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 a pulley simulation 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 research some of the science concepts related to pulleys. Below, make a list science ideas and questions you would like to answer in order to design the best pulley to move the pool table into the van? Feel free to also include any "non-science" issues that may affect your pulley choice.

Find out More about Pulleys on CoMPASS

Go to the website www.compassproject.net. Your TA will give you the login and password.

Pulley Challenge: You are designing a pulley system to help lift a pool table into the van because it is too heavy to lift by hand. How can you design the best possible pulley system to get the pool table into the van?

Later, you will be experimenting with different pulley systems help you decide which pulley system is best.

Use the CoMPASS website to explore the science concepts related to pulleys. Use the space below to record the information you read about in CoMPASS.

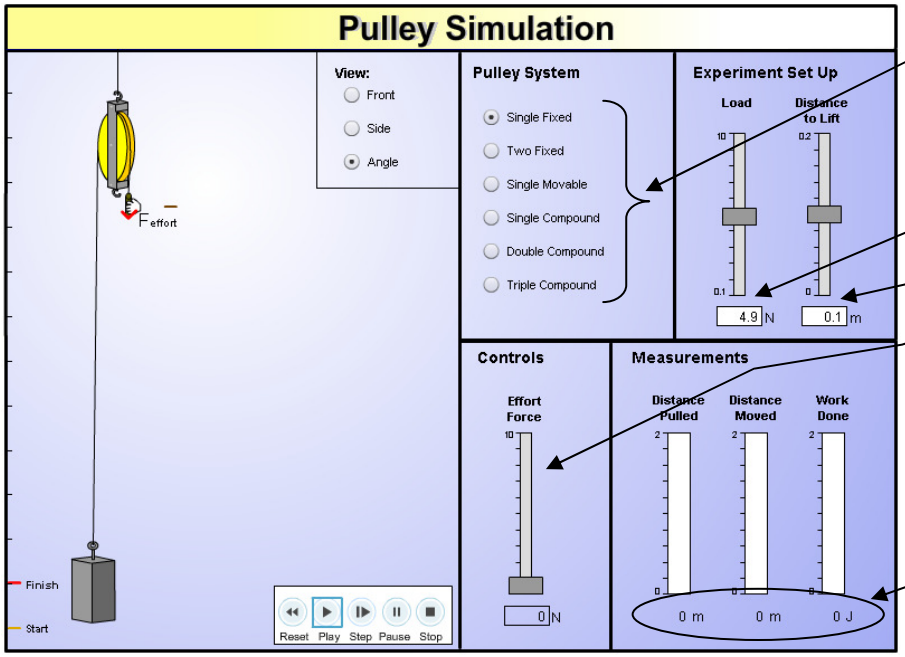
Hints:
Think about which science concepts you need to explore to design the best possible pulley system.

The maps in CoMPASS will show you concepts that are related to the one you are reading. Use the maps to find out more information!

Before clicking on a concept in CoMPASS, think about how information about the concept will help you in your challenge.

Pulley Simulation

You will now use the pulley simulation.
Click on the "PULLEY SIMULATION" icon on the desktop



- Choose the pulley system as per the chart below. Set the parameters as per the figure
- Load = 4.9 N
- Distance to Lift = 0.10 m
- To find the effort force required to move the load, slowly increase the effort force until the load begins to move.
- Record various information in the chart

Load (N) = 4.9 N (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**?

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 simulation's conditions differ from those you would encounter with a real-life pulley system and pool table?