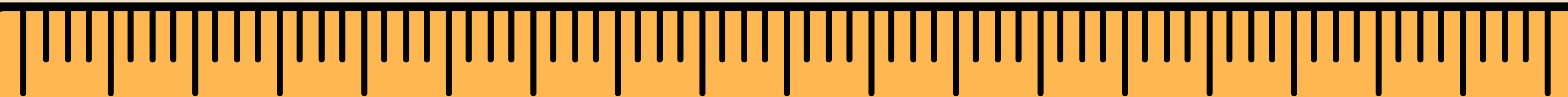


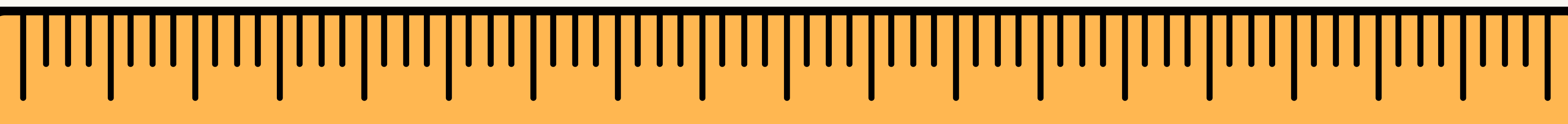
# **WELCOME TO GRADE 7 SCIENCE!**

*Ms. Pia Catnavan*

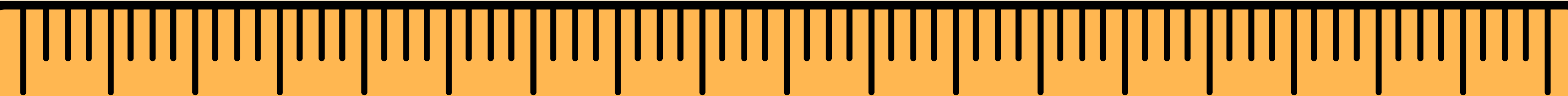


# THINK!

Is it important to measure accurately?  
Why or why not?

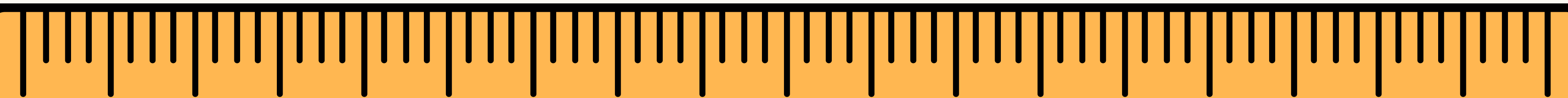
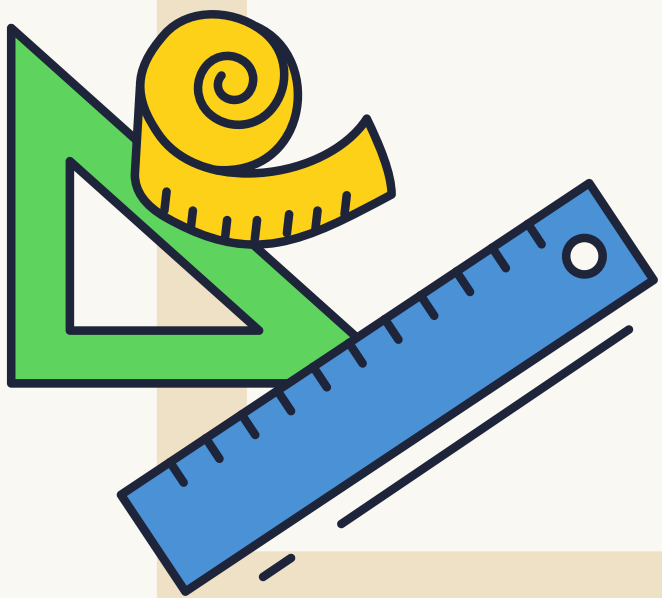


# MEASUREMENT



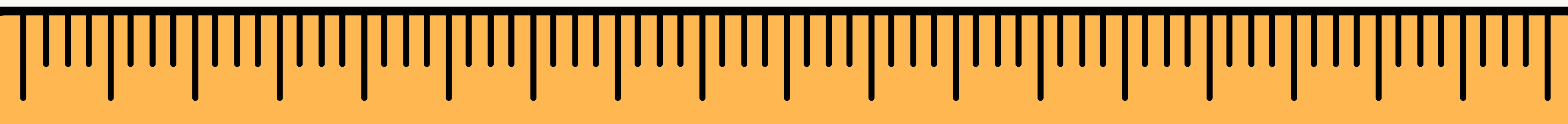
# MEASUREMENT

process of **determining the size,**  
**quantity, or amount of something**  
using a standard unit



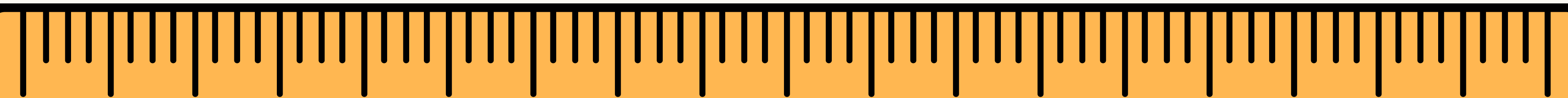
# QUESTION!

How did people in the early days use different devices and units to describe time, length, and mass?



# **EARLY MEASUREMENT**

***In the early days, people used different devices and units to describe time, length, and mass.***

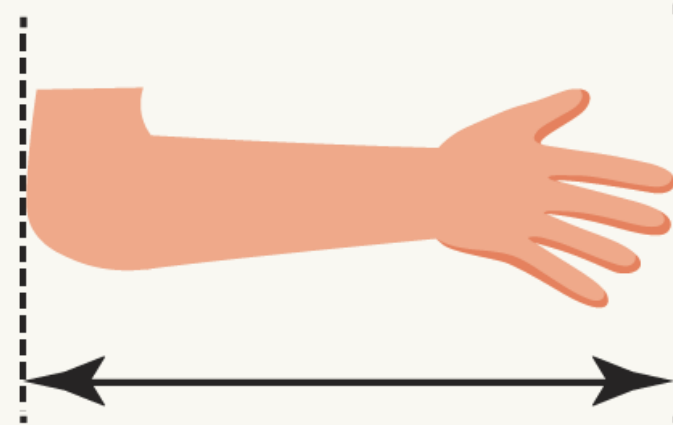


# LENGTH

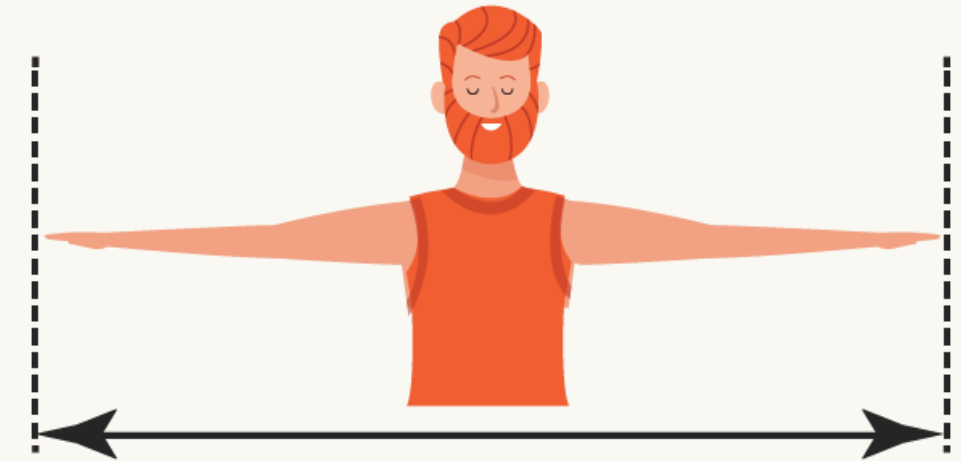
- arm length
- handspan
- palm cubit
- foot



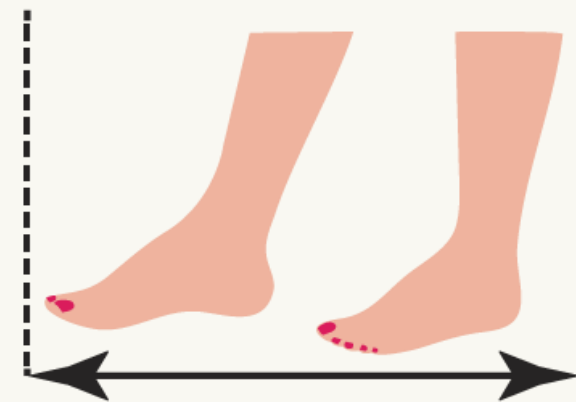
handspan



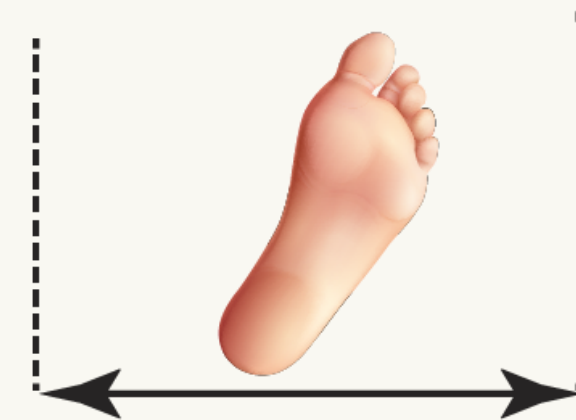
cubit



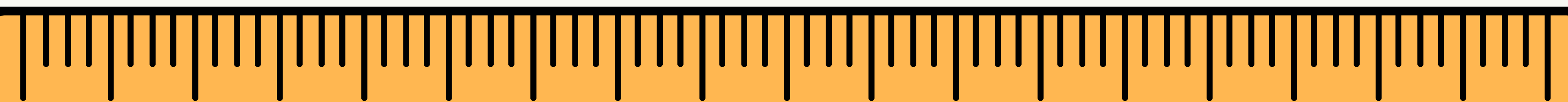
arm span



pace



foot span



# TIME

*moon, star, sun, hourglass, sundial*



# MASS

***balances, scales,  
barley, gold bars***

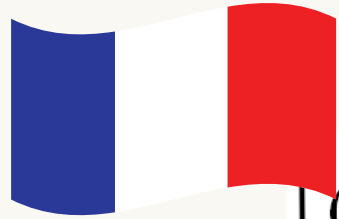


# WHY DO WE NEED A STANDARD?

## TO BE FAIR AND ACCURATE.

**If everyone uses different tools (handspans, pencils), we can never agree on the exact size!**





## Metric

(the rest of the world)



millimeter ~ mm.  
centimeter ~ cm.  
meter ~ m.  
kilometer ~ km.

gram ~ g.  
kilogram ~ kg.

milliliter ~ ml.  
liter ~ L.



