G2-G3 Basic

G4-G5 Advanced

Helping With Math

GRADES

Measuring Skill:
The International System of Units

Suitable for students
aged 6-10

This pack is suitable for learners aged 6-10 years old or 2nd to 5th grades. The content covers fact files and relevant basic and advanced activities of (insert math topics) topics that aim to develop and strengthen the learners' measuring skills.

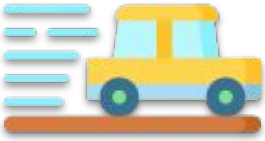
Also known as Three Kings' Day, **Epiphany** is one of the oldest holidays of the Christian church alongside Easter and Christmas. This day celebrates how the Magi or three wise men came to find baby Jesus, Jesus' baptism, and Jesus' first miracle.

It is usually celebrated twelve days after Christmas on **January 6** by Roman Catholics, Protestants, Lutherans, Anglicans, and other Western churches. The Eastern Orthodox celebrate this on January 19 as they consider January 7 as their Christmas Day.

MEASUREMENT

What is measurement?

We use measurement to determine a quantitative value for the physical properties of objects like time, weight, height, temperature, length, speed, or capacity. There are measurement tools, formulas, and units of measurement used to figure out the measurement for each property.

Examples	
	
Physical Property Height Measuring Tool Stadiometer Units of Measurement: Feet / Inches / Centimeters	Physical Property Speed Measuring Tool Speedometer Units of Measurement: mph / kph

Measurement enables us to find out and understand the size or amount of the things around us. With this information, we can compare objects, gauge how many of the objects we need to use, and learn more about a situation and our surroundings to help us make informed decisions and resolve problems.

MEASURING SKILL

Measuring skills are knowing how to measure the physical qualities of objects using measurement tools and measurement techniques.

We use our measuring skills not only in academia but also in many aspects of our everyday lives. Therefore, it is crucial to learn and develop them.

Uses of our measuring skills

Before going to sleep, we set the alarm to make sure that we wake up at a certain time. By doing this, we measure the time of how much sleep we need and count the hours, minutes, or seconds until waking up.

When it is too hot or cold in our homes, we read the thermometer and adjust the thermostat to achieve a cozy temperature.

We cook or bake delicious meals by having the measurements of the right ingredients using weighing scales and measuring cups.

These are just some examples of how we utilize our measuring skills in our day-to-day tasks.

THE INTERNATIONAL SYSTEM OF UNITS

The **International System of Units**, or abbreviated as **SI** *(**S**ystème **I**nternational d'unités)* its French translation, are seven basic units of measurement used worldwide. The General Conferences on Weights and Measures (CGPM) established this system in 1960 and continues to develop it by reexamining the definition of some of the base units.

The **SI System** is a standardized system of measurement utilized in the fields of science and technology. It helps scientists and researchers from all over the world to collaborate easily with one another.

These are the seven basic units of the SI System:

Quantity Name	Unit Name	Unit Symbol
Time	second	s or sec
Length	meter	m
Mass	kilogram	kg
Electric Current	ampere	A
Temperature	kelvin	K
Amount	mole	mol
Luminous Intensity	candela	cd

THE INTERNATIONAL SYSTEM OF UNITS

SI Derived Units

- When base units are combined in equations to come up with the quantitative value of other physical properties, these are called SI-derived units. Many of these SI-derived units are assigned unique names.

  Some examples of physical properties derived from combined SI base units are area and volume.

  - An area of a rectangle is the product of length and width.

    Length x Width = Area of a rectangle

  - Volume is the product of length, width, and height.

    Length x Width x Height = Volume of a rectangle

- Another type of SI-derived unit is basic units with prefixes to indicate multiple quantities. This is mostly applicable to the base units, which originated from the metric system.

  - The prefix *centi-* means one hundredth. When combined with meter means one-hundredth of a meter.

    1 meter = 100 centimeters

  - Or the prefix *milli-* means thousandth. When combined with second, millisecond means a thousandth of a second.

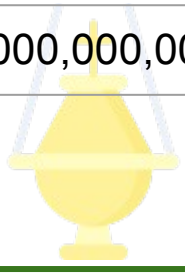
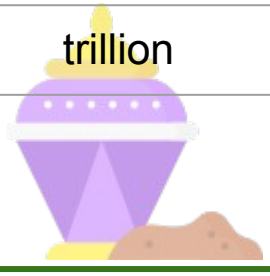
    1 second = .001 milliseconds

THE INTERNATIONAL SYSTEM OF UNITS

SI Prefixes

These are used to indicate multiples of a unit. In the SI base units, these are applicable to the units derived from the Metric System like meter (length), gram (mass), and second (time).

Prefix	Notation	Place Value
pico-	0.000000000001	trillionth
nano-	0.000000001	billionth
micro-	0.000001	millionth
milli-	0.001	thousandth
centi-	0.01	hundredth
deci-	0.1	tenth
-	1	-
deca-	10	ten
hecta-	100	hundred
kilo-	1,000	thousand
mega-	1,000,000	million
giga-	1,000,000,000	billion
tera-	1,000,0000,000,000	trillion

THE INTERNATIONAL SYSTEM OF UNITS

SI Prefixes
Conversion Between Metric Units

For SI units, which were derived from the Metric system: meter (length), kilogram (mass), and second (time), these values can be converted to other metric units.

- If you are **converting a larger unit to a smaller unit,** use the prefix value of the larger unit and **multiply** it by the number value of the larger unit.

  Example: *Kilometers to Meters: Convert 2.5 km to m.*

  ➢ The prefix kilo- means 1000.
  Therefore, we multiply 2.5 by 1000.
  ➢ 1000 x 2.5 = 2000 meters
  ➢ 2.5 kilometers = 2500 meters

- If you are **converting a smaller unit to a larger unit,** use the prefix value of the larger unit and **divide** the number value of the smaller unit by it.

  Example: *Meters to Kilometers: Convert 2500 m to km.*

  ➢ The prefix kilo- means 1000.
  Therefore, we divide 2,500 by 1000.
  ➢ 2500 ÷ 1000 = 2.5 km
  ➢ 2500 m = 2.5 km

METER

The base unit of length. Its unit symbol is ***m***.

This is the fundamental unit of the metric system. It is defined by the distance traveled by light in a second. It is specifically measured as 1/299,792,458 of a second.

Below are the units used in the imperial system and their equivalent value to meter:

- 1 meter = 39.37 inches
- 1 meter = 3.281 feet
- 1 meter = 1.0936 yards
- 1 yard = 0.9144 meters

We can use meter sticks and most tape measures to measure meters.

Metric Conversion Table		
Non-SI Unit	**Multiply By**	**To Find**
inches	2.54	centimeters
feet	0.3048	meters
yards	0.914	meters
miles	1.609	kilometers

Unit w/ Prefixes	Place Value
Picometer (pm)	1/trillion
Nanometer (nm)	1/billion
Micrometer (μm)	1/million
Millimeter (mm)	.001
Centimeter (cm)	.01
Decimeter (dm)	.1
Meter (m)	1
Kilometer (km)	1000
Megameter (Mm)	1 million
Gigameter (Gm)	1 billion
Terameter (Tm)	1 trillion

SECOND

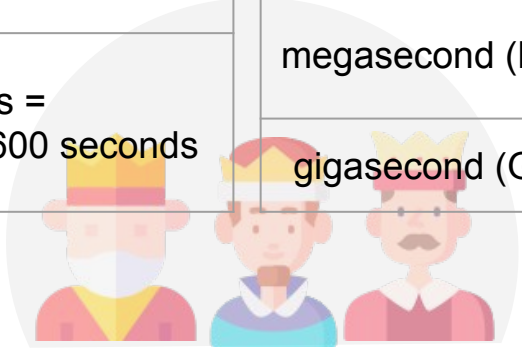
The base unit of time.
Its unit symbol is ***s*** or ***sec***.

This is defined by the 9,192,631,770 cycles of radiation between two levels of the cesium-133 atom at its ground state. The instrument, which can determine the precise measurement of a second is called an atomic or a radio clock.

Aside from the atomic or radio clock that can accurately measure time, we also have other clocks and watches to use as instruments of time measurement.

Non SI-Units of Time	
minute	60 seconds
hour	60 minutes = 3,600 seconds
day	24 hours = 86,400 seconds
week	7 days = 604,800 seconds
month	28-31 days = 2,419,200 to 2,678.400 seconds
year	365 days = 31,557,600 seconds

Unit w/ Prefixes	Place Value
nanosecond (ns)	1/billionth
microsecond (μs)	1/millionth
millisecond (ms)	0.001
second	1
decasecond (das)	10
hectosecond (hs)	100
kilosecond (ks)	1,000
megasecond (Ms)	1 million
gigasecond (Gs)	1 billion



KILOGRAM

The base unit of mass.
Its unit symbol is **kg**.

