Name: ____

Group #: _________ (TA will provide)

Pulley Challenge

Your Challenge:

You are borrowing a pool table from your friend to use at your birthday party but it is too heavy to lift by hand. How will you get the pool table into your van to drive it to your house?

A friend suggests using a pulley to help you. Your group will experiment with various model pulleys to figure out the best pulley to use.

We begin by exploring what you may already know about pulleys.

Pages 2 should be answered INDIVIDUALLY.

You will work with your group for the rest of this packet.

Brainstorming

INDIVIDUALLY: Write down anything you know about pulleys. You may draw pictures along with your words.

Pulley Group Questions

In a few minutes, you will be experimenting with model pulleys. Below, write down any questions you still have about pulleys. Feel free to also include any "non-science" issues that may affect your pulley choice.

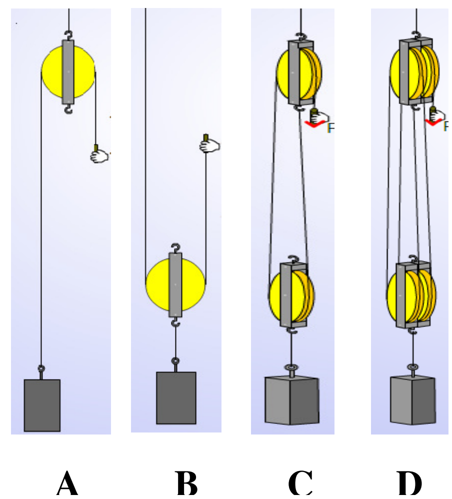
Pulley Hands-On Experiment

Use the available materials to set up and test some pulley systems. You may try different pulley systems out, but **be sure to record your data for each system in the table below**.

Pulley Basics

To the right are examples of pulley systems we will investigate.

- Use an object of mass 500 g as the mock pool table in your experiment.
- Pull the string at the end of the pulley not attached to the object, such that the object moves up a distance 0.10 m
- Use the chart below to record your data and calculate the information needed to complete the table.



A- Single Fixed
B- Single Movable
C- Single Compound
D- Double Compound

Load (N) = <u>4.9 N</u> (due to the 500 g object that you are lifting)

Pulley System	Did the direction of force change? (circle one)	Effort Force (N)	Distance Pulled to Move Object (m)	Distance Object Moved* (m)	Work (J)	Potential Energy (J)	Mechanical Advantage MA	# of Supporting Strands*
Single Fixed	Yes / No			0.10m				
Single Movable	Yes / No			0.10m				
Single Compound	Yes / No			0.10m				
Double Compound	Yes / No			0.10m				

*Supporting strands are the vertical sections of rope that pull up on the pulley system.

Reminder:

Work = Effort force x Distance Pulled

Potential Energy = Load x Distance Object Moved

Mechanical Advantage (MA) = Load ÷ Effort Force

1. Based on your data, which pulley system required the **smallest effort (force)** to lift the load?

Why do you think that is? How can you explain that?

2. Based on your data, when you *increase* the **distance you pull** to lift the object to a certain height, how does it affect the **effort force** required?

Why do you think that is? How can you explain that?

3. Based on your data, how does the **distance you pull** compare to the **distance the object moved** for the pulley with the *smallest effort force*?

Why do you think that is? How can you explain that?

4. Based on your data, when you **changed the pulley system**, how did it affect the **work** required to lift the object?

Why do you think that is? How can you explain that?

5. Based on your data, how does **work** compare to **potential energy** for a given pulley system?

Why do you think that is? How can you explain that?

6. Which pulley system gave you the *greatest* **mechanical advantage**?

Why do you think that is? How can you explain that?

7. Based on your data, when you *increase* the **number of supporting strands**, how does it affect the **mechanical advantage**? (Supporting strands are the vertical sections of rope that pull up on the pulley.)

Why do you think that is? How can you explain that?

8. What is the difference between **effort force**, **work**, **potential energy** and **mechanical advantage**?

Challenge

What would be the best pulley system to use to get the pool table into the van? Explain your answer based on what you have learned from this unit.

How did the experiments' conditions differ from those you would encounter with a real-life pulley system and pool table?