# The Metric System

# Our Learning Goal:

- The student will be able to accurately measure distance, mass, volume, and density using the metric system.

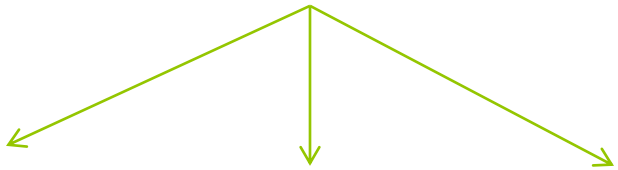
# What do you already know about the metric system?

- Talk at your table and be ready to report out your knowledge!

# What we already know:

# The Metric System

- A ***standard*** unit of measurement used throughout the world that is "based on the 10's"



# PREFIXES:

- What do you already know?
- Did your elementary teacher(s) teach you a phrase to remember the metric prefixes?
- Talk at your table and be ready to report out!

PHRASE: King Henry Doesn't Usually Drink Chocolate Milk

# PREFIXES:

***Kilo*** → Hecto → deca → ***BASE*** → deci → ***centi*** → ***milli***

***UNIT***

(meter, liter, gram)

Largest Prefix ⟶ Basic Prefix (m, L, g) ⟶ Smallest Prefix

# How do I use this?

***Kilo*** → Hecto → deca → ***BASE UNIT*** → deci → ***centi*** → ***milli***

Largest Objects → Average Objects → Tiny Objects

.001 km = .01hm = .1 dam = 1.0 m = 10 dm = 100 cm = 1,000mm

*****Based on ten! You are multiplying or dividing by 10! Simply move the decimal point left or right!*****

**When converting, you need to consider:**
How many decimal places are you moving?
In which direction?
NOW, move your decimal that many places in that direction! DONE!

# Examples:

***Kilo*** → Hecto → deca → ***BASE UNIT*** → deci → ***centi*** → ***milli***

753 grams = _____ kilograms

4.72 meters = _____ centimeters

34.6 decagrams = _____ decigrams

.562 hectoliters = _____ milliliters

1,389.5 decimeters = _____ hectometers

48.3 decameters = _____ decimeters

# Examples:

753 grams = **.753** kilograms

4.72 meters = _____ centimeters

34.6 decagrams = _____ decigrams

.562 hectoliters = _____ milliliters

1,389.5 decimeters = _____ hectometers

48.3 decameters = _____ decimeters

# Examples:

753 grams = **.753** kilograms

4.72 meters = **472** centimeters

34.6 decagrams = _____ decigrams

.562 hectoliters = _____ milliliters

1,389.5 decimeters = _____ hectometers

48.3 decameters = _____ decimeters

# Examples:

753 grams = **.753** kilograms

4.72 meters = **472** centimeters

34.6 decagrams = **3,460** decigrams

.562 hectoliters = _____ milliliters

1,389.5 decimeters = _____ hectometers

48.3 decameters = _____ decimeters

# Examples:

753 grams = **.753** kilograms

4.72 meters = **472** centimeters

34.6 decagrams = **3,460** decigrams

.562 hectoliters = **56,200** milliliters

1,389.5 decimeters = _____ hectometers

48.3 decameters = _____ decimeters

# Examples:

753 grams = **.753** kilograms

4.72 meters = **472** centimeters

34.6 decagrams = **3,460** decigrams

.562 hectoliters = **56,200** milliliters

1,389.5 decimeters = **1.3895** hectometers

48.3 decameters = _____ decimeters

# Examples:

753 grams = **.753** kilograms

4.72 meters = **472** centimeters

34.6 decagrams = **3,460** decigrams

.562 hectoliters = **56,200** milliliters

1,389.5 decimeters = **1.3895** hectometers

48.3 decameters = **4,830** decimeters

# You Try: **Which unit would you use to measure each of these objects? Why?**

*(Use only the common prefixes discussed earlier:* ***Kilo, base unit, centi, and milli****)*

| | OBJECT | UNIT | REASON |
|---|---|---|---|
| Mass (grams) | Cell phone | | |
| | Your body | | |
| Distance (meters) | School to home | | |
| | Toe to heel of your shoe | | |
| Volume (Liters) | Water bottle | | |
| | Water in your pool | | |

# Rate Your Learning on Today's Lesson!

4 = In addition to score 3, you can help teach your peers

3 = you can accurately name the metric prefixes, convert between the metric prefixes, and suggest an appropriate metric prefix to use when measuring an object.

2 = you can accurately do two of the requirements

1 = you can accurately do one of the requirements

0 = you are struggling with all things metric and need more teacher help

# Rate Your Learning on the Learning Goal!

4 = In addition to score 3, you can help teach your peers

3 = you can accurately measure distance, mass, and volume using the metric system.

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# The Metric System

Let's talk DISTANCE!

| | DISTANCE | VOLUME | MASS |
|---|---|---|---|
| **Definition** | | | |
| **Unit** | | | |
| **Tool** | | | |
| **Method** | | | |

| | DISTANCE | VOLUME | MASS |
|---|---|---|---|
| **Definition** | • Width, height, length<br>• How far from one end to the other | | |
| **Base Unit** | | | |
| **Tool** | | | |
| **Method** | | | |

| | DISTANCE | VOLUME | MASS |
|---|---|---|---|
| **Definition** | • Width, height, length<br>• How far from one end to the other | | |
| **Base Unit** | Meter | | |
| **Tool** | | | |
| **Method** | | | |

| | DISTANCE | VOLUME | MASS |
|---|---|---|---|
| **Definition** | • Width, height, length<br>• How far from one end to the other | | |
| **Base Unit** | Meter | | |
| **Tool** | Meter stick<br>or<br>Metric ruler | | |
| **Method** | | | |

| | DISTANCE | VOLUME | MASS |
|---|---|---|---|
| **Definition** | • Width, height, length<br>• How far from one end to the other | | |
| **Base Unit** | Meter | | |
| **Tool** | Meter stick<br>or<br>Metric ruler | | |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1cm (because it is 1mm) | | |

