

## Tools and Equipment, Part II Activity – Pulley Worksheet

### Instructions/Questions

1. What is the measured weight of your object? Load = \_\_\_\_\_
2. How is the Mechanical Advantage of a pulley system calculated?

**A. Set up your pulley, weight and rope as shown at right.**

1. What is the theoretical Mechanical Advantage of this system?

MA = \_\_\_\_\_

2. What is the required force to raise object higher?

Effort = \_\_\_\_\_

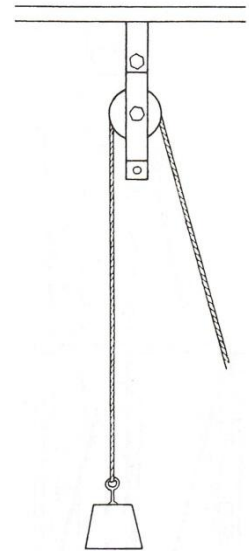
3. Calculate the actual Mechanical Advantage of the pulley system using the following equation:

$$MA_{actual} = \frac{Load}{Effort} =$$

4. How does this compare to the theoretical MA from above?

\_\_\_\_\_

\_\_\_\_\_



**B. Support your load according to the pulley setup shown at right.**

1. What is the theoretical Mechanical Advantage of this system?

MA = \_\_\_\_\_

2. What is the required force to raise object higher?

Effort = \_\_\_\_\_

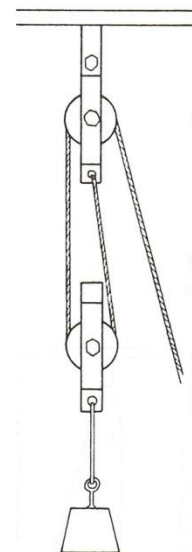
3. Calculate the actual Mechanical Advantage of the pulley system using the following equation:

$$MA_{actual} = \frac{Load}{Effort} =$$

4. How does this compare to the theoretical MA from above?

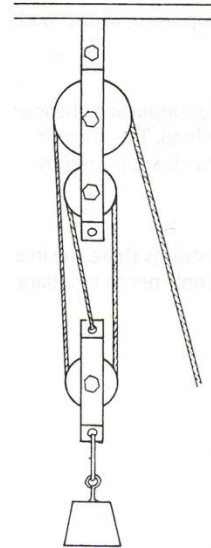
\_\_\_\_\_

\_\_\_\_\_



Name: \_\_\_\_\_ Date: \_\_\_\_\_

**C. Add another pulley to your system as shown to the right.**



1. What is the theoretical Mechanical Advantage of this system?

MA = \_\_\_\_\_

2. What is the required force to raise object higher?

Effort = \_\_\_\_\_

3. Calculate the actual Mechanical Advantage of the pulley system using the following equation:

$$MA_{actual} = \frac{Load}{Effort} =$$

4. How does this compare to the theoretical MA from above?

\_\_\_\_\_  
\_\_\_\_\_

**Results**

In general, were the theoretical mechanical advantages similar to the actual ones?

\_\_\_\_\_

**Discussion**

1. What were some sources of error in your experimental procedure?

\_\_\_\_\_  
\_\_\_\_\_

2. What recommendations would you make as engineers trying to move the gray whale back to the ocean? Would you use pulleys? Why or why not?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. What are some constraints that you as engineers might consider while designing a pulley system for the whale?

\_\_\_\_\_  
\_\_\_\_\_

4. What impacts to the whale might you need to consider for moving it back to the ocean?

\_\_\_\_\_  
\_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

5. Calculate the percent error in the mechanical advantage of the actual pulleys compared to the theoretical pulleys.

$$\% \text{ Error} = \left| \frac{\textit{Theoretical Value} - \textit{Actual Value}}{\textit{Actual Value}} \right| * 100$$

**Pulley Setup A:**

**Pulley Setup B:**

**Pulley Setup C:**