Scientific Method

What is the Scientific Method?

- The scientific method is a logical, problem solving technique.

Steps of the Scientific Method

- **Observation**
- **Problem Statement**
- **Hypothesis Statement**
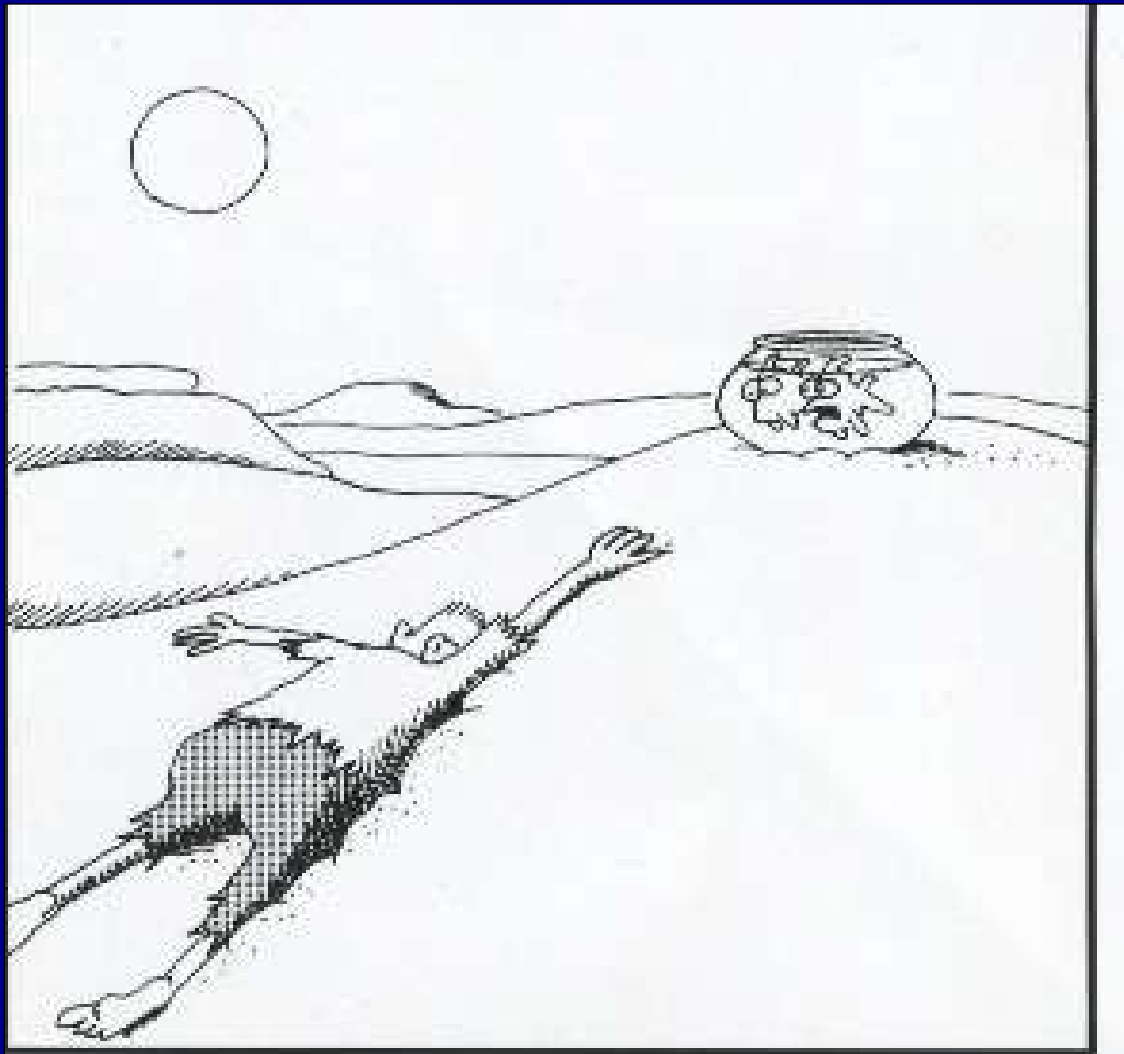- **Experiment / Data Collection**
- **Conclusion Statement**

Observation

observation.

observation

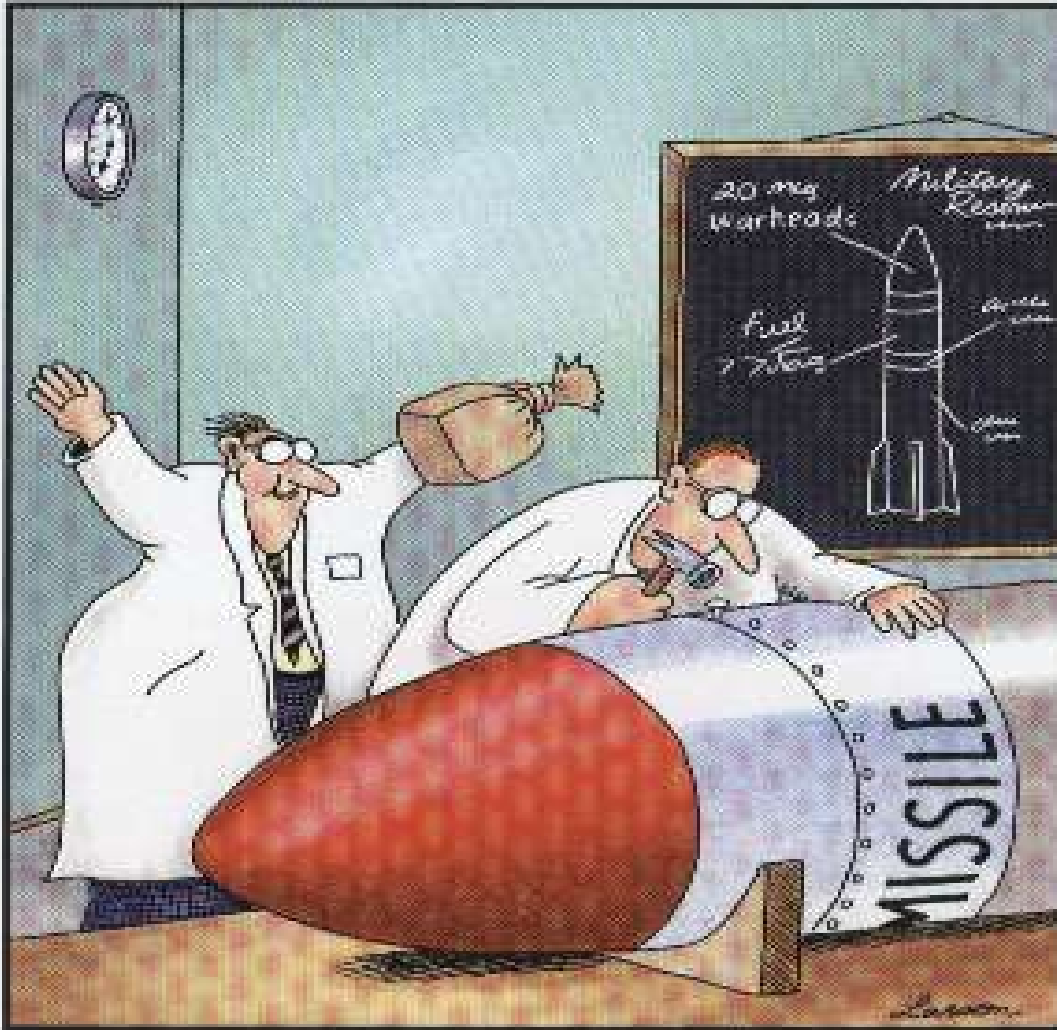fact

inference opinion

Observation vs. Inference

"My word! ... That one came just too close for comfort, if you ask me."

Observation:

Observation:

Inference:

Observation vs. Inference

Observation:

Observation:

Inference:

Problem Statement

- **Careful observations lead to questions that arise.**

- **A problem statement is a question that compares *variables*.**
  - *Example*: Does the drop height affect the bounce height of a superball?

What are Variables?

- A **variable** is something that changes.

  - There are independent variables and dependent variables.

What is an Independent Variable?

An independent variable is a variable that changes unrelated to other factors; a variable we manipulate, or change, on purpose.

An independent variable is the variable whose value we know before we start an experiment.

Example: Does the drop height affect the *bounce height* of a superball?

We know the drop heights we will use.

What is a Dependent Variable?

A **dependent variable** is a variable that changes depending on some other factors; the variable we are trying to find out.

The **dependent variable** is the variable whose value we do not know before we start an experiment.

Example: Does the drop height affect the bounce height of a superball?

We do not know the bounce heights before we start.

What is a Constant?

A constant is a variable that does not change for the duration of an experiment; a value that remains the same.

Example: Does the drop height affect the bounce height of a superball?

The superball does not change during the experiment.