## Customary

(U.S. only)

Length

inch ~ in.  
foot ~ ft.  
yard ~ yd.  
mile ~ mi.

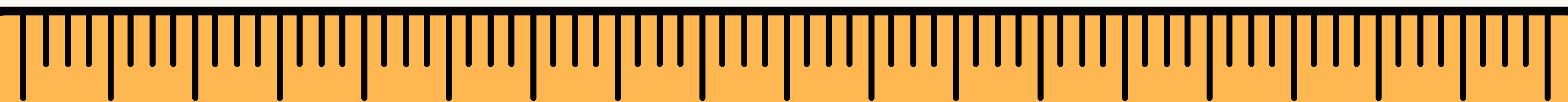
Weight

(dry) ounce ~ oz.  
pound ~ Lb.  
ton ~ T.

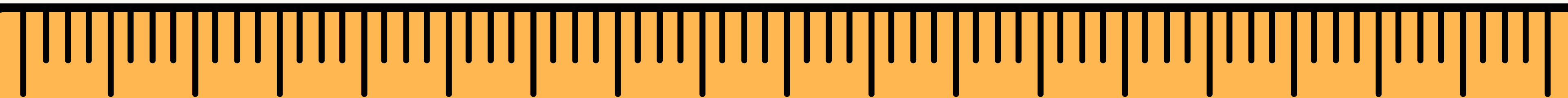
Capacity

(fluid) ounce ~ fl oz.  
cup ~ c.  
pint ~ pt.  
quart ~ qt.  
gallon ~ gal.

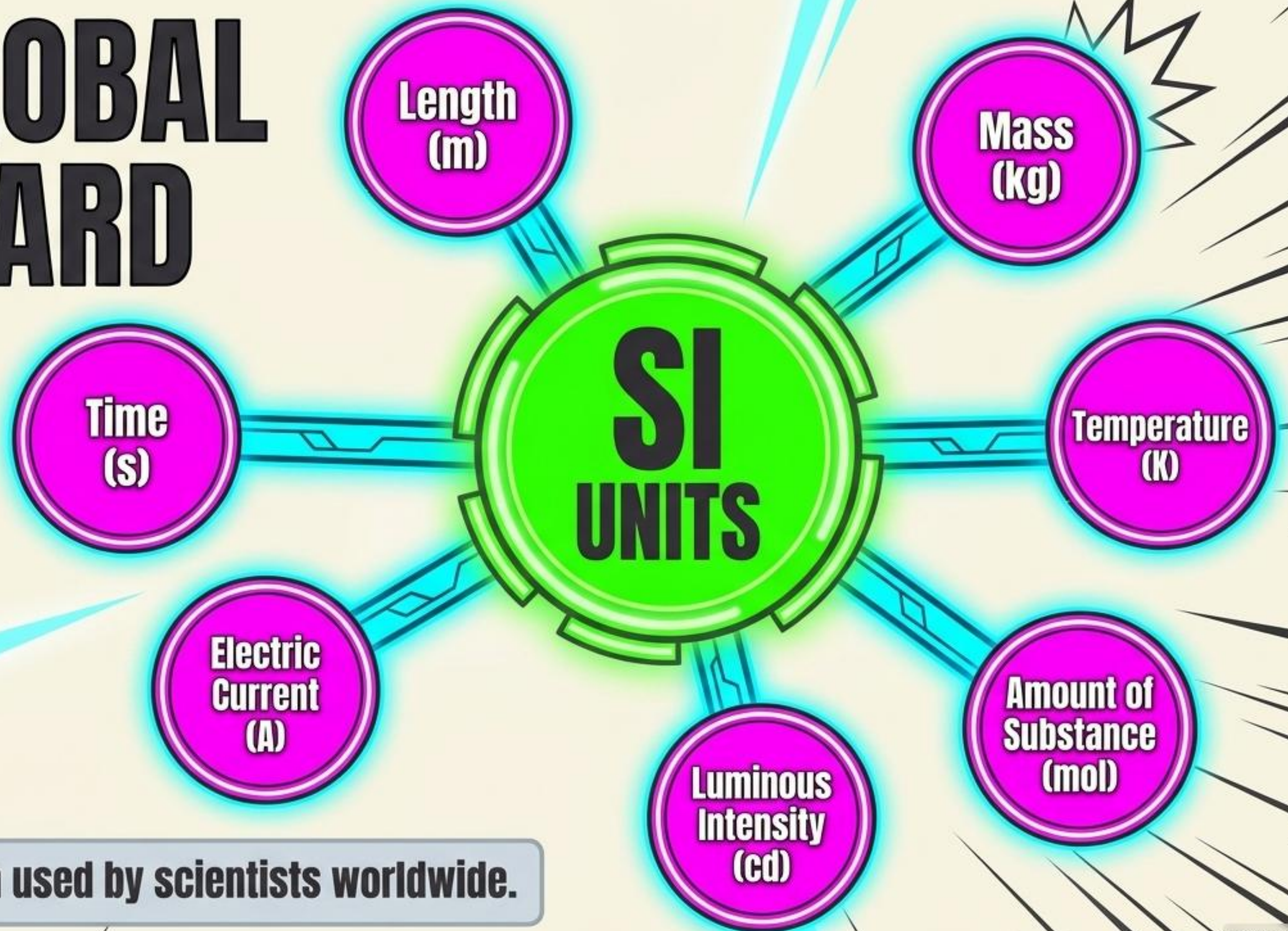
# English system



# INTERNATIONAL SYTEM OF UNITS / SI UNITS



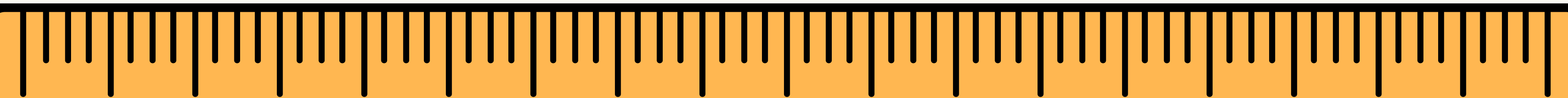
# THE GLOBAL STANDARD



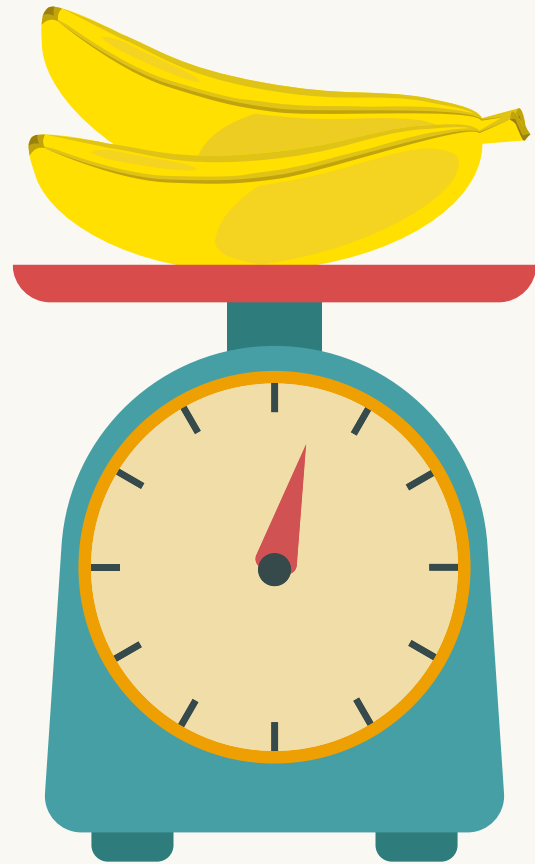
The agreed system used by scientists worldwide.

# 7 STANDARD UNITS

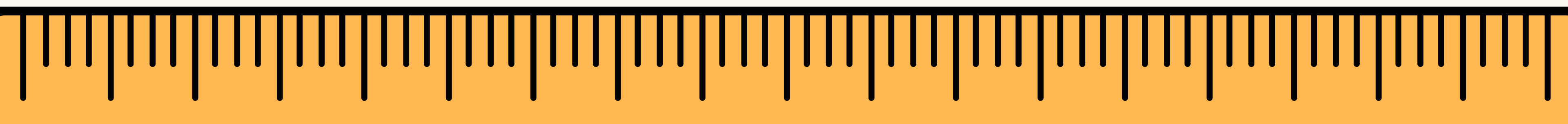
| Physical Quantity   | Name of Unit | Abbreviation |
|---------------------|--------------|--------------|
| Mass                | kilogram     | kg           |
| Length              | meter        | m            |
| Temperature         | kelvin       | K            |
| Amount of substance | mole         | mol          |
| Time                | second       | s            |
| Electric current    | ampere       | A            |
| Luminous intensity  | candela      | cd           |



