Simple Machines

U1LT1: I can apply my knowledge of simple machines and their uses to calculate work.

Visit https://www.msichicago.org/play/simplemachines/. Here you will find a game that walks you through the uses of simple machines. As you play each game, answer the following questions.

1. In the first game, which inclined plane was most successful at helping Twitch achieve his goal? Why did this one work better than the others?

2. In the second game, which class of lever does Twitch use? How do you know?

3. In the second game, where is the best placement for the fulcrum? Explain.

4. In the third game, what wheel size works best? What happens if the wheels you use are too big? Too small?

5. In the fourth game, which pulley system worked best? Why did this pulley work better than the others?

6. Write down how much energy you had left at the end of all of the games.

Answer the following questions pertaining to "Science Court."

1. What is the argument in this Science Court case?

2. According to Dr. Pushnik, what is work?

3. How does Mr. Savage try to show that Joe works harder than Mary?

4. How does Mary lift the robot? What is the advantage of this?

5. What is mechanical advantage according to Professor Parsons?

6. Do machines allow you to do less work? Explain.

7. What does distance have to do with work?

8. Is Mary guilty or innocent? Explain.

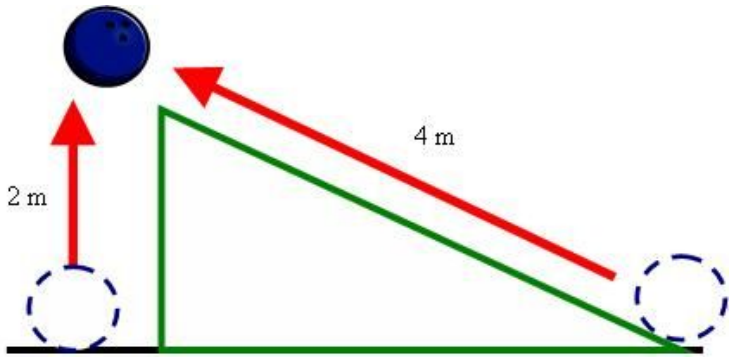
Extention

Now that you have a basic understanding of how simple machines are used, we can use them to calculate work and mechanical advantage. Work is the energy it takes to move an object. If you take your notebook and push it across the table, you are doing work.

Work = (Force Applied) x (Distance the Object Moved)

Work is measured in joules (J)
Force is any push or pull and is measured in newtons (N)
Distance is measured in meters (m)

Keep in mind that the amount of work needed to move an object a certain distance is always the same. It will always take the same amount of work to move an object from point A to point B no matter how you get it there. The simple machines do not change the total amount of work that you have to do, but they change how it feels to do that work.



Use this image to answer the following questions.

1. Which would be easier: to lift a bowling ball straight up above your head or to roll it up a ramp to the same height?

2. In question 1, do both options do the same amount of work? Explain.

3. If I applied 8 newtons of force and lifted the bowling ball up 2 meters, how much work have I done? (Hint: use the equation for work found above).

4. If I roll the same ball up a ramp that is 4 meters long (but 2 meters high, so the ball is lifted to the same location as in question 3), how much force would I have to apply to equal the same amount of work as in question 3?

5. Mechanical advantage is (force to do the work) divided by (force to do the same work with a machine). What is the mechanical advantage of using a simple machine to raise the bowling ball to 2 meters in the air?