



Snippets of Science from Fermilab

PS 3 (3-8) Explain

PERIODIC MOTION: PENDULUMS

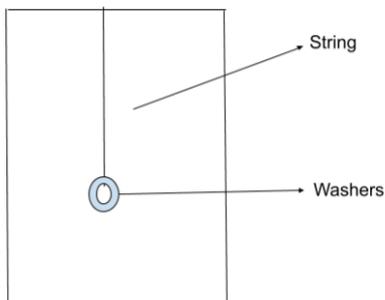
Challenge: Can you use patterns to predict an object's movement?

Goal: Use patterns to determine which variable affects the frequency of a pendulum system.

Fermilab Connection: Fermilab scientists look for patterns in data to understand more about our universe. Use the data collected from this experiment to make predictions and determine which variable affects the movement of the pendulum.

Preparation

Give the students a set length of string to use and a set number of washers (for weight). Set up the pendulum system like the diagram below:



Note: The string needs to be tied around the washer(s) itself, not looped through.

Procedure

1. Take time to explore how the system works. Pay special attention to any patterns you see when you make the pendulum swing.

2. After exploring how the system works, determine how many times the pendulum moves forward and back to its starting position (a cycle) in a certain period of time.
3. After determining how many times the pendulum swings back and forth in a set period of time, test these three different variables: length of the pendulum (string), amount of weight, and release point of the pendulum.
4. Complete the tables on the data sheet for the three different investigations.

GRADE LEVEL
Grades 3–8 with modifications

MATERIALS

- Different lengths of string
- Washers
- Timer
- Apparatus to hold pendulum

Fermilab Resources:
Click on the linked resources!

[How Particle Physics Discovery Works](#)

[Scientific Computing](#)

[Science at Work](#)

Data Sheet:

Periodic Motion: This activity is based on the concept of periodic motion. Periodic motion can be defined as any motion that repeats over and over again with the same time required for each recurrence. A period is the amount of time for the system to complete one cycle. In this example, it is the amount of time for the energy sphere to be released and then return to its approximate release point. The frequency is the number of cycles per unit of time, i.e., how many cycles are completed in one minute.

| Release Point | Number of Cycles per Minute (or a time interval of your choice) |
|---------------|--|
| | |
| | |
| | |
| | |

For this test, keep the length of the string and the number of washers on the pendulum the same. Only change the release point. (You can measure the release point from the ground to the washer or use a protractor if you have one.)

| Amount of Weight (number of washers) | Number of Cycles per Minute (or a time interval of your choice) |
|---|--|
| | |
| | |
| | |
| | |

For this test, keep the length of the string and the release point the same. Only change the number of washers (weight) used on the pendulum for each trial.

| String Length | Number of Cycles per Minute (or a time interval of your choice) |
|---------------|--|
| | |
| | |
| | |
| | |

For this test, keep the the number of washers on the pendulum and the release point the same. Only change the length of the string for each trial.

Conclusions:

What variable affects the number of cycles the pendulum can complete in one minute?

What is your evidence for this conclusion?

Check your work! Look up the correct answer and compare it to your findings. If your findings are not accurate, explain what might have happened.