# MASS

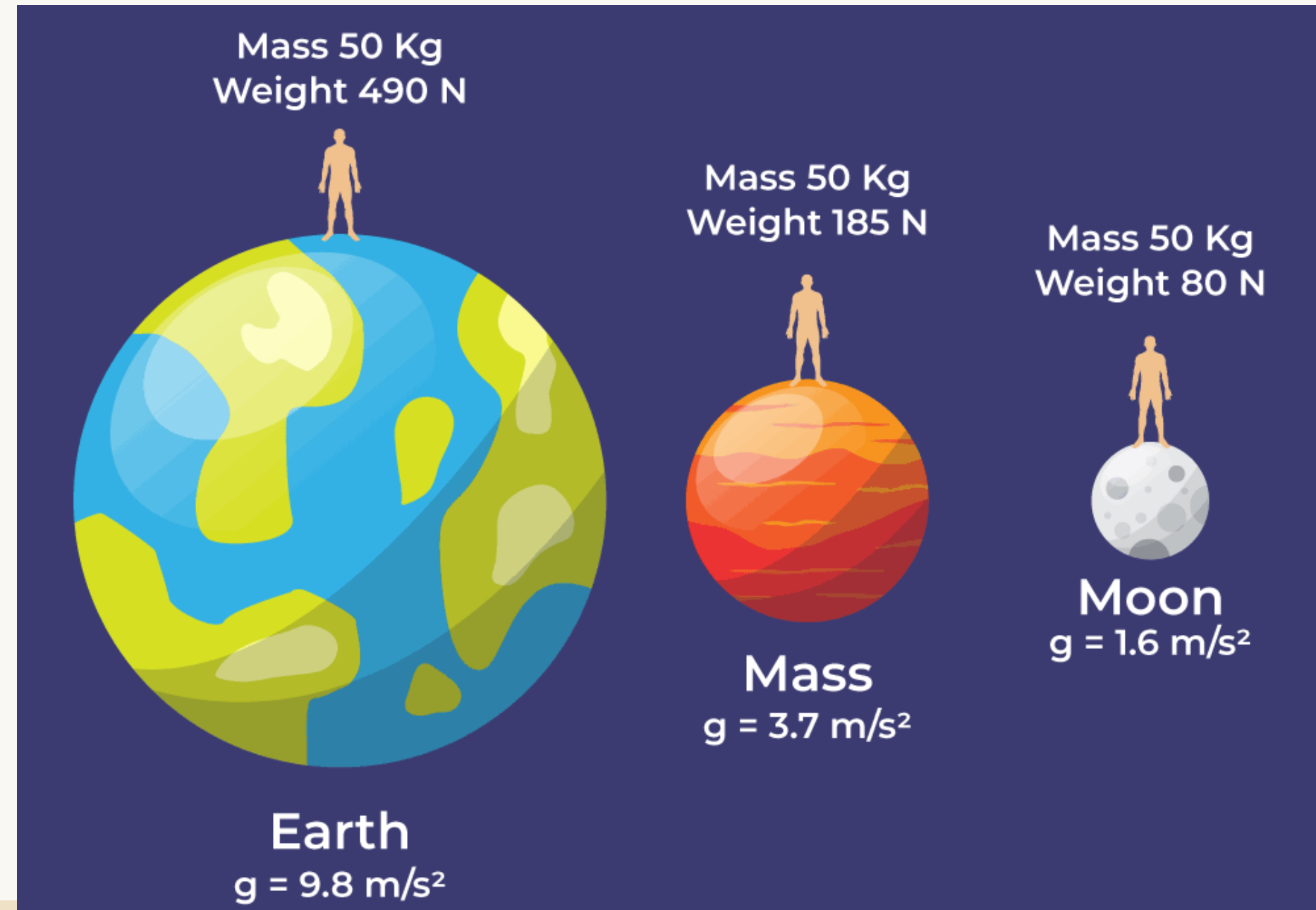


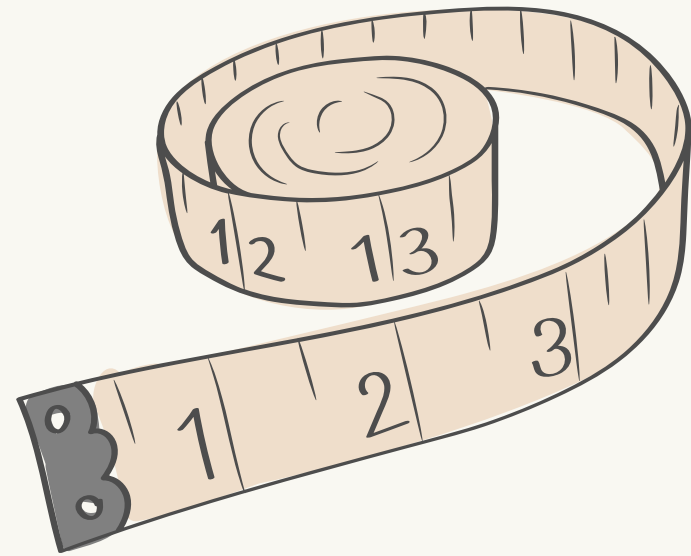
- **quantity of matter** in an object or substance
- **Unit: kilogram (kg)**



# MASS VS WEIGHT

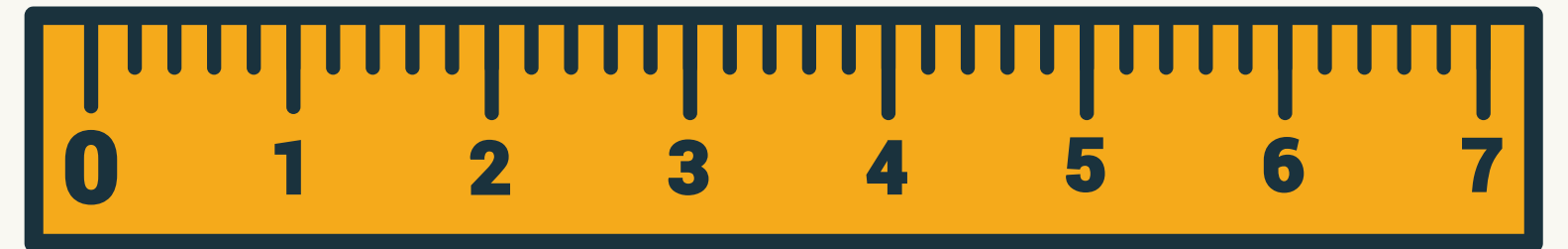
**Weight – force that gravity exerts on an object.**





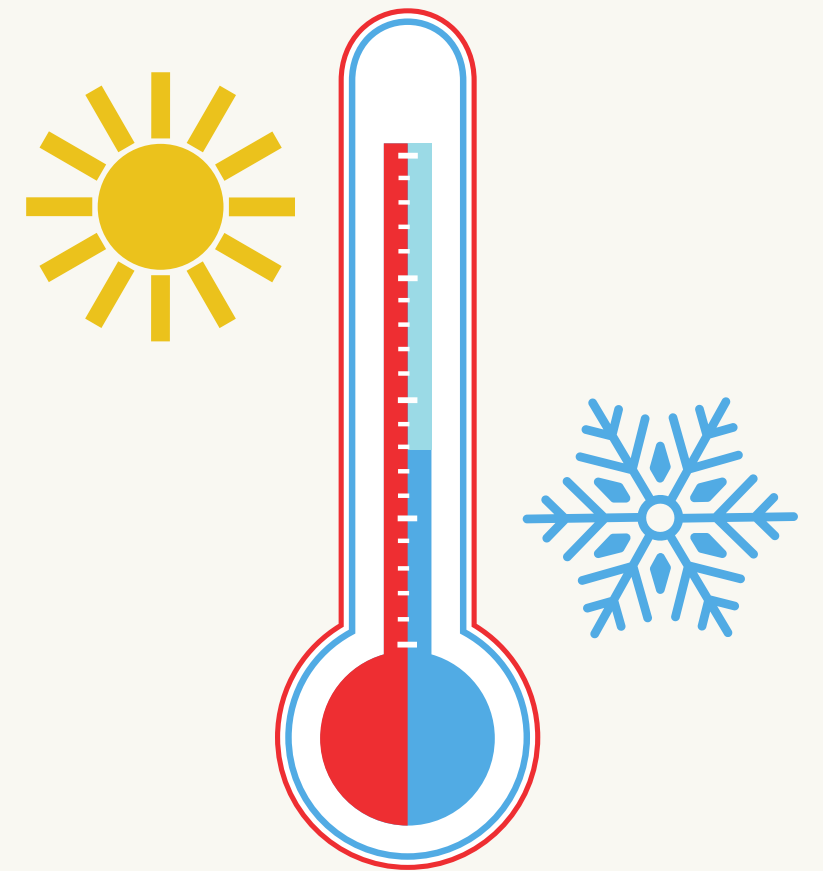
# LENGTH

- measure of **how long an object is** or the **distance between two points**
- SI unit: **meter (m)**



# TEMPERATURE

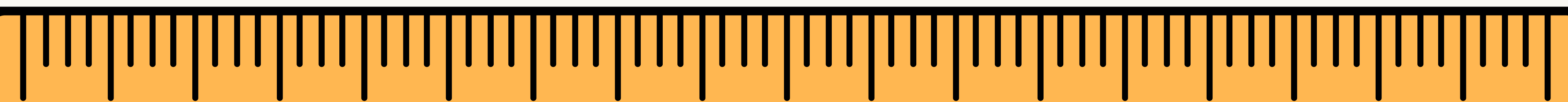
- measures **how hot or cold** something is
- Uses thermometer
- expressed in  $^{\circ}\text{C}$ ,  $^{\circ}\text{F}$ , K
- SI unit: Kelvin (K)





# TIME

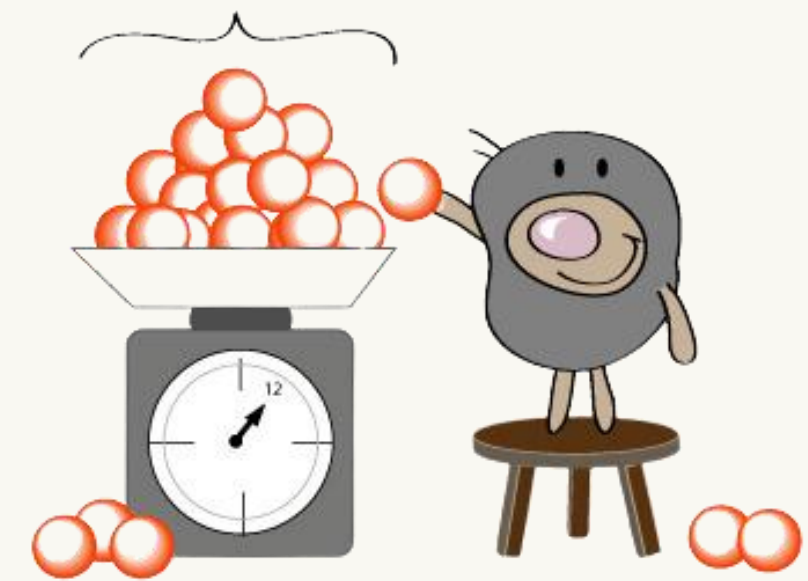
- measures the **duration between events** or the point at which something happens
- Unit: second (s)



