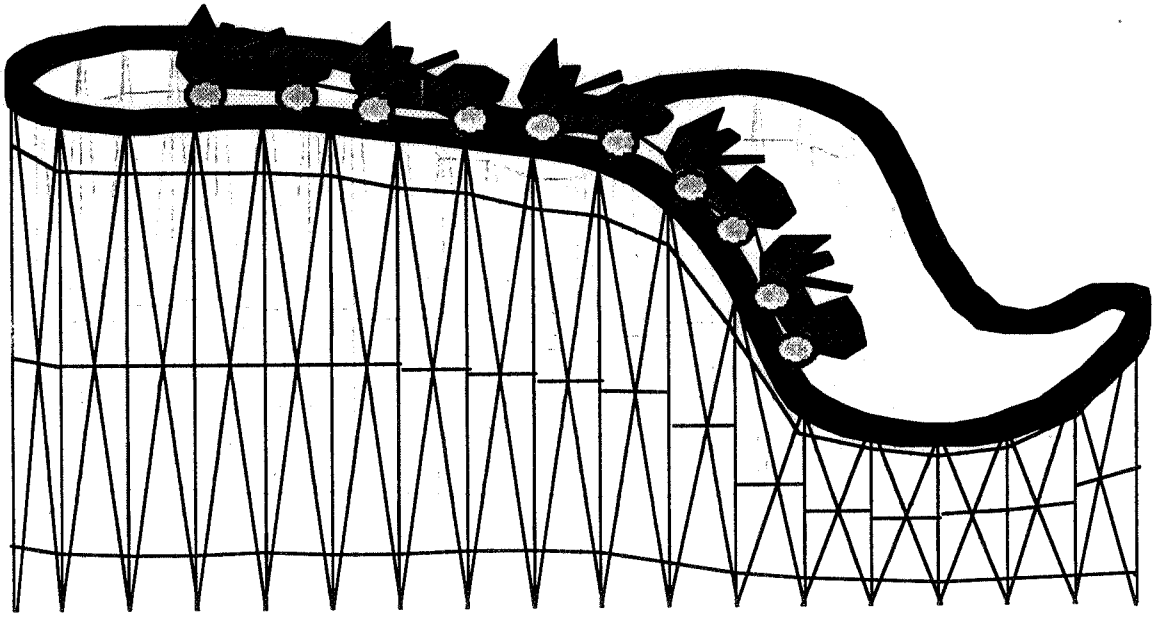
Howard County Public School System
Physical Science
Grade Five

FORCES &
SIMPLE MACHINES



Student Response Booklet

Pilot 2001

Name:_____

Date:_____

Warehouse # 87-03-565

Calculating Work

Part II: Use the data from the charts on the previous page to answer the following questions:

1. When distance doubles:
   - How is force affected? _____
   - How is work affected? _____

2. Based on the results of this investigation, what do you think will happen to the work needed to lift two blocks a distance of two meters. Write your hypothesis on the lines below.

