



Machines

STEM Sims

Lesson 6: Getting Out Less Than You Put In

In previous lessons you have seen how levers can be used to increase an effort force and provide a way for you to lift objects much heavier than you would be able to lift on your own. Levers also have another useful function. Can you figure out another way to use leverage?

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 “3” to select the third 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 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 height moved that is displayed on the Force Device. Please note that the hanging mass remains at the 8.0-meter mark throughout the investigation. Click the “Reset” button.
7. Click the red arrow to move the Force Device to the 2-meter mark on the plank.
8. Repeat steps 4 - 6, making sure to note and record your data in Table 1.
9. Move and test the Force Device at the following positions on the plank, 3, 5, and 6-meter marks.
10. Make sure to note and record your data in Table 1.
11. 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 Distance Moved

Fulcrum Position (m)	Mass (kg)	Force on Mass (N)	Force Device Position (m)	Height Force Device Moved (m)	Applied Force (N)	Height Mass Lifted (m)
0	1	9.8	4			
0	1	9.8	2			
0	1	9.8	3			
0	1	19.6	5			
0	1	19.6	6			
0	2	19.6	4			
0	2	19.6	2			
0	2	19.6	3			
0	2	19.6	5			
0	2	19.6	6			

Do You Understand?

1. Describe how the position of the Force Device relative to the hanging mass affected the lifting force required on the Force Device.
2. Describe how the height moved by the Force Device and the hanging mass changed based on the position of the Force Device.
3. Describe and discuss how a third class lever can be useful even though this type of lever requires a larger input or effort force than the output force.