



Chapter One: Measurement

- **1.1 Measurements**
- **1.2 Time and Distance**
- **1.3 Converting Measurements**
- **1.4 Working with Measurements**



Section 1.2 Learning Goals

- Explain the meaning of time in a scientific sense.
- Discuss how distance is measured.
- Use a metric ruler to measure distance.
- Describe the units used to measure distance in space.

Investigation 1B

Measuring Time

- **Key Question:**
How is time measured accurately?





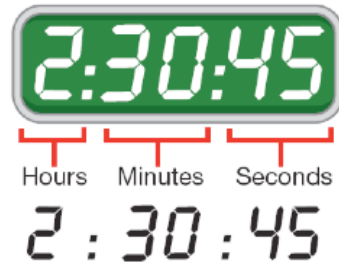
1.2 Time and Distance

- Two ways to think about time:
 - What time is it?
 - How much time?
- A quantity of time is also called a **time interval**.



1.2 Time

- Time comes in mixed units.
 - Seconds are very short.
 - For calculations, you may need to convert hours and minutes into seconds.



How many seconds is
this time interval?

1.2 Distance



- **Distance** is the amount of space between two points.
- **Distance** is measured in units of length.
- **The meter** is a basic SI distance unit.

**In 1791, a meter was defined as one ten-millionth of the distance from the North Pole to the equator.
What standard is used today?**



1.2 Metric prefixes

- Prefixes are added to the names of basic SI units such as meter, liter and gram.
- Prefixes describe very small or large measurements.

Prefix	Prefix + meter	Compared to 1 Meter
kilo-	kilometer	1,000 times bigger
centi-	centimeter	100 times smaller
milli-	millimeter	1,000 times smaller



1.2 The meter stick

- A meter stick is 1 meter long and is divided into millimeters and centimeters.





1.2 The meter stick

- Each centimeter is divided into ten smaller units, called millimeters.



What is the length in cm?



1.2 Units of distance in space

- **One light year is equal to the distance that light travels through space in one year (9.46×10^{12} km)**
- **The parsec is an astronomical distance equal to about 3.26 light years.**

Object	Distance from Earth (ly)
Sirius (brightest star in the sky)	8.8
Betelgeuse (appears as a red star in the sky)	700
Crab Nebula (remnant of an exploded star)	4,000
Andromeda galaxy (a huge group of billions of stars)	2.5 million