# Scientific Method

# What is the Scientific Method?

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

# Steps of the Scientific Method

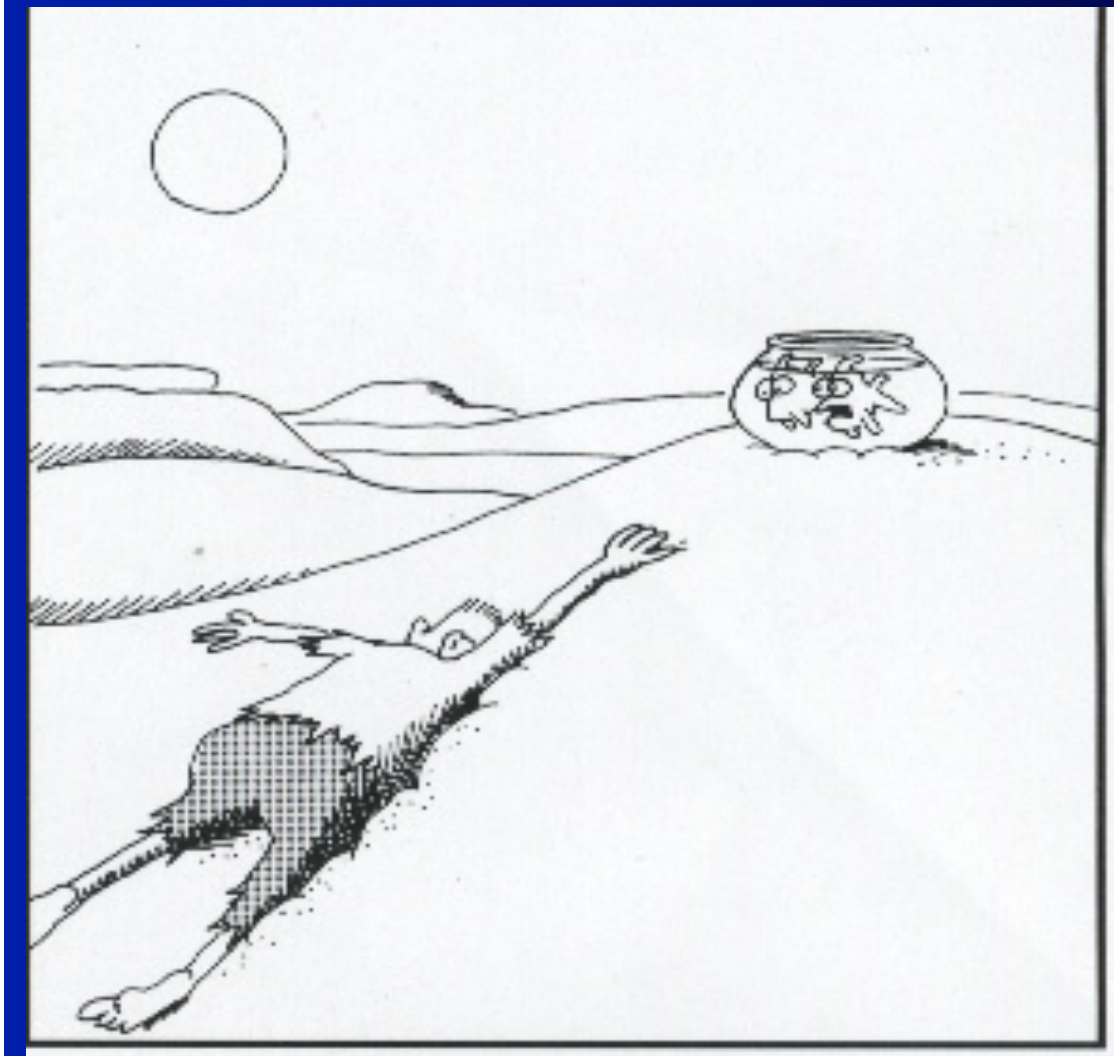
- Observation
- Problem Statement
- Hypothesis Statement
- Experiment / Data Collection
- Conclusion Statement

# Observation

- The scientific method begins with **observation**.

