

Measurement Again

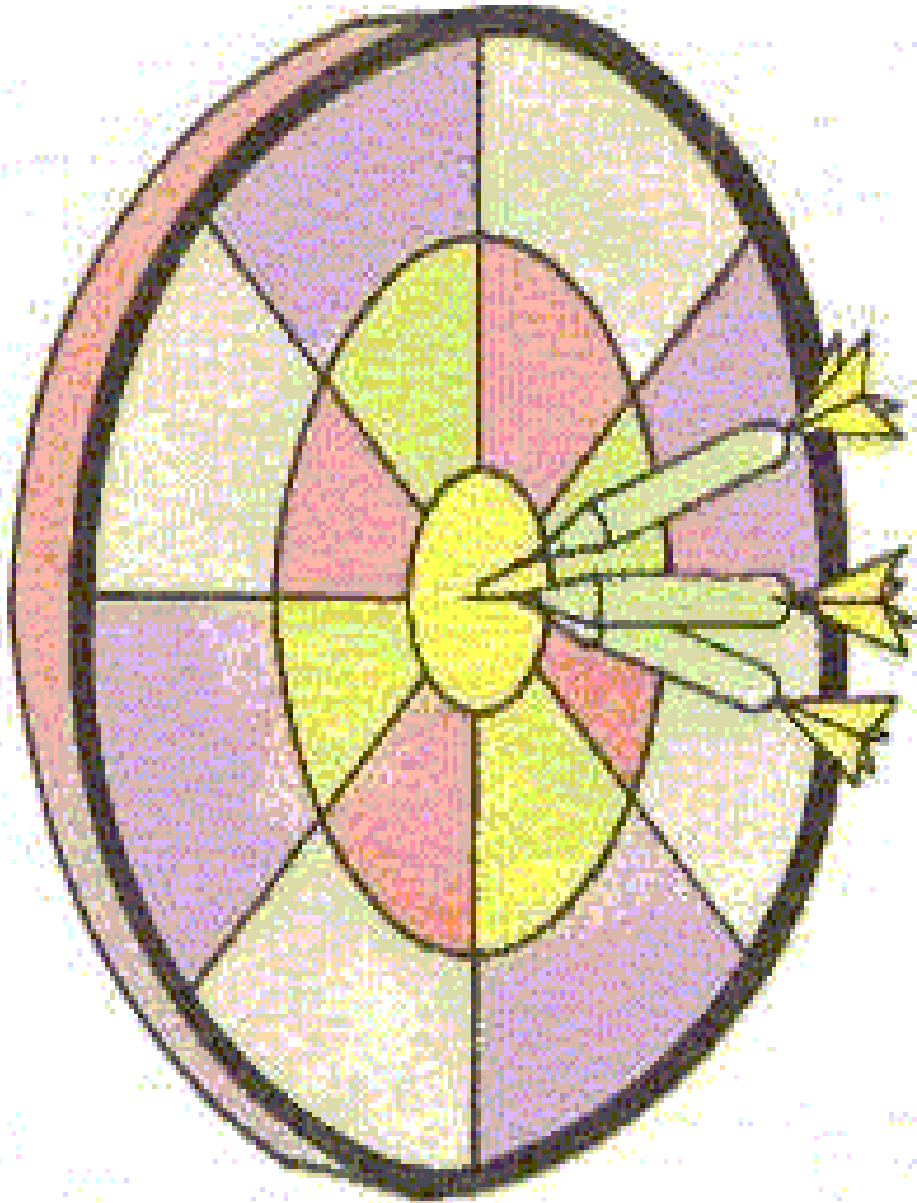
Accuracy

- How close a measurement comes to an accepted value.

