



# Machines

## STEM Sims

### Lesson 9: Doubling Down

Compound pulleys have two or more pulleys connected within a system. Sailboats often use a multitude of compound pulleys to operate the sails on the boat. Are you ready to sail into this investigation of multiple pulleys?

#### Doing the Science

1. Start the Machines Simulation by clicking on the “Sim” tab.
2. Click the “Pulleys” button at the bottom of the screen.
3. Select the bottom-left pulley (Compound, Moveable) from the four pulley buttons at the bottom of the screen.
4. Use the Newton Converter button at the bottom right-hand corner of the screen if you need help converting the hanging mass from kilograms to newtons for the Force on Mass Due to Gravity column.
5. Click the green “Pull” button on the Force Device in the middle of the screen.
6. Note and record in Table 1 the height the 1.0-kg mass lifts off the ground, the applied force, and the distance the Force Device pulled the string that is displayed on the Force Device.
7. Click the “Reset” button.
8. Click on the 2.0-kg mass to replace the 1.0-kg mass on the pulley. Repeat the experiment with the 2.0-kg mass.
9. Make sure to note and record your data in Table 1.

**Table 1. Force and Distance Moved**

Mass (kg)	Force on Mass Due to Gravity (N)	Height Mass Lifted (m)	Applied Force (N)	Distance Force Device Moved String (m)
1				
2				

#### Do You Understand?

1. Describe how the effort force exerted by the Force Device compared to the force on the hanging mass due to gravity.
  
2. Describe how the distance the Force Device moved the string (input distance) compared to the distance the hanging mass moved (output distance).
  
3. Describe and discuss how this compound, moveable pulley was useful in accomplishing a task.