



Metric Family

presents

SI BASE UNITS

— *Metric Makes Measurements More Manageable* —

INTRODUCTION

The purpose of this booklet is to enable Guyanese to become familiar with the metric system and, in particular, the International System of Units or SI Units. With most of the world using the metric system of measurements, these SI units are now an intrinsic part of our lives.

The meat, flour, fruit and vegetables we buy; the pills, tablets and capsules doctors prescribe; the distances vehicles cover and boats sail and athletes run, as well as fabric bought for our garments to be made from are **all** weighed and measured using SI units.

Given this trend, Guyana must fully embrace metric measurements. Thus, this booklet intends to promote a culture in which Guyanese not only “think metric” but also actively use the SI units in their everyday lives.

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MEET THE METRICS

Martin



Marcie



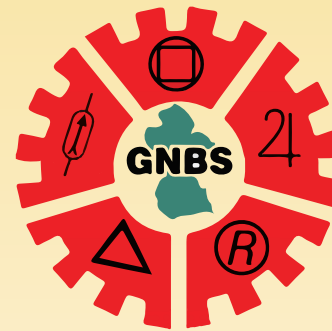
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LEARN ABOUT...



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Follow us on...



Guyana National Bureau of Standards (GNBS)

The Guyana National Bureau of Standards (GNBS) operates under the Ministry of Tourism, Industry and commerce as a semi-autonomous governmental organization responsible for standards and quality in Guyana. It is the only National Standards Body in Guyana. It is also an ISO 9001:2015 certified agency.

GNBS was established in March 1985, under Act No. 11 of the year 1984. It has the legal status of a statutory corporation governed by a National Standards Council (NSC) appointed by the Minister of Business. While the GNBS is a self-revenue generating agency, it also benefits from funding from the Government of Guyana.

An Executive Director and a Deputy Director head the GNBS. Together, they work in alignment in the operations of the agency. The Executive Director oversees the corporate departments while the Deputy Director oversees the technical departments.

Corporate Departments

Finance

Human Resources and Administration

Information Communication and Technology

Marketing and Communications

Technical Departments

Business Support Services

Calibration and Testing Services

Certification Services

Legal Metrology Services

Product Compliance Services

Standardization Services

As the premiere national institution for standards and quality in Guyana, the GNBS plays several vital roles, including:

- ❖ Enhancing trade and business competitiveness through standards.
- ❖ Facilitating business growth and development by helping industries enhance their efficiency and quality of products through standards.
- ❖ Implementing standards to protect consumers from poor quality products and services.
- ❖ Supporting a National Quality Infrastructure that offers key services, such as verification of all weighing and measuring devices used in trade, calibration of measuring instruments used in industry, testing and certification to ensure quality products and services.

WE LOOK TO THE FUTURE

Why do we need Measurement Standards?

The Role of Measurements in our Daily Lives



Why do we need Measurement Standards?

Whenever we buy, sell or exchange any item, we use a wide range of units. Measurement standards play a very important role in defining each of these units. As we exchange greater quantities and varieties of materials, the more difficult it becomes to exchange items directly.

As such, we need precise information about the quantities of those items in order to exchange them accurately and fairly. Measurement standards allow us to carry out many activities and transactions with the confidence of knowing exactly how much of each item we are dealing within.

For today's advanced technologies, even more precise measurement standards are required. Measurement standards are therefore an indispensable part of our everyday lives.

The Role of Measurements in our Daily Lives

Measurement is at the heart of all science and engineering. It is only when we can measure something that scientists and engineers can study and improve it. As science and engineering play an important role in our lives, measurement matters for everyone.

Measurement affects our daily lives in many ways such as when:

- ❖ We use scales in the markets to buy our supplies of fruits, vegetables and meat. We also use scales to weigh precious materials such as gold and diamonds. What would happen if the process of weighing was completed incorrectly?
- ❖ We use scales to measure amounts of ingredients when cooking.
- ❖ We buy paint and then buy some more a year later and the colour matches.
- ❖ Our medical care depends critically on measurements, concentrations of chemicals in blood or the intensity of X-rays. We also rely on measurements when we measure out doses of medicines, record blood pressure reading, take temperatures and pulses.
- ❖ We drive our cars safely and comfortably because of the measuring tools within the car like the speedometer, temperature indicator, fuel tank indicator, etc.
- ❖ Engineers and architects read blueprints with precise dimensions and markings.
- ❖ A satellite navigation system guides us along a road and it depends on the time measured by ultra-precision clocks on satellites.
- ❖ Trade between countries is based on many weight and size measuring tools.

In all these situations, and thousands more, we are enjoying the benefits of a global system of measurement.