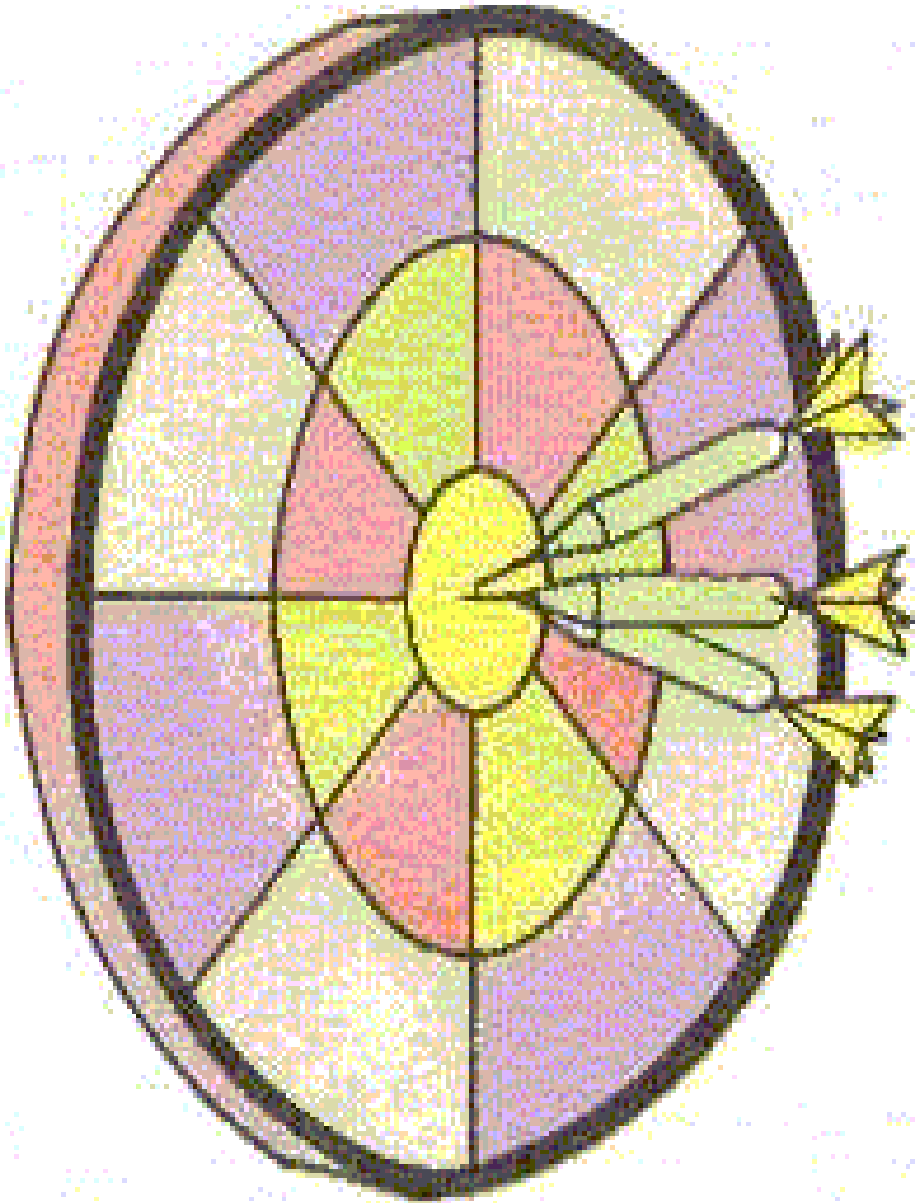
Precision

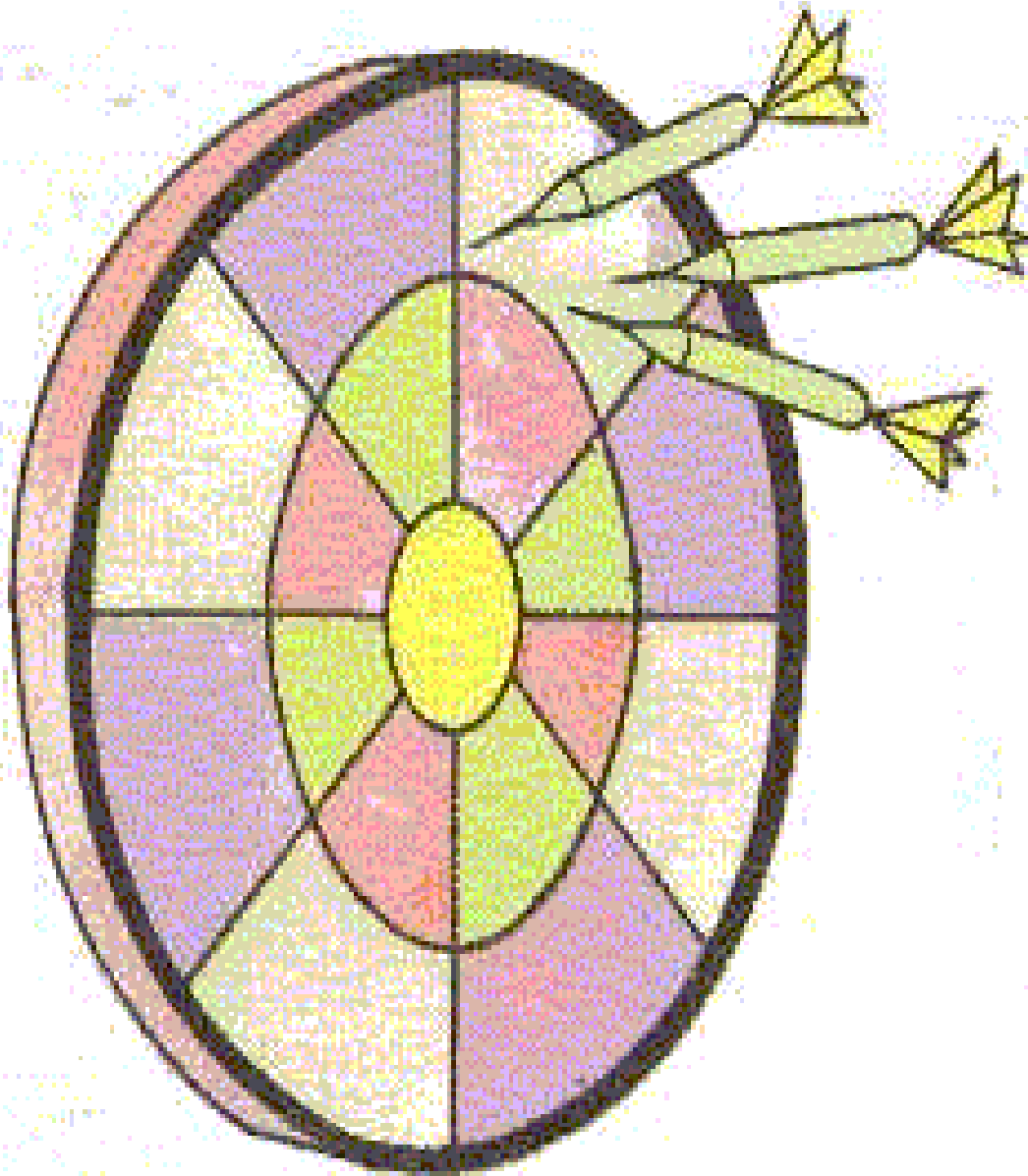
- How close a group of similar measurements comes to each other (reproducibility).

