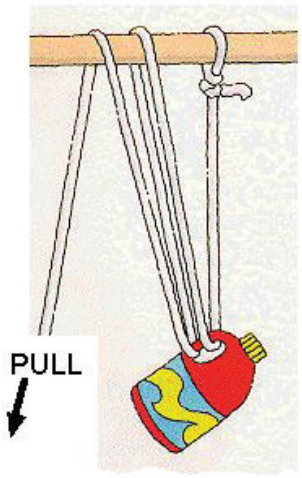
Simple Machines

Compiled by: Nancy Volk

Making Simple Machines:

Pulley System:

To make a simple pulley system take a thin rope (clothesline rope) and wind it around a broom stick and secure it to a gallon milk jug filled with water. Try one loop around the broom stick, two loops around the broom stick and three loops around the broom stick (see image). Determine which is the easiest to lift? With one loop, two loops or three loops? The pull is the force or effort applied. If you have a spring scale, attach this to read the actual force needed to lift the jug in each case. For more information about pulleys, search "Pulley Bill Nye The Science Guy" for a wonderful visual about pulleys.



Inclined Planes:

Using a fairly hard, smooth surface such as cardboard, made an angle on top of the desk with four books stacked on top of each other on one end of the desk . Using a rubber band attached to a small bag of rice, lift the bag of rice up the ramp. While pulling the rice up the ramp, measure the distance of the rubber band. Next, lift the bag of rice directly up vertically to the same final height and measure the distance of the rubber band stretch. Which situation takes more force to lift the rice bag? For a visual about inclined planes go to: www.youtube.com/watch?v=NxL13SzLqg&NR=1

Screw:

Take an 8 1/2" piece of paper and cut it in half height wise. From one of the two pieces create a 90 degree triangle and cut the triangle out evenly. Place a pencil along the straight edge of the triangle and roll up the triangle. If done patiently the angled edge of the paper should form a spiral up the pencil. This is how a screw is made, by wrapping an inclined plane around a base.

Wedge:

A wedge is made of two inclined planes placed back to back—or straight edges together. Explain how this object works. Explain the following example. Place two wooden blocks together. Force the wedge through the two blocks. How far did the blocks move? Why? Now try pounding a nail into the board. Try nailing a flat topped screw into the board. What is the difference? Why is one so much easier than the other? What type of simple machine is the hammer?

Wheel and axle:

Using an old CD or DVD, find a marker that almost fits tight into the center hole. Using a bit of clay, secure the pen to the disc. Now when you turn the axle (the marker) the wheel should also turn. Compare the distance the axle turns in one rotation to the distance the disk turns. Complete this task by measuring the circumferences. What is the ratio of the small to the large circumference?

MOST*

VOCABULARY:

- Simple Machines
- Inclined Plane
- Lever
- Pulley
- Screw
- Wedge
- Wheel and Axle

Inside This Packet

What is a Simple Machine? 1

Activity 1: Levers Simple Machines 2

Activity 2: Identifying Simple Machines 3

Activity 3: Simple Machines Chart 4

Activity 4: Identifying Simple Machines 5

New York State Standards 8

Students will be able to:

Identify six types of simple machines

Given a device, determine what type of simple machines are contained in it

Make simple machines

Design a device that contains simple machines to complete a task

@mmiq with incredible machines pictured in them:

How Things Work: Wheels At Work
by Andrew Dunn

Wheels On The Bus

Nice Wheels
by Gwendolyn Hooks (wheelchair)

Wheels and Axles
by Anne Weisbacher

Wheels and Axles in My World
by Joanne Randolph (Spanish/English)

What Do Wheels Do All Day
by April Jones Prince

Dr. Seus Books:

The King's Stilt's

Horton Hears a Who

The Sneetches

Making Simple Machines:

Lever:

There are three types of levers. To better understand levers, let's learn a few terms about them. The load is the weight of the object being lifted or moved. The effort is the amount of force put into the system to make the load move. And the fulcrum is the point around which the lever pivots. The names of the types of levers are class 1, class 2, and class 3. For a class one lever the fulcrum lies between the force arm and the lever arm. The teeter totter is a classic example of this type of lever. First class levers include: a claw hammer, a water pump, balance, a crowbar, a car jack, pliers and scissors.

To make a first class lever:
Take a ruler and place an object near the center part of the ruler. Place a light weight on one end and press down on the other end. Note what happens.

