Name: _____   Date _____

Activity: Uniform Circular Motion
Swinging the Pipes

There are four bobs attached to strings of different lengths, ranging from short to very long. You will determine the properties of uniform circular motion for the four bobs that have four different radii that swing in a circular motion at a constant rate.
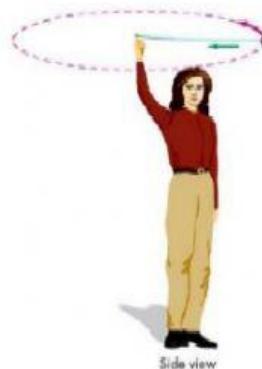
Instructions

String & bob #1 = shortest bob
String & bob #2 = medium bob
String & bob #3 = long bob
String & bob #4 = longest bob

1. Using your stopwatch feature on your smart phone, record the time for the bob to swing 20 times. Record the time in seconds.

2. Repeat the procedure for all four bobs on a string.

Calculations

Mass of the T-fittings (bobs) is 0.070 kg. Calculate centripetal force to the third decimal place.

Circumference of the circle: $2 \cdot \pi \cdot r$ Use length of the bob for r

Rotation speed: $v = \dfrac{n \cdot C}{t}$ t = time. C = circumference   n = 20 (# of rotations)

Centripetal Acceleration: $a_c = \dfrac{\left(v^2\right)}{r}$ v = rotation speed r = turn radius

Centripetal force: $F = m \cdot a_c$ m = mass in kg a_c = centripetal accel.

DATA TABLE AND CALCULATIONS

Bob on a string	Length (m)	Time for 20 Swings (sec)	Circumference (m)	Rotation speed (m/s)
# 1 Shortest	0.25 m			
# 2 Medium	0.50 m			
# 3 Longer	0.75 m			
#4 Longest	0.95 m			

Bob on a string	Length (m)	Centripetal Accel (m/s^2)	Centripetal Force (N)
# 1 Shortest	0.25 m		
# 2 Medium	0.50 m		
# 3 Longer	0.75 m		
#4 Longest	0.95 m		

Part 1. Calculate the parameters of uniform circular motion. Show all calculations in the boxes next to each step of the problem.

1. A merry-go-round has a turn radius of 10 meters. It rotates 6 times per minute. A boy rides the hobby horse at the edge of the merry-go-round. The boy's mass is 30 kg.
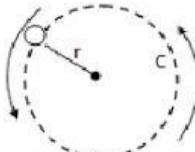
a. Calculate the circumference of the merry-go-round.		c. Calculate the centripetal acceleration affecting the boy.	
b. Calculate the rotation speed of the merry-go-round.		d. Calculate the centripetal force affecting the boy.	

2. Julio attaches a ball to the end of a string. The length of the string is 0.75 meters. The mass of the ball is 1.2 kg. Julio swings the ball around in a circle 20 times in 16 seconds.

a. Calculate the circumference of the ball's path.		c. Calculate the centripetal acceleration affecting the ball.	
b. Calculate the rotation speed of the ball.		d. Calculate the centripetal force affecting the ball.	