# AMOUNT OF SUBSTANCE

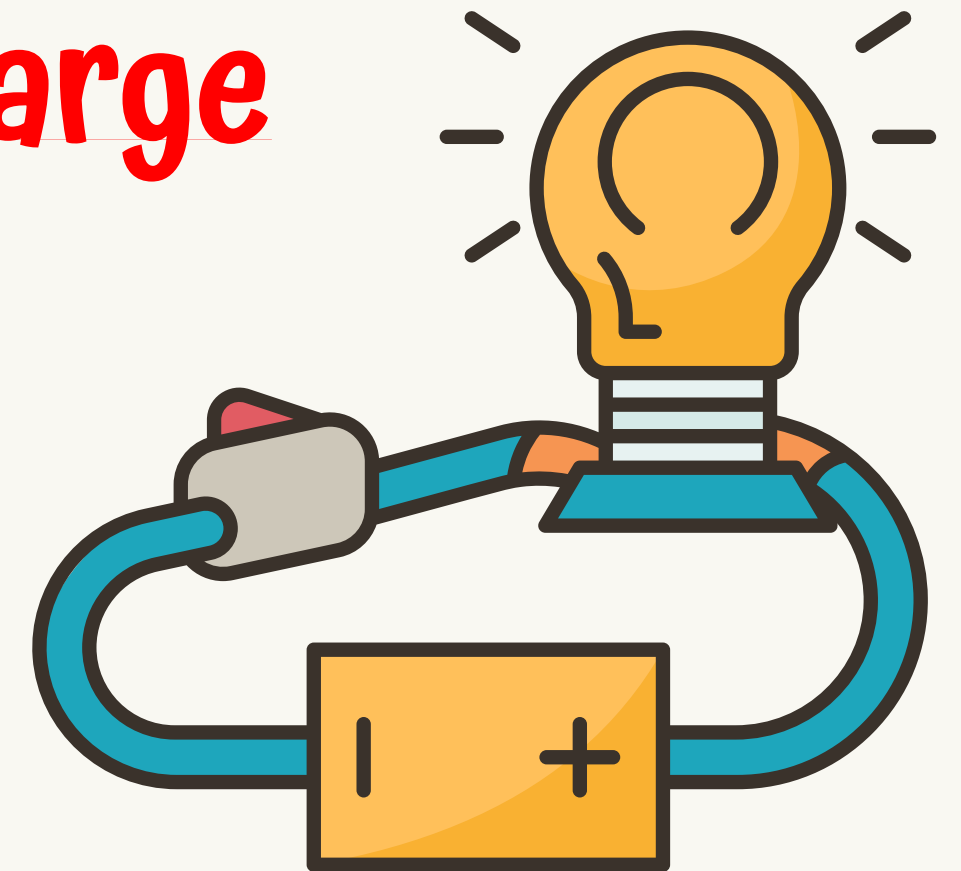
- *measures the quantity of entities (like atoms, molecules, ions) in a sample*
- *SI unit: mole (mol)*

$6.02 \times 10^{23}$  carbon atoms = 12 grams



# ELECTRIC CURRENT

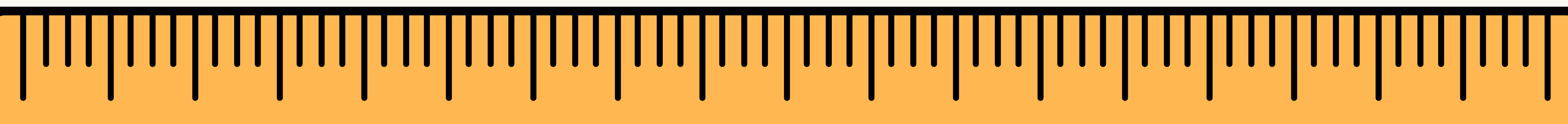
- measures the **flow of electric charge** through a conductor
- SI unit: Ampere (A)





# LUMINOUS INTENSITY

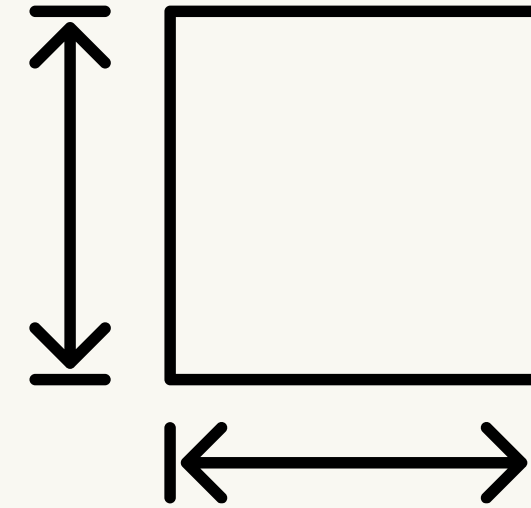
- measures **how much light** is emitted in a specific direction from a light source
- SI unit: candela (cd)



# Other measurements:

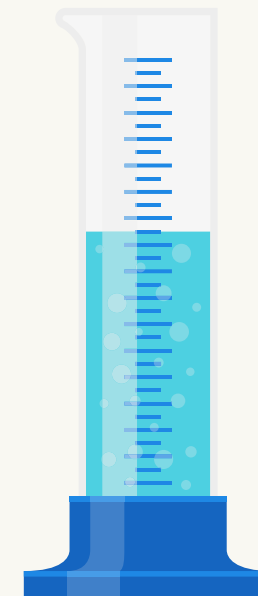
## Area

- **SI Unit: Square Meter ( $\text{m}^2$ )**
- Other Units: Square Kilometer ( $\text{km}^2$ ), Hectare (ha), Acre, Square Foot ( $\text{ft}^2$ )



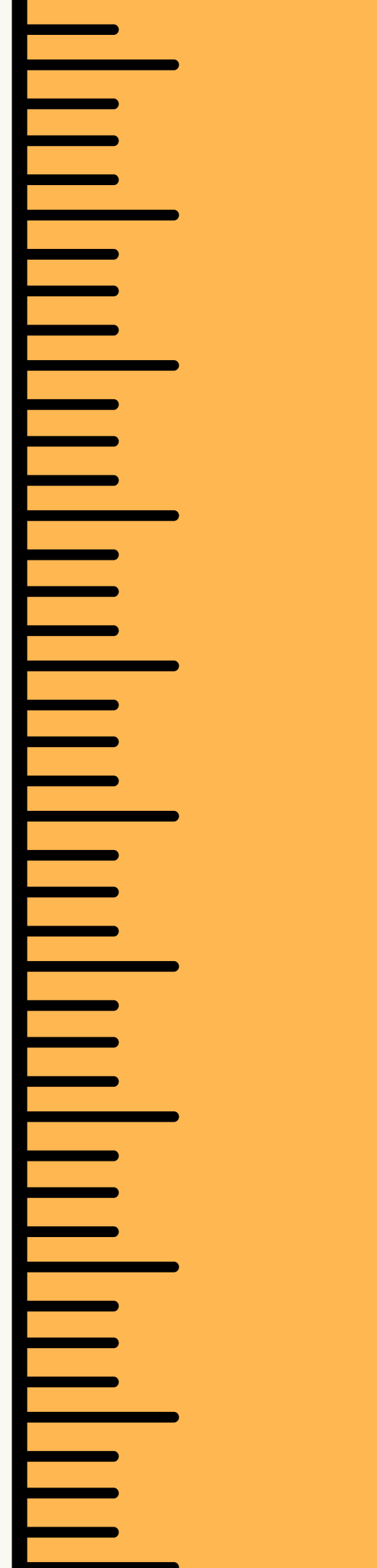
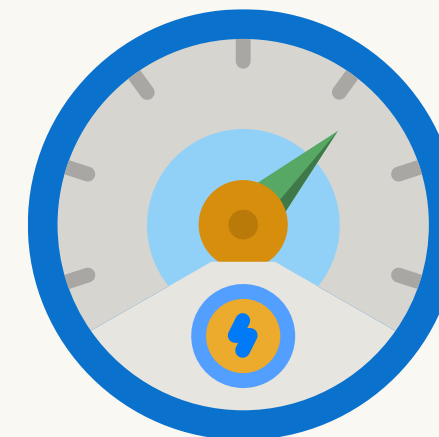
## Volume

- **SI Unit: Cubic Meter ( $\text{m}^3$ )**
- Other Units: Liter (L), Milliliter (mL), Cubic Centimeter ( $\text{cm}^3$ ), Gallon, Pint

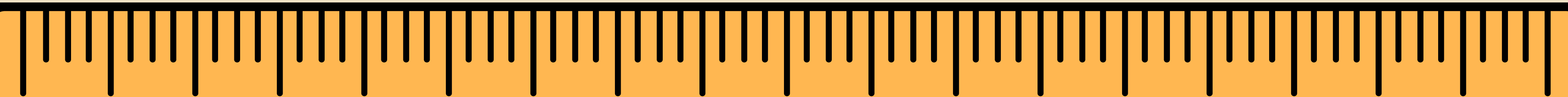


## Speed/Velocity

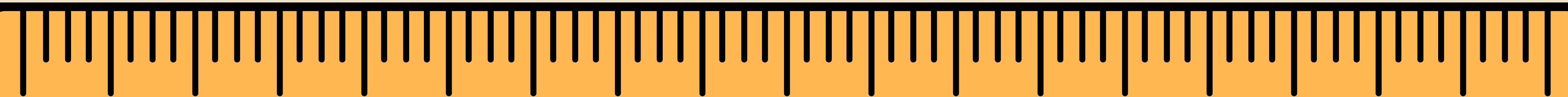
- **SI Unit: Meters per Second ( $\text{m/s}$ )**
- Other Units: Kilometers per Hour ( $\text{km/h}$ ), Miles per Hour (mph)



# CONVERTING UNITS OF MEASUREMENT



# **METRIC SYSTEM/ SI UNIT CONVERSION**



| Common Prefixes used with SI Units |           |               |                    |
|------------------------------------|-----------|---------------|--------------------|
| Prefix                             | Symbol    | Meaning       | Order of Magnitude |
| <i>giga-</i>                       | G         | 1 000 000 000 | $10^9$             |
| <i>mega-</i>                       | M         | 1 000 000     | $10^6$             |
| <i>kilo-</i>                       | k         | 1 000         | $10^3$             |
| <i>hecto-</i>                      | h         | 100           | $10^2$             |
| <i>deka-</i>                       | da        | 10            | $10^1$             |
|                                    | base unit | 1             | $10^0$             |
| <i>deci-</i>                       | d         | 0.1           | $10^{-1}$          |
| <i>centi-</i>                      | c         | 0.01          | $10^{-2}$          |
| <i>milli-</i>                      | m         | 0.001         | $10^{-3}$          |
| <i>micro-</i>                      | μ         | 0.000 001     | $10^{-6}$          |
| <i>nano-</i>                       | n         | 0.000 000 001 | $10^{-9}$          |

# METRIC SYSTEM CONVERSION

Miguel is measuring a garden bed that is **250 centimeters** long. He needs to write the length in **meters** for his science project.

