Student Worksheet
Simple Machines – Lesson 3: The Wheel and Axle

Name(s):_____ Section:_____
_____ Date:_____

Talk Now - 3a: Predicting with the screw
If this inclined plane moves 3 cm to the left, how high will it lift the object?

_____

_____

_____

How do you predict the force applied to the resistance compares to the force you must apply to the screw?

_____

_____

_____

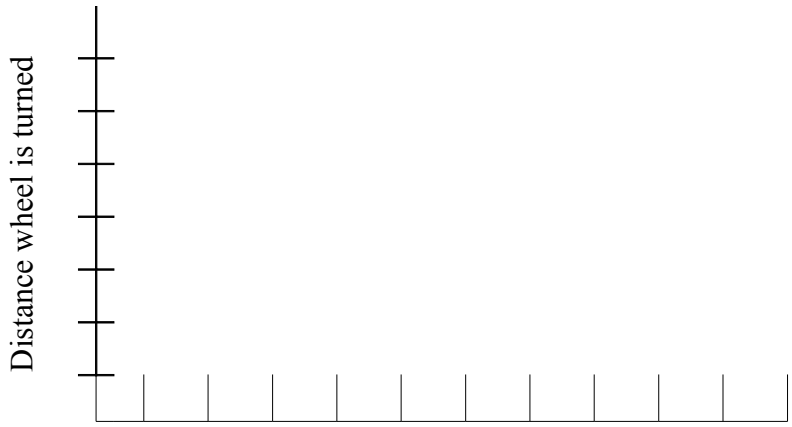
Lab Instructions:
Record the effort force, the distance lifted and the thread density for 5 tests. We will explore the Wheel radius in another lab, so leave it fixed during these tests for now.

Data Collection::
Table 1: The Screw &

	Effort Force	Distance turned	Wheel radius
1			
2			
3			
4			
5			
6			
7			
8			

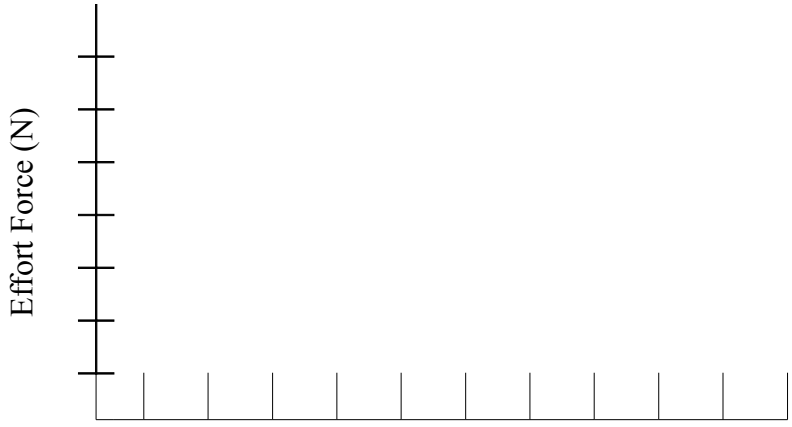
Graphing - 1::
Use the data from Table 1 to complete these graphs.

Graph 1A



Analysis question:
1. As the number of threads per centimeter increases, what happens to the distance the wheel is turned to lift the gate?

Graph 1B



2. As the number of threads per centimeters increases, what happens to the amount of force needed to turn the wheel?

Talk Now – 3b: discuss thread density
Discuss the relationships shown on graphs A and B with your partner. In your own words explain how an increase in the thread density changes the distance the wheel is turned and the amount of effort force needed to lift the slab. Be sure to use complete sentences.

Talk Now – 3c: the wheel and axle
With your partner, list as many possible reasons why they used a wheel to turn the screw instead of a screwdriver.

With your partner predict what changes might occur when you adjust the wheel's radius. Record your prediction.

Lab Instructions:

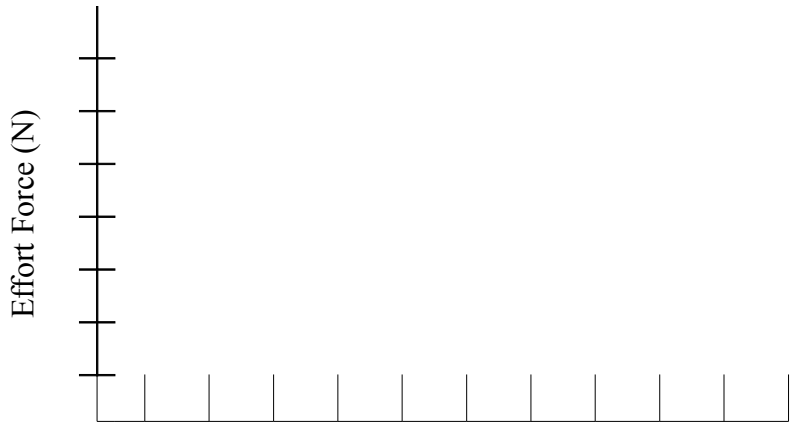
- Select a wheel size and record the effort applied, distance lifted and wheel radius in your lab packet.
- Repeat this test using at least 4 different radii.
- Record data from each test before going on.

Data Collection::
Table 2 – The Wheel & Axle

Effort Force	Distance Turned	Wheel Radius

Graphing – 2::
Use the data from Table 2 to complete graph C

Graph 2A



Analysis Questions:
1. What happens to the effort force as the radius increases? Use complete sentences.

2. Compare these results with your predictions. Use complete sentences.

3. If an increase in the length of an effort arm results in a decrease in the effort force, explain why an increase in the radius of a wheel results in a decrease in effort force needed.

4. As the radius of the wheel increases, what happens to its circumference?

5. How does this change the distance the handle moves to make one full rotations?

6. What would you gain if you applied the effort force at the axle instead of at the outside of the wheel?

Talk Now – 3d: Machines in Combination

Discuss with your partner. You have seen that adjusting thread density will change the amount of effort force needed and adjusting the wheel radius will also change the amount of effort force needed. Explain in your own words the advantage of combining these two simple machines. Use complete sentences.

Challenge:

Predict 3 different combinations of thread density and wheel radius which will allow the gate to be lifted using the same effort force.