Hypothesis Statement

- **A hypothesis statement is a statement that expresses the expected answer to the problem statement;**
  - **what you think the results of the experiment will show.**
- ***Example*: If a superball is dropped from increasing heights then the bounce heights will also increase because…**

Experiment

- An **experiment** is a planned way to test a hypothesis and find out the answer to the problem statement.
- An **experiment** is a way to collect data and determine the value of the dependent variable.
- An **experiment** compares the independent variable to the dependent variable.
- An **experiment** can only test one dependent variable at a time.

Conclusion Statement

- A **conclusion statement** is a statement that presents the findings of the experiment, what the data shows, and states if the hypothesis was correct (supported) or incorrect (negated).

Why Do We Use Graphs?

- **Graphs help us visualize numerical data.**
- **There are several different types of graphs:**
  - **Bar graphs**
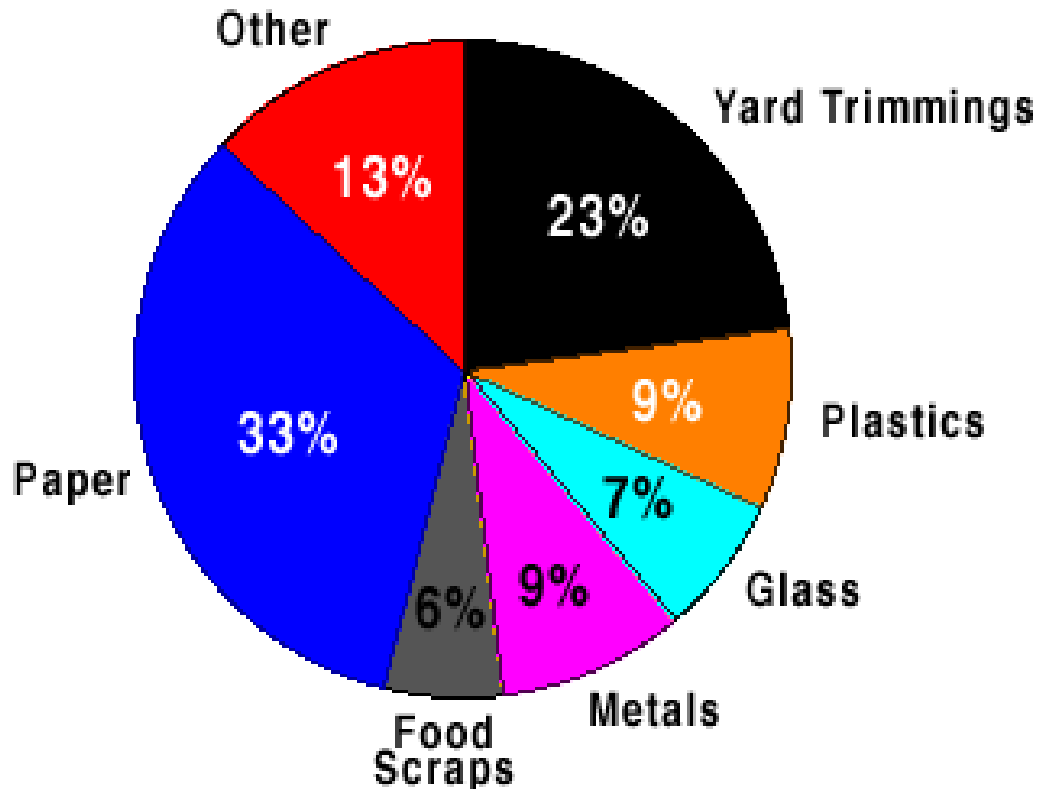 - **Pie graphs**
  - **Line graphs**

