WAMC Lab Template

Math Concept(s): solving equations, concept equations, accuracy in measuring.
Source / Text: CORD: Labs and Real-World Applications.
Developed by: Jerry Rice   E-Mail: jrice@sheltonschools.org   Date: 6/21/2022

Attach the following documents:

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

Lab Plan

Lab Title: Balancing Equations. This lab will be completed at the beginning of chapter two, Solving Equations. This will become student-generated data to which we can return throughout the chapter.
Prerequisite skills: Some facility with measuring, and some skill with a calculator.

Lab objective: To show that the two 'sides' of an equation are actually equal.

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*

Mathematics K–12 Learning Standards:

- http://www.corestandards.org/Math/Content/HSA/REI/A/2/ Understand solving equations as a process of reasoning and explain the reasoning.
- http://www.corestandards.org/Math/Content/HSA/REI/B/3/ Solve equations and inequalities in one variable.
- http://www.corestandards.org/Math/Content/HSA/CED/A/4/ Create equations that describe numbers or relationships.

Standards for Mathematical Practice:
K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- http://www.corestandards.org/ELA-Literacy/RST/9-10/3/ Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks…
- http://www.corestandards.org/ELA-Literacy/RST/9-10/4/ Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context…
- http://www.corestandards.org/ELA-Literacy/RST/9-10/7/ Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

K-12 Science Standards

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Technology
- Measuring tools and calculators.

Engineering
- https://www.nextgenscience.org/topic-arrangement/hsengineering-design#:~:text=HS%2DETS1%2D2,solved%20through%20engineering. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)
- ☐ Global Awareness
- ☐ Health/Safety Literacy
- ☐ Financial/Economic/Business/Entrepreneurial Literacy
- ☐ Environmental Literacy
- ☐ Civic Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
- ☒ Think Creatively
- ☐ Work Creatively with Others
- ☐ Implement Innovations
Critical Thinking and Problem Solving
- ☒ Reason Effectively
- ☐ Use Systems Thinking
- ☐ Make Judgments and Decisions
- ☐ Solve Problems
Communication and Collaboration
- ☐ Communicate Clearly
- ☐ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
- ☒ Access and Evaluate Information
- ☐ Use and manage Information
Media Literacy
- ☐ Analyze Media
- ☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
- ☒ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
- ☐ Adapt to Change
- ☐ Be Flexible
Initiative and Self-Direction
- ☐ Manage Goals and Time
- ☐ Work Independently
- ☐ Be Self-Directed Learners
Social and Cross-Cultural
- ☐ Interact Effectively with Others
- ☐ Work Effectively in Diverse Teams

Productivity and Accountability
- ☐ Manage Projects
- ☒ Produce Results
Leadership and Responsibility
- ☐ Guide and Lead Others
- ☐ Be Responsible to Others

<u>Teacher Preparation: (What materials and set-up are required for this lab?)</u>

Materials

- An assortment of round objects to measure, cloth tape measures, and calculators.

Set-Up Required:

- Minimal. Let students gather their circular objects from the pile and choose their measuring device. Review the terms diameter, radius, and circumference. Review the formula for the circumference of a circle.

<u>Lab Organization Strategies:</u>

Leadership (Connect to 21st Century Skills selected):

- Students will face some difficult measuring tasks. They will have to think creatively and to work cooperatively to solve them.

Cooperative Learning:

- More than two hands will be necessary for some of this activity. Students will have to cooperate.

Expectations:

- Students will generate data that they will use on the day of the lab and return to later for additional evaluation.

Timeline:

- This lab can be completed in a one-hour class session.

<u>Post Lab Follow-Up/Conclusions:</u>

Discuss real world application of learning from lab

- Really weird stuff, such as the value of Pi, can be figured out.

Career Applications

- Accuracy in measuring and seeing a task through to conclusion are valuable skills in many settings.

Optional or Extension Activities

- Find and measure very large and very small circles. Are your conclusions still valid? If not, why not?

Jerry Rice

Algebra I

Math Lab: Balancing Equations.

Goals:

- Learn to solve concept equations for any variable.
- See that, if they are rearranged properly, the two sides of an equation remain equal.
- Develop greater accuracy in our measuring.

Equipment:

Calculator, cloth measuring tape, assorted circular objects to measure.

You may do this work with one partner or on your own.

Procedure:

1.   Create a table to record your data. It could look something like this:

Equation	Left Side	Right Side	Object Measured	Measured left side	Calculated right side
$c = \pi d$	c	πd	a		
			b		
			c		
	d		a		
			b		
			c		
	π		a	3.14	
			b	3.14	
			c	3.14	

2. Solve the concept equation for 'd' and then 'π'. Record those results in your table.

3. Measure the circumference of your three items. Record this data.
4. Measure the diameter of each of your items. Record this data in your table.
5. Calculate and record the values for the right side of your equations.
6. Are the two sides of your equations equal to each other? Are they close? What might account for small discrepancies? What might account for larger discrepancies?

WAMC Lesson Plan

Name(s): Jerry Rice
Email Address: jrice@sheltonschools.com
Lesson Title: Balancing Equations.
Date:
Text: CORD: Labs and Real World Applications   STEM Correlation:
        Lesson Length: One to two class periods.

Big Idea (Cluster): The two sides of an equation are equal.
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• Mathematical Practice(s): • #1: Make sense of problems and persevere in solving them.

Content Objectives: To demonstrate that equations ae balanced.	Language Objectives (ELL):
Vocabulary:	Connections to Prior Learning
Questions to Develop Mathematical Thinking: • Why must we perform the same operation on each side of an equation? • Why do accurate measurements matter?	Common Misconceptions: • I can't 'solve' this because there are no numbers.

Assessment (Formative and Summative):

• Student produced results of lab.

Materials:

• Assorted round objects to measure, cloth tape measures and rulers, paper and pencil to record measurements, and our trusty calculators.

Instruction Plan:

Introduction: When did you last calculate the value of Pi? Let's try to do it now!
Explore: What is Pi, and how is it related to the parts of a circle?
When I observe students: They should be wrestling with their measurements and recording them in the table they have built.
Questions to Develop Mathematical Thinking as you observe: Why do some of your equations involve multiplication while others require division?
Answers: To be sure that both sides are equal.
Summarize: Many students will not believe that they can manipulate an equation with no numbers. This will be a new skill for them.

Career Application(s):

- Measuring skills: carpentry, metal fabrication. Algebra skills: a wide range of jobs including engineering and medical professional jobs.

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