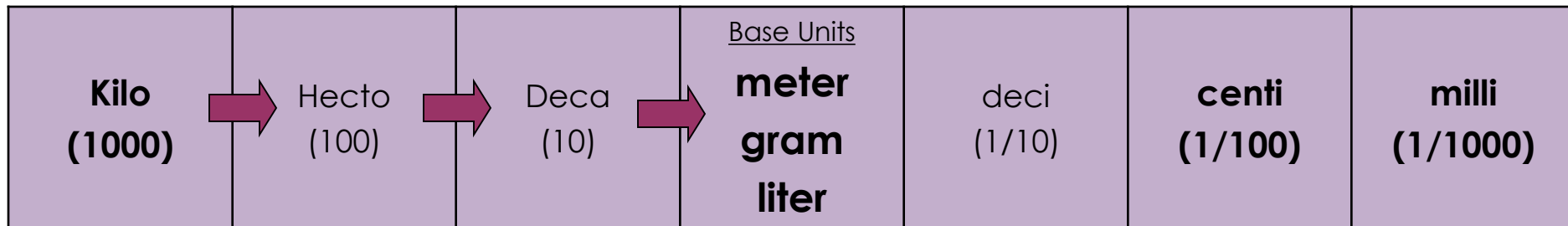


Metric System



- Now let's start from kilometers and convert to meters

.3 kiloliters (kL) = _____ liters (L)





Metric System



■ Summary

- Base units in the metric system are meter, liter, gram
- Metric system is based on powers of 10
- For conversions within the metric system, each “step” is 1 decimal place to the right or left
- Using the diagram below, converting to the right, moves the decimal to the right and vice versa

Kilo (1000)	Hecto (100)	Deca (10)	<u>Base Units</u> meter gram liter	deci (1/10)	centi (1/100)	milli (1/1000)
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+ Typical Metric Units

- What metric unit would you use to measure the length of the room?
- What metric unit would you use to measure the distance between the mall and school?
- What metric unit would you use to measure your weight?
- What metric unit would you use to measure the amount of liquid in a soda bottle?
- What unit would you use to measure the amount of space a toy car would take up?