Bar Graphs

Absences at City H.S.
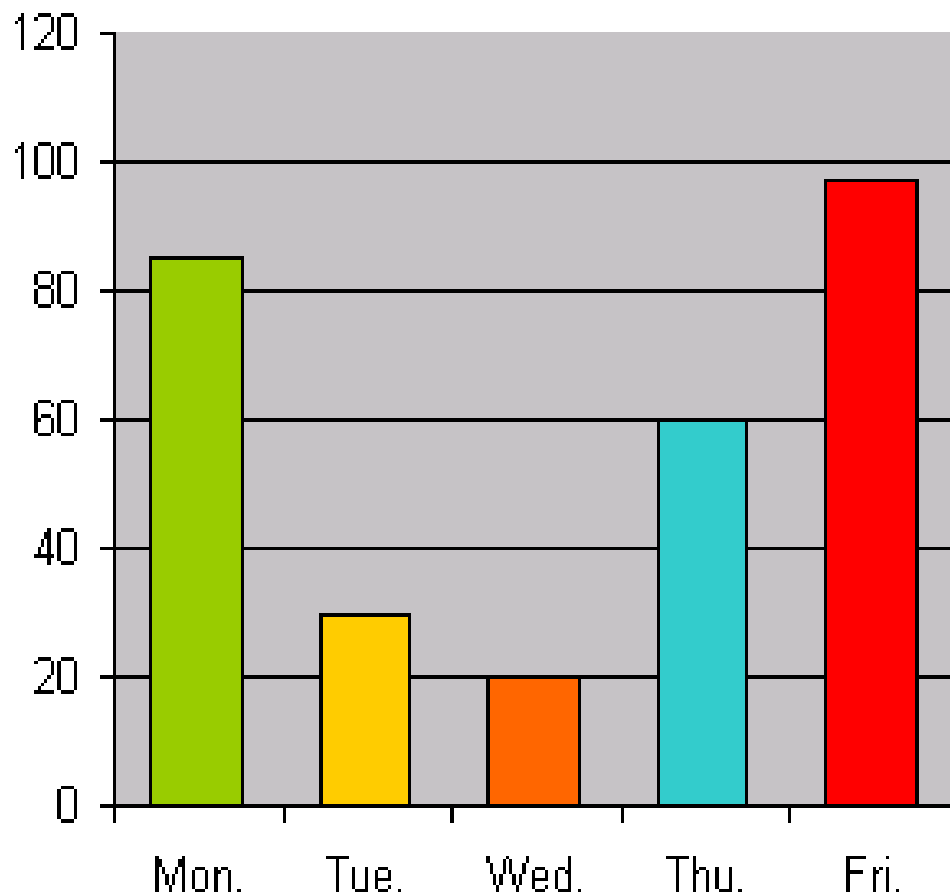
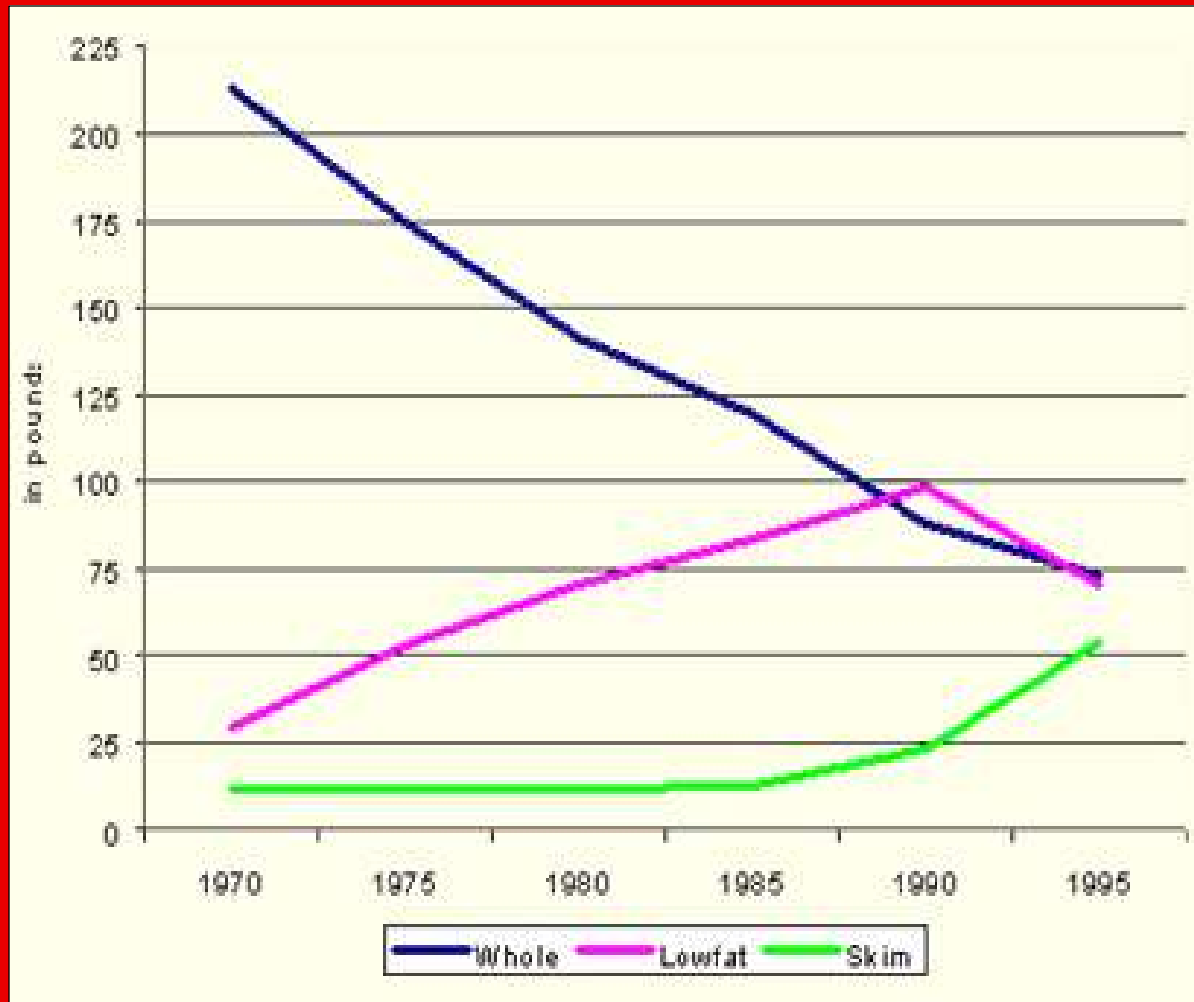- **Bar graphs are used to show a comparison of multiple objects.**