LEARN MORE ABOUT

What is
the SI?

Why use
the SI?



What is the SI?

The International System of Units (SI) is more commonly known as **the metric system**. Every day, people around the world use the SI in science and commerce, making the SI the most widely used system of measurement in the world. The widespread adoption of the SI allows science, industry and trade to measure physical objects and phenomena using the same units, so that the results can be compared meaningfully worldwide.

In 1875, representatives of seventeen nations met in Paris and signed a diplomatic treaty called the Metre Convention. The Metre Convention created an intergovernmental treaty organization called the CGPM or General Conference on Weights and Measures. Today, 60 countries, including all of the major industrialised ones, are

members of the Meter Convention.

In 1960, the 11th General Conference on Weights and Measures (CGPM) established the SI or International System of Units. The CGPM remains the international authority that ensures the widespread use of the SI. It modifies the SI as necessary to reflect the latest advances in science and technology. A landmark decision made at the 26th meeting of the General Conference on Weights and Measures (CGPM) on November 16, 2018, led to the revision of the definitions of the kilogramme, the ampere, the kelvin and the mole in order to assure the future stability of the SI. Consequently, from May 20, 2019, all SI units are defined in terms of constants that describe the natural world.

Why use the SI?

Guyana's Weights and Measures Act of 1981, Section 3, states that "the International System (SI) of Units shall have legal force and validity in Guyana." This was given effect by Ministerial Order on January 01, 2001, making the SI the only legal system of measurement in Guyana (Official Gazette - January 27, 2001). Therefore, using metric measures is the law!

As the metric system is a decimal system of weights and measures **it is easy to convert between units simply by multiplying or dividing by 10, 100, 1000.** This makes using the metric system very easy!

The metric system is a world-wide standard. Unlike some non-metric measurements, which can vary even between countries, metric measurements are set by international agreement and therefore are the same wherever you happen to be.

The metric system is set to prevail as the only measurement system used throughout the world, so those who do not use it or continue to use non-metric units will be left behind the global economy.

LEARN THE UNITS

What are the SI Units?

The Basics of the Metric System in use everyday

- Mass / Weight,
- Length and
- Volume



What are the SI Units?

The SI covers units for every type of measurement, but at the heart of the SI is a set of seven units known as the "base units."

They are:



the kilogram



the metre



the second



the ampere



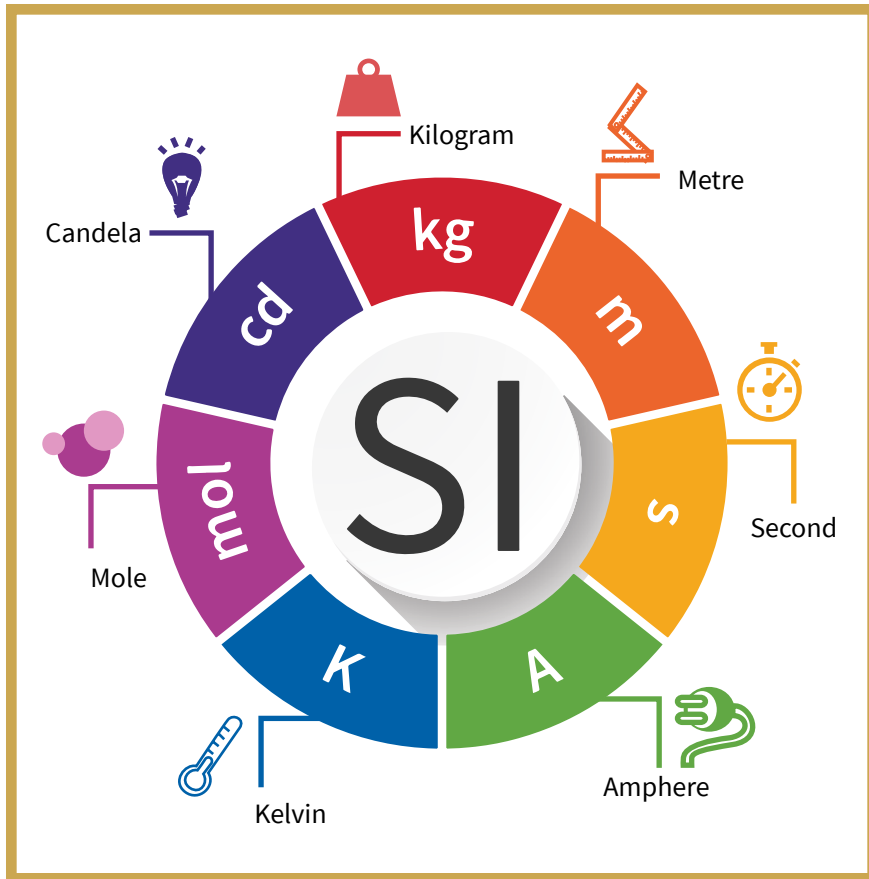
the kelvin



the mole



the candela



Unit	Symbol	Quantity
kilogram	kg	mass
metre	m	length
second	s	time
ampere	A	electric current
kelvin	K	temperature
mole	mol	amount of substance
candela	cd	luminous intensity

