Student Worksheet

Simple Machines - Lesson 1: The Wedge and Lever

Name(s):______________________________ Section:______________________________

______________________________ Date:______________________________

Talk Now - 1a: Shape of the wedge
With your lab partner, predict how the shape (proportion) of the wedge might influence its effectiveness. Write your prediction here:

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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.

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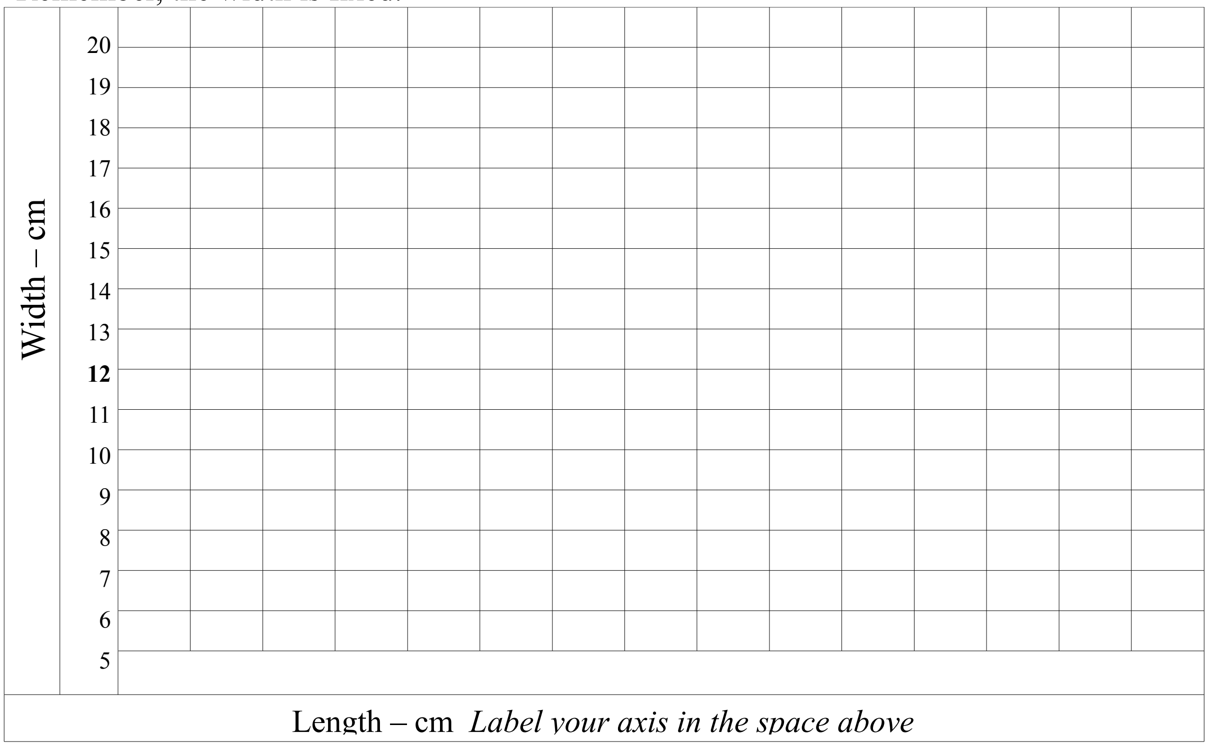
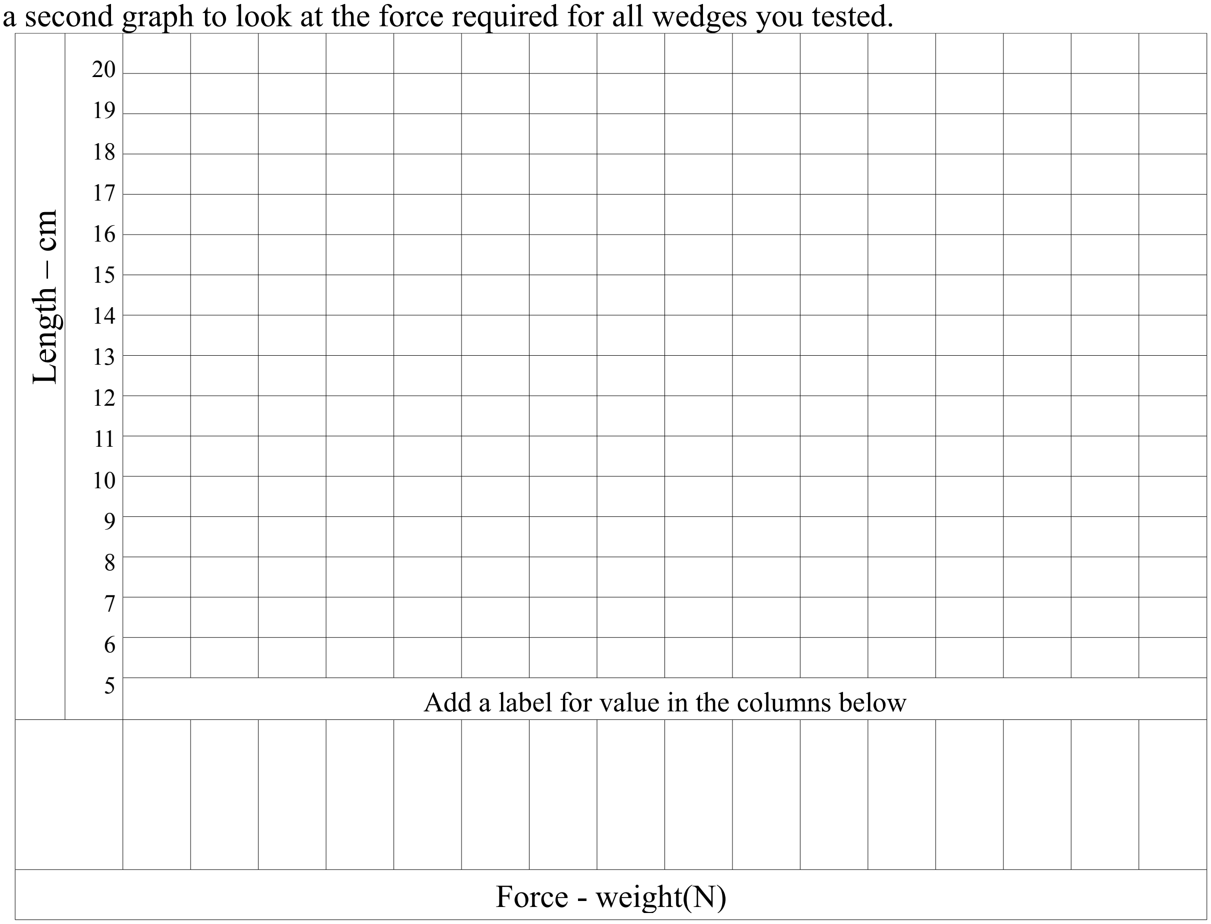
Data Analysis -1:

