

AP Physics Part 1 Lab Handout 08 "Simple Machines: Levers"

Your Name: _____ Lab Partner(s): _____

Purpose: To investigate how changing the positions of the effort, resistance and fulcrum affect the mechanical advantage of three types of levers.

Materials: 100 gram mass spring scale
meter stick fulcrum string loop

Procedure:

1. Find the resistance force (F_r) of the 100 g mass by attaching it directly to the spring scale. If the spring scale does not read 0.98 N then your scale needs adjustment.
2. Set up a first class lever. Position the mass at 0 cm, the spring scale at 100 cm and the fulcrum at 75 cm.
3. Pull down on the spring scale to lift the mass until the lever is horizontal. Record the effort force (F_e) to the nearest 0.01 N.
4. Repeat step 3 for the fulcrum at 60 and 50 cm.
5. Set up a second class lever. Position the fulcrum at 0 cm, the spring scale at 100 cm and the mass at 75 cm. Hold one finger lightly on the meter stick at 0 cm to keep it on the fulcrum.
6. Pull up on the spring scale to lift the mass until the lever is horizontal. Record the effort force (F_e) to the nearest 0.01 N.
7. Repeat step 6 for the mass at 50 and 25 cm.
8. Set up a third class lever. Position the fulcrum at 0 cm, the mass at 100 cm and the spring scale at 80 cm. Complete step 6.
9. Repeat step 6 for the spring scale at 60 and 40 cm.

Results:

Observations:

Data:

Lever Type:	L_e	L_r	F_e
1st class fulcrum at 75 cm			
1st class fulcrum at 60 cm			
1st class fulcrum at 50 cm			
2nd class mass at 75 cm			
2nd class mass at 50 cm			
2nd class mass at 25 cm			
3rd class scale at 80 cm			
3rd class scale at 60 cm			
3rd class scale at 40 cm			

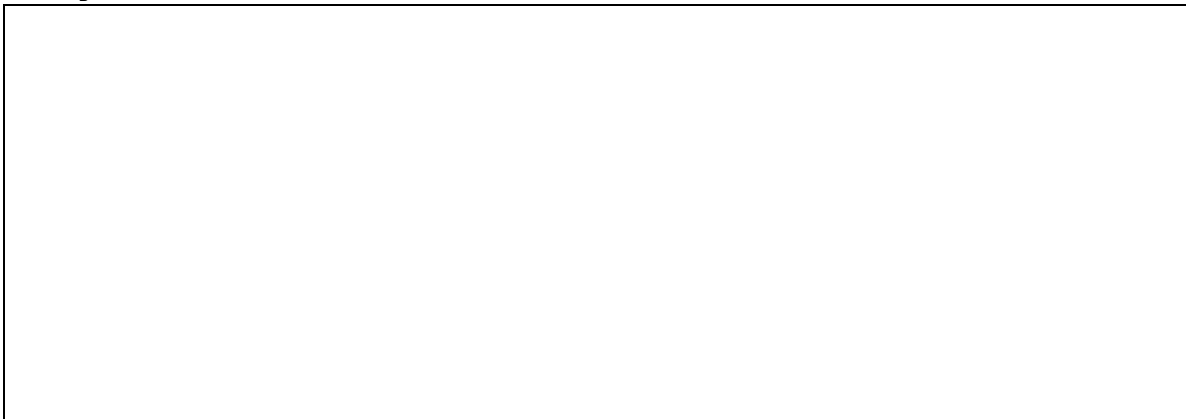
Data Analysis: (show complete work for one example of each calculation)

1. Calculate the actual mechanical advantage for each lever using
 $AMA = F_r / F_e$.

2. Calculate the ideal mechanical advantage for each lever using
 $IMA (\text{lever}) = L_e / L_r$.

Lever Type:	AMA	IMA
1st class fulcrum at 75 cm		
1st class fulcrum at 60 cm		
1st class fulcrum at 50 cm		
2nd class mass at 75 cm		
2nd class mass at 50 cm		
2nd class mass at 25 cm		
3rd class scale at 80 cm		
3rd class scale at 60 cm		
3rd class scale at 40 cm		

Diagram:



Error Analysis:

Conclusion: