FOSS® AT HOME
LEVERS AND PULLEYS

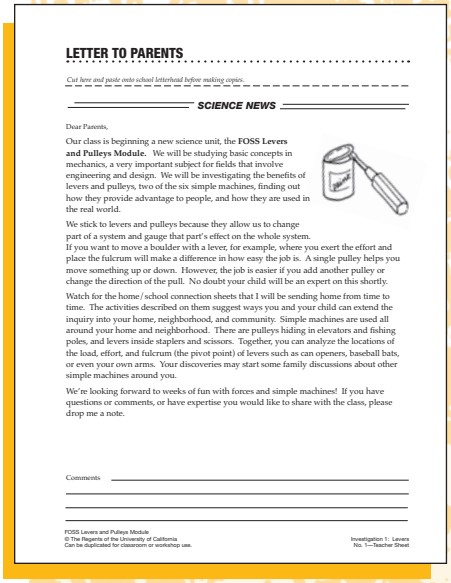
The FOSS® (Full Option Science System™) program offers a number of ways to get parents involved in their child's science education. Included here are short descriptions of several ways to bridge from classroom to home.

Letter to Parents. The letter to parents can be sent home at the start of a new science module. The letter describes what children will be learning and ways that parents can enrich the science-learning experience.

FOSS Science Stories. *FOSS Science Stories* is a series of original books developed to accompany and enrich the FOSS modules. The books include a variety of articles written in a number of styles, including narrative tales, expository articles, technical readings, and historical accounts.

Here are some suggestions for using *FOSS Science Stories* at home.

- **Expository and Historical/Biographical Readings.** The expository and historical/biographical readings provide excellent opportunities for students and parents to discuss the science content students are learning in the module. Specific articles include *Class 2-Levers, The Inclined Plane,* and *The Work of Pulleys.*
- **Technical Readings.** The technical readings provide good opportunities for students to do a science activity at home with their families or follow instructions for a science project. For example, students could do the activity outlined in *Pulleys* as homework or as their end-of-module project.
- **"Questions to Explore."** Students can read the article in class and then answer the "Questions to Explore" at home in their science notebooks. You might consider this strategy after students read *Simple Machines* or *The Wedge.*
- **After the Story.** See the Science Stories folio in the Teacher Guide for suggestions on how to extend the stories at home. For example, after students read *Class-1 Levers,* you might have students locate class-1 levers at home, such as a crowbar, claw hammer, or scissors. Students can identify the location of the load, effort, and fulcrum. You might also have students compare the distance of the load to the fulcrum for each tool.



LETTER TO PARENTS

Cut here and paste onto school letterhead before making copies.

SCIENCE NEWS

Dear Parents,

Our class is beginning a new science unit, the **FOSS Levers and Pulleys Module.** We will be studying basic concepts in mechanics, a very important subject for fields that involve engineering and design. We will be investigating the benefits of levers and pulleys, two of the six simple machines, finding out how they provide advantage to people, and how they are used in the real world.

We stick to levers and pulleys because they allow us to change part of a system and gauge that part's effect on the whole system. If you want to move a boulder with a lever, for example, where you exert the effort and place the fulcrum will make a difference in how easy the job is. A single pulley helps you move something up or down. However, the job is easier if you add another pulley or change the direction of the pull. No doubt your child will be an expert on this shortly.

Watch for the home/school connection sheets that I will be sending home from time to time. The activities described on them suggest ways you and your child can extend the inquiry into your home, neighborhood, and community. Simple machines are used all around your home and neighborhood. There are pulleys hiding in elevators and fishing poles, and levers inside staplers and scissors. Together, you can analyze the locations of the load, effort, and fulcrum (the pivot point) of levers such as can openers, baseball bats, or even your own arms. Your discoveries may start some family discussions about other simple machines around you.

We're looking forward to weeks of fun with forces and simple machines! If you have questions or comments, or have expertise you would like to share with the class, please drop me a note.

