Circular Motion Lab                                            Name: _____
AP Physics 1                                                   1  2  3  4  5  6  7  8

**Goal:** to investigate the centripetal forces acting on different objects revolving on a spinning plate

Preliminary Questions:
1.  What is the force that will keep a penny from flying off of a spinning plate?


2.  Predict! How will changing the mass of an object change how fast it can move around on a spinning plate (tangential velocity) before it flies off?


Materials:
- Circular Motion Apparatus
- Sticky Tack
- 5 pennies
- One eraser

PART 1
1.  Place three pennies on your circular motion apparatus as shown

2.  Open up Technique on an iPad and prepare to film from directly above the plate.

3.  Hit record on your iPad and SLOWLY pull on the string attached to the apparatus, accelerating the plate until all the pennies fly off!

4.  Watch your video in slow motion and answer the questions below:


   Questions
   **a.  Which penny flew of first? Which penny flew off last?**



   **b.  Why do you think the pennies flew off in this order? (Use equations to support your answer!)**



PART 2
1.  Place one penny on the outside of the circular motion apparatus.

2.  Measure the distance between the center of the apparatus and the center of your penny. Record it below

3.  Position your iPad so it is directly above the plate and so the entire apparatus is in view.

4.  Hit record and slowly pull on the string, accelerating the plate until the penny once again flies off.

Finding Centripetal Force:
5.  On Technique, determine the time at which your penny flies off. Rewind the video until it is 0.03 seconds before the penny starts to move off of the plate. Using the pen tool up in the upper right-hand corner of the screen, draw a circle at the point where the tape piece is at this time.

6. Move the video ahead until it is 0.03 seconds AFTER the penny begins to move. Using the pen tool, draw another circle where the tape piece is at that time

7. Use the angle tool (the yellow one found with the other drawing tools) and find the angle between your two points.

   a. Convert your angle from degrees to radians using the conversion factor: 360° = 2π rad.

   b. Find the angular velocity.

   c. Find the tangential velocity.

   d. Find the centripetal force needed to keep it moving in a circle.

8. Stick 5 pennies on top of each other using sticky tack and place them on your rotational motion apparatus.

9. Repeat steps 2-7 with the stack of pennies.

   a. Find the tangential velocity of the penny when it begins to move.

   b. Find the centripetal force needed to keep it moving in a circle.

   c. Compare your data to that of one penny. What is the same? What is different? Why do you think that is?

10. Repeat steps 2-7 using an eraser instead of pennies.

   a. Find the tangential velocity of the eraser when it begins to move.

   b. Find the centripetal force needed to keep the eraser moving in a circle.

   c. Compare your data to that of one penny and multiple pennies. What is the same? What is different? Why do you think that is?