Lab Framework

Text: CORD

Unit number and title: Unit 15 Using Formulas to Solve Problems

Short Description: Students will use the distance formula *d=rt* to find the rate of speed they are traveling given a distance traveled and the amount of time it took. The students will "power walk" 10 meters. One student will time how long it takes to cover the distance and a third student will record the data. Partners will take turns walking. The students will then calculate their rate in miles per hour. Then the students will find the distance from school to their home using MapQuest and determine how long it would take them to get to school if they "power walked". Isolate r in the formula to obtain an expression for rate. The students will use this form of the formula to determine their speed.

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Lab Title

Your Power Walking Speed

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
  - Read and write a formula
  - Rearrange the parts of the distance formula to solve for rate
  - Substitute values in the formula to find the rate
  - Use the calculator to solve the problems with the formula
- **Statement of pre-requisite skills needed**
  - Time keeping
  - Measurement techniques
  - Problem solving techniques-Unit 1
  - Conversions
  - Ratios/Proportions
  - Calculator and computer skills
  - Cooperative learning skills
  - Estimating
- **Vocabulary**
  - Variable
  - Formula
  - Mathematical Expression
  - Expression
- **Materials List**
  - Tape measure (or other measurement tool)
  - Stop watches
  - Lab Sheets with instructions
  - Internet access
  - Calculator
- **State Standards addressed**
  - Math: A1.1.A, A1.1.B, A1.2.A, A1.6.B

Reading: 2.1, 2.1.4, 2.1.6,
Writing: 1.1, 1.2, 2.2

- **Leadership Skills**
  Working successfully with partners
  Taking a leadership role in a group setting
- **SCAN Skills/Workplace Skills**
  Respect for self and others;
  Responsibility for personal actions and commitments;
  Self-discipline and moderation;
  Diligence and a positive work ethic
  Approaches practical problems by choosing appropriately from a variety of mathematical techniques.
  Uses quantitative data to construct logical explanations for real world situations.
  Expresses mathematical ideas and concepts orally and in writing
- **Set-up information**
  Get materials
  Model PowerWalk
  MapQuest working
  Have groups ready (unless having students choose)
- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline- One Day)**
  Lab would work well outside if possible.
  Set up measuring tapes and give each group a stopwatch. Make sure students understand the distance to be traveled.
  Students will work in groups of three (may vary depending on teacher preference). Each student will take a turn walking. One student will time the walker and one student will record the information. The students will take turns with each role. The students are expected to participate in each role and work cooperatively within their group.
  Students may practice a few times if they wish to "warm-up". Students will have 10 minutes to complete the data collection (may vary). Once data has been collected students will complete the lab worksheet.

- **Teacher Assessment of student learning** (scoring guide, rubric)
  Questioning students before, during, and after activity
  Completion of the worksheet
- **Summary of learning** (to be finished after student completes lab)
  -discuss real world application of learning from lab
  - students will discuss their findings and answers to the last two questions

- **Optional activities**
  Possible discussions and extensions:
  Height/Weight –does it affect the speed?
  How would the actual time vary from the theoretical time it would take to travel to school given your speed?
  What are some other uses for determining rate given distance and time?
  Graphing the data, creating data tables
  Create an entire class graph, scatter plot

LAB TITLE: Your Power Walking Speed
STUDENT INSTRUCTIONS: Your group will take turns Power Walking 10 meters.

- **Statement of problem addressed by lab**
  What is your rate in miles per hour? How long would it take you to travel to school from your house at this rate?

- **Grouping instructions and roles**
  Students grouped prior to activity
  Roles-Recorder, timer, walker. Students will participate in all three roles.
  Students will need to take responsibility to get their data collected.
- **Procedures** – steps to follow/instructions
  Determine the distance to be walked using the measuring tape
  Practice a few walks with the timer
  Walk when the timer is ready and recorder will write down the data
  Switch roles until all three partners have data recorded
  Determine the distance using MapQuest from your house to the school

- **Outcome instructions**
  Use the recorded data to answer and solve the problems
  Be able to rewrite the distance formula to determine the rate
  Using the rate determine the amount of time it would take to travel a set distance

- **Assessment instructions** (peer-teacher)
  Show all steps and work
  Write in complete sentences when showing work
  Check your answer

Lab Data Collection

Student: _____ **Date:** _____

Unit: 15 Using Formulas to Solve Problems

Lab Title: Your Power Walking Speed

Criteria: Write the problem/objective in statement form

Data Collection: Record the collected data

Name:	Distance (meters)	Time (seconds)
	10m	
	10m	
	10m	

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

Use the distance formula $d=rt$ to calculate the rate in miles per hour for each member in your group. You will need to isolate r and rewrite the formula. (Hint: Don't forget to convert your time units and distance units for your final answer—*Miles* per *Hour*)

Fill in your calculations in the table below.

Name:	Distance (Miles)	Rate (MPH)	Time (Hours)

Now go to MapQuest at http://www.mapquest.com/ and determine the distance from your house to school. The address for the school is:
212 S. 6th Avenue
Yakima, WA 98902.
Use your home address as the starting location and the school address as the End.

Distance from your house to school:_____.

Using the distance formula determine how long would it take you to get to school if you traveled at your power walk rate (Solve for time).

Assume you walked to school with your group members from your house. Determine each person's time to travel to school.

Group Member #1

Group Member #2

Compare your time with your partner's times. Were you surprised by the results? What might cause the difference in rates?

Summary Statement: The time we calculated to travel to school is an estimate. Do you think the actual time would differ from our theoretical time? Why or why not? Give at least two reasons. Be prepared to discuss with the class.