Simply Machines – Holiday Version Teacher Information

Background: This unit was developed as a review of simple and compound machines for a 1-week unit incorporating the Home Alone movies. You could also use the activity pages with the Grinch movie as it depicts simple and compound machines as well. Depending on the level of background knowledge your students have, you can choose which lessons you want to utilize. Many of my students do not have a solid understanding of work and machines. I am using this unit the week prior to winter break. We will continue with physics lessons after break when we complete the Snowball Fight version of the Super Slingers project challenging them to create a catapult using a mousetrap and assorted materials I provide. They will use a large marshmallow as their snowball! See the additional resources listed on the next page.

Resources

Worksheet #1: Simply Machines - The Basics (See page 3)

Students watch an EDPuzzle video to help them fill in Part A. Questions are built into the video to give feedback on their understanding, which can be used to help me design additional lessons to target any gaps they have.

Link: https://edpuzzle.com/media/61b3721a6ff91442d7e62706

For Part B, students complete the simple machines activity on EDHeads to identify simple machines found around in a home/garage. The activity challenges them to identify the types of machines used and use their knowledge to answer related questions.

Link: http://edheads2.org/simplemachines/story.html

Worksheet #2: Simply Machines - Holiday Challenge (See page 4)

Students will complete Part A as they watch the holiday movie in class by listing at least 3 examples of each. I will split the movie over three class periods to allow time for a review of the contraptions featured and to incorporate several demos to reinforce how simple machines help us do work. An example is challenging students to open a door by pushing near the hinges, in the middle, and on the opposite end. Other demos include pulleys (single vs. multiple), ramps (different slopes), and screws (# of threads). I also hope to get them to identify other science-related concepts they have observed, such as water turning to ice as freezing.

For Part B, students will create their own battle plans to accomplish a holiday-related task. (See page 5 for a page your kids can use.) Some ideas include a burglar alarm for a stocking/presents, trap for snooping siblings trying to see what presents they are getting, or a machine for decorating sugar cookies. I imagine the kiddos will get quite creative when given the opportunity! The finished contraption must include at least 3 simple machines and 10 steps. They will hand draw the contraption or use Google Draw to make a digital version. They will also need to write a paragraph that explains the steps labeling with A, B, C, etc. See pages 5-7 for the project requirements that includes the project rubric.

NOTE: Answer keys are provided on the last two pages.

Digital versions are available for the student worksheets and a class presentation you can use to share background information about Rube Goldberg and introduce the project.

Student File
https://docs.google.com/presentation/d/1TDQh3ajE2K14p4RqK4za3PhF1f9uO69s1N8aANiFqrQ/edit?usp=sharing.

Class Presentation
https://docs.google.com/presentation/d/1l8N5tdzi7NkmNKAskKnpEyD70utxIC3pTOX4312LygY/edit?usp=sharing .

NOTE: *Be sure to choose File → Make a copy to save your own copy of the file before assigning to students.*

Google Drawings Tutorials

PDF: https://drive.google.com/file/d/1EBxS0w_vsYNI8zuriH4fwrE3UJmHwM8H/view?usp=sharing

YouTube - https://www.youtube.com/watch?v=eSU0JbxWpoc

Rube Goldberg Examples – I did this project in the Spring of 2020 as a remote learning project. Go to https://www.mrstomm.com/rube-goldberg-machines.html to see the devices my students developed. Many of them used Google Drawing to create them.

Additional Resources

Science Starters – I begin each class period with a warmup targeting different science concepts to review what we've discussed in class or as an introduction to a lesson. I have added the new ones to the page at https://sciencespot.net/Pages/startersphysci.html. These include Simple Machines - Basics (Includes video), Machines 2, Machines 3, Machines – Bike, and Compound Machines.

Snowball Fight – Super Slingers – Go to https://sciencespot.net/Pages/junkboxprojects.html for more details about this mousetrap catapult challenge and extension lessons incorporating engineering design.

Work & Machines Unit – Online unit designed for use with remote learning. Go to https://sciencespot.net/Pages/classphys.html#Anchor2 for more information.

Science of Christmas - My students will explore the Science of Christmas with a few online challenges. The sets are available on GimKit and Blooket.

