



RUBE GOLDBERG MACHINES

LESSON 2: Simple Machines

LESSON OVERVIEW	GRADE LEVEL	BASE LESSON TIME
In this lesson, students will learn about the six simple machines and will discuss how they function. They will explore this briefly in a hands-on fashion and lead to the realization that these tools are the base for almost any machine or more complex tool that we use. There will also be some acknowledgment of how tools make our lives easier.	K-8	90-120 minutes <i>This lesson may be split into two class periods.</i>

TEACHER/LEADER TIPS
<p>It is recommended that this lesson be split into two class periods to allow students ample time to explore the simple machines and how they work during the Simple Machine Station activity. To keep students actively engaged, we suggest that teachers spend the first class period focused on two/three of the six machines. Teachers may lead the explanation of the chosen two/three machines using Google Slides: YIP RGM Lesson 2 and then allow students to explore the two/three corresponding stations. Then, in the second class period, introduce the remaining machines using the Google Slides to go through the stations.</p> <p>Teachers are strongly encouraged to set up the Simple Machine stations before class.</p> <p>Teachers may choose to show the accompanying Google Slides: YIP RGM Lesson 2 with the class while guiding students through the lesson.</p>

GETTING YOURSELF READY		
Materials:	Your Preparation:	Agenda:
<ul style="list-style-type: none"> • Google Slides: YIP RGM Lesson 2: Simple Machines • <u>Video Link</u> (included in Google Slides): Open a Refrigerator RGM (1:22) https://www.youtube.com/watch?v=wp2EY2wifn8 • Simple Machines worksheet 	<ul style="list-style-type: none"> • Set up Google Slides: Lesson 2 • Set up Simple Machine Stations for activity • Print Simple Machines Worksheet 	<p>Warm-Up: Move it! (5 minutes)</p> <p>Instruction: Introduction to Simple Machines (20 minutes)</p> <p>Activity: Simple Machine Stations (60-90 minutes)</p> <p>Closure: (5 minutes)</p>

<p>• Simple Machine station supplies:</p> <ul style="list-style-type: none"> • A box filled with books (or something to make it heavy) • Wooden rulers (several) • Soup can or toilet paper roll • 2 Boards (varying in lengths) • String • Rubber bands 	<ul style="list-style-type: none"> • Heavy Books • Matchbox cars • 9 inch Paper Square • Tape • Pencils • Paper • Dull Scissors • Regular scissors • Sharp Scissors • Sewing spool • Objects to lift 	
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GETTING YOUR STUDENTS READY

Objective: Students will understand the basic simple machines. They will explore and evaluate the mechanical advantage of simple machines.

CONTENT

<p>Warm Up: Move It! (5 minutes)</p>	<p>Put a box filled with books on your desk or on the floor at the front of the class. Ask a couple of students to come up and try to nudge the box. You don't want them to try to actually lift it because it will be heavy and they could hurt themselves. You just want to prove that the box is fairly heavy.</p> <p>Ask the class: You could probably lift this box, but not easily. What if you had to put it on a shelf that was as high as the ceiling? How would you get it up there? (Write this and all of the following answers on the board. You are not quite ready to introduce the simple machines so use whatever language your students use. You will revisit these ideas somewhat immediately.)</p> <p>What if you had to carry the box home? (If students do not get beyond just carrying the box and taking rests, add to the question and ask: Are there any devices that could help you? It may be that students are coming up with "things" that incorporate one of the simple machines, like a cart or a dolly. If so, this is a great lead into the lesson.)</p>
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<p>Instruction: Introduction</p>	<p>Use the Google Slides: Lesson 2 to introduce and explain the 6 types of simple machines:</p>
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to Simple Machines (20 minutes)	<table border="1"> <tr> <td style="text-align: center;">Inclined Plane</td> <td style="text-align: center;">Wedge</td> </tr> <tr> <td style="text-align: center;">Lever</td> <td style="text-align: center;">Wheel & Axle</td> </tr> <tr> <td style="text-align: center;">Pulley</td> <td style="text-align: center;">Screw</td> </tr> </table>	Inclined Plane	Wedge	Lever	Wheel & Axle	Pulley	Screw
	Inclined Plane	Wedge					
	Lever	Wheel & Axle					
Pulley	Screw						
<p>After going over the six simple machines</p> <p>Share Video #2: Share the Open Your Refrigerator RGM video which features a Rube Goldberg machine built using all 6 simple machines, with some used more than once. Ask the students to identify the simple machines used in the machine (garage door, file cabinet, hammer = lever, binder = incline plane, dolly = wheel and axle, punching glove screw, bucket = pulleys, refrigerator opening - wedge, etc). (Video is included in Google Slides: Lesson 2)</p> <p>Link: This Mind Blowing Rube Goldberg Machine Will Open Your Refrigerator (1:22) https://www.youtube.com/watch?v=wp2EY2wifn8</p> <p>Use a Think-Pair-Share or group discussion to ask students: Do you have any new ideas about how you would put the box up on a very high shelf? (Students have just read about the pulley, which is an obvious answer. Write pulley on the board after students have offered up the answer. Lever is a possible answer, though maybe not the best choice for the task.)</p> <p>What about carrying the box home? Is there a machine that could help you? (After students answer, put wheel and axle on the board.)</p> <p>Are there other ways to move the box, if you simply had to move it? (You could slide the box down an inclined plane, or lift it with a lever.) What do the simple machines we've discussed so far do?</p> <p>(Simply, the machines help us move things.) Which simple machines are not up on the board?</p> <p>(The screw and the wedge.) What are these machines good for? (Both are also used to move things in the simplest sense, however the screw seems to have more of a function of holding things together.)</p>							
<p>Activity: Simple Machine Stations (60-90 minutes)</p>	<p>Note to Teacher: <i>You may choose to divide this lesson into two blocks or class periods to allow students sufficient time to explore each simple machine station.</i></p> <p>Distribute the Simple Machines worksheet. In this part of the lesson, students will experience six simple machine stations. Divide the class into 6 small groups. Assign each group to a station. Allow 10-15 minutes per station.</p>						

Before beginning, review with students in a large group, or at each station, what the experiment is. Students may fill out their worksheet as they complete each station.

Set up the simple machine stations (recommended that this set-up is done prior to class)

LEVER

Objective: The students will make a lever out of the given materials and explore the relationship of the fulcrum to the load. The students will discover that it is easier to move an object when the fulcrum is closer to the load.

Materials: Wooden rulers, Object to lift , Soup can or Toilet paper roll

Lever Hint: Move the fulcrum closer to the load. Move the fulcrum away from the load. Inclined

INCLINED PLANE

Objective: The students will make inclined planes with boards varying the slope of the board. There will be rubber bands around the book. The students will tie the string to the rubber bands and pull the books up the different inclined planes. They will also pull the books straight up without using the inclined planes. The students will find that it takes more work to move an object up an inclined plane with the steepest slope

Materials: 2 Boards varying in lengths, String, Rubber bands, Ruler ,Heavy book

Inclined Plane Hint: Look at the stretch of the rubber bands straight up compared to different inclined planes.

WHEEL & AXLE

Objective: The students will push one car on its side and the other on its wheels. They will note the difference in distance traveled.

Materials: Several matchbox cars, Rulers

Wheel & Axle Hint: Try one of the cars on its side.

SCREW

<p>Objective: The students will make a screw out of an inclined plane. Students will cut the square diagonally to make an inclined plane. Tape one of the short edges of the triangle to a pencil. Wrap the triangle around the pencil. They will actually see the inclined plane as part of the screw.</p>
<p>Materials: 9 inch Paper Square, Tape, Pencil , Scissors, Tabletop</p>
<p>Screw Hint: What is a screw made out of? How can you make an inclined plane with the given materials?</p>

WEDGE
<p>Objective: The students will cut paper with both sharp scissors and dull scissors. They will observe that the sharp scissors will cut better than the dull scissors.</p>
<p>Materials: Paper, Dull Scissors, Sharp Scissors</p>
<p>Wedge Hint: How are the cuts different?</p>

PULLEY
<p>Objective: The students will make a pulley with a sewing spool, string, and a pencil. They will use this pulley to lift an object. They will compare lifting the object with the pulley and without the pulley. They will find that it is easier to lift an object with the use of a pulley.</p>
<p>Materials: Sewing spool, String, Pencil, Object to lift</p>
<p>Pulley Hint: Compare using the pulley and not using the pulley.</p>

After the students have had a chance to visit the stations, ask one student from each station to give a quick summary explanation of that simple machine to the class.

CLOSURE
(Check for Understanding)

Closure: (5 minutes)
In a group discussion, ask the students: Did anything about your simple machine surprise you? (This offers an opportunity for students to share any discoveries they made.)