**Answer: 2.5 m**



# METRIC SYSTEM CONVERSION

Joshua biked **3.7 kilometers** to school. He wants to write his distance in **meters** for his PE logbook.

**Answer: 3,700 m**



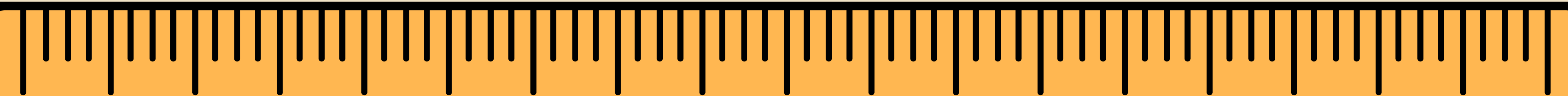
# METRIC SYSTEM CONVERSION

Lara is baking cookies. The recipe says she needs **8000 milligrams** of sugar. She wants to change that to **grams**.

**Answer: 8 g**

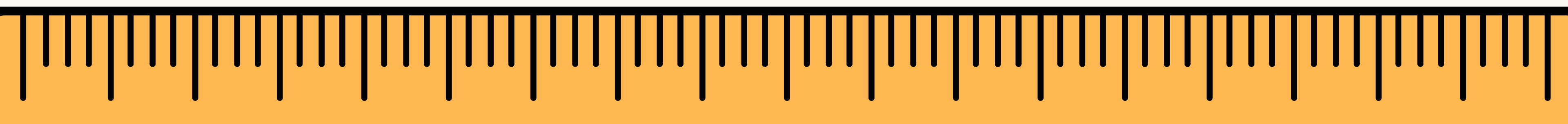


# **ENGLISH SYSTEM CONVERSION**



# CONVERSION FACTOR

a mathematical number or ratio used to change a measurement from one unit of measurement to another without altering its actual value



# CONVERSION FACTOR

a standard equivalence of two units

Ex:  $1 \text{ kg} = 1,000 \text{ g}$



# ENGLISH SYSTEM

## CONVERSION FACTOR

### Length

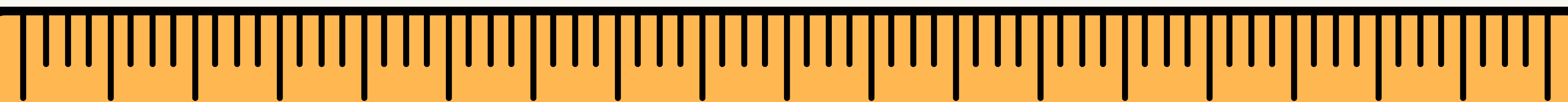
1 in. = 2.54 cm  
1 m = 39.37 in.  
1 mi = 1.609 km  
1 ft = 12 in.  
1 yard = 3 ft  
1 mi = 5280 ft

### Mass

1 oz = 28.35 g  
1 lb = 453.6 g  
1 kg = 2.205 lb  
1 g = 15.43 grains

### Volume

1 qt = 0.946 L  
1 gal = 3.785 L  
1 L = 33.81 fl oz  
1 fl oz = 29.57 mL  
1 L = 1.057 qt



# ENGLISH SYSTEM CONVERSION

Ella ran **2 miles** during PE class. She wants to know how many **feet** that is.

Conversion factor:

$$1 \text{ mi} = 5280 \text{ ft}$$

**Answer: 10,560 ft**



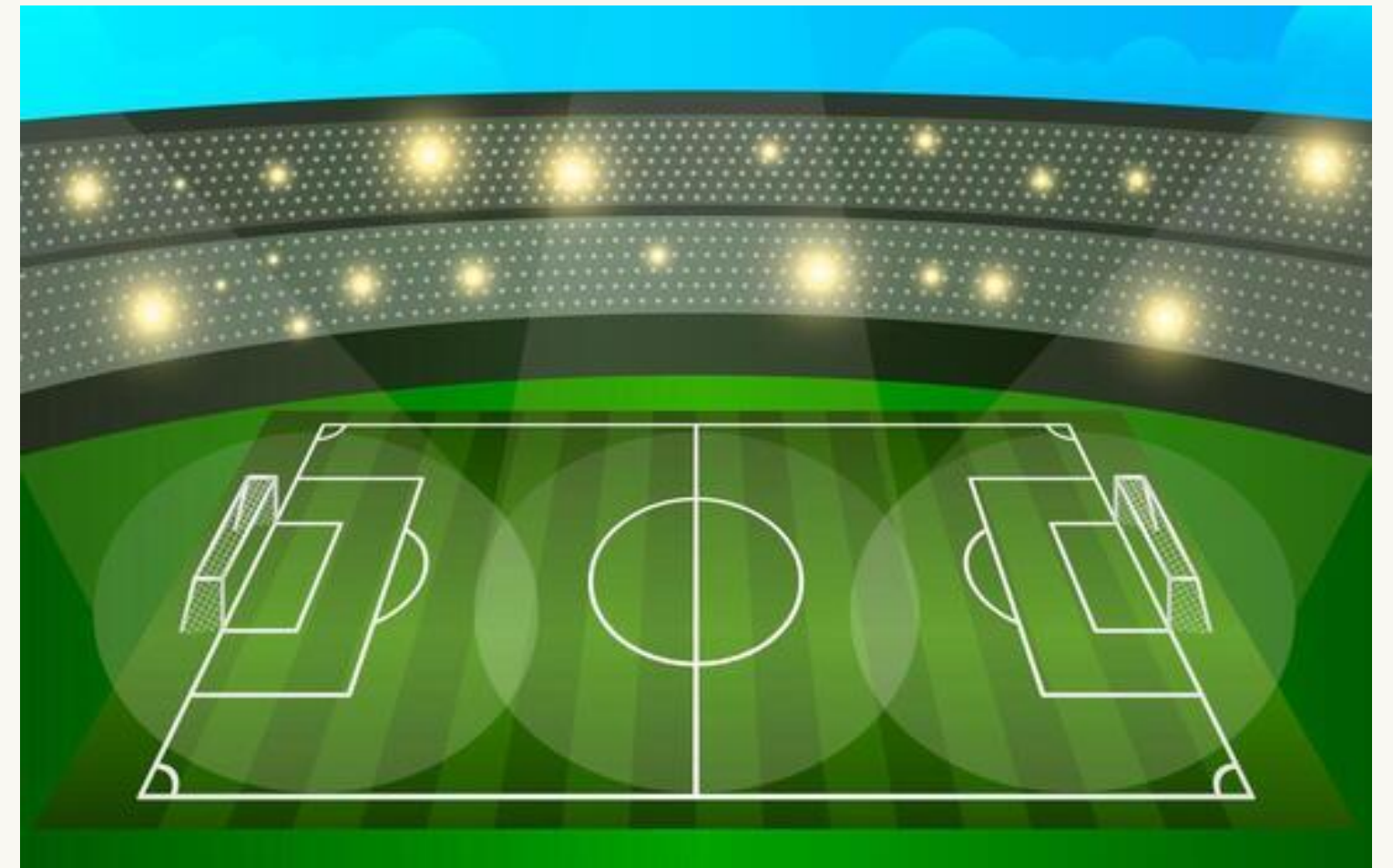
# ENGLISH SYSTEM CONVERSION

Elsa is measuring the school football field. It's **55 yards** long.  
How many **feet** is that?

Conversion factor:

$$1 \text{ yd} = 3 \text{ ft}$$

**Answer: 165 ft**



# ENGLISH SYSTEM CONVERSION

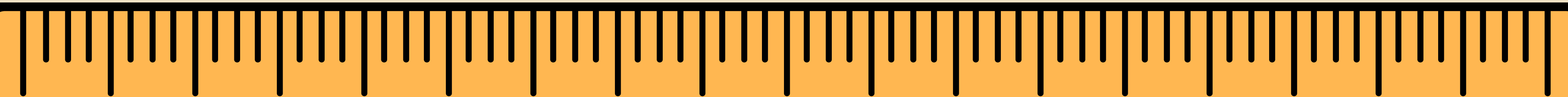
You are making a lemonade for a picnic, and the recipe calls for 32 fluid ounces of water. You only have a measuring cup in your home. Convert 32 fl. oz. to c.

Conversion factor:  $1\text{ c} = 8\text{ fl. oz.}$

**Answer: 4 cups (c)**



# ENGLISH to METRIC SYSTEM CONVERSION

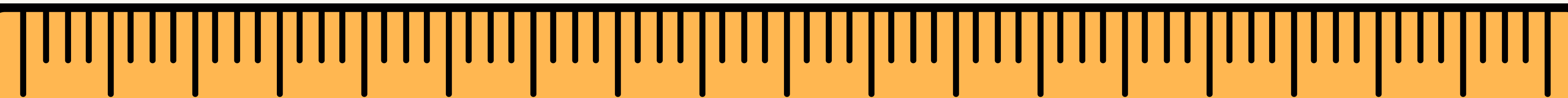


# ENGLISH to METRIC CONVERSION

Carlo is measuring a small box that is **15 inches** long. He wants to know its length in **centimeters**.

