1. MY SOLAR SYSTEM

Go to my website: mrjacobsshelbyjrhigh.weebly.com and look under assignments for the button that reads: My Solar System. Push the button. This should take you to the website for this lab.

This model simulates the actions that occur between bodies in a solar system. During this exercise you will set-up, observe and measure the action between these bodies. For your default set up, check the boxes for System Centered, Show traces, Show Grid and Tape measure in the box on the right side of the screen. At the bottom of the box, set the slide bar at accurate.

MODEL 1

1. Find Body 1 at the bottom of the screen. Leave the mass at 200 but change the X under position to 0.

2. Find Body 2 at the bottom of the screen. Leave the mass at 10 but change the X under position to 100.

3. Press the start button and stop it when body 2 returns to its original starting point.

   A. How much time has passed? _____

   B. What name would you give to the path created by body 2? _____

   C. What does body 1 represent in this model? _____

   D. What would body 2 represent in the model? _____

   E. How would you describe the shape of the path created by body 2? _____

4. Use the tape measure to find the distance between body 1 and the starting point of body 2.

   A. What is the distance? _____

   B. What is the distance between body 1 and the point opposite the start? _____

   C. Would you now change your description of the path? Why or Why not?

   D. Draw a picture of Model 1 on your graph paper.

MODEL 2

5. For Model 2 again set Body 1 again set the mass at 1000, x=0,y=0. For Body 2 set mass at 10, x=400, y=0. For Body 3 set mass at 9.8, x=300, y=0.

A. Start the simulation. Stop the simulation when Body 3 returns to the beginning point. How much time passed? _____

B. Restart the simulation and stop when Body 2 reaches its beginning point. How much time passed? _____

C. Compare and contrast the two models.

D. Measure the distance from the closest point to Body 1 and the farthest point from Body 1 for both Body 2 and Body 3.

Body 2 Closest _____ Farthest_____ Body 3 Closest_____ Farthest _____

E. Start the simulation again and closely watch the motions of Bodies 1 & 2 as they go around Body 1. What do you observe?

F. In 1609, the astronomer Johannes Kepler published the first 2 of his three laws of planetary motion. How does this simulation relate to Kepler's laws?

G. Draw Model 2 on the graph paper.

MODEL 3

6. For Model 3 again set Body 1 at a mass of 1000, x=0, y=0. Body 2 set mass at 10, x=400, y=0. Body 3, set mass at 0.98, x=300, y=0, and for Body 4, set mass at 0.35, x=125, y=0.

A. Start the simulation and stop when Body 4 returns to its starting point. Record the time below. Repeat this for Body 3 and Body 2.

Body 4 _____ Body 3 _____ Body 4 _____

B. Measure the distances from the farthest and closest points each of these bodies reach.

Body 4 Farthest _____ Closest _____ Body 3 Farthest _____ Closest _____

Body 2 Farthest _____ Closest _____

C. What name might you give to the paths that each body traces in the simulation? _____

D. What is the shape of these pathways?

E. Draw Model 3 on the graph paper.

F. Hypothesis what may cause the difference in shape of each of these pathways.

MODEL 4

7. In Model 4, Body 1 is still a mass of 1000, x=0, y=0. Body 2 has a mass of 20, x=400, y=0 and Body 3 has a mass of .0001, x=375, y=0.

A. Start the simulation. What do you notice is different?

B. Explain the relationship between Body 2 and Body 3.

C. What names might you give to Body 2 and Body 3?

Body 2_____ Body 3 _____

D. Measure the farthest and closest distance between Body 1 and Body 2 & 3.

Body 2 Farthest _____Closest _____

Body 3 Farthest _____ Closest _____

MODEL 5

8. In the pull down menu in the upper right go to Four Star Ballet. Stop the simulation at a time of 30. Draw the pattern created by the stars on your graph paper. Start the simulation again.

