

SIULATING RESISTANCE IN WIRE

Performance Standard 6D.J

This task uses electrical resistance in a wire as a context for finding the constant of proportionality and applying it to a new situation using electrical resistance in a wire as demonstrated through a computer program.

- *Mathematical knowledge:* determine the constant of proportionality.
- *Strategic knowledge:* set up the variation equation and apply the constant.
- *Explanation:* explain what was done to the variables and why it happened.

Procedures

1. ***In order to solve problems using comparison of quantities, ratios, proportions and percents (6D)***, provide students with sufficient learning opportunities to develop the following:
 - Set up and solve proportions for direct and inverse variation of quantities involving powers and multiple variables.

Computer programs in the workplace at times call for programmers to have the ability to analyze information that emphasizes what changes occur on a variable when other dependent variables are either kept constant or changed in a formula. This assessment also aligns with Workplace Skill H4 (Solving Problems and Critical Thinking/Employ reasoning skills).

2. Students are given a copy of a problem that asks them to code a program in visual basic to simulate an equation showing the effects on all variables when one variable is held constant and another variable is changing. They must use up and down arrows for each variable to access number ranges. It is assumed that students have studied direct and inverse variation in single and compound situations.
3. Evaluate the students' work using the mathematics rubric and make sure they have used appropriate ranges for the variables as follows:
 - A range of numbers for Voltage. Numbers range from 1 to 100.
 - A range of numbers for Current. Numbers range from 1 through 10.
 - A range of numbers for Resistance. Numbers range from 1 through 10.
 - For example, keep voltage constant at 50. As you change the current from 1 to 10, the resistance will change from 50 to 5 automatically. See chart:

Voltage	Current	Resistance
50	1	50
50	2	25
50	3	16.66
50	4	12.5
50	5	10
50	6	8.33
50	7	7.14
50	8	6.25
50	9	5.55
50	10	5

4. Evaluate each student's work using all three dimensions of the rubric and its guide to determine the performance level. Use the standard rubric, giving a score for each category for each question. Minor computational errors might include rounding errors. Use of incorrect variable correlation in the formula should result in no more than a 2 in mathematical knowledge. A 4 in mathematical knowledge would require correct answers.

Examples of Student Work

- [Meets](#)
- [Exceeds](#)

Time Requirements

- Two class periods

Resources

- Copies of the "Simulating Resistance in Wire" task sheet
- Access to a computer with visual basic software
- Mathematics Rubric

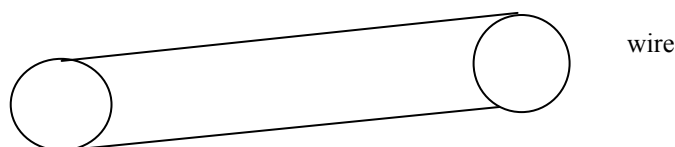
NAME _____ DATE _____

SIMULATING RESISTANCE IN WIRE

Student Task Sheet

Write a visual basic program that will simulate the effect of changing one variable in an equation when a third value is held constant. Your program should allow the user to choose which variable to change (using arrow keys) and which variable to keep constant. The third variable should change automatically to correspond with the other two selections.

Resistance of a wire carrying an electrical current is directly proportional to current divided by the voltage.



Ohms law states that the relationship between voltage, current and resistance in the formula $V = I * R$ where $V =$ Voltage, $I =$ Current and $R =$ Resistance.

- a) Show that your program works as intended. Make voltage, current, or resistance constant; and see how each reacts when you change the other variable. For example, keep the voltage constant at 50, and vary the current from 1 to 10. What happens to the resistance when this is done?
- b) Make sure to use the following set range of numbers for each variable, and use up and down arrows to access those numbers. Have the voltage range from 1 to 50, the current range from 1 to 10, the resistance range from 1 to 10.

Turn in a copy of your program and a written description of how your program solves problems involving Ohms law, including what happens at each step.

MATHEMATICS RUBRIC

NAME _____ DATE _____

- Exceeds standard (must receive a 4 in each area)
- Meets standard (must receive all 3's or a combination of 3's and 4's)
- Approaches standard (must receive all 2's or any combination which may include a 3 or a 4)
- Begins standard (has no 3's or 4's but not all 1's)
- Absent (has all 1's and 0's)

	Mathematical Knowledge	Strategic Knowledge	Explanation
4	<ul style="list-style-type: none"> • Wrote the right answer. • Used math words correctly to show understanding of how math works. • Worked it out with no mistakes. • Used the right math words and labeled the answers. 	<ul style="list-style-type: none"> • Identified all the important parts of the problem, and knew how they went together. • Showed all the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote what was done and why it was done. • If a drawing was used, all of it was explained in writing.
3	<ul style="list-style-type: none"> • Knew how to do the problem, but made small mistakes. 	<ul style="list-style-type: none"> • Identified most of the important parts of the problem. • Showed most of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote mostly about what was done. • Wrote a little about why it was done. • If a drawing was used most of it was explained in writing.
2	<ul style="list-style-type: none"> • Understood a little, but made a lot of big mistakes. 	<ul style="list-style-type: none"> • Identified some of the important parts of the problem. • Showed some of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote some about what was done or why it was done but not both. • If a drawing was used, some of it was explained in writing.
1	<ul style="list-style-type: none"> • Tried to do the problem, but didn't understand it. 	<ul style="list-style-type: none"> • Identified almost no important parts of the problem. • Showed almost none of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote or drew something that didn't go with the answer. • Wrote an answer that was not clear.
0	<ul style="list-style-type: none"> • No answer attempted. 	<ul style="list-style-type: none"> • No strategy shown. 	<ul style="list-style-type: none"> • No written explanation.
Score			