



# Machines

## STEM Sims

### Lesson 5: Lifting Lever

The three classes of levers differ in the position of the fulcrum relative to the lifting and resistance forces. A second class lever has the fulcrum at one end, the resistance force in the middle, and the effort force at the opposite end of the plank. Can you lift yourself up to the task of investigating levers?

### Doing the Science

1. Start the Machines Simulation by clicking on the “Sim” tab.
2. Click the “Levers” button at the bottom of the screen.
3. Click the number “2” to select the second class lever from the three numbered 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 column.
5. Click the green “Pull” button on the Force Device on the right side 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 height moved that is displayed on the Force device. Please note that the Force Device remains at the 8.0-meter mark throughout the investigation.
7. Click the “Reset” button.
8. Click the red arrow to move the 1.0-kg mass to the 2-meter mark on the plank.
9. Repeat steps 4 - 7, making sure to note and record your data in Table 1.
10. Move and test the 1.0-kg mass at the following positions on the plank: 3, 5, and 6-meter marks.
11. Make sure to note and record your data in Table 1.
12. Click on the 2.0-kg mass to replace the 1.0-kg mass on the plank. Repeat the entire experiment with the 2.0-kg mass.

**Table 1. Forces and Height Moved**

Fulcrum Position (m)	Mass (kg)	Force on Mass (N)	Mass Position (m)	Height Mass Lifted (m)	Applied Force (N)	Height Force Device Moved (m)
0	1		4			
0	1		2			
0	1		3			
0	1		5			
0	1		6			
0	2		4			
0	2		2			
0	2		3			
0	2		5			
0	2		6			

**Do You Understand?**

1. Describe how the position of the hanging mass affected the lifting force required on the Force Device.
2. Describe how the height moved by the Force Device changed based on the hanging mass position.
3. Is it correct to say that you got more work out of the machine (lever) than you put into it since you used a smaller force to lift the heavier hanging mass? Please explain your response.