# Let's Practice!

- Using the metric ruler

- "Ruling" Distance Measurement

# The Metric System

Let's talk MASS!

| | DISTANCE (width, height, length) | VOLUME | MASS |
|---|---|---|---|
| **Definition** | How far from one end to the other | | |
| **Base Unit** | Meter | | |
| **Tool** | Meter stick<br>or<br>Metric ruler | | |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | |

| | **DISTANCE** (width, height, length) | **VOLUME** | **MASS** |
|---|---|---|---|
| **Definition** | How far from one end to the other | | The amount of matter (“stuff”) in an object |
| **Base Unit** | Meter | | |
| **Tool** | Meter stick<br>or<br>Metric ruler | | |
| **Method** | Line up the object with the zero mark on the tool & read your answer. **Each line = .1 | | |

| | **DISTANCE** (width, height, length) | **VOLUME** | **MASS** |
|---|---|---|---|
| **Definition** | How far from one end to the other | | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | | |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | |

| | DISTANCE (width, height, length) | VOLUME | MASS |
|---|---|---|---|
| **Definition** | How far from one end to the other | | The amount of matter (“stuff”) in an object |
| **Base Unit** | Meter(m) | | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | |

| | DISTANCE (width, height, length) | VOLUME | MASS |
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| **Definition** | How far from one end to the other | | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | ~Start with the largest #s! (Do 100's, then 10's, then 1's – *make sure the 100's & 10's "click" into place*!)<br>~Once it is balanced, add all readings together! |

# Let's Practice!

- Using the balance

- Massive Problems

# Rate Your Learning on Today's Lesson!

4 = In addition to score 3, you can help teach your peers

3 = you can accurately read a metric ruler, measure objects with a metric ruler, read a balance, and measure objects with a balance.

2 = you can accurately do two of the requirements

1 = you can accurately do one of the requirements

0 = you are struggling with all things metric and need more teacher help

# Rate Your Learning on the Learning Goal!

4 = In addition to score 3, you can help teach your peers

3 = you can accurately measure distance, mass, and volume using the metric system.

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# The Metric System

Let's talk VOLUME!

| | DISTANCE (width, height, length) | VOLUME | MASS |
|---|---|---|---|
| **Definition** | How far from one end to the other | | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | DISTANCE (width, height, length) | VOLUME | MASS |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | DISTANCE (width, height, length) | VOLUME | MASS |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | Liter (L) – usually liquid | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | **DISTANCE** (width, height, length) | **VOLUME** | **MASS** |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | Liter (L) – usually liquid<br>Also, cubic centimeters ($cm^3$) | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | **DISTANCE** (width, height, length) | **VOLUME** | **MASS** |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | Liter (L) – usually liquid<br>Cubic centimeters ($cm^3$) | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | Liquid = graduated cylinder, flask, beaker | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer. **Each line = .1 | | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | DISTANCE (width, height, length) | VOLUME | MASS |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | Liter (L) – usually liquid<br>Cubic centimeters ($cm^3$) | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | Liquid = graduated cylinder, flask, beaker<br>Solid = meter stick, ruler (usually) | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer. **Each line = .1 | | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | **DISTANCE** (width, height, length) | **VOLUME** | **MASS** |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | Liter (L) – usually liquid<br>Cubic centimeters ($cm^3$) | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | Liquid = graduated cylinder, flask, beaker<br>Solid = meter stick, ruler (usually) | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | 1. Liquid = fill the tool & read | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | **DISTANCE** (width, height, length) | **VOLUME** | **MASS** |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | Liter (L) – usually liquid<br>Cubic centimeters ($cm^3$) | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | Liquid = graduated cylinder, flask, beaker<br>Solid = meter stick, ruler (usually) | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | 1. Liquid = fill the tool & read<br>2. L X W X H | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

| | **DISTANCE** (width, height, length) | **VOLUME** | **MASS** |
|---|---|---|---|
| **Definition** | How far from one end to the other | The amount of space an object takes | The amount of matter ("stuff") in an object |
| **Base Unit** | Meter(m) | Liter (L) – usually liquid<br>Cubic centimeters ($cm^3$) | Grams (g) |
| **Tool** | Meter stick<br>or<br>Metric ruler | Liquid = graduated cylinder, flask, beaker<br>Solid = meter stick, ruler (usually) | balance |
| **Method** | Line up the object with the zero mark on the tool & read your answer.<br>**Each line = .1 | 1. Liquid = fill the tool & read<br>2. L X W X H (cube/rectangular solid)<br>3. Irregular Shape Solid (that sinks in water):<br>"Water Displacement":<br>a. Add $H_20$ to cylinder<br>b. Record $H_20$ amount<br>c. Add object<br>d. Record difference | ~Start with the largest #s! (Do 100's, then 10's, then 1's)<br>~Once it is balanced, add all readings together! |

# Let's Practice!

- Using a Graduated Cylinder

- Measuring Liquid volume with a graduated cylinder

# Rate Your Learning on Today's Lesson!

4 = In addition to score 3, you can help teach your peers

3 = you can accurately read a graduated cylinder, measure liquid volume using a graduated cylinder, and decide which size graduated cylinder should be used.

2 = you can accurately do two of the requirements

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# Rate Your Learning on the Learning Goal!

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