- An **observation** is a visible or provable **fact**.
- An ***inference*** is an **opinion**, or conclusion, based on observed facts.

# Observation vs. Inference



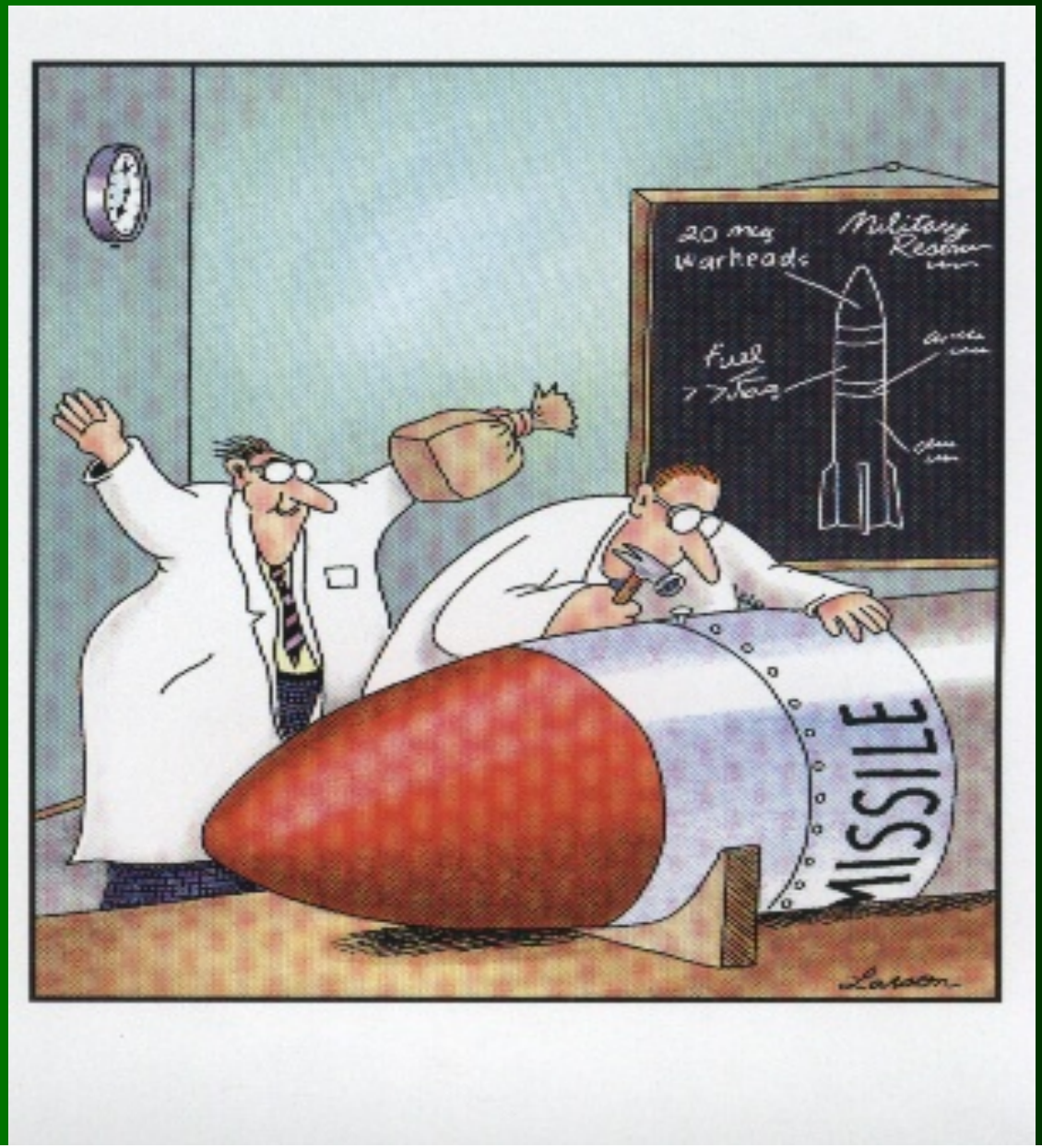
"My word! … That one came just too close for comfort, if you ask me."

