Lab Framework

Text: CORD

Unit number and title: Unit 16 Solving Problems involving Linear Equations

Short Description: This lab focuses on the calculation of the spring constant. The spring constant is used because it directly connects the concept of slope within a linear equation. The main fundamental equation is y = mx. In physics terms, F = -kx, where the "k" is the same as "m" in our fundamental equation.

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Lab Title

Calculation of a Spring Constant

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
  The objective of this lab is to determine the **spring constant, k**
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)
  Students will need to know the basics of linear equations
  The reading of a yard stick
  Advanced students may have to use concepts of physics—F = m a
- **Vocabulary**
  Weights (masses), Spring constant, Displacement
- **Materials List (per team)**
  The materials required for this lab may be dependent on the supplies in your school's physics or science department
  Yard stick
  Springs (Slinky)
  Hook
  Scotch Tape
  Metal stands
  4 equal masses (can be grams or ounces) per team
- **State Standards addressed**
  Math: A 1.4.B

  Reading:
  2.1.4. Apply comprehension monitoring strategies for informational and technical materials, use prior knowledge.
  2.1.5. Apply comprehension monitoring strategies for informational and technical materials, complex narratives, and expositions: synthesize ideas from selections to make predictions and inferences.

Writing:
2.2.1. Demonstrates understanding of different purposes for writing.
2.4.1. Produces documents used in a career setting.

- **Set-up information**
As stated above, the materials for this lab is dependent on your school's science department
Set up is straight forward requiring a sturdy table, clamps, stands, rulers, equal masses and springs.
Students must observe safety rules and be very careful with all equipment.

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

  Students will follow the basic groups of three format— Team Spokesman, Team Recorder and Team Checker

- **Teacher Assessment of student learning** (scoring guide, rubric)
  The teacher may use any scoring guide related to labs

- **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

- **Optional activities**
  If students are interested, the teacher may extend the lab to advance topics in physics.
  This website may be used as a reference:

  http://www.4physics.com/phy_demo/HookesLaw/HookesLawLab.html

- **Career Applications**
  Careers in Physics, Engineering, Architecture

LAB TITLE: **Calculation of a Spring Constant**

STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**

  This lab addresses the problem of calculating the spring constant of any spring.

- **Grouping instructions and roles**

  Grouping for students consists of the following makeup: Team Spokesman/ Leader, Team Recorder and Team Checker

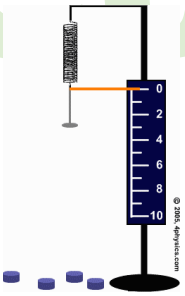
  Each team will have three members with these specific duties as follows:

Team Spokesman:
Reports the progress of the team to the teacher and is the only one allowed to articulate team questions. Announces the team's results to the class

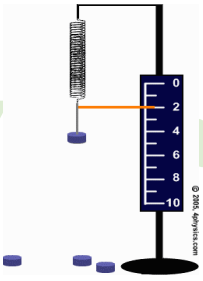
Team Recorder:
Keeps track of any written work the team has to do
Helps in the formulation of any team questions

Team Checker:
Double checks the results of any computations or calculations
Helps in the formulation of any team questions
Performs the lab procedures

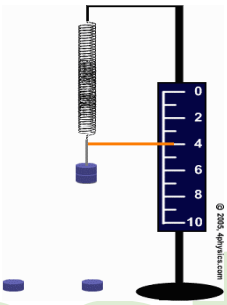
- **Procedures** – steps to follow/instructions
  1. Lay out all equipment
  2. Connect metal base to metal rod and make sure that it is firmly set in place at the edge of the table
  3. Attach a metal clamp at the top of the rod. Make sure the clamp hangs over the edge of the table.
  4. Attach a spring to the metal clamp and attach a hook to the end of the spring
  5. Hold the yard stick at the side of the spring hook apparatus. Note the zero point on the ruler with no masses on the spring



  6. Place the first mass (50 grams) on the spring and note the displacement



  7. Place the second mass (50 grams) on the spring and note the displacement



8. Repeat the same procedure for the other two 50 gram masses
9. If you will like more data points, more masses may be used

- **Outcome instructions**

1. Make a table of values—"y" will represent your masses (grams) and "x" your displacement (centimeters)
2. The masses should be added, i.e., 50, 100, 150, 200 g, etc.
3. The displacement should be added, ie, 2, 4, 6, 8 cm
4. With this data, graph the data on a x-y axis
5. The trend of the data should be a straight line

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)