

WAMC Lab Template

Math Concept(s): Gather data to use for period calculations (square roots)

Source / Text: Big Ideas 8th grade

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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):

Student will use a variety of weights and string length to explore the effects that both have on the time it takes for a pendulum to swing back and forth (aka the period).

Lab Plan

Lab Title: Tic Toc Data

Prerequisite skills: Weight and length measurement and calculation; recording results.

Lab objective: To allow students the opportunity to explore the effects of both pendulum length and pendulum weight on the time it takes to sway in one direction and back again.

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

Mathematics K–12 Learning Standards:

- 4.MD.A.7

Standards for Mathematical Practice:

- MP5, MP6, MP7, MP8

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

- CCSS.ELA.Literacy.SL.8.1 (A,C,D); CCSS.ELA.Literacy.SL.8.4;
ELA.RST.6-8.3., ELA.RST.6-8.7

K-12 Science Standards

- MS.PS2-2

Technology

- MS.ET.S1-3

Engineering

- MS.ET.S1-3

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

- Global Awareness
 Financial/Economic/Business/Entrepreneurial Literacy
 Civic Literacy
 Health/Safety Literacy
 Environmental 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

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

Materials

- String
- yard stick
- duct tape
- weights: yoyos, washers, lab weights
- paper for recording results
- stop watch

Set-Up Required:

- Each table group needs to have a yard stick taped to the surface with 12” of the stick hanging free over the edge of the table.
- Each yard stick needs a groove carved at the end in order to ensure the free swinging of the string.
- Have a variety of yoyos, washers sizes and weight sizes available that can easily be attached to a string for swinging.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

-

Cooperative Learning:

- Students will work in pairs/table groups
- students will collaborate to share and analyze results
- students will collaborate to perform period calculations

Expectations:

- Students will use at least 3 different types of weights to tie to the end of 3 different lengths of string and record the results of swinging it from one side and back to the original position.
- Students will record data to use in a follow up lesson

Timeline:

- one class period

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Ask students to offer suggestions of why knowing the period of a pendulum might be important.
- Discuss where students may have seen this motion before.

Career Applications

- Machinist, Manufacturing, Clock Making, Music (metronomes), Geophysical surveying, Seismology

Optional or Extension Activities

- Have students predict the period of one of their length-weight combinations if the length was doubled or halved.

Attachment 1: **Lab Instructions**

- Set up each table group with a yard stick taped to the surface- have 12” of the stick hanging free over the edge of the table.
- Carve a groove carved at the end of each yard stick so that the string can swinging freely at the end of it.
- Gather a variety of yoyos, washers sizes and weight sizes that can easily be attached to a string for swinging.
- Students decide who will be the ‘swinger’ of the weight (adding the ‘start’ and ‘stop’ command for the times) and who will be the timer.
- Each group member will record the results of each trial.
- In groups, students will select a minimum of 3 different weight types. With each type, they will attach it to the free end of the string (representing a pendulum) measured at a minimum of 3 different lengths. Students will record the time it takes for the weight to be swung from one side to the other, coming back to the original position. The swinger alerts the timer with a “start” command as he/she releases the weight. When the weight returns to the start position, the swinger will give the timer the “stop” command to complete the trial and indicate the time recording. This will be repeated twice more in order to have 3 trials per weight and string length.
- If time, students can explore with different weight combinations and pendulum lengths in different locations.

Attachment 2: **Student Handouts**

Tic Toc Lab Results

Name: _____

The first type of weight we used: _____

| Trial Number | Pendulum Length | Swing Time |
|--------------|-----------------|------------|
| 1 | | |
| 2 | | |
| 3 | | |

The second type of weight we used: _____

| Trial Number | Pendulum Length | Swing Time |
|--------------|-----------------|------------|
| 1 | | |
| 2 | | |
| 3 | | |

The third type of weight we used: _____

| Trial Number | Pendulum Length | Swing Time |
|--------------|-----------------|------------|
| 1 | | |
| 2 | | |
| 3 | | |

Noticings: _____

Attachment 3: **Rubric/Assessment**

Name: _____

| Score | Procedure Skills | Direction Following | Group Work |
|--------------|---|---|---|
| 4 | Completed all of the trials with all of the weights. | Followed all of the lab directions. | Collaboration allowed team to successfully complete all lab component. |
| 3 | Completed some of the trials with all of the weights. | Followed most of the lab directions. | Collaboration allowed team to successfully complete most of the lab components. |
| 2 | Completed some trials with some weights. | Followed some of the lab directions. | Collaboration allowed team to successfully complete some of the lab components. |
| 1 | Unsuccessfully attempted to complete some trials with some weights. | Attempted to follow some of the lab directions. | Collaboration was attempted, but lab components could not be completed. |