

Name _____
Period _____

Date _____

SIMPLE MACHINES

LAB ACTIVITY STATIONS

Station #1- Constructing Levers

Materials:

30 cm ruler

10 pennies

Pencil

Level desk or table top

Objective:

To construct a lever and balance it.

Procedure:

A. Lay down the pencil flat on the desk.

B. Lay the ruler across the pencil so that the two ends of the ruler teeter back and forth like a see saw.

C. Adjust the ruler on the pencil so that the two ends balance perfectly. The balance point should be at about the 15 cm (6 inch) mark.

D. Stack 5 pennies at the very edge of the ruler on the 1 cm (1 in.) side and the other 5 pennies on the very edge of the 30 cm (12 inch) side. Since the two piles of pennies are about equal in weight, the two ends of the ruler should remain balanced.

E. Take three pennies off of the 30 cm (12 inch) side and place them on the stack at the 1 cm (1 inch) side. You should now have 8 pennies on one side and 2 on the other. The ruler should be tilted down toward the 1 cm (1 inch) side. You've just constructed a lever!

Challenge

How can you lift four times your weight? Try it with these pennies! Without adding any weight to either side and without moving the pennies, can you figure out how to get the two ends of the ruler to balance? (Note: The ruler doesn't have to balance exactly — it just needs to be at the point where it teeters back and forth without touching the desk.)

Questions:

1a. Draw the lever that you balanced in the challenge.

1b. Describe how you were able to balance the lever with the pennies stacked unevenly.

Station #2- Levers and Mechanical Advantage

Materials:

Meter stick
Calculators
Classroom door

Objective:

To explore different types of levers and calculate their mechanical advantages. To calculate the mechanical advantage of a lever use the following equation:

$$\text{Ideal Mechanical Advantage} = \frac{\text{Distance from fulcrum to input force}}{\text{Distance from fulcrum to output force}}$$

Questions:

2a. Draw the front door of the classroom and label fulcrum, input force, and output force.

2b. What type of lever is the door to the classroom?

2c. What mechanical advantage does the classroom door have? (*hint: the center of the door represents the output force*)

2d. Calculate the mechanical advantage the lab cabinet door that our classroom rules are written on.

2e. Describe the difference between these two doors in terms of shape, size, purpose, and mechanical advantage.

Station #3- Incline Plane

Materials:

Toy car

Meter sticks

4 ½ foot long 1x8 pine board

Calculator

Textbooks

Spring scale (2.5N)

Objective:

Construct a ramp, calculate the force needed to move a car up the ramp, and calculate the mechanical advantage of the ramp.

Procedure:

Working as a group, your job is to get the toy car onto one of the room chairs using as little force as possible. You are allowed to pull on the truck only using the 2.5 N spring scale, but you can roll the truck on anything you want. The idea, then, is to get the truck onto the chair while keeping the maximum force needed (i.e. biggest reading shown on the spring scale during the operation) as small as possible.

3a. Discuss this as a group and come up with a plan. Sketch your plan below and label the materials that you used.

3b. Now test your idea using the equipment provided. What was the maximum reading on the spring scale during the move?

3c. If you could change any part of your equipment to make the maximum reading on the spring scale smaller, what would you do? Explain your reasoning carefully.

3d. Describe in your own words how you see the relationship between the length of the ramp and the force needed to pull the truck.

3e. Calculate the ideal mechanical advantage of the ramp that you used.

$$\text{Ideal Mechanical Advantage} = \frac{\text{Length of Incline}}{\text{Height of Incline}}$$

Station #4- EdHeads

Materials:

Computer

Objective:

Investigate simple machines used in a mechanics garage.

Procedure:

1. Go to “The House” activity site and click on “The Garage.” ([www. EdHeads.org](http://www.EdHeads.org))
2. There are 10 simple machines hidden in the garage. Find each simple machine and answer the corresponding questions.
3. When your group completes the activity type in all group members names and print your scores. Give the results to the teacher. (Printer is HP 1300N)

Station #5- Compound Machines

Objective:

Examine each of the compound machines and answer the questions below.

Questions:

5a. What two simple machines are found in a pair of scissors?

5b. What four simple machines are found in a can opener?

5c. What two simple machines are found in a stapler?

5d. Within your mouth there are two simple machines. What are they?