**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 <u>does not change</u> 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.

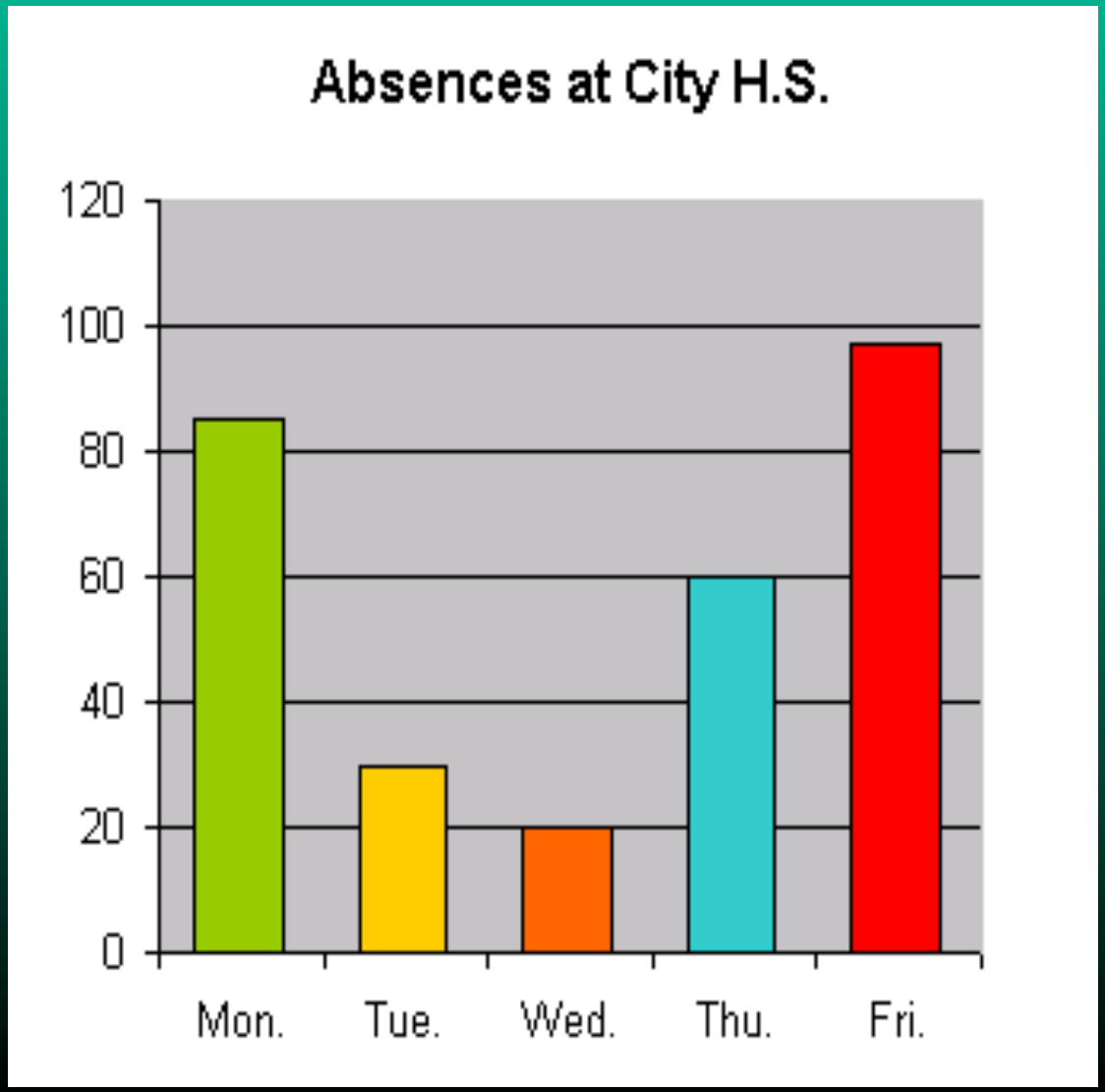
# Conclusion Statement

- 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?