The Basics of the Metric System in use everyday

THE KILOGRAM

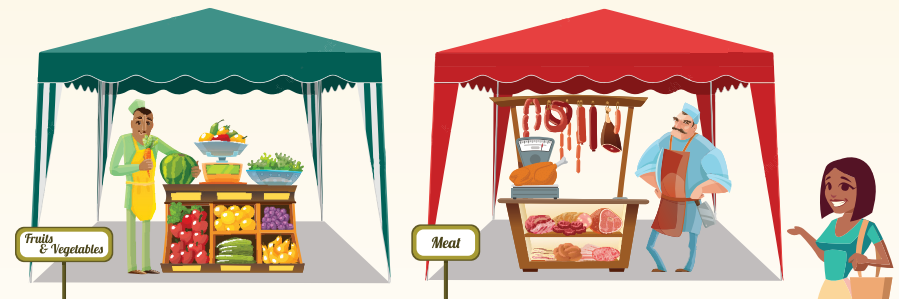


The kilogram

kg

is the SI Unit of **mass**

We use kilograms (kg) to measure the weight or mass of heavier objects.



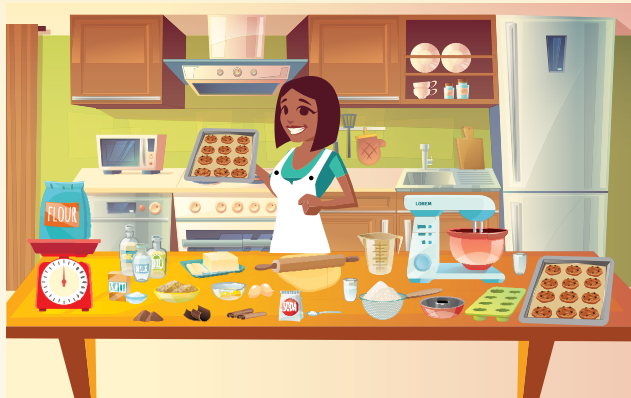


I am going to be the next Miss Guyana! I weigh 60 kilograms.



We use grams (g) to measure the weight or mass of very light objects. A small paperclip weighs about a gram.

When baking for my family, I weigh flour in grams.



We use milligrams (mg) to measure very small and extremely light objects. Example medications or pills.



We use tonnes (t) for very large and extremely heavy objects (ships, truck load sand, stone).

It's easy to measure weight or mass using kilograms or grams.



Quick conversion facts:

1000 milligrams (mg) = 1 gram (g)

1000 grams (g) = 1 kilogram (kg)

1000 kilograms (kg) = 1 tonne (t)

THE KILOMETRE



The kilometre

km

is the SI Unit of distances or lengths

We use kilometres (km) to measure long distances or lengths.



1 metre (m) is a little longer than 1 yard. We use metres (m) to measure the length of a house, or the size of a playground. The length of this guitar is about 1 metre.

I measure lengths using metres, like this 2m length of wood.





“ I’ll need 7m of cloth for your new dress, Maria! ”



We use centimetres (cm) to measure how tall we are, or how wide a table is. A fingernail is about one centimetre wide.



I’m 6 feet or 183 cm tall.



A millimetre (mm) is the smallest unit of length. A millimetre is about the thickness of your national identification card.

It’s easy to measure length or distance using metres or kilometres.



Quick conversion facts:

- 10 millimetres (mm) = 1 centimetre (cm)
- 100 centimetres (cm) = 1 metre (m)
- 1000 metres (m) = 1 kilometre (km)

THE LITRE



The litre



is the SI Unit of **volume of liquid**

We use litres (l) for measuring volume of liquid.



Milk, soda and other drinks are often sold in liters.



“ Every day, I drink a 1 litre bottle of coconut water. It’s good for my skin! ”



“ I buy paint and thinner by volume using litres. ”





Can I have 10 litres of gasoline please?



We use millilitres (ml) to measure very small amount of liquids.



20 drops of water droplets make about 1 millilitre.



When Max has a cold, I give him 5ml or 1 teaspoon of medicine.

It's easy to measure volume of liquids using the litres or millilitres.