Second Class Levers:
In the second class lever the load arm lies between the fulcrum and the force arm. A good example of this type of lever is the wheelbarrow. The axle of the wheel serves as the fulcrum, the handles are the force arm, and the load is carried between the two in the bucket part of the wheel barrow. In the second class lever, the fulcrum is usually closer to the load, which reduces the force needed to accomplish the work.

To make a second class lever:
Using a ruler, place it flat on the desk. Put a piece of clay near the end of the ruler yet on the ruler. Lift the far end up and watch the load also be lifted to a lesser degree.

Third Class Lever:
In this class of levers, the force arm lies between the fulcrum and the load arm. Because of this alignment, a relatively large force is required to move the load. This is offset by the fact that it is possible to produce movement of the load over a long distance with a relatively small movement of the force arm. We often employ this class of lever when we wish to produce large movements of a small load, or to transfer relatively low speed of the force arm to high speed of the load arm. When a hockey stick or a baseball bat is swung a third class lever is in effect. The elbow acts as a fulcrum in both cases and the hands provide the force. The load is moved at the end of the stick or bat.

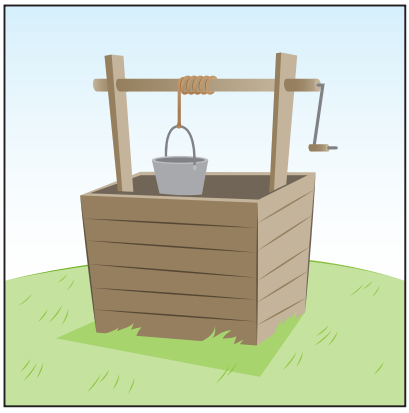
To make a third class lever:
Take a pair of chopsticks and attempt to pick up an object with the far end.

Activity 1: Identifying Simple Machines

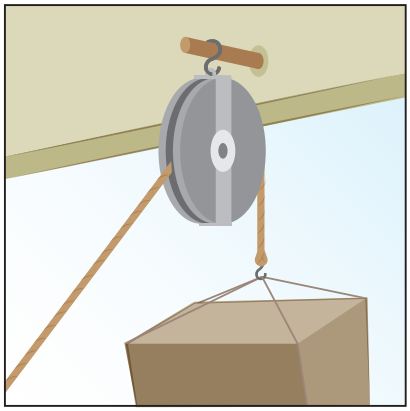
Name: _____ Date: _____

Directions: Go around the room and locate various machines. List them on the reverse side of this page. List the correct term for the machine under each picture below.

_____

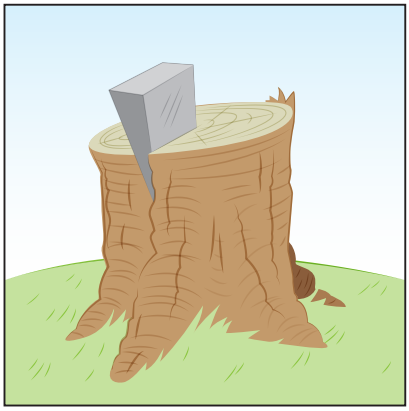


_____

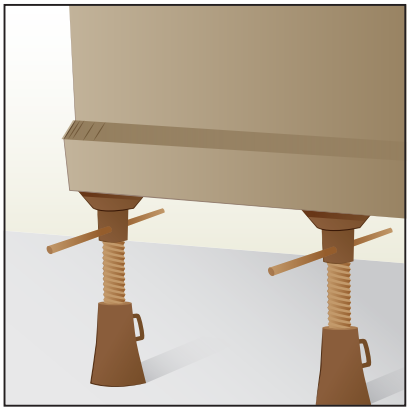


_____

_____



_____



_____

Activity 2: Identifying Simple Machines

Name: _____ Date: _____

Directions: Name examples for each of the following simple machines.

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

Activity 3: Identifying Simple Machines

Name: _____ Date: _____

Directions: Using the six simple machine terms, write down which ones are present in each of the pictures.

