Advancement Training

System of Measurement (Unit 1-Lesson 1)

Operations Department Training

System of Measurement

Introduction

- To work in the field of meteorology, you must have a basic understanding of the science of measurement (metrology).
- The Metric System (CGS, centimeter-gram-second) has been recognized for use in science and research.
- The metric system is easy to learn as it is based on decimals.
- CGS describes physical events, with units that measure length, weight, and time, respectively. The derivation of those units are included in this brief.

System of Measurement

Learning Objective

- Recognize the units of measure used in the Metric System and how this system of measurement is used in Meteorology.

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Length

- The meter is slightly larger than the English yard (39.36 inches vs 36 inches).

- Prefixes are used in conjunction with the meter to denote smaller or larger units of the meter.

System of Measurement

Common Prefixes

Prefix (1)	Symbol	Decimal Value	Sci Notation
Kilo	K	1000	10_3
Hecto	H	100	10_2
Deka	D	10	10_1
Deci	d	.1	10_{-1}
Centi	c	.01	10_{-2}
Milli	m	.001	10_{-3}

(1) These prefixes are used with all metric units such as meters, grams, liters, and seconds (eg., kilometers, hectometers, centiliters, milliseconds).

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Area

- A square has four equal sides and it is a one-plane figure-like a sheet of paper.
- To determine how much surface area is enclosed within the square you multiply the length of one side by the length of the other equal side (LxL).
- Ex. If the sides were 1 cm in length the area of the square would be 1cm x 1cm = 1 square cm or 1 cm_2

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Volume

- If squares having an area of 1 cm_2 were stacked on top of each other until the stack was 1 cm tall, you would end up with a cube whose sides were each 1 cm in length.
- To determine volume of the cube you simply multiply the length by the width and height (V=LWH).
- Each side is 1 cm you end up with a volume of 1 cubic centimeter (cm_3).
- Once determining volume is understood, you are ready to learn about weight.

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Weight

- The conventional unit of weight is the gram (gm). You could use the previous slides table and substitute gram for meter and the symbol (gm) for the symbol (M).
- **The gram is the weight of 1 cm^3 of pure water at 4 degrees C.*
- **The weight of the 1 cm^3 of water is 1 gm.*
- **Weight and mass are proportional to each other.*
- However, the weight of the 1cm3 of water changes moving away from the gravitational center of the Earth. In space the water is weightless, but it is still a mass.
- Mass is expressed as a function of inertia/acceleration, while weight is a function of gravitational force. When we express the movement of an object we use the terms mass and acceleration.

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Density

- With the previous explanation of grams and centimeters, you now understand how physical factors can be measured and described.
- For example, density is the weight something has per unit of volume. The density of water is given as 1 gram per cubic centimeter or 1gm/cm^3.

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Force

- *Force is measured in dynes.
- A dyne is the force that moves a mass of 1 gram, 1 centimeter per square second.