Quick conversion facts:

1000 millilitres (ml) = 1 litre (l)

1000 litres (l) = 1 kilolitre (kl)

USING THE BASIC UNITS

Converting between Units

Temperature

Writing Dates

Writing Times



Converting between Units

The metric system is a decimal system of weights and measures, so it is easy to convert between units simply by multiplying or dividing by 10, 100, 1000.

As multiples of units have a standard prefix, it is easy to see how much one unit is of another unit. For example, when you see the kilo- prefix, it means one thousand units of something, e.g.,



1 kilogram = 1000 grams

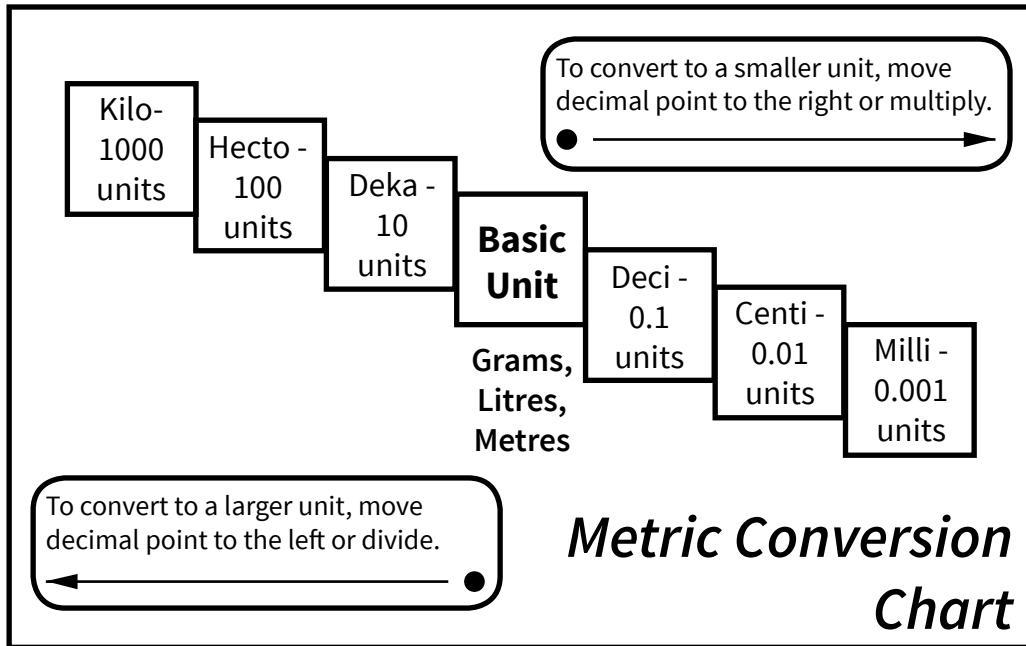


1 litre = 1000 millilitres



1 kilometre = 1000 metres

Here is an easy way to convert between SI units:



Temperature

Temperature is a measure of how hot or cold something is.

Temperature is measured using a thermometer, usually in Celsius ($^{\circ}\text{C}$) or kelvin (K). The base unit of measuring temperature is **Kelvin (K)**.

Common used unit ($^{\circ}\text{C}$) - Degree Celsius

273 K = 0°C

Normal day	29 – 30 $^{\circ}\text{C}$
Hot day	30 – 32 $^{\circ}\text{C}$
Cool day	25 – 28 $^{\circ}\text{C}$
Normal body temperature	37 $^{\circ}\text{C}$
Boiling point of water	100 $^{\circ}\text{C}$
Freezing point of water	0 $^{\circ}\text{C}$
Fahrenheit	$^{\circ}\text{F} = (9/5 \times ^{\circ}\text{C}) + 32$
Celsius	$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$

Writing Dates

The international standard ISO 8601, which deals with the numeric representations of date and time, outlines two internationally accepted formats for writing dates as shown below.

1. All numeric format (in which only numbers are used):

YYYY-MM-DD (year-month-day)

Example: 2020-01-20

2. Non-numeric format:

Example: Monday, January 20, 2020

Writing Times

We should use the international twenty four hour clock system instead of a.m. or p.m.

We should say **eight hours (08:00 h)** instead of eight o' clock, and **sixteen hours thirty (16:30 h)** instead of four thirty (4:30 p.m.).

***The day starts at 00:00 h and ends at 23:59:59 h.**



Metric Makes Measurements More Manageable.

WHERE YOU CAN FIND US?

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Follow this Family -

Martin, Marcie, Maria & Max.

As they

Learn, Think & Use Metric.

Every Day for

Mass (kilogram), Volume (litre) & Length (metre).

We all should! A message from
Guyana National Bureau of Standards (GNBS).

