



Swinging

A Third Grade Science Performance Task

Student Name: _____

Teacher Name: _____

Science is about being curious and asking **TESTABLE QUESTIONS**, then doing **FAIR TEST EXPERIMENTS** to find answers. This is the main way science has been able to build a huge body of knowledge through centuries of work. ***Fair test experiments*** are one way that we know what we know.

A ***fair test experiment*** is an experiment carried out under fair conditions. While keeping all conditions the same, one factor is changed on purpose to see how it affects another factor. A ***fair test experiment*** is almost always carried out many times to help make the results valid.

Curiosity: Observe and Wonder

One thing that makes people different from other animals is that we are naturally curious. As children we learn that we can ask questions about the world around us.

Galileo Galilei, who was known for asking questions, was one of the greatest scientists of all time. He was born in Pisa, Italy in 1564 and died in 1642. For his many great accomplishments and outstanding thinking, he has often been called "the father of modern science", "the father of modern astronomy", and "the father of physics".

He is most often remembered for using the first telescope to make many observations that no one else had ever seen: craters on the Moon, moons orbiting Jupiter, and the phases of Venus.

Galileo also did many experiments involving moving objects. One thing he noticed was the gentle swinging of a church chandelier. He began studying things that swing, and made important discoveries about how things swing and how they can be used to measure time. This eventually led to the development of the first clocks. These clocks kept time by the swinging of a pendulum (a weight on the end of a string or rod that is free to swing).



In this task you will investigate pendulum motion. Your teacher will demonstrate a pendulum. Carefully observe its swings back and forth.

- Does the size of the swing change as time passes?
- Can a pendulum swing forever?
- Can anything affect how much time a pendulum takes to swing back and forth?

Definition

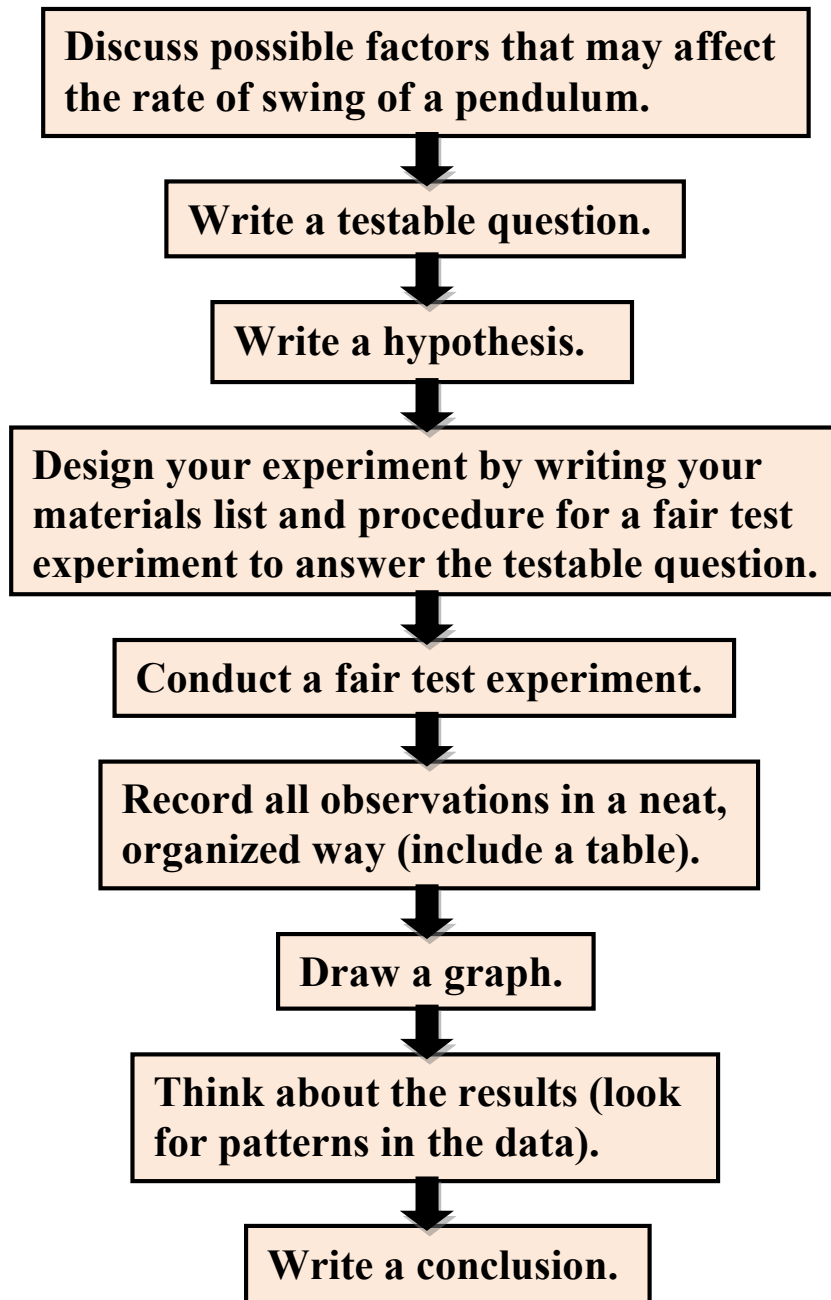
Period - the time to complete one full cycle