   _____

   _____

   _____

3. Explain why you made that hypothesis and use evidence to support your hypothesis.

   _____

   _____

   _____

   _____

   _____

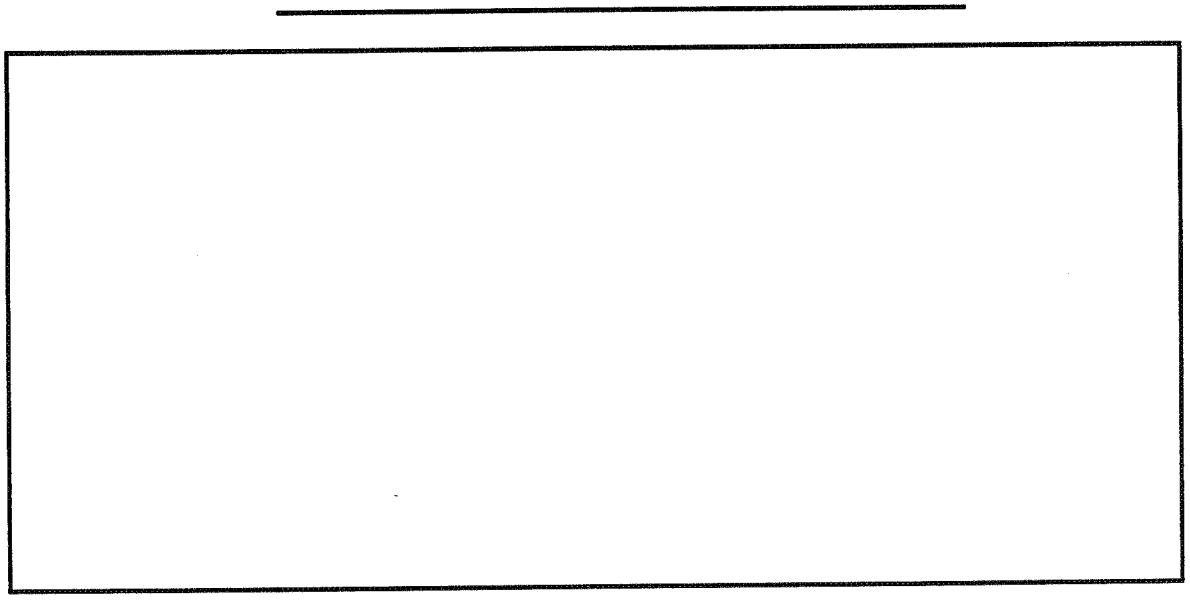
   _____

   _____

Our "Work" Investigation

Part II:

1. **Create a chart in the space below to organize the data you collect. Use a ruler to construct the chart.**

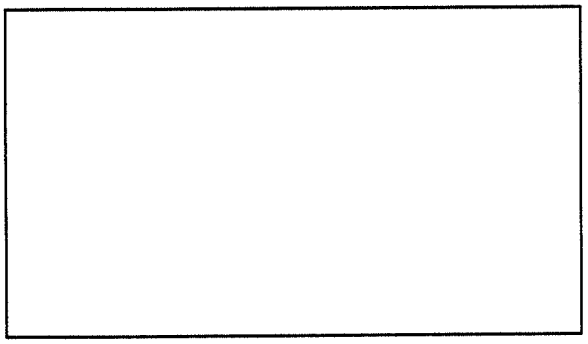


2. **Conduct the investigation.**

How Much Work Can It Be?

Directions: Read SRP p. 2, "Work, Work, Work!" Use the information from the text and from investigations conducted in class to answer the following questions.

1. Heidi pushes a model race car five meters with a force of fifty Newtons. How much work has she done? Show your calculations in the box below. Write your answer on the lines.



2. What must happen for work to be done? Support your answer with evidence from the text on SRP p..

3. Based on the results of the "work" investigations in class and the information from the text on SRP p., which student do you think did more work in the class demonstration with the stack of four books? Explain your answer below.

Friction

Investigation Question: How does the force of friction affect the work needed to move an object over a surface?

Materials: Block with an eye hook
Meter stick
Spring scale
Various surfaces

Prediction: Which surface do you predict will require the most work to pull the block one meter? Explain your thinking.

_____

_____

_____

Procedure:

1. List each test surface on the chart below.
2. Make sure the spring scale is set to zero each time the block is set on a new surface.
3. Attach the spring scale to the block.
4. Pull the block a distance of one meter on the each surface.
5. Record the amount of force needed to pull the block along each surface.
6. Calculate the work done.

Surface	Distance	Force	Work

My Conclusion(s) About Friction

Part I. Conclusion

In this investigation, I investigated (wanted to find out)…

I predicted (hypothesized) that…

My prediction was _____ my results because the data…
(the same as, different from)