A. What happens between the time of 38 and 41?

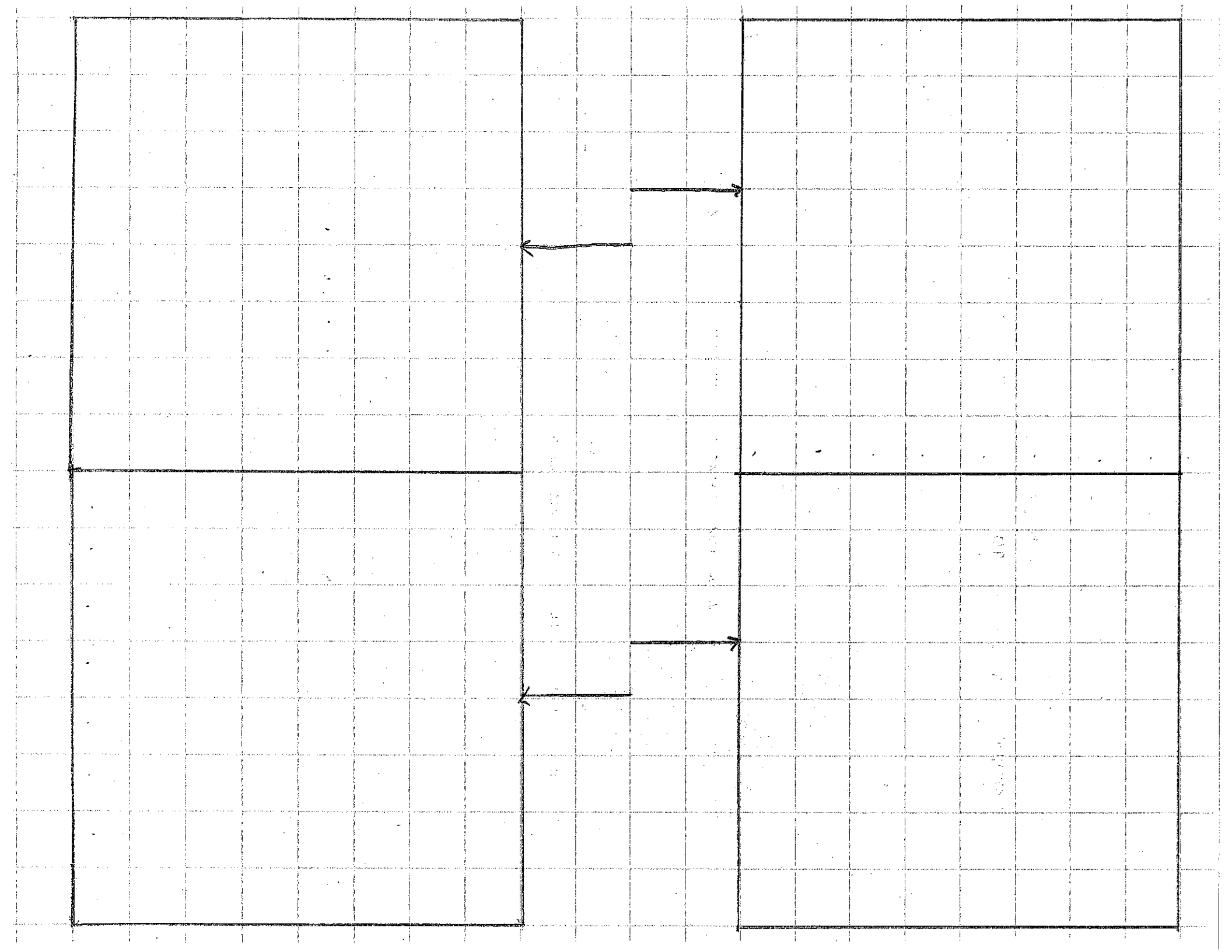
B. What do you think may have caused this?

C. Let the simulation run to about a time of 250. What do you observe happening? Can you explain this?

MODEL 6 - Challenge

9. In the pull down menu, go to ellipses. We can clearly see Kepler's 1st and 2nd laws of planetary motion demonstrated here. Look at object 4. Measure the time it takes to go from x=220, y= 0, its original position, to x=163, y=100. You should get a time of 2.9 A similar amount of time is needed to go from x=0, y= -152 to x=176, y= -88 along the path of object 4. You are testing Kepler's 3rd law. Using the measuring tape you should be able to draw and measure two triangular regions. (see model 6 on graph) The area of these two regions should be very close to equal. Try it. Hint: Area = $\sqrt{p(p-a)(p-b)(p-c}$

Where p = a+b+c/2



Model 6