Used in context: A pendulum's period is the amount of time it takes to swing back and forth one time.

Your Team's Task

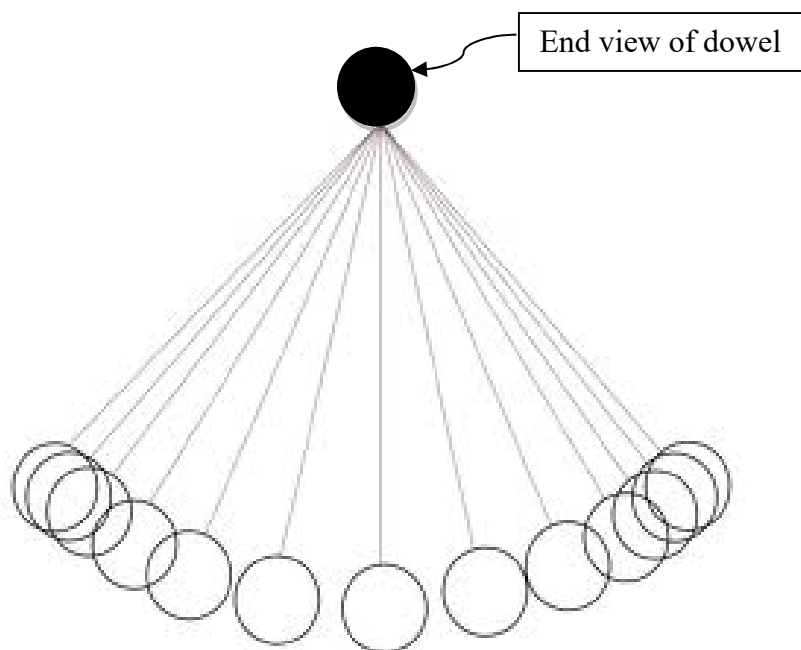
Your team will investigate how a factor affects the number of periods that a pendulum makes in 10 seconds.

To accomplish this, your team will need to:



More Information About Your Experiment

- The pendulum you will investigate will be a string (about 1 meter long) with loops tied at both ends and a paperclip attached to one end of it.
- You have several washers ---- some or all of them can be connected to the paperclip.
- You have a pole, base, and a pendulum clamp. Set up the apparatus and put the string through the pendulum clamp so that the paperclip (with washers) will be able to swing as a pendulum. (Your teacher will show an example)
- When conducting the experiment, do not push the pendulum. Simply pull it up to the desired height and let it go.
- Your team will need to be able to count how many periods the pendulum makes in 10 seconds. It may be necessary for a member of your team to be able to have a clear view of the classroom wall clock (which has a second hand).



Let's Get Started!

Discuss possible factors that may affect the period of swing of a pendulum.

List at least 3 factors that may affect the time it takes a pendulum to swing back and forth:

1. _____
2. _____
3. _____



Write a testable question.

How does _____
affect the number of periods a pendulum makes
in 10 seconds?

Write a hypothesis.

If we increase _____,
then the number of periods the pendulum makes
in 10 seconds _____ because

Design your experiment by writing your materials list and procedure for a fair test experiment to answer the testable question.

Think carefully about what you are going to do in this experiment. To conduct a fair test experiment you need to be sure that each trial is done the same way. In the space below, list some things you have to do the same way each time to make sure each trial is consistent. It is okay if there are fewer than 9 things.