Therefore, I conclude (learned) that …

Part II. Definition for Friction

Friction is _____

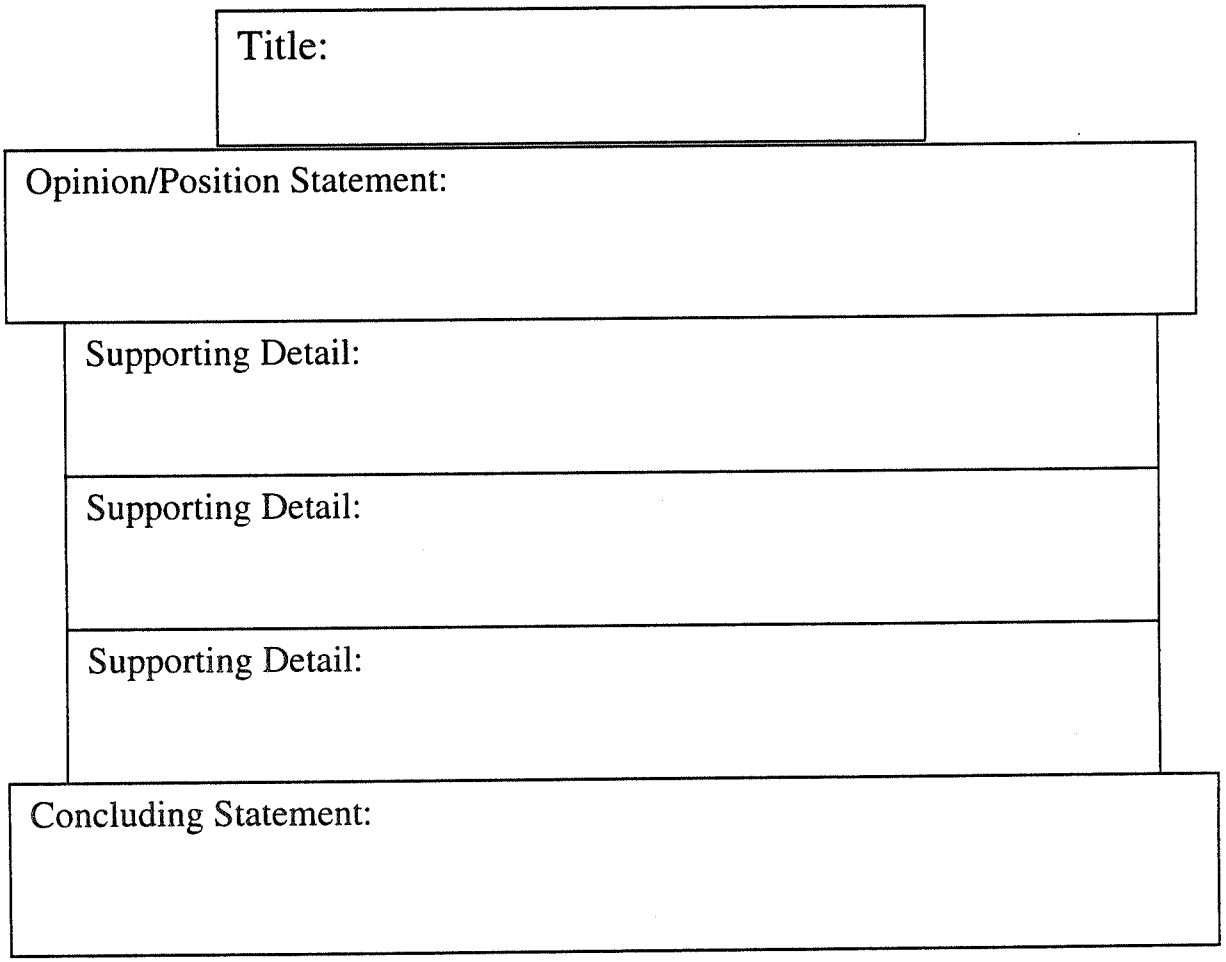
Thrills and Chills

Now that you have designed a fabulous new roller coaster, you will create an advertisement to persuade other fifth grade students that your design is filled with thrills and excitement!

The advertisement must contain the following criteria:

- Opinion/position statement
- Three supporting details that include science facts from this unit
- Strong concluding statement that either summarizes, makes a prediction, or a personal statement
- An attention grabbing title

Use the organizer below to organize your thoughts!

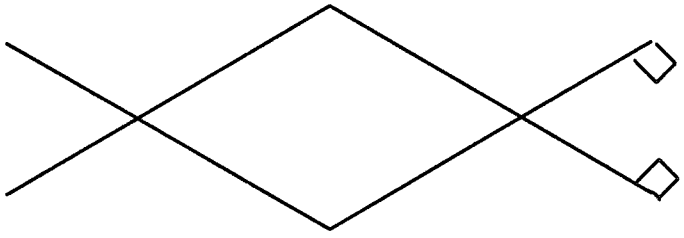


CONSTRUCT A SIMPLE MACHINE

Materials: LEGOS Kit, Task Card 2

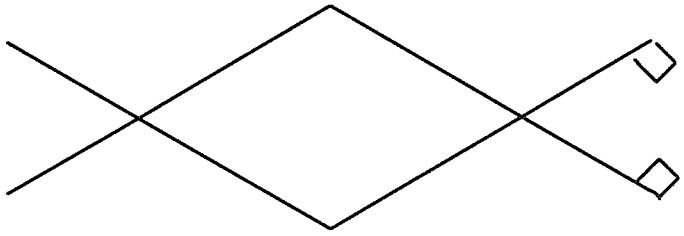
1. Construct a few objects of your own using the LEGOS pieces. What are some objects you made?