Simply Machines – The Basics

Name _____

Part A: EDPuzzle – Simple Machines – Watch the video on EDPuzzle to answer these questions.

1) A simple machine is a device that makes _____ easier by magnifying or changing the direction of a _____.

2) The _____ advantage refers to how much a machine can _____ or strengthen a force.

3) The definition for work is using _____ to move an object across a _____.

4) Fill in the chart by describing how each simple machines works and giving examples.

	Name	Description	Examples
	**Lever**		
	**Wheel & Axle**		
	**Pulley**		
	**Inclined Plane**		
	**Wedge**		
	**Screw**		

5) A _____ machine is a combination of several _____ machines into _____ device.

6) Give <u>three</u> examples of simple machines we use each day. _____ _____ _____

Part B: EDHeads – Simple Machines (Put on some headphones before you begin!)

Click the "Start" and then select an activity (room). You may complete them in any order.

For each room, follow the directions to find the simple machines and answer the related questions. Watch for highlights to help you. When you are finished a section, write your score in the chart below along with the total points possible. Continue to the other activities until you have done all 5 of them.

Room	Garage	Bedroom	Kitchen	Bathroom	Tool Shed
Score	_____ out of _____ pts	_____ out of _____ pts	_____ out of _____ pts	_____ out of _____ pts	_____ out of _____ pts

Simply Machines – Holiday Challenge

Name _____

Part A: Find It Challenge: **Make a list of the simple machines used in the contraptions the character creates as you watch the video. You need at least 3 examples of each one.**

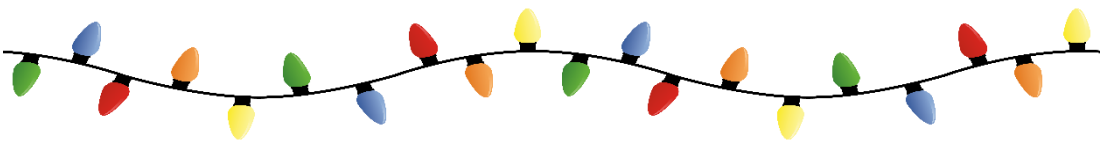
Lever 	**Inclined Plane** 
Pulley 	**Wedge** 
Wheel & Axle 	**Screw** 

Part B: Your Turn – Battle Plan

1) What holiday-related task(s) will your device accomplish?

2) Draw a picture of your battle plan to help you accomplish this task.

- Your plan needs to include at least 3 simple machines and 10 steps.
- Write a paragraph that provides step-by-step directions to show the order of the steps. Use letters to identify each step, i.e. A for step 1, B for step 2, etc. You also need to identify the simple machines used in your device.
- You may draw it by hand on the back of this page. You can also use Google Drawing to do a digital image. Send a link to the teacher to print.



Simply Machines Holiday Challenge

Name _____

Description:

Simply Machines Holiday Version Project Requirements

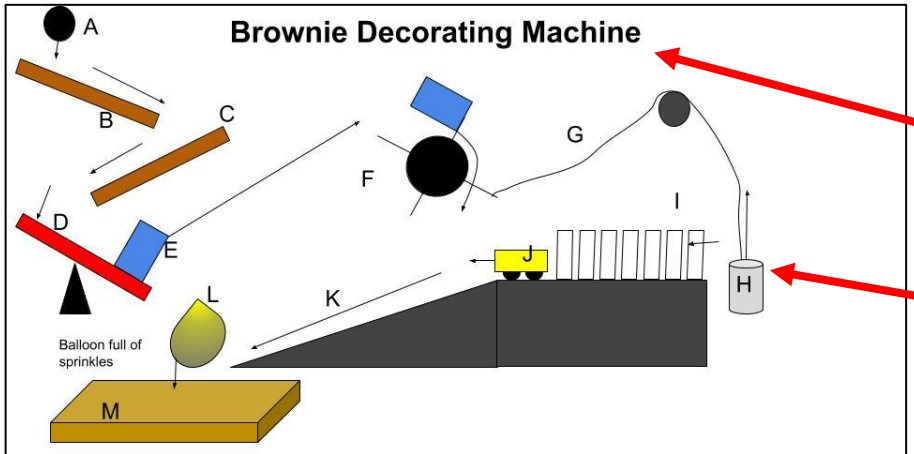
Goal: Draw a "Rube Goldberg"-style machine that uses at least 3 different types of simple machines to accomplish one holiday-related task using a minimum of 10 steps.

Requirements:

- Your machine must accomplish **at least one task**, such as turning Christmas tree lights on/off, opening a present, or setting up a trap to keep siblings from snooping in your room for presents. Give your machine a name/title that tells what it does.
- Draw your machine either by hand or on the computer. **Label your drawing** using the same letters (A, B, C, etc.) for the steps.
- Your machine must have **at least 10 steps**. You need to include a **written list** with letters to show the order, such as A for the first step, B for the second step, etc.
- You must use **at least 3 different types of simple machines**, such as levers, pulleys, inclined planes, screws, wedges, and wheel and axles. You need to include a list of all the simple machines with your device.

  Clarification: You cannot use 3 of the same type of simple machine, such as only using levers. You must use other types of simple machines, such as 3 levers, 2 pulleys, and 1 inclined plane.

Sample Project (Designed on Google Drawings by Mrs. T.)



The bowling ball (A) is dropped and rolls down one ramp (B) and then lands on the other (C). It continues rolling until it lands on the end of the lever (D), which throws the box (E) into the air to hit the spokes on the wheel (F) making it turn clockwise. As the wheel turns, it pulls the string (G) on the pulley to raise the bucket (H). The bucket hits the dominoes (I) as it swings and starts them in motion. The last one hits the car (J) with a needle on the front to send it down the ramp (K). As the needle (L) hits the balloon, it pops to spread the sprinkles (M) on top of the pan of brownies.

Simple machines used - Lever (Seesaw D, dominoes I), Inclined planes (Ramps B, C, K), Wheel and axle (F), Pulley (G), Wedge (Needle on the car)

1st – Give it a name to share what task it is designed to do.

2nd – Draw the machine and label with A, B, C, etc.

3rd – Write a paragraph outlining the steps (A, B, C, etc.) in order.

How do you turn it in?

1st - Find the **Simply Machines Challenge Project** on **Google Classroom.**

2nd –Save a picture of your machine from Google Drawing or take a picture of a hand drawn diagram and upload it to Google Drive.

> *If you take a picture of a hand drawn diagram, make sure you can read the steps and list of simple machines. If not, type the info on A Google Doc and add your picture. Share the document with your teacher.*

3rd - Click **"Add or Create"** to submit your assignment for the teacher to review.

Want to see some super machines?

Check out these awesome videos – OK Go and Honda Commercial!

Frequently Asked Questions

- **Am I able to look online for ideas?**
  Yes, you can look for ideas, but your machine should be your own design. Do not copy someone else's work for your project!

- **Do I have to draw it by hand or can I use online drawing tools to make an electronic version?**
  You can draw it by hand or use online tools, such as Google Drawings. *Click HERE for a tutorial on Google Drawings or check out this VIDEO.*

- **How do I add my drawing to the Google Doc?**
  Use your phone or your laptop's camera to take a picture or take a screenshot and then insert it into the Google Doc.

- **Do I have to build the device/machine?**
  No, do not need to build it – just design it either on the computer or drawn on paper.

- **Can I build the device/machine?**
  Yes, you can! Make a video to show me how it works! Bonus points will be added depending on how many toilet paper rolls you incorporate as simple machines.

Project Rubric – Grades will be determined using the rubric below.

	Great (3)	Good (2)	Fair (1)	Poor (0)
Task **____/3**	Designed machine would accomplish the assigned task	Designed machine needs a few modifications to accomplish the assigned task	Machine is lacking major parts that would allow it to accomplish the assigned task	Machine is not completed
# of Simple Machines Pts x2 **____/6**	Includes 3 (or more) different types of simple machines	Includes 2 different types of simple machines	Includes only 1 type of simple machine	Machine is not completed
# of Steps Pts x2 **____/6**	Includes 10 or more steps that are labeled and easy-to-follow	Includes 7-9 steps that are mostly labeled and easy-to-follow	Includes 6 or less steps or some steps are not labeled	Machine is not completed
Other **____/3**	Diagram is neatly drawn, easy to read, and designed machine shows originality and/or creativity*	Diagram is good, but needs some corrections; designed machine shows originality and/or creativity*	Design is hard to understand/read; shows little originality and/or creativity*	Machine is not completed

**Not copied from another idea found online or from a classmate*

Go to https://www.rubegoldberg.com/ to learn more about Rube & his machines!

Simply Machines – The Basics ANSWER KEY

Part A: EDPuzzle – Simple Machines – Watch the video on EDPuzzle to answer these questions.

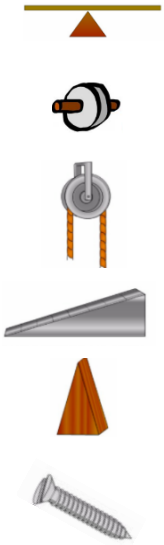
Link: https://edpuzzle.com/media/61b3721a6ff91442d7e62706

1) A simple machine is a device that makes **WORK** easier by magnifying or changing the direction of a **FORCE.**

2) The **MECHANICAL** advantage refers to how much a machine can **MAGNIFY** or strengthen a force.

3) The definition for work is using **ENERGY** to move an object across a **DISTANCE**

4) Fill in the chart by describing how each simple machines works and giving examples.



Name	Description	Examples
Lever	***Bar or rod that pivots or turns on a fulcrum (fixed point)***	***Seesaw, crow bars, tweezers***
Wheel & Axle	***Wheel with a rod in the middle for the axle Reduces friction (roll instead of slide)***	***Cars, bicycles, and scooters; Doorknobs & pencil sharpeners***
Pulley	***Wheel with a rope wrapped around it More pulleys together = less force needed***	***Used to raise a flag, blinds, & elevators***
Inclined Plane	***Flat surface with one end higher than the other; easier to slide than lift straight up***	***Ramps & slides***
Wedge	***Two inclined planes put back-to-back The longer the wedge, the less effort needed***	***Axes, knives, and chisels***
Screw	***An inclined plane wrapped around a pole The longer the path (more threads) = less force needed***	***Bolts, jar lids, and light bulbs***

5) A **COMPOUND** (or complex) machine is a combination of several **SIMPLE** machines into **ONE** device.

6) Give <u>three</u> examples of simple or compound machines we use each day. **Answers will vary**

Examples: Doors = levers, Stairs = ramp, Bottle cap = screw, Scissors – levers and wedges

Part B: EDHeads – Simple Machines (Put on some headphones before you begin!)
LINK: http://edheads2.org/simplemachines/story.html

Click the "Start" and then select an activity (room). You may complete them in any order.

For each room, follow the directions to find the simple machines and answer the related questions. Watch for highlights to help you. When you are finished a section, write your score in the chart below along with the total points possible. Continue to the other activities until you have done all 5 of them.

Room	Garage	Bedroom	Kitchen	Bathroom	Tool Shed
Score	_____ out of _____ pts	_____ out of _____ pts	_____ out of _____ pts	_____ out of _____ pts	_____ out of ANSWERS WILL VARY

Simply Machines – Holiday Challenge

Name _____

Find It Challenge: Make a list of the simple machines used in the contraptions shown in the video.

Lever  *Board used as a lever to launch objects* *Pry bar used to open a door, window, etc.*	**Inclined Plane**  *Ramps, stairs, or other angled surface, such as an icy driveway*
Pulley  *Using a rope through a hook or light on the ceiling to lift objects* *Ringing a bell that has a rope attached to the top and goes through a hook*	**Wedge**  *Cutting edges of scissors or knives* *Ax head used to chop a rope/line*
Wheel & Axle  *Any wheel on a car, bike, etc.* *Marbles on the floor that roll causing someone to fall* *Doorknobs*	**Screw**  *Bottle caps* *Lightbulb* *A rope wound around a pole that unwinds*

Answers will vary depending on the movie
I have included some possible ones.

Your Turn – Battle Plan

1) What holiday-related task(s) will your device accomplish?

2) Draw a picture of your battle plan to help you accomplish this task.

- Your plan needs to include at least <u>4 simple machines</u> and <u>10 steps</u>.
- Label all the simple machines.
- Write a paragraph that provides step-by-step directions to show the order of the steps. Use letters to identify each step, i.e. A for step 1, B for step 2, etc.
- You may draw it by hand on the back of this page. You can also use Google Draw to do a digital image. Send a l