1. Be sure the student releasing the pendulum releases it at the same time the time keeper says "Go".
2. Be sure the pendulum swings without hitting anything during the 10 seconds being measured.
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

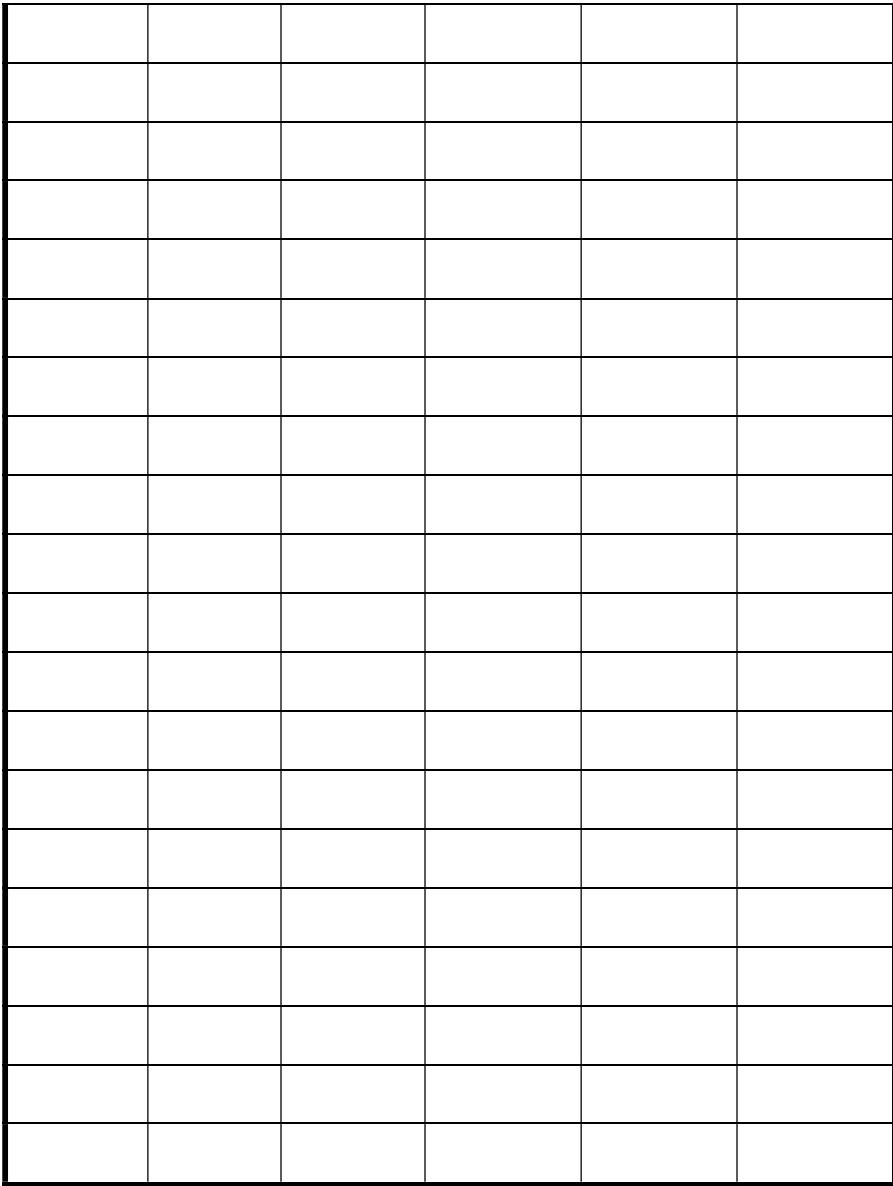
When conducting the experiment, you may think of even more things that you must do consistently to make this a fair test. If so, come back to this page and add to the list above.



Conduct a fair test experiment.

Record all observations in a neat, organized way (include a table).

Draw a graph.



Questions

Answer these questions after all teams have shared their results with the class.

1. What factors were investigated by at least one team in your class?



2. Which factor investigated in your class seemed to have the greatest effect on the period of a pendulum? Explain.

3. Based on the data, how could you build a pendulum that takes one second to swing back and forth? Explain.

4. If on a playground swing, what could you do to make it swing back and forth in a shorter time? Explain.

5. Why is a pendulum used in a pendulum clock? Explain.



Extension Question

Imagine that your friends own a pendulum clock, but it is running a little fast (every day it gains one minute of time). What would you suggest they do to adjust their clock?

New Questions?

While doing experiments, people's curiosity often leads them to think of different questions they would like to investigate. Did any new or different questions come to your mind?



Possible New Questions We Have:

1.

2.

3.