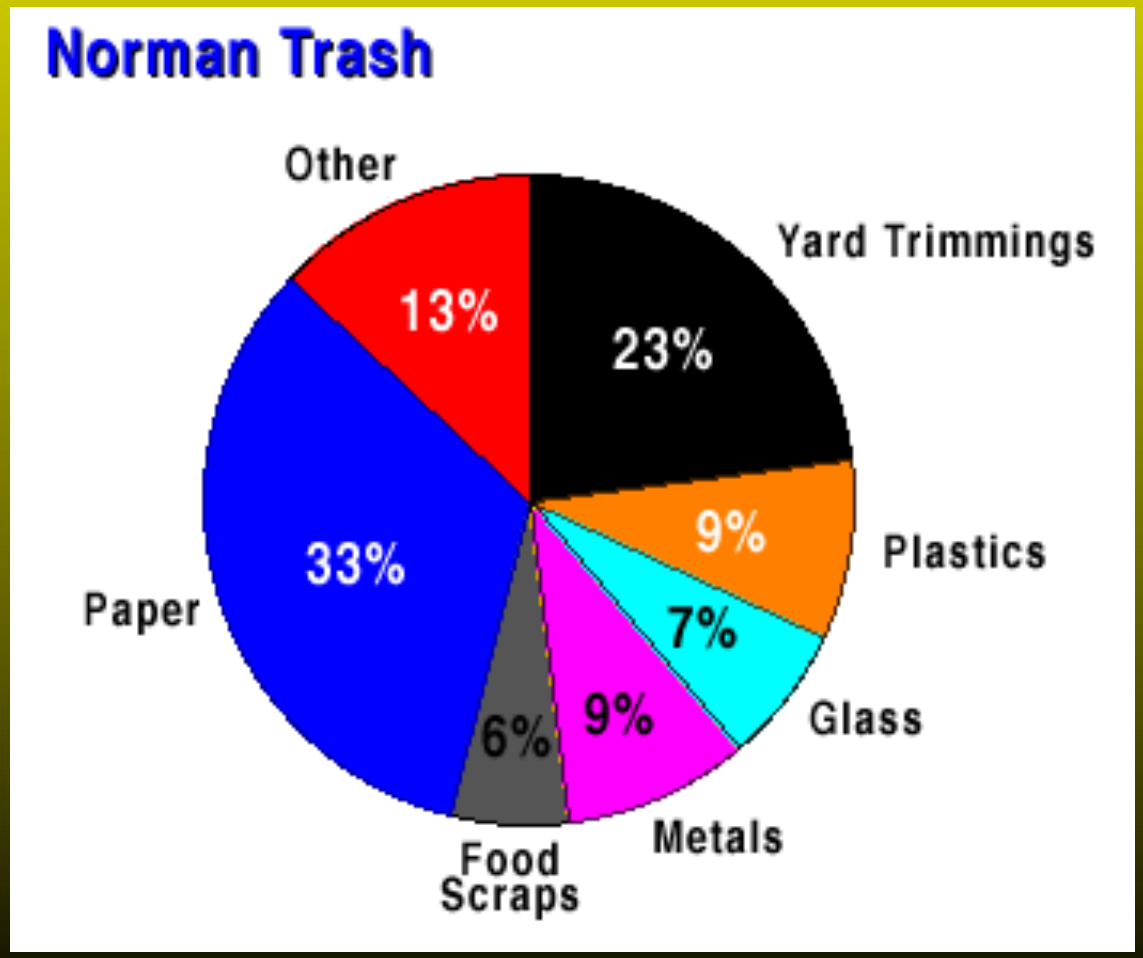
- Graphs help us visualize numerical data.
- There are several different types of graphs:
  - Bar graphs
  - Pie graphs
  - Line graphs