The physical constant used to accurately measure the kilogram is called Planck's constant.

Planck's constant is fixed at 6.626070150 × 10−34 kg·m2/s. This value is measured by a machine called the Kibble balance, which identifies the mechanical energy exerted by the mass of an object and finds the corresponding value of electrical energy.

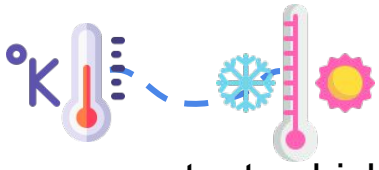
An instrument we can use to measure kilograms is a balance scale.

Conversion	Multiply By
Tons to Kilograms	907.18
Pounds to Kilograms	0.454
Pounds to Grams	454
Ounces to Grams	28.35
Ounces to Milligrams	28350

Unit w/ Prefixes	Place Value
Picogram (pg)	1/trillionth
Nanogram (ng)	1/billionth
Microgram (µg)	1/millionth
Milligram (mg)	0.001
Centigram (cg)	.01
Decigram (dg)	.1
Gram (g)	1
Decagram (dag)	10
Hectogram (hg)	100
Kilogram (kg)	1000
Megagram (Mg) *metric ton*	1 million
Gigagram (ng)	1 billion

KELVIN

The base unit of thermodynamic temperature.
Its unit symbol is ***k***.



The definition of Kelvin is based on the Boltzmann constant, which is equal to 1.380649 × 10−23 joule per kelvin. It is the factor of the proportion between the pressure of a gas and its temperature.

We use thermometers as instruments to measure temperature.

Conversion Formulas	
Celsius to Kelvin	Add 273 to the value
Fahrenheit to Kelvin	Subtract 32, multiply by 5, divide by 9, and then add 273.15
Kelvin To Celsius	Subtract 273
Kelvin To Fahrenheit	Subtract 273.15, multiply by 1.8, and then add 32

AMPERE

The base unit of electric current.
Its unit symbol is ***A*** or ***Amp.***

It is defined by the number of electrons that are flowing per second through an electrical conductor. The amount of this electrical charge is called a coulomb. The specific definition of an ampere is 1.602176634 × 10−19 coulomb. Therefore, one ampere is equal to one coulomb or vice versa.

1 A = 1 C/s

The instrument for measuring an electric current is an ammeter.

MOLE

The base unit of the amount of substance.
Its unit symbol is ***mol***.

The definition of mole is **6.022 140 76 x 10^{23}** elementary entities, which is based on the value of the Avogadro constant. These elementary entities are atoms, molecules, ions, electrons, or any specified group of particles.

There are no devices that can directly measure moles. We can only use other measured quantities to calculate the value by dividing the mass of the substance by its molar mass. Molar mass is the total mass of an element or a substance.

If we know the molar mass of an element or a substance, we can find out how many moles a specific substance has based on the definition of a mole.

CANDELA

The base unit of luminous intensity.
Its unit symbol is ***cd***.

A candela is defined by a monochromatic radiation of frequency 540 × 1012 hertz with a radiant intensity in that same direction of 1/683 watt per steradian (SI unit for solid angle).

This unit of measurement establishes how bright a light or object is based on how we see the light from a certain direction. Imagine a flashlight pointed towards you and then realizing how bright the light is from this direction.

The instrument we can use to help measure luminous intensity is called a photometer.

EXERCISES ON THE INTERNATIONAL SYSTEM OF UNITS

1. Convert 1500 g to kg.

2. Convert 36°C to Kelvin.

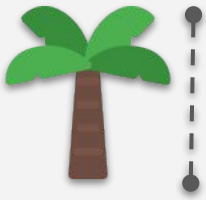
TABLE OF ACTIVITIES

TWELFTH NIGHT

G2-G3
Basic

The exact date of the twelfth night or the eve of Epiphany depends on the branch of Christianity, which celebrates it. The beginning of the twelve days of Christmas starts from Christmas day up to Epiphany. Identify the SI unit of measurement that corresponds to the twelve items below.

1. 

2. 

3. 

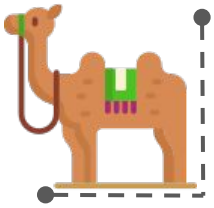
4. 

5. 

6. 

7. 

8. 

9. 

10. 

11. 

12. 

THE THREE WISE MEN

G2-G3
Basic

Balthasar, Melchior, and Gaspar (or Casper) were the names of the three wise men who came to an epiphany that the birth of a new 'king' is about to happen and that Jesus will serve a special purpose. Answer the questions for each number below.

1. What does the SI Unit, candela, measure?

_____

2. What is the physical constant used to accurately measure a kilogram?

_____

3. Which instrument is used to accurately measure a second?

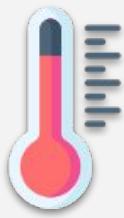
_____

STAR OF BETHLEHEM

G2-G3
Basic

It is said in some accounts that the star of Bethlehem is what urged the three wise men to search for Jesus Christ and what led them to him. Connect the SI units on the left to their corresponding measuring instrument on the right.

1. Second
2. Kilogram
3. Meter
4. Ampere
5. Kelvin



FINDING THE WAY

G2-G3
Basic

Help the three wise men find their way to meet Jesus Christ. Shade or color the path with the correct value of SI prefix.

1. Deci-		0.1 10 .01	
2. Milli-		10 .001 1000	
3. Hecto-		.000001 100 1	
4. Micro-		.001 .000001 100	

THREE GIFTS

G2-G3
Basic

The three wise men brought gold, frankincense, and myrrh as gifts to Jesus. Gold symbolizes kingship on Earth. Frankincense signified divinity. And myrrh symbolizes Jesus' mortality. List down the units of measurement that correspond to the physical properties assigned to each gift below. Write it down in the space provided.

mole milligrams pounds feet micrograms

centimeters gigameter celsius months years

seconds minutes days inches nanometers

ounces yards kilograms tons

 **Length**	 **Mass**	 **Time**

THREE KINGS DAY

G4-G5 Advanced

Three Kings Day **or the** ***Epiphany*** **begins a festive celebration in some parts of the US. This holiday marks the beginning of the Carnival season and the baking of King Cakes, which is a tradition influenced by the French settlers. Take a peek at the celebrations. Solve each problem and show your solutions.**

1. The first parade of the Carnival is happening on Three Kings Day. Preparations for the parade that will go for three miles is underway. Convert the distance of the parade into kilometers.

   Solution:

2. Pick-up a few ingredients from the supermarket to bake a King Cake. You will need two lbs of flour. Convert this measurement into grams.

   Solution:

DREIKÖNIGSTAG

G4-G5 Advanced

In parts of Germany and Austria, Dreikönigstag or Three Kings Day is celebrated with children dressing up like the three kings, going house to house, singing carols, and collecting money for charity. Get a glimpse of Dreikönigstag. Encircle the correct letter of your answer for each number.

1. The children are walking 2.5 km around the neighborhood. What is the equivalent of this distance in meters?

Solution:

a. 250 meters
b. 2500 meters
c. 25 meters

2. Outside while caroling, the temperature is at 10 degrees Celsius. What is the equivalent of this in Kelvin?

Solution:

a. - 263 k
b. 10 k
c. 283 k

3. The boxes that the children carry to collect donations from the community weigh 100 grams each. There are ten children in a group. What is the total weight in kilograms?

Solution:

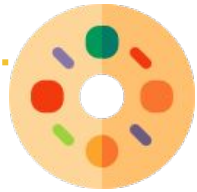
a. 10 kg
b. 100 kg
c. 1 kg

DÍA DE LOS REYES

G4-G5 Advanced

Children receive gifts in Mexico and some Latin countries during Three Kings Day or Epiphany. Traditionally, they also eat *Rosca de Reyes*, the Three Kings bread. Encircle the letter of the value among the three choices that do not match the value provided in each number.

1. 1000 mm	a. 100 cm	b. .01 m	c. 10 dm
2. 657 g	a. 657000 mg	b. 65.7 dag	c. 6.57 cg
3. 288 cm	a. 2.88 m	b. .0288 dam	c. 28.8 dm
4. 85 hs	a. 8.5 ks	b. 8500 s	c. .85 ms
5. 3.5 kg	a. .035 hg	b. 350 dag	c. 3500 g


KING CAKE

G4-G5 Advanced

A *King Cake* is a sweet pastry that is served during Epiphany or Three Kings Day in many countries. The bread usually contains a small baby figurine or a *fève* that represents the Christ Child. It means luck & prosperity to whoever finds it, and that person gets a prize. Find the *fève* by converting the values provided. Show your solution.

