MiSP Simple Machines / Inclined Plane Worksheet #1 L3

Name ______________________________ Date _____________

WEDGE-EASE (AIMS *MACHINE SHOP*)

Key Question: What isosceles triangle can you draw and view as a cross section to make the best knife blade?

Introduction:

A wedge is a simple machine that helps a person split, cut, or move things apart. A wedge is one moveable inclined plane or two inclined planes back-to-back. Axes, chisels, and knives are examples of wedges.

Procedures:

Your teacher will use three different wedges to move two heavy books apart. The wedges are all the same thickness but their angled surfaces or slopes are different lengths. The three wedges will be placed between the books. Weights will be added to the end of the wedge until the books move apart.

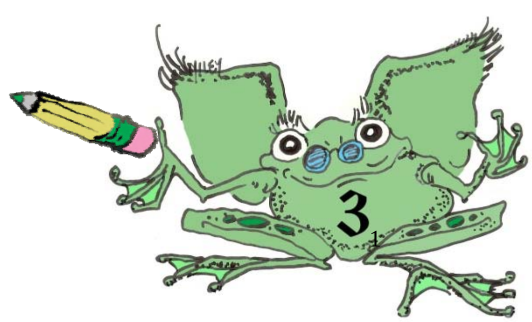
Record your Data:

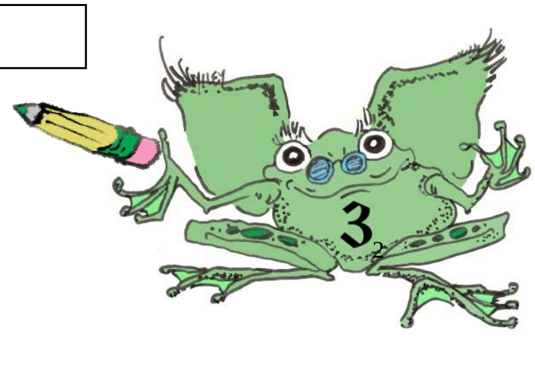
Wedge length	Wedge slope length (cm)	Mass needed to move the books apart (g)

Graph your data:

Graph the data on the next page.

- Label the *x*-axis.
- Label the *y*-axis.
- Connect the data points with straight lines.

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Discussion Questions:
Wedge-Ease Connecting Learning (AIMS *Machine Shop*, pp. 214-215)

1. Which of the three wedges required the greatest amount of weight to spread the books apart? Which required the least amount?

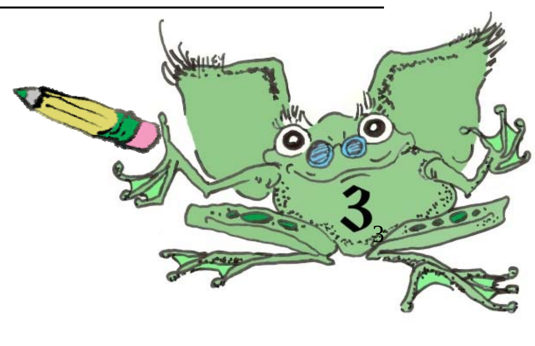
2. What relationship is there between the size of the wedge and the effort required to push it through something?

3. How is this relationship [see your answer to #2 above] shown on the graph?

4. What dimensions would you use to construct a wedge that requires the least amount of force to split something?

5. If a wedge is 5 cm in length, how much force would it take to push through the books? How did you determine this?

6. If you knew the force required to split the books was 220 grams, what must the length of the wedge be?



7. Use the information from the graph to calculate the unit rates of change (slopes) for the Wedge-Ease experiment for the two line segments on the graph.

Unit Rate of Change = $\dfrac{\Delta \text{ Mass needed to move the books (g)}}{\Delta \text{ Wedge Length (cm)}} = \dfrac{\Delta y}{\Delta x} = \dfrac{(y_2 - y_1)}{(x_2 - x_1)}$

Segment of Graph (wedge length)	Ordered Pair used for calculation (x_1, y_1) (x_2, y_2)	Δ Mass needed to move books (g) Δy	Δ Wedge Length (cm) Δx	**Unit Rate of Change (slope)** $\Delta y/\Delta x$
______ to ______ cm				
______ to ______ cm				

8. Compare the two unit rates of change calculated above. Why is the unit rate of change negative (-)? Which segment showed the greatest decrease in mass needed to move the books apart?

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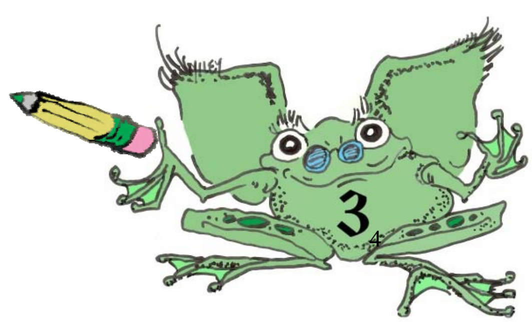

9. Use the equation for a line to calculate the *y*-intercept of the first segment on the Wedge-Ease graph. The equation for a line is

$y = mx + b$
where m is the unit rate of change (slope) and
b is the y-intercept

Y-Intercept
$m =$ Ordered pair (x, y) = (___ , ___) $y = mx + b$ Solve for b:

10. Looking at all the data points in this experiment and considering what you have learned about wedges, would a graph of many wedge lengths ever have a *y*-intercept? (Hint: What length would the wedge have to be for there to be a *y*- intercept?)

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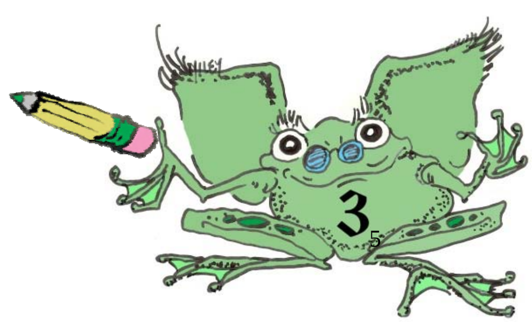

11. Based on the unit rate of change (slope) that you calculated above and the *y*-intercept, write an equation for the first line segment on the Wedge-Ease graph.
Remember that the equation for a line is $y = mx + b$ and m is the unit rate of change (slope) and b is the *y*-intercept.

Equation for the graph segment between _____ and _____ cm

12. The equation you determined in #11 above would be useful for estimating the mass needed to move the books apart for wedge lengths between the end points of the line segment but NOT for estimating mass needed for wedge lengths less than the first point and greater than the second point. Why?