Conversion factor:  $1 \text{ in} = 2.54 \text{ cm}$

**Answer: 38.1 cm**



# ENGLISH to METRIC CONVERSION

While shopping, you find a basket of strawberries that weighs **5.5 pounds**. Since you're more familiar with the metric system, you want to convert the weight to **kilograms**.

Conversion factor:  $1 \text{ kg} = 2.20 \text{ lbs}$

**Answer: 2.5 lbs**



# ENGLISH to METRIC CONVERSION

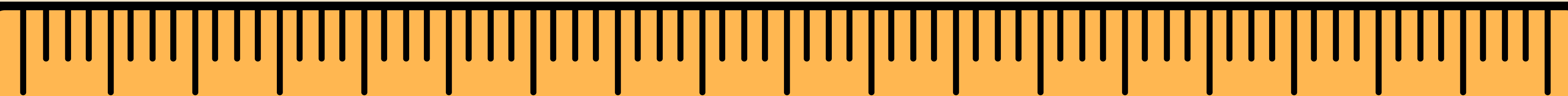
You've bought a bottle of iced tea at a local store, and the label shows **20 fl oz**. You need to know how many milliliters this is. Convert 20 fluid ounces to **milliliters**.

Conversion factor:  $1 \text{ fl oz} = 29.57 \text{ mL}$

**Answer: 591.4 mL**



# TIME CONVERSION



# Time Conversion

Maria walks to school for 25 minutes every morning. How many seconds does she spend walking?

Conversion factor:  $1 \text{ min} = 60 \text{ s}$

**Answer: 1,500 s**



# Time Conversion

An online science class lasts 7,200 seconds. How many hours is the class?

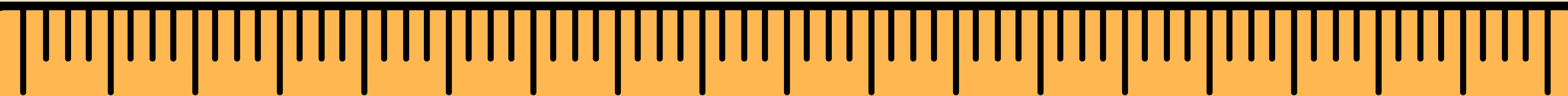
Conversion factor:

$$1 \text{ hr} = 3,600 \text{ s}$$

**Answer: 2 hr**



# TEMPERATURE CONVERSION



# TEMPERATURE CONVERSION FORMULAS

Fahrenheit  
to Celcius

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

Celcius to  
Fahrenheit

$$^{\circ}\text{F} = \left(\frac{9}{5} \times ^{\circ}\text{C}\right) + 32$$

Celsius to kelvin

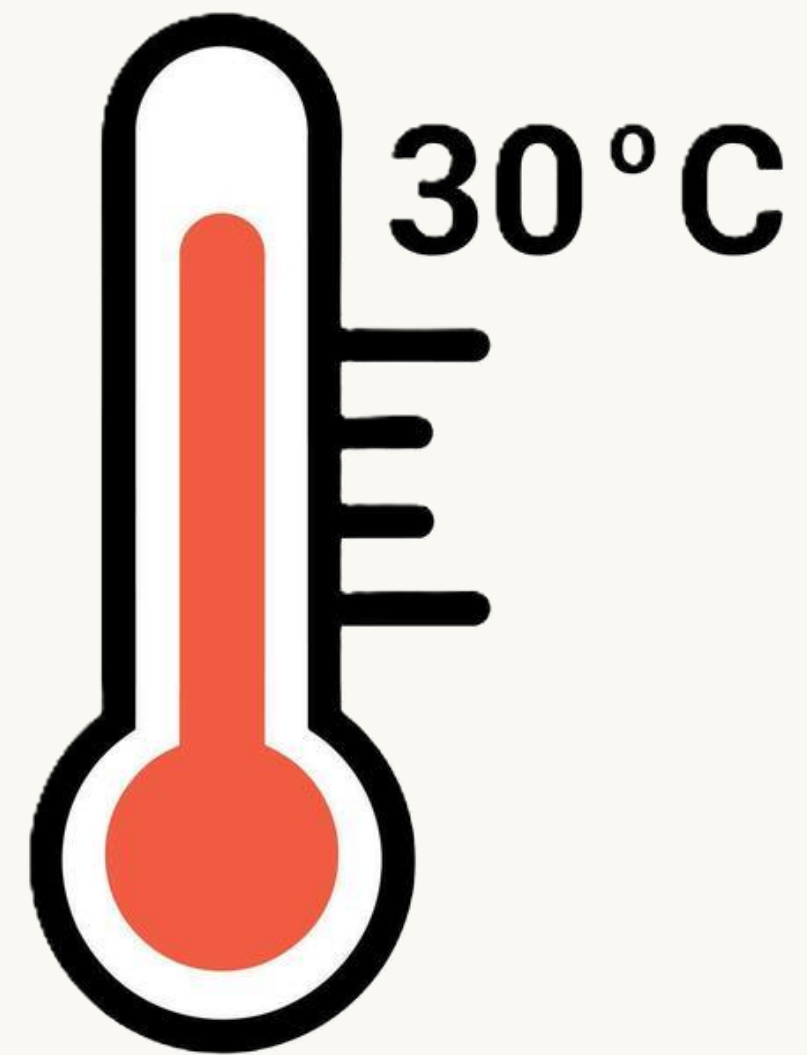
$$\text{K} = ^{\circ}\text{C} + 273.15$$

Kelvin to Celsius

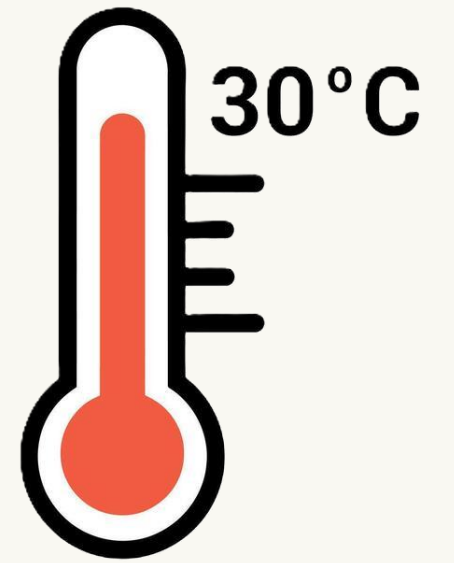
$$^{\circ}\text{C} = \text{K} - 273.15$$

# Temperature Conversion

The weather forecast says the temperature is  $30^{\circ}\text{C}$ . What is the temperature in Fahrenheit?



# Temperature Conversion



The weather forecast says the temperature is 30°C. What is the temperature in Fahrenheit?

Celsius to Fahrenheit

$$^{\circ}\text{F} = \left(\frac{9}{5} \times ^{\circ}\text{C}\right) + 32$$

Solution:

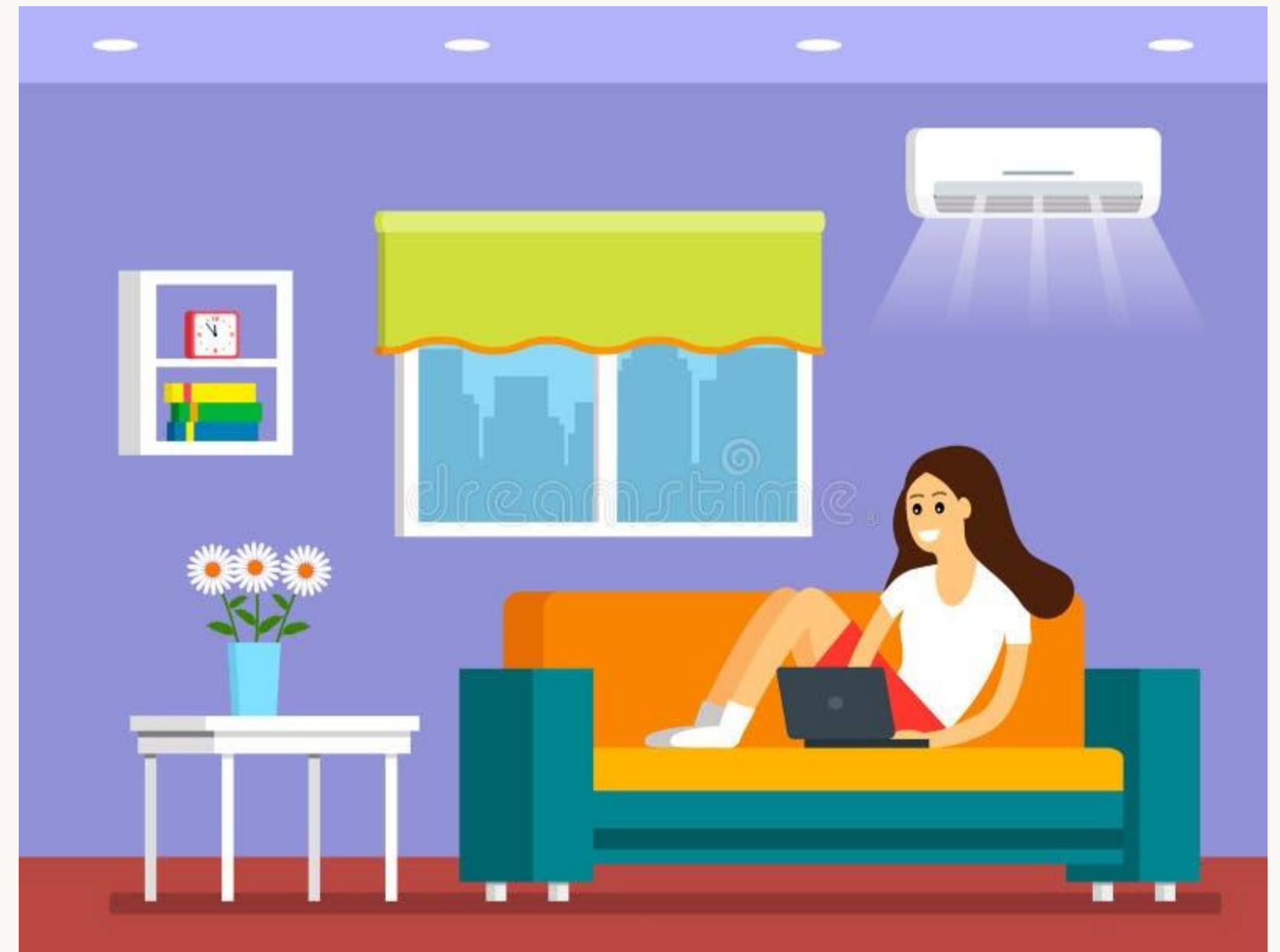
$$^{\circ}\text{F} = (30 \times 9/5) + 32$$

$$^{\circ}\text{F} = 54 + 32$$

**Answer: 86°F**

# Temperature Conversion

An air conditioner is set to  $68^{\circ}\text{F}$ . What is the temperature in Celsius?