1. 6ft = _____ m

Solution:

2. 7 °C = _____ k

Solution:

3. 5 oz = _____ g

Solution:

4. 8 mins = _____ s

Solution:

CARNIVAL

G4-G5 Advanced

In the US, the Carnival season is mainly celebrated in New Orleans. It starts on the day of the Epiphany up to the Mardi Gras festivities. It is the final festivity before Lent. Note down objects or situations related to the Epiphany and Carnival that you think can be measured by the SI units of measurements. Write down your answers in the spaces provided below.

1. Second	
2. Meter	
3. Kilogram	
4. Ampere	
5. Kelvin	
6. Mole	
7. Candela	

ANSWER GUIDE

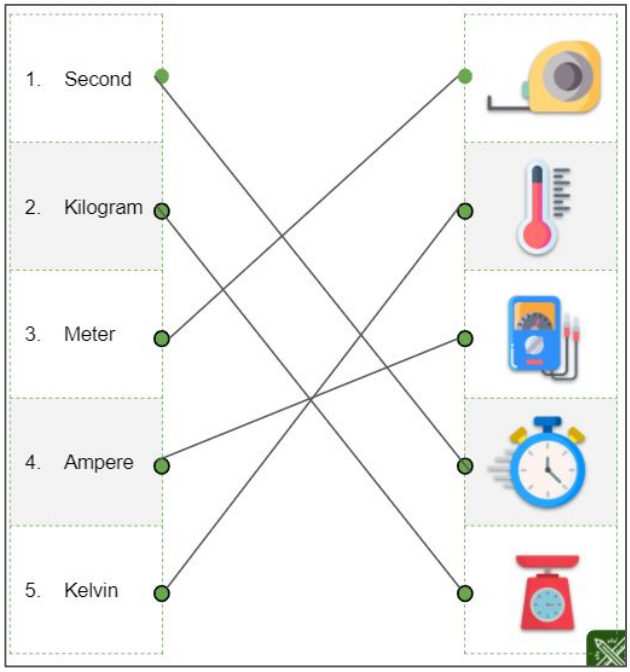
Activity 1

1. Candela
2. Meter
3. Kilogram
4. Second
5. Ampere
6. Kelvin
7. Mole
8. Kelvin
9. Meter
10. Second
11. Kilogram
12. Candela

Activity 2

1. Luminous Intensity
2. Planck's Constant
3. Atomic or Radio Clock

Activity 3



1. Second = Stopwatch
2. Kilogram = Scale
3. Meter = Tape Measure
4. Ampere = Ammeter
5. Kelvin = Thermometer

ANSWER GUIDE

Activity 4

1. Deci-	0.1	
	10	
	.01	
2. Milli-	10	
	.001	
	1000	
3. Hecto-	.000001	
	1	
	100	
4. Micro-	.001	
	.000001	
	100	

1. Deci- = 0.1
2. Milli- = .001
3. Hecto- = 100
4. Micro - .000001

Activity 5

Length	Mass	Time
Centimeters Gigameters Yards Feet Inches Nanometers	Milligrams Ounces Pounds Kilograms Micrograms Tons	Seconds Minutes Days Months Years

ANSWER GUIDE

Activity 6

1. Miles to Kilometers
   Formula: Multiply miles value to 1.609

   3 (miles) x 1.609 = 4.827 km

   3 miles = 4.827 km or 4.83 km (rounded off)

2. Pounds to Grams
   Formula: Multiply pounds value to 454

   2 (lbs) x 454 = 908 grams

   2lbs = 908 grams

Activity 7

1. b. 2500 meters
   2.5 x 1000 = 2500 m

2. c. 283 k
   10 + 273 = 283 k

3. c. 1 kg
   100 g x 10 = 1000 g
   1000 g / 1000 = 1 kg

Activity 8

1. b. .01m
2. c. 6.57 cg
3. b. .0288 dam
4. c. .85 ms
5. a. .035 hg

ANSWER GUIDE

Activity 9

1. **6ft = 1.83 m**
   6 x .3048 = 1.8288
   6ft = 1.8288 m or rounded off 1.83 m

2. **7°C = 280 k**
   7 + 273 = 280

3. **5 oz = 142 grams**
   5 x 28.35 = 141.75
   5oz = 141.75 or rounded off 142 g

4. **8 mins = 480 seconds**
   8 x 60 = 480

Activity 10

Answers may vary.

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