Pie Graphs

Norman Trash

- Other 13%
- Yard Trimmings 23%
- Plastics 9%
- Glass 7%
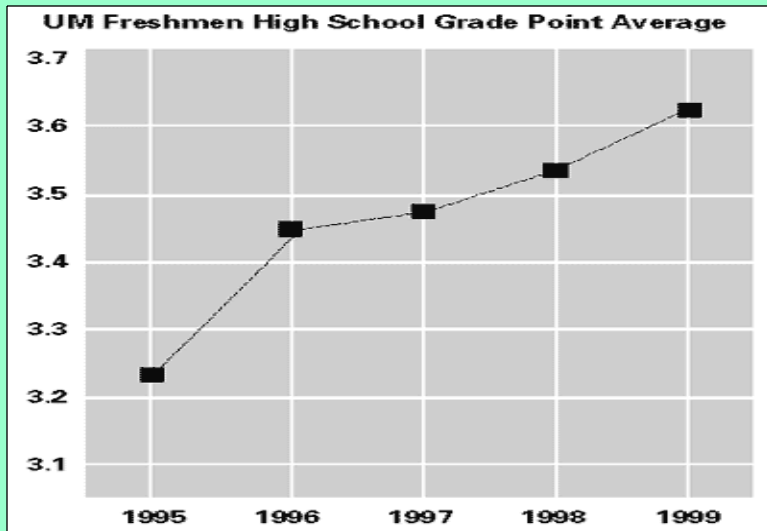- Metals 9%
- Food Scraps 6%
- Paper 33%

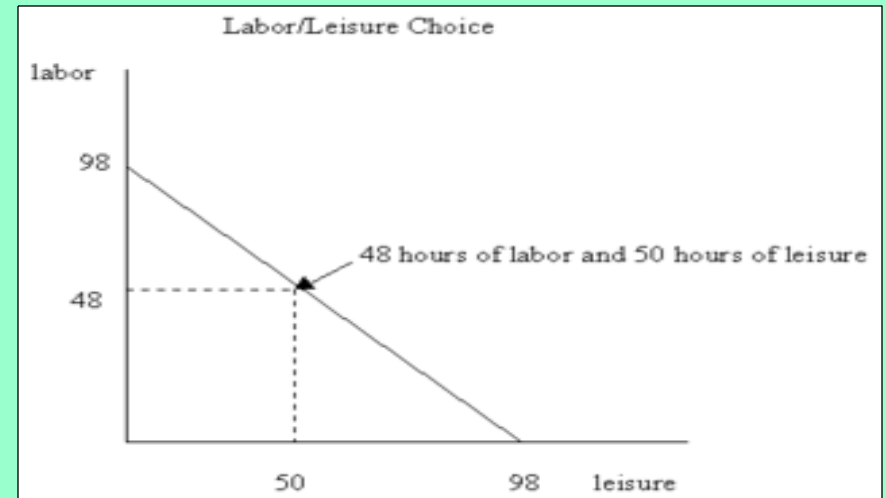- **Pie graphs are used to compare the parts of a whole.**

Line Graphs

Line graphs are used to show the relationship between variables.

Types of Relationships (between variables)

Direct: as x increases y increases

Indirect: as x increases y decreases

Constant: as x increases y remains the same