1 _____

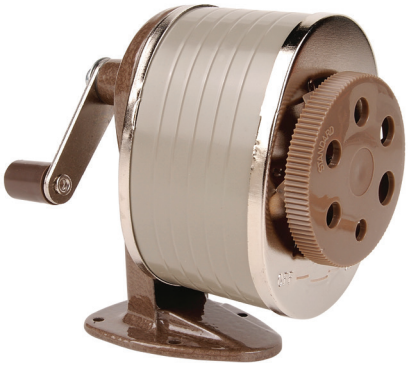
2 _____

3 _____

4 _____

Activity 3: Identifying Simple Machines

Name: _____ Date: _____

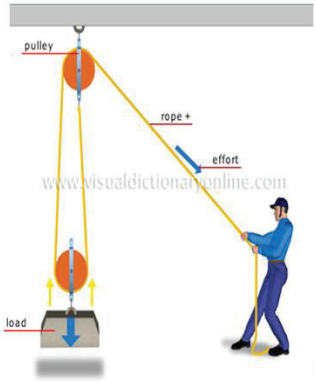


5 _____

6 _____

7 _____

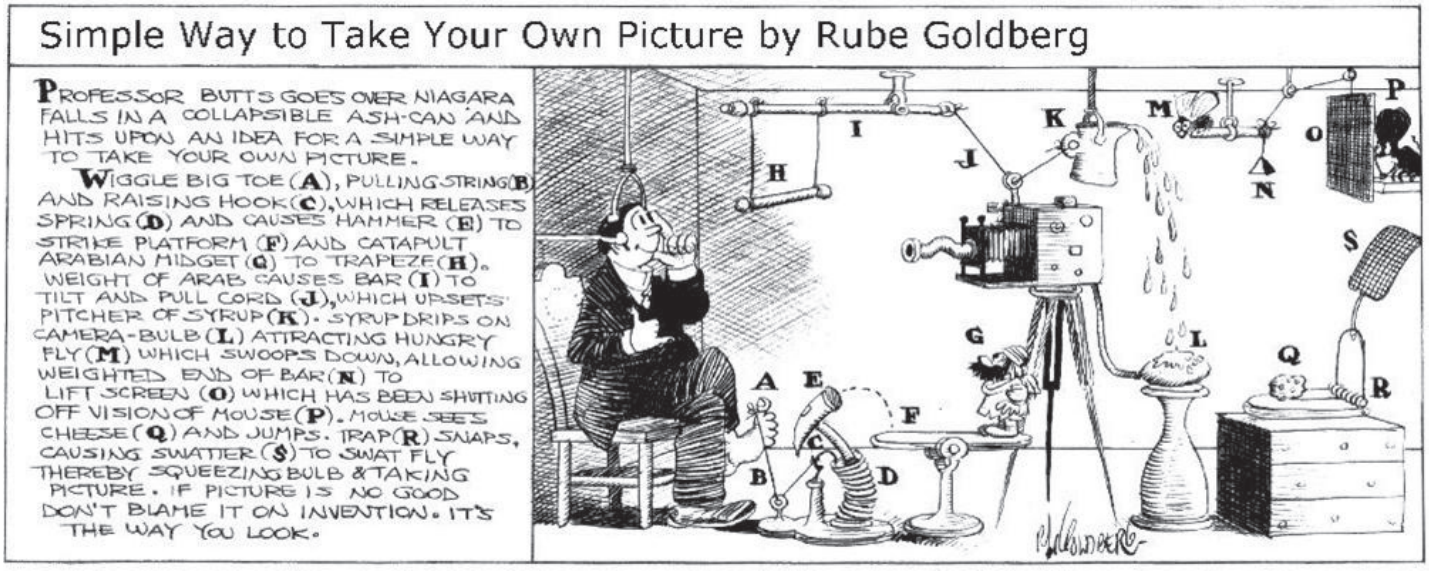
8 _____



9 _____

Activity 4: Identifying Simple Machines

Name: _____ Date: _____



Directions: Take a look at the picture above. Identify at least three simple machines. Name them and tell what job they perform.

1 _____

_____

_____

_____

2 _____

_____

_____

_____

3 _____

_____

_____

_____

Notes:

New York State Elementary Level Science Standards

Skills: Classifying, Identify, gathering/organizing data, Identifying variables, Interpreting data, Manipulating materials, observing, and predicting.

Standard 1: Mathematical analysis:
Key Idea 3

Standard 1: Scientific Inquiry:
Key idea 1
Key idea 2, s2.3, s2.3a, s2.3b
Key idea 3, s3.1, s3.2, s3.2a

Standard 1: Technology:
Key Idea 1, t1.1b, t1.1c, t1.3a,b,c , t1.4, t1.5

General Skills:
i, ii, iii, iv, viii, x, xii, xiii, xiv, xvii, xviii, xix, xxiii

Standard 4: Physical Setting:
Key idea 3, 3.1b, 3.1c, 3.1d, 3.1e
Key idea 4, 4.1b
Key Idea 5, 5.1a, 5.1b, 5.1c, 5.1d, 5.1f