MiSP Simple Machines / Inclined Plane Worksheet #2a L3

Name _____ Date _____

MAKING THE GRADE (AIMS *MACHINE SHOP*)

Key Question: How much force does it take to lift 400 grams 20 centimeters in height?

Learning Goal: Students will measure and compare the forces needed to lift an object straight up and on an inclined plane.

Problem:

- How does the length of an inclined plane affect the force?

Procedures:

Check off each step as you complete it.

- ☐ Follow the instructions given by your teacher and on the Making the Grade handouts (pp. 191-193).
- ☐ Complete the data chart and graph on the handouts.

Discussion Questions:

Making the Grade Connecting Learning (pp. 195–196, #2–#4, #8)

1. What generalization about the inclined plane can you make from the graphs?

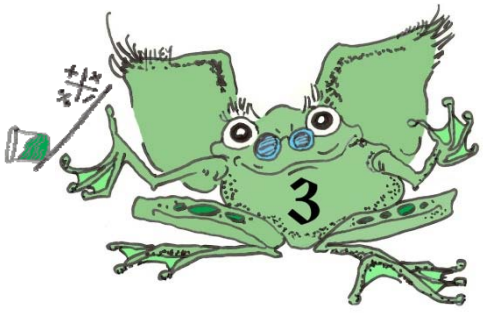
   _____

   _____

2. How could you use an inclined plane to help you?

   _____

   _____



3. Why did the force go down as the length of the plane got longer? Did you reach the same height?

_____

_____

4. Theoretically, comparing the amount of force times the distance of pull for each example should give you the same results. In the activity you will find that these are not exactly the same. What causes the difference?

_____

_____

5. Use the graph to predict the force that would be used if the resistance traveled

   55 cm: _____

   110 cm: _____

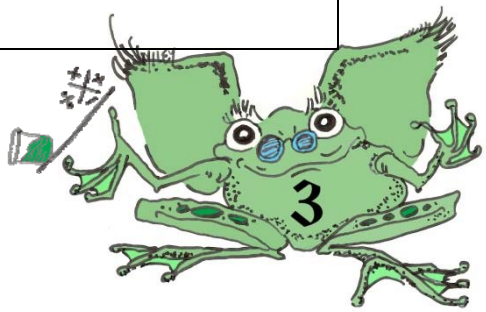
6. Look at the line segment on the graph between the 40 cm and 50 cm data points. Complete the sentence, "As the *x*-values on this graph INCREASE,

   the *y*-values _____."

7. Use the information from the graph to calculate the unit rate of change (slope) for the line segment between the 40 cm and 50 cm data points. Use the formula below to complete the chart.

Unit Rate of Change = $\frac{\Delta \text{ Effort Force (rbu)}}{\Delta \text{ Distance Resistance Traveled (cm)}} = \frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$

Ordered Pair used for calculation (x_1, y_1) (x_2, y_2)	$\frac{\Delta \text{ Effort Force (rbu)}}{\Delta y}$	Δ Distance Resistance Traveled (cm) Δx	**Unit Rate of Change (slope)** $\Delta y / \Delta x$



8. Put the calculated unit rate of change (slope) into words to explain how inclined planes make it easier to move objects to higher locations.

_____

_____

_____

_____

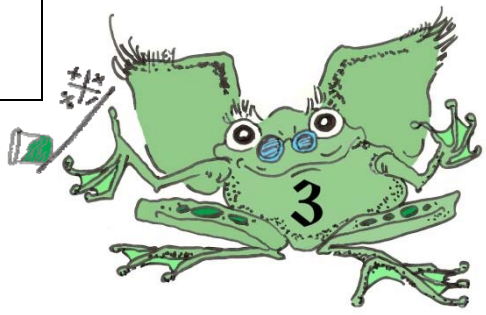
Determine the *y*-intercept for the line segment between the 40 cm and 50 cm data points. Use the equation for a line to calculate the *y*-intercept. The equation for a line is

$y = mx + b$
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:

9. Based on the unit rate of change that you calculated above and the *y*-intercept, write an equation for the line segment between the 40 cm and 50 cm data points.
Remember that the equation for a line is $\boldsymbol{y = mx + b}$ and m is the unit rate of change (slope) and b is the *y*-intercept.

Equation — Line segment from the 40 to 50 cm data points



10. The line segment from 40 cm to 50 cm would intersect the *x*- and *y*-axes if it was extended. Graphed inclined plane experimental data, as in the experiment you did, would NOT intersect the *x*- and *y*-axes. Why not?