# Temperature Conversion

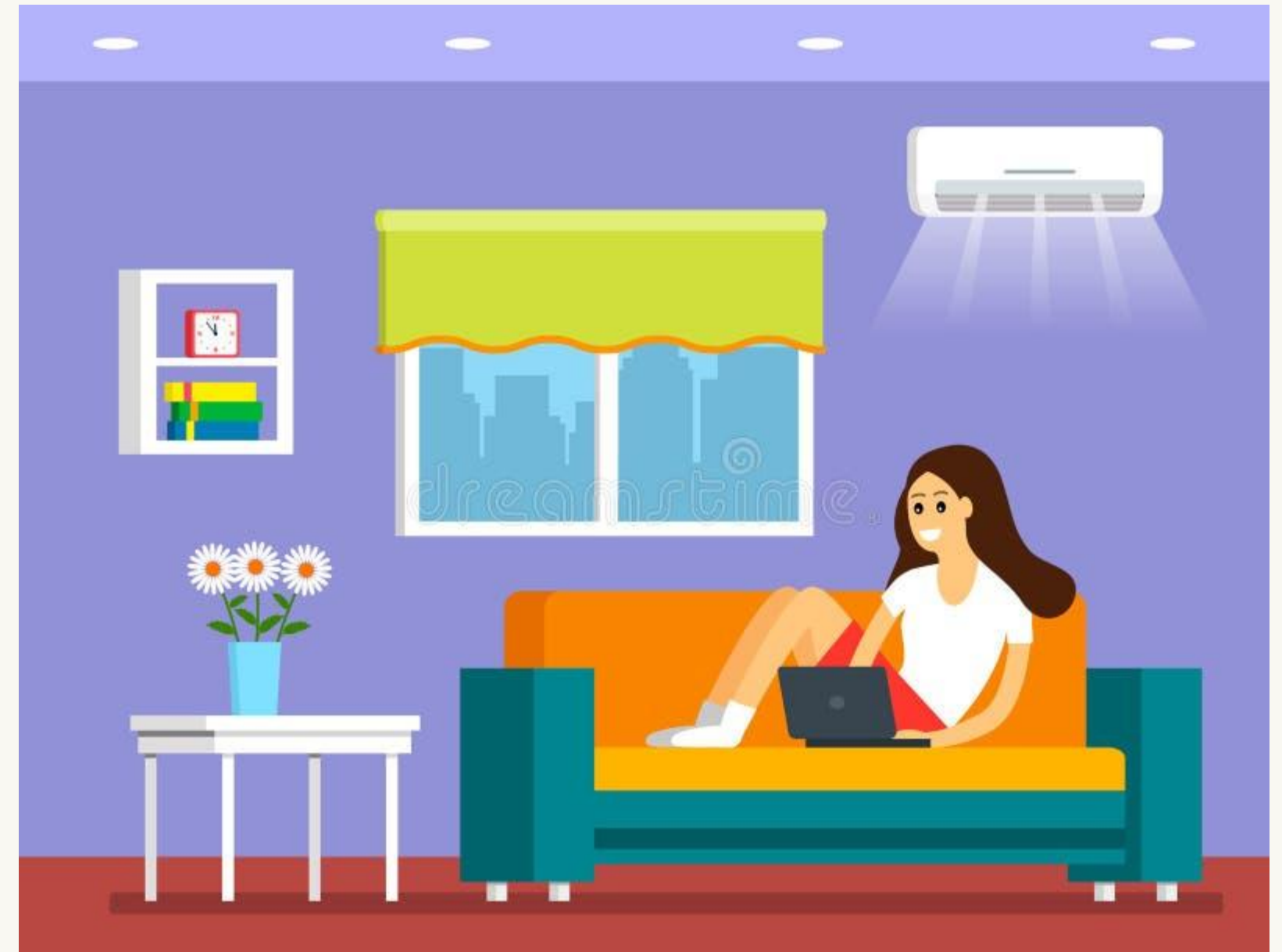
An air conditioner is set to 68°F. What is the temperature in Celsius?

Solution:

$$^{\circ}\text{C} = (68 - 32) \times 5/9$$

$$^{\circ}\text{C} = 36 \times 5/9$$

**Answer: 20°C**



# Temperature Conversion

A substance is heated to  $50^{\circ}\text{C}$ .  
What is its temperature in Kelvin?



# Temperature Conversion

A substance is heated to  $50^{\circ}\text{C}$ .  
What is its temperature in Kelvin?

Solution:

$$K = 50 + 273.15$$

**Answer:  $323.15\text{ K}$**



# Temperature Conversion

Liquid nitrogen has a temperature of 77 K. What is its temperature in Celsius?



# Temperature Conversion

Liquid nitrogen has a temperature of 77 K. What is its temperature in Celsius?

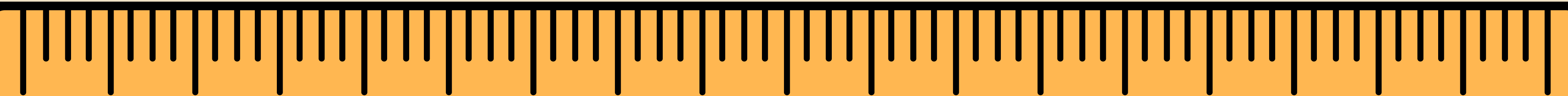
Solution:

$$^{\circ}\text{C} = 77 - 273.15$$

**Answer:  $-196.15^{\circ}\text{C}$**



# Measuring Using Measurement Tools

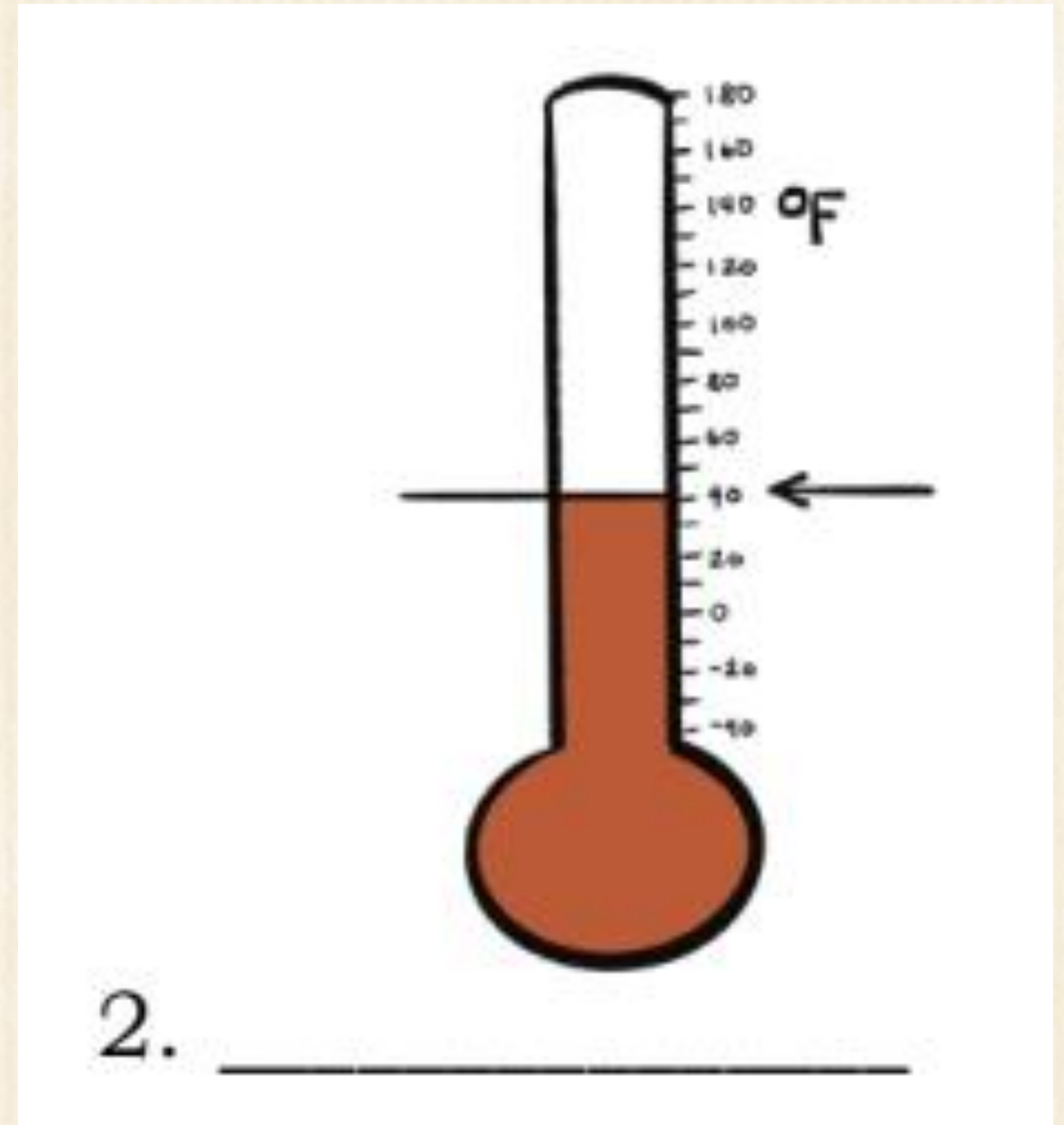


Identify the measurement of each of the following substances/material.

