Lab Framework

Text:Cord

Unit number and title: Unit 9, Ratios and Proportions

Short Description: Students measure and document arm reach, height, and foot length.The data is converted to ratios, average ratios are figured and ratios are used to make predictions.

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Date: June 2009

Lab Title
Reach for a Ratio

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
  - Accurate measurment
  - Convert data to ratios
  - Compare ratios
  - Compute average ratios
  - Review data concepts of mean, median, average, outlier
  - Completion of data table and demonstrate method of calculations
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

  It would be useful to do Unit 1 – Problem Solving and Unit 3 -Measuring in English and Metric Units
- **Vocabulary**
  - Ratio
  - Proportion
  - Equal Ratio
  - Direct Proportional relationship
  - Range
  - Mean
  - Median
  - Average
  - Outlier
  - Correlation
- **Materials List**
  - Set Up several tape measures on the wall to get accurate heights
  - More tape measures for arm reach and foot length
  - Lab Sheet – one per student
- **State Standards addressed**

  Math: Standards 7.2.E, A1.8.A, A1.8.B, A1.8.C, A1.8.E, A1.8.F, A1.8.G

  Reading: (Reading)

  Writing: GLE 3.2.2, 3.3.1, 3.3.2, 3.3.3
- **Leadership Skills**

  1.2 The student will demonstrate the ability to acquire and use **information** in a family, community, business and industry

settings. This means that the student can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.

- **SCAN Skills/Workplace Skills**

Writing

A. Communicates thoughts, ideas, information, and messages in writing
B. Records information completely and accurately
D. Uses language, style, organization, and format appropriate to the subject matter, purpose, and audience.

Arithmetic

A. Performs basic computations
B. Uses basic numerical concepts such as whole numbers and percentages in practical Situations

Mathematics

A. Approaches practical problems by choosing appropriately from a variety of mathematical techniques.
B. Uses quantitative data to construct logical explanations for real world situations

- **Set-up information**
  1. Digital Projector for master data collection
  2. Measurement stations with many tape measures
  3. Copies of Lab Sheet
  4. Collection of Nature/Ratio pictures for digital display
- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required) total time ~ 1 hour**
  (10-20 depending on slides) This class period will start with a review of ratios and proportions. Ratios in nature will be demonstrated with slides. This would be a good time to introduce the golden ratio. Next, students will be reminded of various estimation techniques that use their body parts. I have heard that your arm reach is about your height. How true is this? What is the average ratio of the class of arm length to height? What about foot length to height? Could we use this information to predict other people's height? Introduce lab activity.

  Discussion of metric vs English measurement units and how to accurately take measurements would be useful before beginning the lab.
  Review of ratio, how many ways could our ratios be written for this to be useful, how should our ratios be presented?

  (20 -30min) Students will need help from a partner to make accurate measurements but each student should be responsible for their own Lab Sheet. These groups should be two or three students with one being measured, the others measuring and recording data.

  Set up a few height measurement stations on the wall. A few foot and arm tape measures should be made available – there are other ways to measure too, using tiles on the floor or string – do what works, see if the kids come up with other ways.

  There should be a master data bank on the digital projector to be filled out as data becomes available.

  (20 min) Complete calculations and lab questions

- **Teacher Assessment of student learning** (scoring guide, rubric)

The Lab Sheet will be graded according to the included rubric, in class participation, attitude, focus will also be assessed.

- **Summary of learning** (to be finished after student completes lab)
  -discuss real world application of learning from lab
  What's the conclusion? How close are peoples arm length to their height? How closely could you predict foot length based on height?
  -opportunity for students to share/present learning
  Students will write measurement and ratio data on master data sheet. If time allows there could be opportunity to show how averages were derived and variations of individuals from the averages.

- **Optional activities**
  Using arm length, estimate the measurement of several items.
  Using foot length, estimate the measurement of several items
  Given a variety of unknown measurements, make predictions
- **Career Applications**
  Tailor, Shoe Salesman

LAB TITLE: Reach for a Ratio
STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**
  How true is this statement:
  The average persons arm reach – finger tip to finger tip- is about the same length as their height.
  Is there a correlation between height and foot length?

- **Grouping instructions and roles**
  Groups of two or three will work together to collect measurement data
  Individuals will be responsible for completing data sheet

- **Procedures** – steps to follow/instructions
  As a class, we will decide if we are using metric or English measurements, we will discuss ways to maximize accuracy with given measurement tools.
  Students will rotate through measurement stations to get measurements from each team member. They will compute the ratios for their measurement then post their raw data and ratio figures on a master sheet digitally projected.
  Students will use the projected data to compute a class average – outliers?? (the one armed guy?)

- **Outcome instructions**
  Complete the Lab Sheet

- **Assessment instructions** (peer-teacher)
  Classroom participation, working well with others, sharing of resources, will be assessed. Lab Sheet will include grading rubric.

Lab Data Collection

Student: _____ **Date:** _____

Unit: Unit 9 Ratio and Proportion

Lab Title: Reach for Ratios

Criteria: Write the problem/objective in statement form
State the problem, or question here, in a complete sentence (10 pts).

Data Collection: Record the collected/given data: (30pts)

Student	Height	Arm Reach	Ratio Arm:Height	Foot length	Ratio Foot:Height

What is the range of ratios Arm:Height _____

What is the range of Foot:Height _____

Which ratio is more closely **directly proportional** to height? _____

Calculations: Compute the class average ratios, are there any ratios that should be left out (outliers)? Show your work! (30pts)

Arm:Height

Foot:height

In percent, how close are your personal ratios from the average? (your ratio:average ratio)

Summary Statement (somehow relate your findings to the problem/objective above!): (20 pts)

Follow-Up Questions (10 pts each=30 pts total, neatness counts, show your work)

1. If three folks about 6' tall could encircle a fir tree, finger tip to finger tip, what is the approximate circumference of that tree?

- bonus if you can tell me the diameter of the tree!

2. A guy walks into the shoe store – he's 5'10", how long do you think his foot will be?

3. Compare the ratio of your measurements to those of the class average. What percentage off of the average is your body???