2. Using Task Card 2, construct the machine at the bottom of the back page.
   A. Use arrows (↑,↓) to show in what direction the handles and grippers moved when they were squeezed together.



handles grippers

   B. This time, use arrows (↑,↓) to show I what direction the handles and grippers moved when they were pulled apart.



handles grippers

3. Pick up several small objects with your machine. List the objects you were able to pick up with the simple machine. Describe the objects that were easiest to lift.

_____

_____

_____

Classy Levers

Station #	Simple Machine	Lever Class
4		
5		
6		

Fixed and Movable Pulleys

3. When you used a movable pulley, in what direction did you pull on the string? In what direction did the object move?

4. Compare the weight of the object with the force you used to lift the object with a movable pulley.

5. What conclusions can you make about how each pulley arrangement helped you do work on the object?

6. How are a single fixed pulley and a first class lever similar? Support your answer with evidence from your investigations.

Plane and Simple – Part II

Use the measurements from the inclined plane you constructed following the diagram in #4 of Part I of this investigation to complete #1 - 4.

1. Measure in meters, the height of the starting line _____m.
2. Measure, in meters, the height of the finish line _____m.
3. Calculate the distance the block will be lifted by using this formula:

Finish line	-	Starting Line	= Distance Block Lifted
_____ m	-	_____ m	= _____ m

4. Record the Distance Block Lifted on the chart below.

Work Without Using an Inclined Plane Chart

# of Blocks	Force (N)	Distance Block Lifted (m)	Work (J)
1 block			

5. Hook a block on the spring scale. Without using an inclined plane, lift the block in the air, equal to the distance the block is lifted from Step 3. Record the force on the chart above.
6. Calculate (use a calculator) and record the work required on the chart above.

Use evidence from the investigations to answer the following questions:

1. Is more **force** needed to move a block with an inclined plane or without an inclined plane? Explain your answer.

_____

_____

_____

_____

_____

_____

Rube Goldberg Activity Criteria Sheet

Your Rube Goldberg Machine must include the following criteria:

_____ A title

_____ A task for the machine to do

_____ A diagram that shows how the machine works

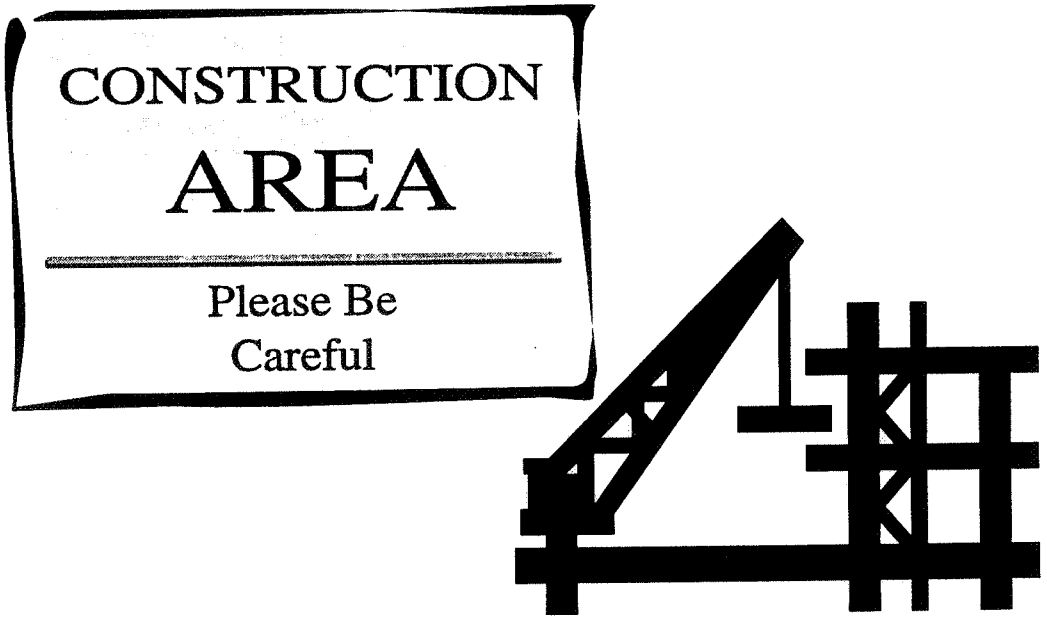
_____ Six steps to complete the task

_____ Numbers on the diagram to correspond to steps

_____ At least one lever, one pulley, and one inclined plane

_____ Labels to indicate the simple machines

WARNING: Your machine may not be powered mechanically or electrically!



*** **Note:** Use this page as your criteria checklist! ***