Comments

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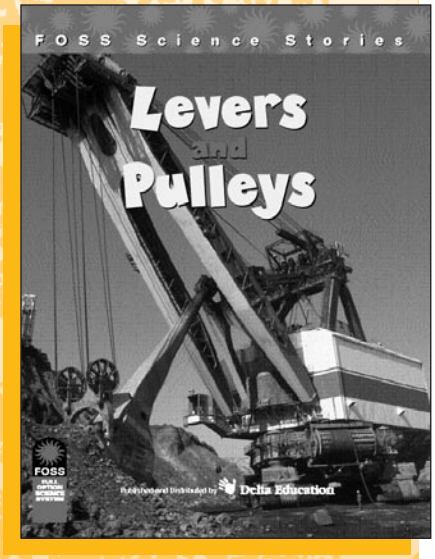
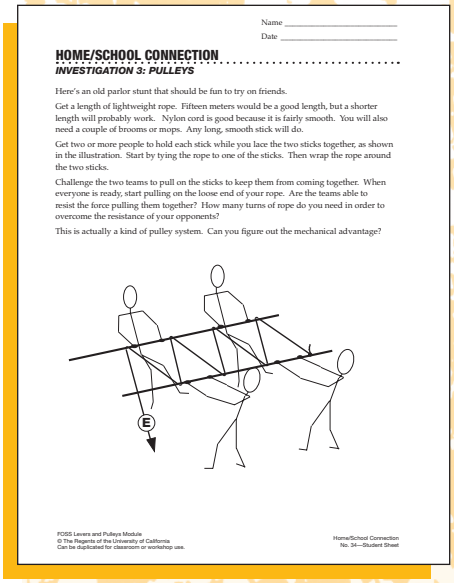
Investigation 1: Levers
No. 1—Teacher Sheet

No. 1—Teacher Sheet





Name _____
Date _____

HOME/SCHOOL CONNECTION
INVESTIGATION 3: PULLEYS

Here's an old parlor stunt that should be fun to try on friends.

Get a length of lightweight rope. Fifteen meters would be a good length, but a shorter length will probably work. Nylon cord is good because it is fairly smooth. You will also need a couple of brooms or mops. Any long, smooth stick will do.

Get two or more people to hold each stick while you lace the two sticks together, as shown in the illustration. Start by tying the rope to one of the sticks. Then wrap the rope around the two sticks.

Challenge the two teams to pull on the sticks to keep them from coming together. When everyone is ready, start pulling on the loose end of your rope. Are the teams able to resist the force pulling them together? How many turns of rope do you need in order to overcome the resistance of your opponents?

This is actually a kind of pulley system. Can you figure out the mechanical advantage?

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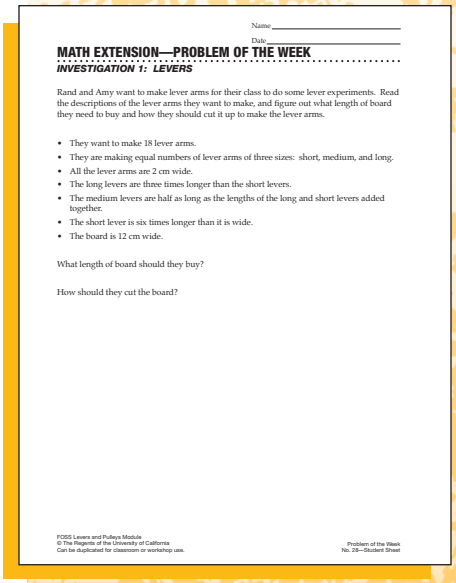
Home/School Connection
No. 34—Student Sheet

No. 34—Student Sheet



Name _____
Date _____

MATH EXTENSION—PROBLEM OF THE WEEK
INVESTIGATION 1: LEVERS

Rand and Amy want to make lever arms for their class to do some lever experiments. Read the descriptions of the lever arms they want to make, and figure out what length of board they need to buy and how they should cut it up to make the lever arms.

- They want to make 18 lever arms.
- They are making equal numbers of lever arms of three sizes: short, medium, and long.
- All the lever arms are 2 cm wide.
- The long levers are three times longer than the short levers.
- The medium levers are half as long as the lengths of the long and short levers added together.
- The short lever is six times longer than it is wide.
- The board is 12 cm wide.

What length of board should they buy?

How should they cut the board?

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Problem of the Week
No. 28—Student Sheet

No. 28—Student Sheet

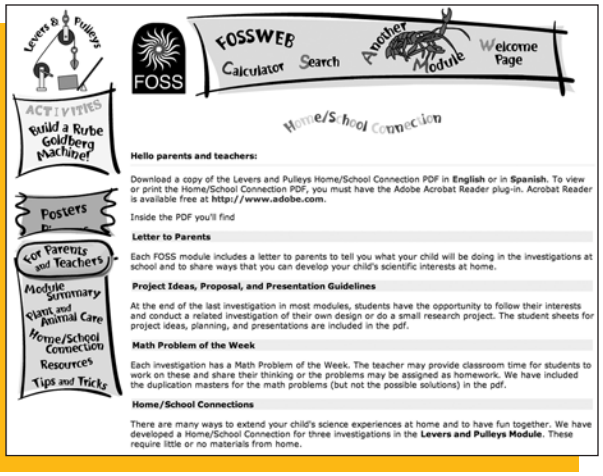
NOTE: *All student sheets, including the Letter to Parents, Home/School Connection, and Math Problems of the Week, are available in FOSS Teacher Guides and online at www.fossweb.com. They are also available in Spanish. See* For Parents and Teachers: Home/School Connection *on page 4 of this folio.*

Student Sheets. Throughout the module, students complete various recording and response sheets. Students should bring the sheets and/or their science notebooks home for families to review and discuss. For example, student sheet number 12, *Levers at Work,* is a good opportunity for students to explain and review with parents the different classes of levers found in tools and other household implements.

Home/School Connections. Home/School Connections are activities developed specifically for the whole family to enjoy at home. For example, in Investigation 3 (student sheet number 34), students make broom-stick pulley systems and use them to overcome the resistive force of family members trying to prevent the sticks from being pulled together.

Interdisciplinary Extensions. Each investigation has suggestions for art, language, math, social studies, and science extensions. These are good family activities. For example, after Investigation 3 students can find pulleys at home and make a list. They might also do the *Math Problem of the Week* at home.

FOSSweb (www.fossweb.com). FOSSweb is an interactive website where families can find instructional activities and interactive simulations specifically designed for each FOSS module.



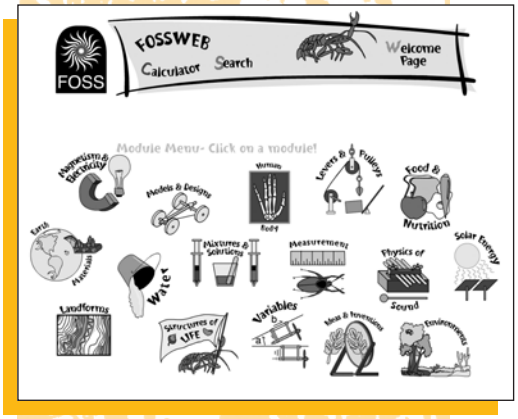
NOTE: Pages 3 and 4 of this folio can be photocopied and sent home for parents to read. Those pages provide information on the resources for students and their families on FOSSweb.

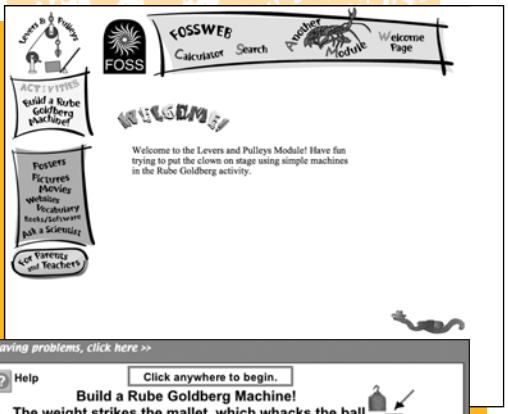
FOSSWEB (WWW.FOSSWEB.COM)

The FOSS program maintains a resource-rich website for students and their families and friends. To explore the resources available for the **Levers and Pulleys Module**, first enter www.fossweb.com in your browser.

The FOSS website requires plug-ins for your browser. We recommend that you click the "Test Your Browser" link at the bottom of the home page before you begin to ensure your computer has the minimum requirements.

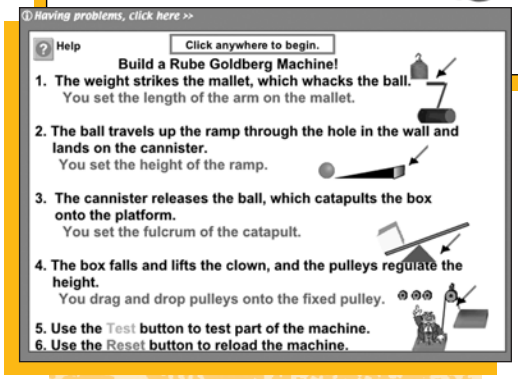
Click the grades 3–6 icon to get a menu that links to each of the 3–6 modules. There you can choose **Levers and Pulleys** and travel to a wealth of information and activities specific to this module.

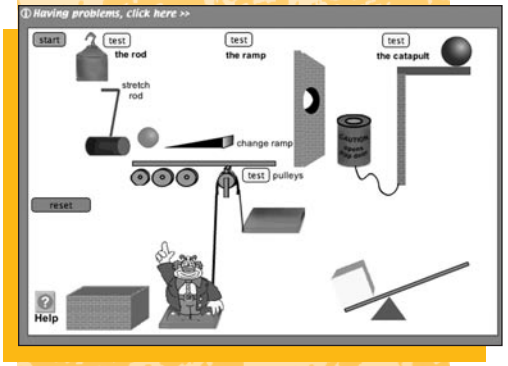




ACTIVITIES

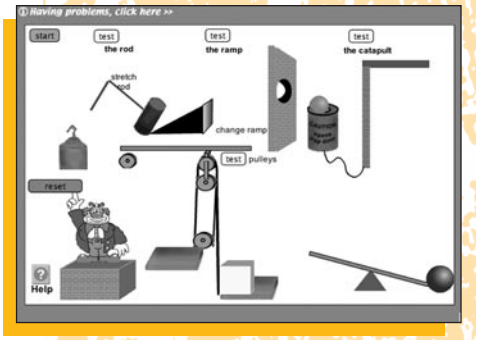
In the **Levers and Pulleys Module,** you'll find an activity called Build a Rube Goldberg Machine! This activity should be introduced after students have completed the first three investigations and have read about simple machines in the *FOSS Science Stories*. In this activity children use different simple machines to create a Rube Goldberg machine. Tell students that Rube Goldberg (1883–1970) was a Pulitzer Prize–winning cartoonist, sculptor, and author. He was best known for his "Inventions" cartoons, which use a string of outlandish tools, people, plants, and steps to accomplish everyday simple tasks in the most complicated way. His drawings point out that using complicated methods for simple tasks often overwhelms people. You might ask,





- *What is a machine?* [Any mechanical or electric device that assists in the performance of human tasks.]
- *How would you design a machine that uses levers and pulleys to lift a chair to the top of the school?*
- *What are the other simple machines we have read about and how do they work?*

Review the introductory screen with the children. Explain that their challenge is to make all the simple machines work together. Move on to the next screen and demonstrate the various machines: the rod (click and hold to lengthen), the ramp (click and hold to change the slope), the catapult (click and hold the fulcrum of the lever to change its position), and the pulley (change the number of pulleys by clicking, holding, and moving into position). Show how to test each



component by clicking on the Test button and on the ? button. When students think they have their Rube Goldberg machine in perfect shape, they can click the Start button and observe the results.

MOVIES

The Movies section includes pulleys in action, such as in construction.

PICTURES

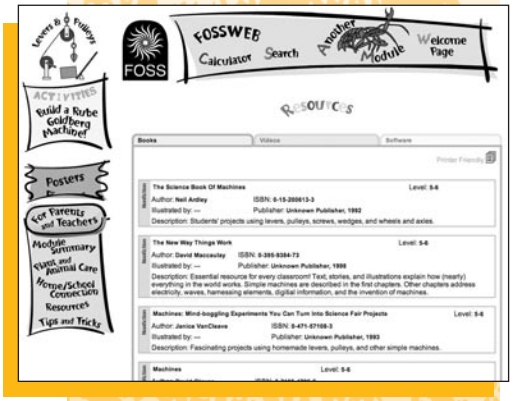
In the Pictures section, you can view images of different types and uses of levers, pulleys, and other simple machines. These pictures might be used as a starting point for further research for the end-of-module project.

WEBSITES

The Websites section includes links to sites that can extend and enrich children's experiences with the **Levers and Pulleys Module.**

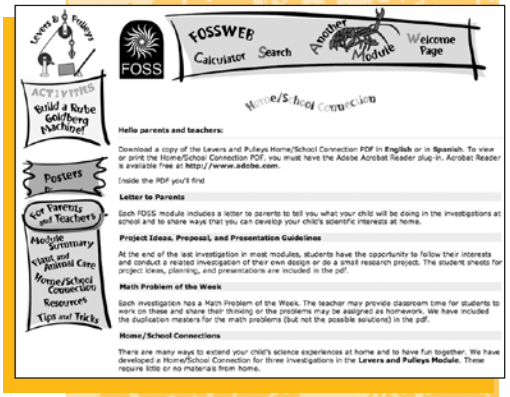
VOCABULARY

In the Vocabulary section, you will find the glossary words and definitions used in the **Levers and Pulleys Module.** They are provided in English and Spanish.



BOOKS/SOFTWARE

This section includes an annotated list of books, videos, and software recommended for the **Levers and Pulleys Module.** You should be able to find many of these titles at your local library.



FOR PARENTS AND TEACHERS: HOME/SCHOOL CONNECTION

The For Parents and Teachers section includes the Home/School Connection that describes ways for families to do science together. For example, in Investigation 2, families can look for pictures of levers at home. Then they can group the pictures by class. Look in this section for other resources included in a downloadable PDF file, including a general letter introducing the module, student projects, and math problems that relate to the science investigations.