# Bar Graphs



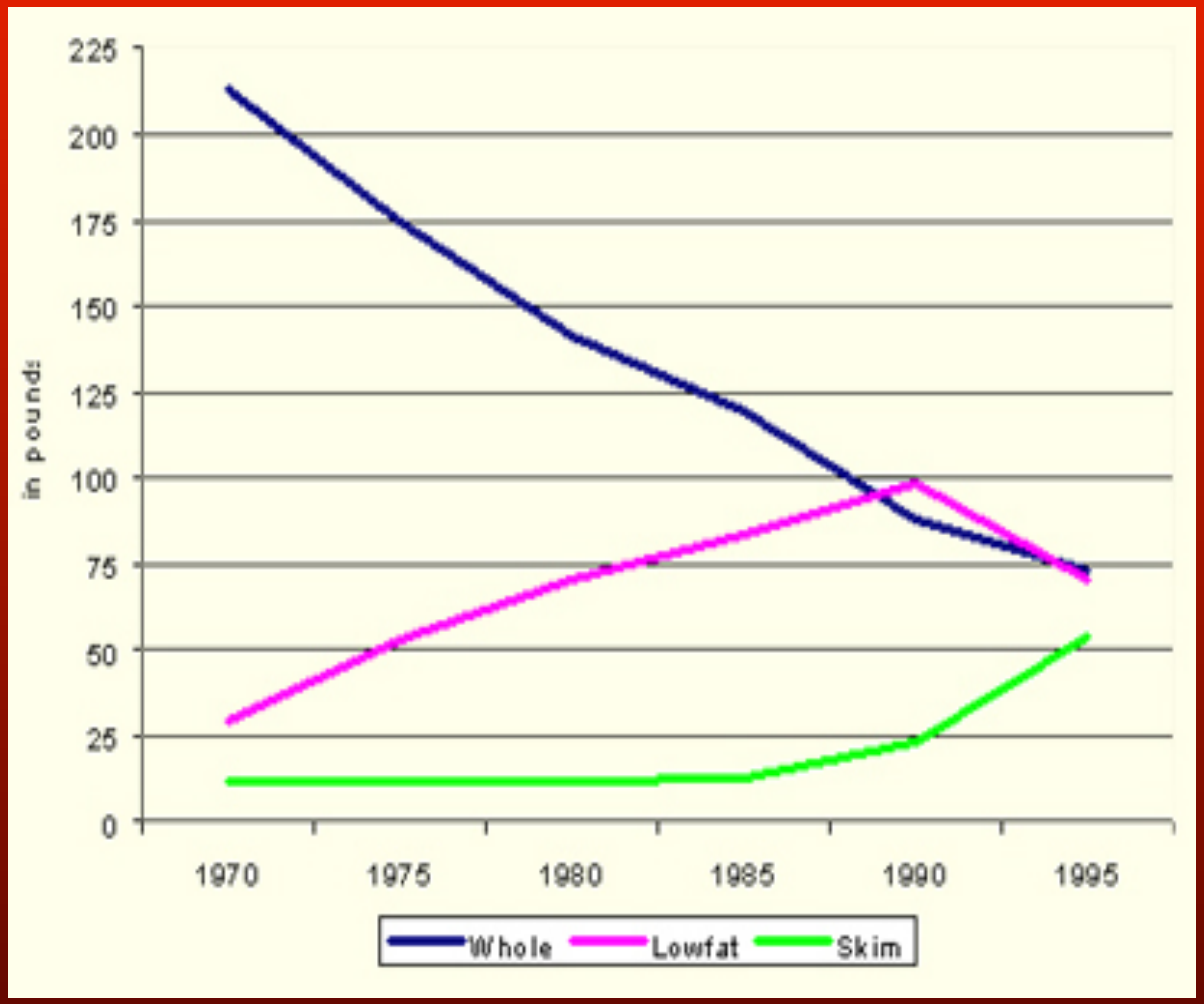

- **Bar graphs are used to show a comparison of multiple objects.**

# Pie Graphs



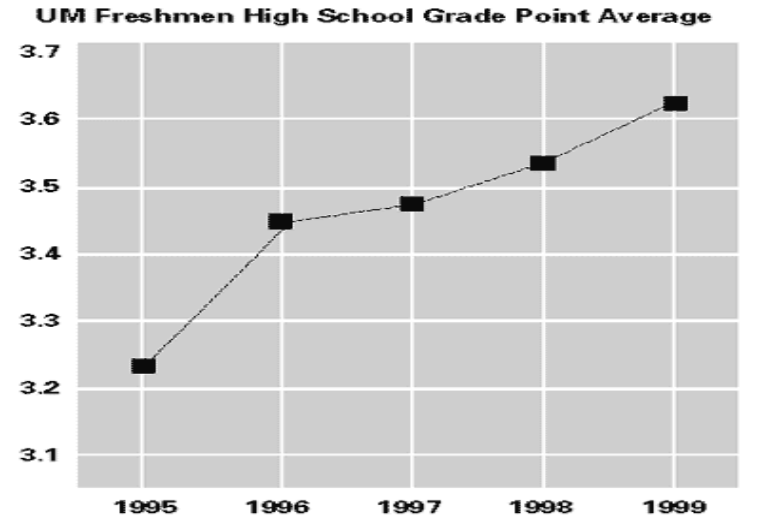

- **Pie graphs are used to compare the parts of a whole.**

# Line Graphs

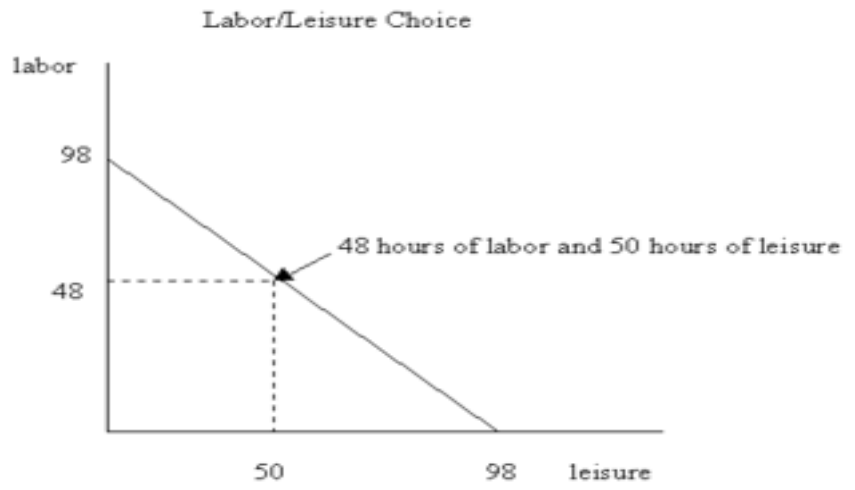



**Line graphs are used to show the relationship between variables.**

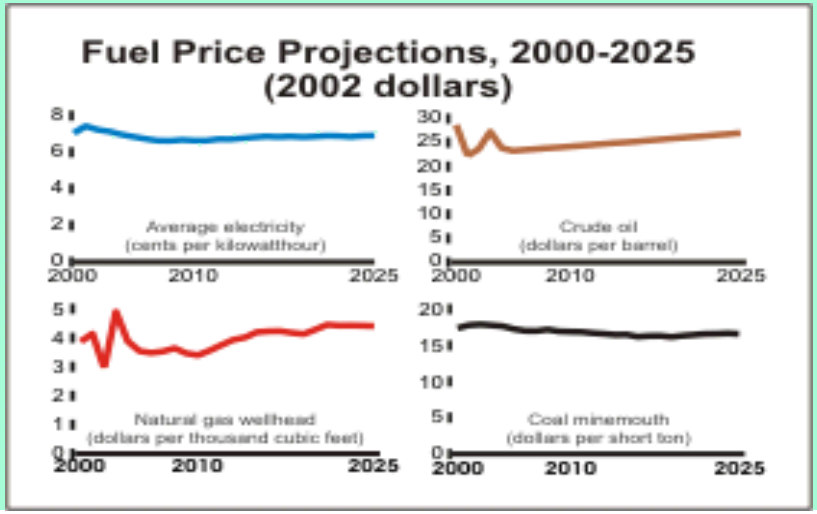
# Types of Relationships (between variables)




**Direct: as x increases y increases**




**Indirect: as x increases y decreases**




**Constant: as x increases y remains the same**