Accurate
and
Precise

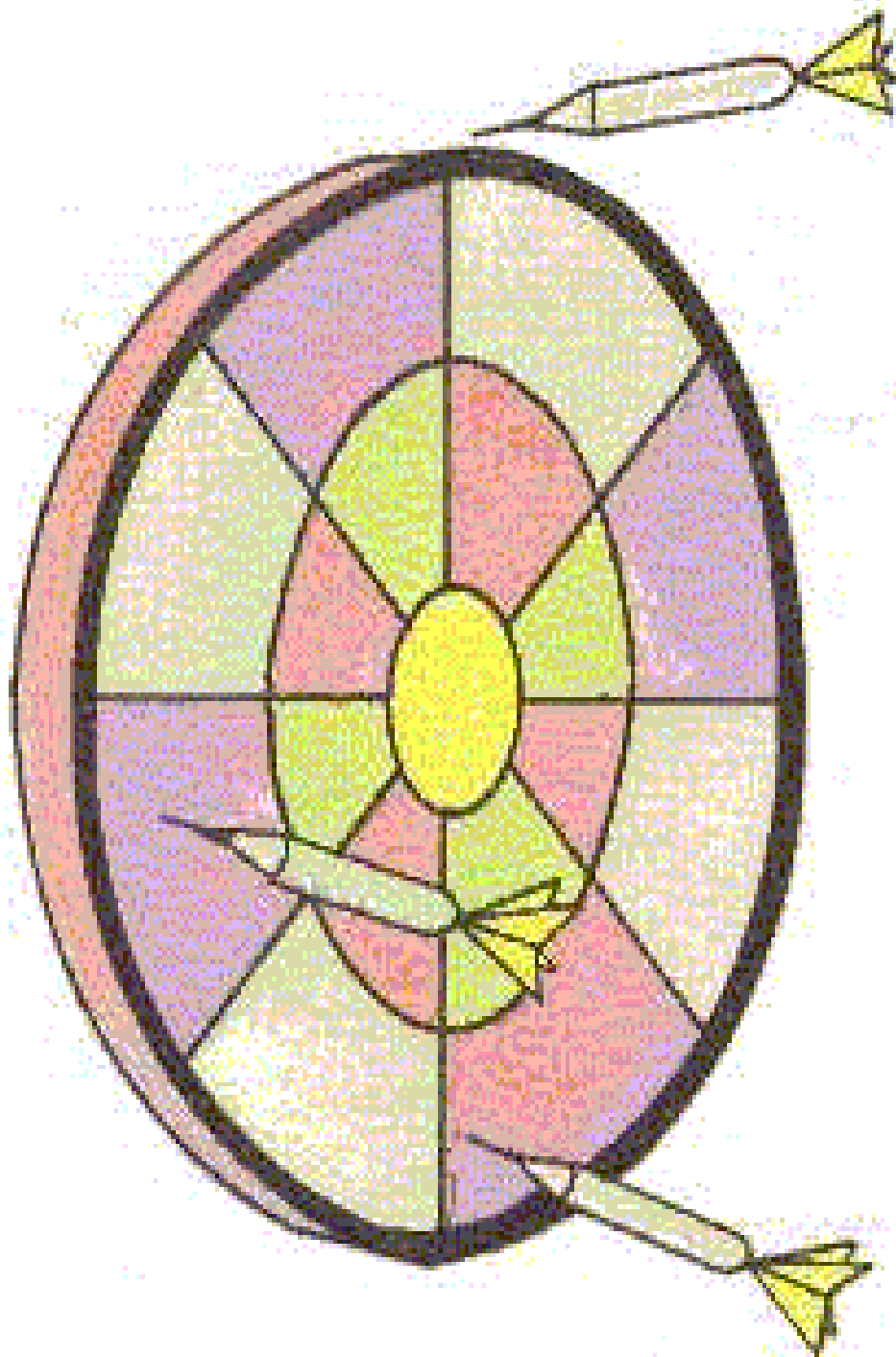


Accurate
and
Precise





Precise,
but not
accurate



Neither
Accurate
nor
Precise

Significant Figures

- All the digits in a measurement that can be accurately known plus a last digit that must be estimated.

Finding The Number Of Significant Figures In A Number

The Easy Rules

**If there is a decimal place in
the number.**

- Draw an arrow from left to right to find the first non-zero digit, then count the rest of the digits as significant figures.

If there is no decimal place in
the number.

- Draw an arrow from right to left to find the first non-zero digit, then count the rest of the digits as significant figures.

Rounding Rule

- Measurements or calculations cannot be more precise than the least precise measurement and should be rounded.

EXPERIMENTAL ERROR AND PERCENTAGE ERROR

- The experimental error is calculated by subtracting the accepted value from the observed value
- $(E = O - A)$.

- The percentage error is the comparison of the experimental error to the accepted value expressed as a percentage.

- The sign of the error may be either positive (the experimental result is too **high**) or negative (the experimental result is too **low**).

- **% Error =**

- **Observed - Accepted X 100**

- **Accepted**

UNITS -- The Language OF Science

- 1. The **meter** (m) is the SI unit of length measurement. There are **100** centimeters (cm) in a meter.

- **Area** is a measurement of the number of squares (i.e. **cm²**) that fit into a two-dimensional object.

- **2. Volume** is a measurement of the number of cubes (i.e. cm^3) that fit into a three-dimensional object.

–The **liter (L)** is the **SI** measurement of volume.

- There are 1,000 milliliters (mL) in a liter.
- A mL is the same as a cm^3 .

- 3. **Matter** is anything that occupies space.
Mass is the **amount** of matter present.

- The SI unit of mass is the **kilogram (Kg)** which is defined as the mass of $1,000 \text{ cm}^3$ (mL) of water at 4°C .

- There are **1000** grams (g) in one kilogram

- 4. Density measures the amount of **matter** in a given unit of **volume**.

The units for density are
 g/cm^3 or g/mL .

Density is defined as
mass/volume.

- 5. Water has a density of 1 g/cm^3 . If an object is **more** dense than water, it will sink.

- A sunken object displaces its **volume** in water. If an object is **less** dense than water, it will float. A floating object will displace its **mass** in water.

Metric units of Measure:

Length?

Mass?

Heat?

Volume?

Temperature?

Metric units of Measure:

Length:	METER
Mass?	GRAM
Heat?	JOULES
Volume?	LITER
Temperature?	CELSUIS

Metric Prefixes

- Kilo?
- Centi?
- Milli?
- Micro?

Metric Prefixes

- Kilo: 1000
- Centi? 100
- Milli? 1000
- Micro? 1000000

