Student Worksheet: Simple Machines - Lesson 1: The Wedge and Lever

Name:_____ Period:_____Date:_____

http://aspire.cosmic-ray.org/labs/machine/index.html

Lab Instructions:

1. Select a length for your wedge. The width will remain at 12 cm.
2. Record the length of your first wedge and the force - or weight (N) - that was applied.
3. Repeat this using 6 to 8 different lengths

Data Collection: Table 1: Wedge

	Length(cm)	Width(cm)	Force(N)
1		12	
2		12	
3		12	
4		12	
5		12	
6		12	
7		12	
8		12	

Talk Now - 1b: Effectiveness of the wedge

Do you notice any patterns to help you predict how much weight will break the stone?

Write a general statement explaining which wedges will work most efficiently.

Let's move on to the Lever:

Lab Instructions: The Lever

1. Select a placement for the fulcrum and record your data.
2. Record effort distance, effort force and indicate whether or not it was successful.
3. Repeat using various fulcrum placements.

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Data Collection: Table 2: Lever

	Effort Distance(D_E)	Effort Force(F_E)	Success
1			
2			
3			
4			
5			
6			

Data Analysis - 2:
Use your data from Table 2 to create a new table showing work done. Use the data from successful attempts.
Calculate: Effort Distance (m) x Effort Force(N) = Work (J)

Table 3: Lever – work done

	Effort Distance (m)	X Effort Force(N)	= Work(J)
1			
2			
3			
4			
5			

Analysis Questions:

1. What do you notice about the amount of work done in each successful trial?

2. Compare the effort distance(D_E) and effort force (F_E) in all trials. What happens to the amount of F_E as the D_E increases?

3. Use the term "inverse" or "direct" to explain the relationship between F_E and D_E as you adjusted your lever. (Use complete sentences.)

Student Worksheet: Simple Machines – Lesson 2: The Inclined Plane and Pulley

Name(s):_____ Period:_____Date:_____

http://aspire.cosmic-ray.org/labs/machine/index.html

Lab Instructions

1. Select a length for the inclined plane.
2. Record the length, effort force and indicate whether or not it was successful.
3. Repeat using various lengths.

Data Collection: Table 1: Inclined Plane

	Inclined Plane Length	Effort Force	Success
1			
2			
3			
4			
5			
6			

Analysis Questions - 1:

1. From your chart of data, find the maximum effort our crew member can sustain to pull the stone up from the inclined plane.

2. What is the length of this inclined plane?

3. Would this be the ideal length to use for the inclined plane?

4. What other factors might you consider?

Student Worksheet: Simple Machines – Lesson 2: The Inclined Plane and Pulley

Name(s):_____ Period:_____Date:_____

Data Analysis - 1: calculate work done with inclined plane

Transfer the data for length and effort from Table 1 onto Table 2. Calculate the amount of work done to get the stone to the top of each inclined plane. Remember: Work = Force applied X distance mass is moved.

Table 2: Incline Plane work done

	Effort Force(N)	X	Distance(m)	=	Work Nm(J)
1	3,480 N		40 m		139,200 j
2					
3					
4					
5					
6					

How do the values of work found for the various lengths of inclined plane compare? Use complete sentences in your answer.

Lab Instructions:

Record the number of supporting ropes, the effort force applied to the rope, and the distance the rope is pulled on Table 3. Record the data for all 4 available arrangements. Calculate the work input for each trial on Table 3 by multiplying the force applied by the length the rope was pulled.

Data Collection: Table 3: The Pulley

# of supporting ropes	Force applied(N)	Length of rope pulled(m)	Work Done(j)

Compare your 4 values for work, and using complete sentences describe what you found.

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

Name(s):_____ Period:_____Date:_____

http://aspire.cosmic-ray.org/labs/machine/index.html

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			