To look at this information in another way, make a line graph showing the wedge dimensions you have tested. Remember, the width is fixed.



Use a second graph to look at the force required for all wedges you tested.



Analysis questions:

1. Using the data from your chart and your graph, write a general statement about the length and width of the wedges that did the work most efficiently.

2. Make a prediction of what might happen with extreme shaped wedges. i.e.: an extremely long wedge or a very short, almost-flat wedge. Might there be problems at both extremes? Explain your prediction.

3. How did the force which was applied to the wedge change as you changed the length of the wedge?

4. What is the relationship between the wedge length and the force required to use it?

5. Refer back to your prediction at the beginning of this lab. How might you change your statement to be more accurate or more complete?

Let's move on to the Lever:

Talk Now – 1c: Predicting the effectiveness of a lever
With your partner, discuss predict how a lever might be used to make work easier. Together, form an answer for the following question and write it down: How will a lever make lifting the block onto the sled easier for Harry?

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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.

Data Collection::
Table 2: Lever

Effort Distance(D_E)		Effort Force(F_E)	Success
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Talk Now – 1d: Predicting and testing success
Predict fulcrum placements which will not be successful. Explain why you think these placements won't be successful. Use complete sentences.

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Test your prediction (hypothesis.) Do you want to add to your prediction or change it a little?

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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			
6			
7			
8			
9			
10			

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.)

4. What are the advantages of using a lever to lift this stone?

Data Analysis – 3:
Use the same data again to complete Table 4 which will help us look at mechanical advantage. When you have filled in the data, calculate the MA both ways for each successful test.

Table 4: Mechanical Advantage

Force of Rock(F_R) /	Effort Force(F_E) =	MA	Effort Distance(D_E) /	Distance of Rock (D_R) =	MA

Analysis Questions:

1. What conclusions can you draw from comparing the MA using the forces and the MA using the distances for each trial?

2. a) Comparing different trials: As the effort distance (D_E) increases, what happens to the MA?

   b) What happens to the effort force (F_E)?

Talk Now – 1e: Summarizing your conclusions
Create a statement explaining the advantage of using a lever to lift a heavy mass:

Refer back to your prediction at the beginning of the lever lab. How might you change your statement to be more accurate or complete?

Brainstorm a list of ways that a lever might be used in your world today: