Lab Framework

Text:Cord

Unit number and title: Unit 9 Using Ratios and Proportions

  Short Description: Direct and Indirect proportions

Developed by: Jim Van Fleet (From Algebra Lab:Making Connections)

Contact Information: Castle Rock High School

Date:6-24-10

Lab Title
Direct or Inverse Proportions

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**

- The relationship between a set of variables can be direct or inverse. In part one of this activity, the relationship between the volume of a confined air pocket and applied pressure will be determined. In part two, the relationship between the volume of a confined air pocket and its temperature will be determined.
The data will be analyzed and plotted in order to learn the characteristics associated with each type of relationship.

  Time Required: 2 days

  Group Size: 2 students

  Statement of pre-requisite skills needed (i.e., vocabulary, measurement techniques, formulas, etc.)

      Students should be able to plot a graph.

- **Vocabulary**

      Volume, pressure, data, length
- **Materials List**
- One thin stem pipette filled with colored water, sealed at one end.
- Centimeter ruler
- Set of 5 books per group
- A disposable cup
- Thermometer or temperature probe

- **State Standards addressed**
      Math: 7.2B and 7.2C
      Reading: (Reading)
      Writing: (Writing)
- **Leadership Skills**
      Facilitator, recorder, Time Keeper, Presentation skills

- **SCAN Skills/Workplace Skills**
      Plotting, Graphing, Laboratory skills

- **Set-up information**

Day 1 Activities

1. Obtain a thin stem pipette. Measure the length of the air pocket. (**The length of the air pocket is proportional to the volume of confined air.**) Record the length in the data table.

2. Stack one book on the bulb of the pipette. This will be recorded as one book of applied pressure. Notice that the volume of air in the pipette has changed. Measure the length of the air pocket and record the value.

3. Repeat, adding a second book to the stack. Measure and record the length of the pocket of air.

4. Add books, one at a time, recording the volume after each, until 5 books have been stacked onto the pipette.

Pressure (# of books)	0	1	2	3	4	5
Length of air pocket (cm)						

Day 1 Analysis:

1. Graph the data using pressure (number of books) as the independent variable and volume (length of air pocket) as the dependent variable. Label each axis and give the graph a name.

2. Determine whether the relationship between pressure and volume is a direct or an inverse proportionality.

Day 2 Activites:

1. Obtain a plastic cup. Fill the cup ¾ of the way with water. Put the thin stem pipette into the cup, bulb end down. Insert a thermometer (or use a temperature probe) and record the temperature of the water. Measure and record the length of the confined air pocket.

2. Lower the temperature of the water by adding a small amount of ice to the cup. Allow the pipette to sit in the ice water for about 2 minutes. Take it out and measure the length of the air pocket. Record the length and the temperature.

3. Lower the temperature by adding more ice. Allow the pipette to sit in the water for about 2 minutes. Take it out and measure the temperature and record the length of the air pocket.

4. Continue the process until a total of five data points have been collected.

Temperature (°C)						
Volume						

(cm)							

Day 2 Analysis:

1. Make a plot of length (y axis) versus temperature (x axis). Label each axis and give the plot a title.

2. Does the shape of this graph reflect a direct or an inverse relationship between volume and temperature?

3. Use a graphing utility to find the best fitting linear function for your data. What does the slope represent? What does the y-intercept represent? (In a classroom, have students compare their slope and y-intercept with those from the other groups.)

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required)**

  - **Teacher Assessment of student learning**
  Lab Safety 20%
  Small Group Dynamics 20%
  Presentation and reporting results 60%
- **Summary of learning** (to be finished after student completes lab)
  -discuss real world application of learning from lab
  -opportunity for students to share/present learning
  Students in their group present to whole class, reporting their results and their conclusions

- **Optional activities**
  Report on Pressure and Columns (must be negotiated with teacher
- **Career Applications**
  Hydraulics, Medical Lab Career

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LAB TITLE:_____
STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**

- **Grouping instructions and roles**

- **Procedures** – steps to follow/instructions

- **Outcome instructions**

- **Assessment instructions** (peer-teacher)

Lab Data Collection

Student: _____ **Date:** _____

Unit: _____

Lab Title:

Criteria: Write the problem/objective in statement form

Data Collection: Record the collected/given data

Calculations: Complete the given calculations to solve for an answer(s)

Summary Statement:

Other Assessment(s)