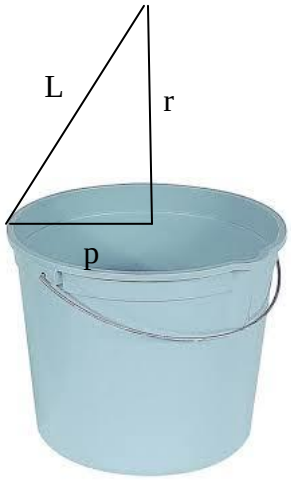
Ping Pong Pail



You may work with a small team during this activity, but be sure that you each try this.

1. Be sure that the plastic pail is tied **securely** to the string.

2. Determine the **radius** *p* of the top of the plastic pail in meters: _____

3. Fill the plastic pail with ping pong balls (we could use water, but this will be a much drier option).

4. You and each of your team members **MUST** to wear goggles during the rest of this activity.

5. Go outside to a location where you will not hit anyone with the pail or flying ping pong balls.

6. Trial 1: Measure the length *L* of the string in meters: _____
Hold the string near the end and rotate the plastic pail in a vertical circle. Note how fast you need to rotate it in order to prevent the ping pong balls from falling out.

7. Trial 2: Stop the rotation and hold the string at a location closer to the pail so that it is shorter. Measure the length *L* of the string in meters from the top of the pail to your hand: _____
Rotate the pail again in a vertical circle, and note how fast you need to rotate it in order to prevent the ping pong balls from falling out.

8. Trial 3: Stop the rotation again, hold the string at a location even closer to the pail so that it is now even shorter. Measure the length *L* of the string in meters from the top of the pail to your hand: _____
Again, rotate the pail again in a vertical circle, and note how fast you need to rotate it in order to prevent the ping pong balls from falling out.

9. The minimum speed needed to prevent the ping pong balls from falling out is derived from $mg = \frac{mv^2}{r}$, so $v = \sqrt{rg}$, where r is the radius of the circle, $r = \sqrt{L^2 - p^2}$

Trial	Pail radius *p* in m	String length *L* in m	Circle radius *r* in m	Pail velocity *v* in m/s
1				
2				
3				

10. Which trial required the fastest velocity? Which allowed the slowest? Why?

11. If you used fewer ping pong balls should the results differ? Explain. Try it and find out.

12. If you used golf balls, water, or something else, would the results differ? Explain why or why not.

13. What physics concepts are demonstrated by this activity?