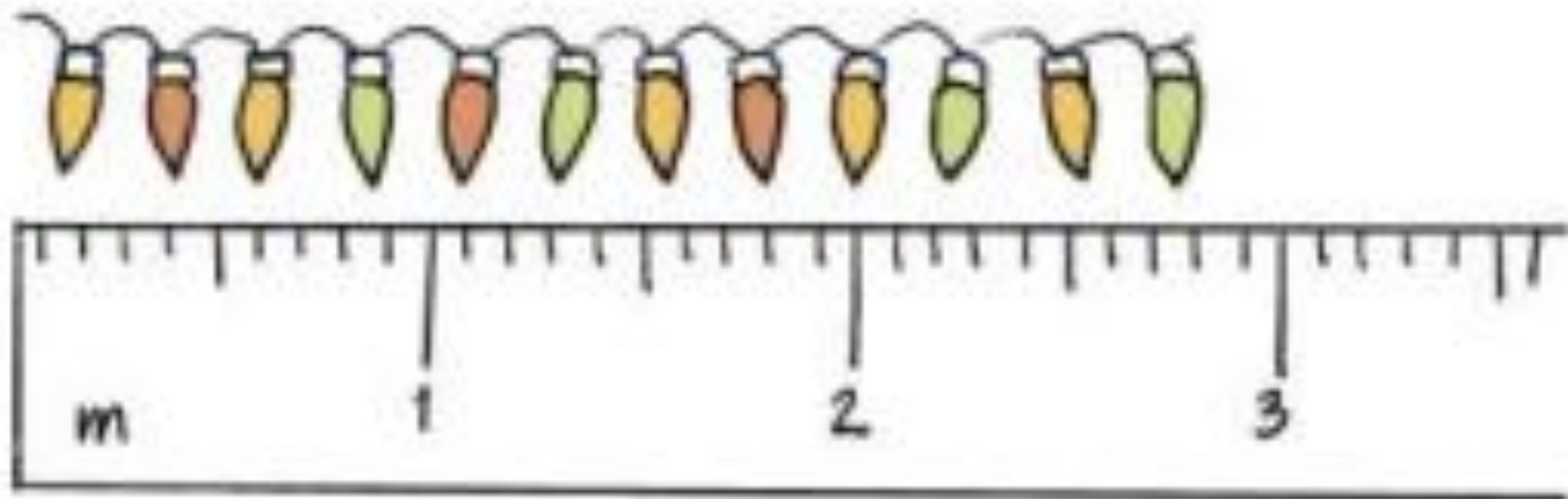


1. \_\_\_\_\_

Identify the measurement of each of the following substances/material.

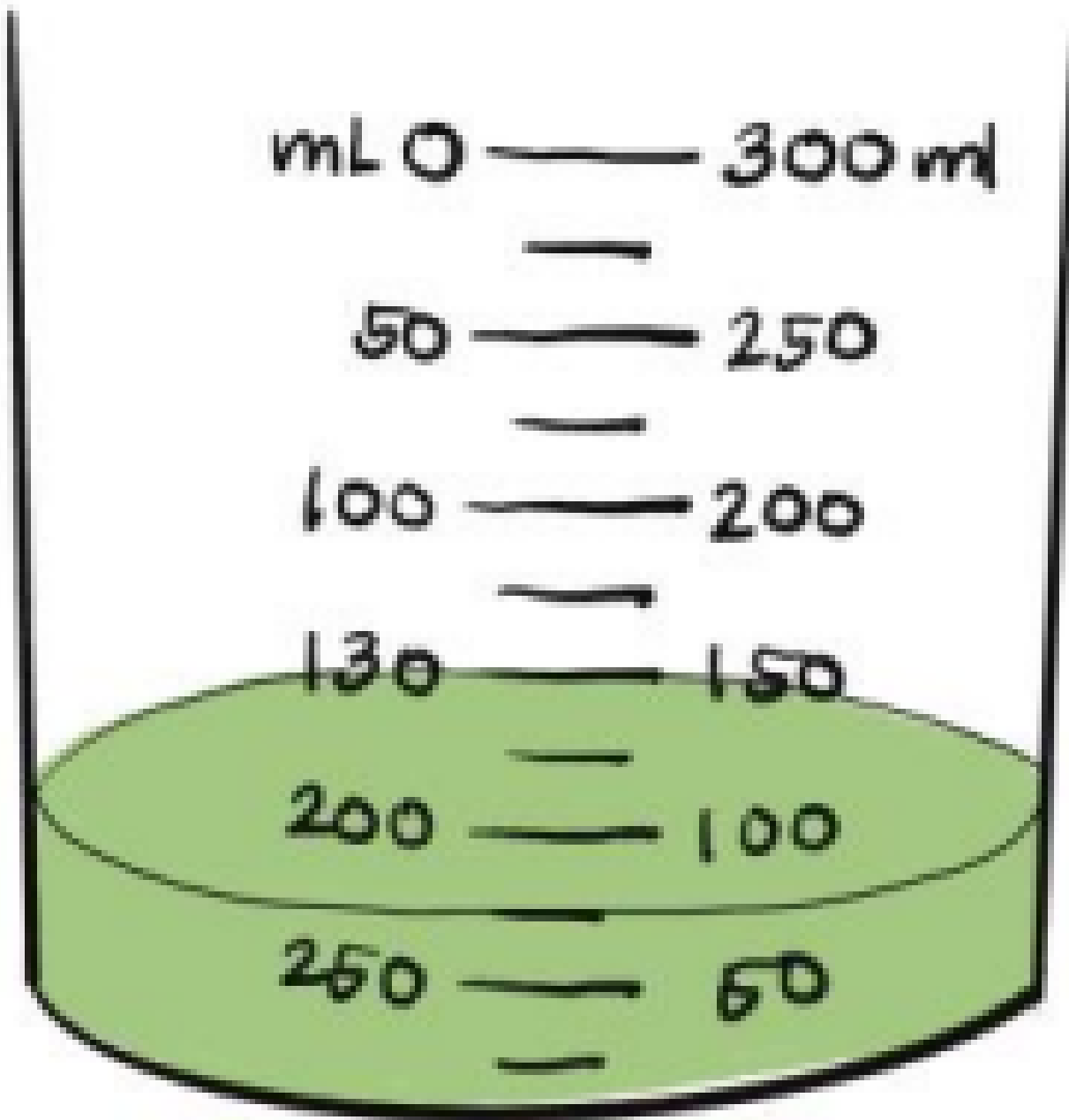


Identify the measurement of each of the following substances/material.



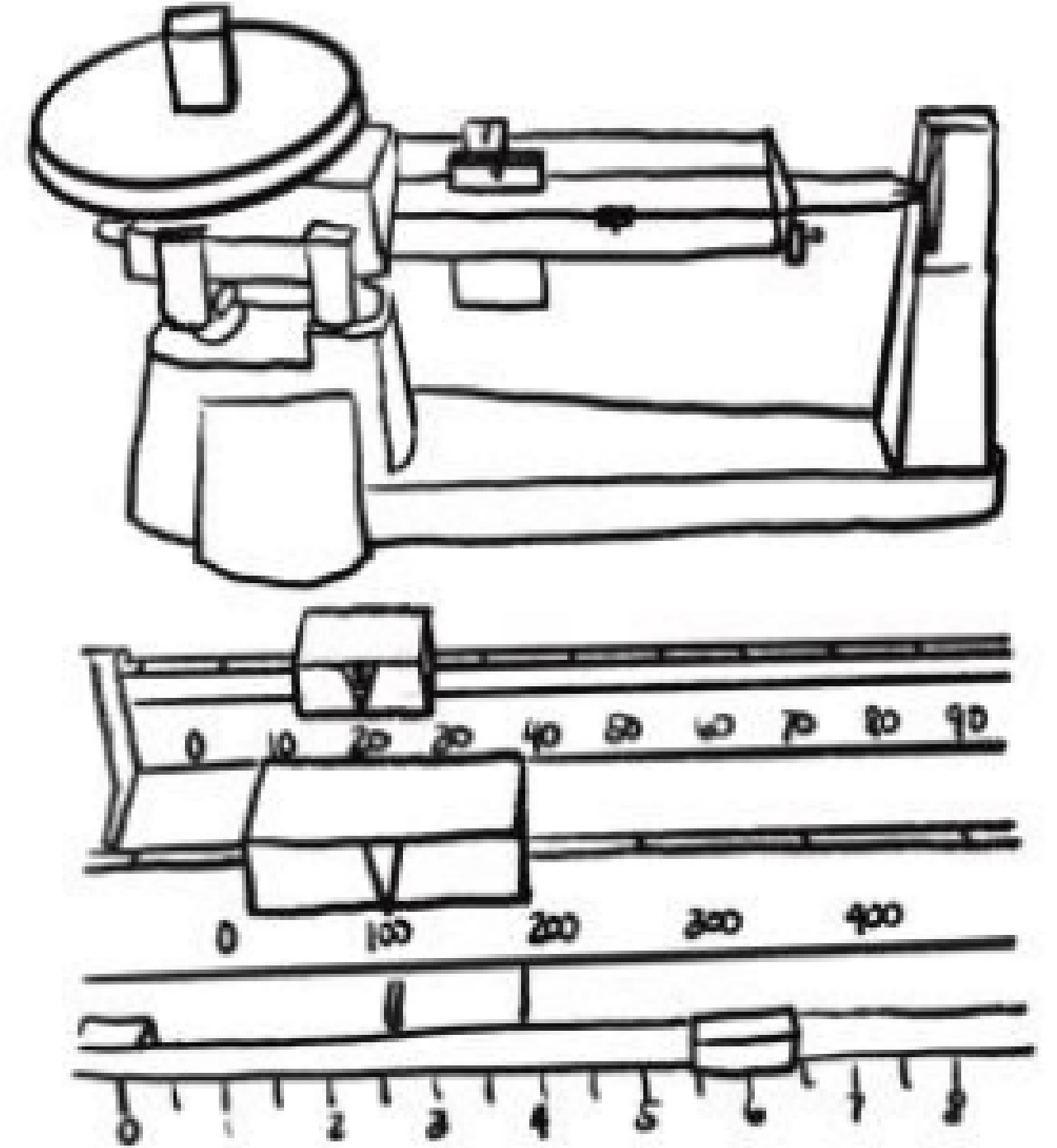
3. \_\_\_\_\_

Identify the measurement of each of the following substances/material.



4. \_\_\_\_\_

Identify the measurement of each of the following substances/material.



5. \_\_\_\_\_

# THANK YOU!

*Ms. Pia Catana*

