NS A1 (pg 1 of 2) **Metric System** Name_____

English System

Can you convert miles to feet? (1 mile = 5280 ft) inches to yards? (36 inches = 1 yard) miles to inches?
Can you convert pounds to tons? (2000 lbs = 1 ton)
Can you convert quarts to gallons? (4 quarts = 1 gallon) gallons to tsp? (1 quart = 4 cups 16 Tbs = 1 cup 1 Tbs = 3 tsp)

Since it is difficult to remember the conversion factors needed to change the size of measurements, and we are one of only two countries left in the world with the English system, why have we not changed to the easier metric system?

- U.S. arrogance or pride
- resistance to change or stubbornness
- cost

Introducing the Metric System **(You've been introduced before.)**

length − meter How long?
a meter is approx an arm span or big step, a centimeter is approx the width of a finger (1 meter is approx 1 yard)

mass − grams How heavy?
a nickel has a mass of approx 5 grams (1 kg is approximately 2 pounds)

volume − liters How big? (What size?)
remember the 2 L soda bottle (approximately a half gallon, 2 quarts)

Prefixes are used to change these base units into smaller or larger sizes. Each unit is larger or smaller by a factor of 10. Then when you have a particular measurement and you want to change the size of the unit, you simply move the decimal point of the number since the conversion are all factors of 10.

How can remember which direction to move the decimal?

- If the unit gets smaller....the number gets bigger / If the unit gets larger....the number gets smaller.
- Move down the chart....decimal moves right / Move up the chart....decimal moves left.

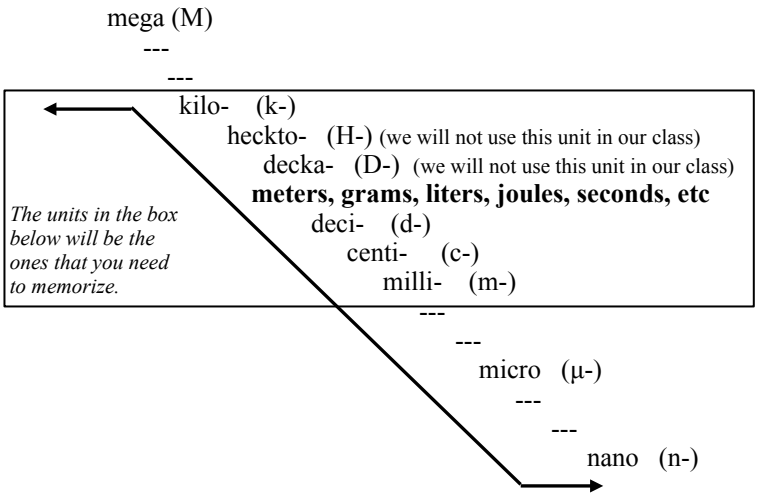
1 Mm = 1,000,000 m

1 km = 1000 m

10 dm = 1 m
100 cm = 1 m
1000 mm = 1 m

1,000,000 μm = 1 m

1,000,000,000 nm = 1 m



How to convert 0.0024 km to cm

Use the quickie stair-step method presented above

- using the chart above, count the number of steps you need to move to get from kilo- to centi-
- 5 steps therefore move the decimal place 5 spaces
- since the unit is getting smaller, the number gets bigger therefore move the decimal to the right
- 0.0024 km converts to 240 cm

OR use conversion factors

- use the following conversion factors: 1km = 1000m and 100cm = 1m, which you can tell from the list above.
- Arrange the conversion factors so that the units will cancel each other out when multiplying with the starting number.
- $0.0024\,km \times \frac{1000\,m}{1\,km} \times \frac{100\,cm}{1\,m} = 240\,cm$

more on the back →

Converting *compound units* such as grams per ml (g/ml) or miles per hour (mi/hr)

- The density of air is 0.00129 g/ml and we want to convert to g/L
  - ✓ First think about its meaning. If 0.00129 grams fit in 1 ml, how many grams will be able to fit in 1 L? Many more....
    - ➢ so don't make the mistake of moving the decimal the wrong way.

Solution

- We don't usually write a number in the denominator of the units because it is understood to be a 1
  - ✓ but 0.00129 g/ml means the same as $\frac{0.00129g}{1ml}$
- To make the conversion, you may be more successful showing the conversion factor and making sure your units cancel out correctly
  - ✓ $\frac{0.00129g}{1ml} \times \frac{1000ml}{1L} = 1.20g/ml$

Converting *derived units* such as cubed or squared units: cm^3 or m^2

- When using squared units (for area) the decimal moves two places not just one, because the decimal moves one place on the length and one place on the width for a total of two places. For squared units, determine the number of places the decimal should move based on the prefix change, and then double (not square) that amount.
- When using cubed units the decimal moves three places not just one, because the decimal moves one place on the length and one place on the width, and one place on the height for a total of three places. For cubed units, determine the number of places the decimal should move based on the prefix change, and then triple (not cube) that amount.
- For instance, what if we want to convert 0.00036 m^3 to cm^3
  - ✓ This is an volume unit, meaning a length, a width, and a height so the decimal place change is three times the number of decimal places you would otherwise expect.
  - ✓ We are moving from a larger to smaller unit, so the number gets larger.
  - ✓ Since m to cm is a 2 decimal place move
  - ✓ but this is a 2 decimal place move on the length *and* the width *and* the height for a total of 6 decimal places to move.
  - ✓ thus 0.00036 m^3 = 360 cm^3
- Or you might like this way: $0.00036m^3 \times \frac{100cm}{1m} \times \frac{100cm}{1m} \times \frac{100cm}{1m} = 360cm^3$