Circular Motion Lab Sheet

Imagine swinging a rope over your head in a circular motion like a cowboy might swing a laso. How fast would you have to swing it to keep it parallel to the ground? How much force would be required? How would changing the weight on the end of a rope affect how much force was needed? These are only a few of the questions that can be addressed by collecting and analyzing data in a circular motion lab.

This lab is normally performed by physics students in a genuine lab setting, and not using a computer simulation. However, time is a big factor in determining how to complete this lab efficiently. Here is the [simulation.](http://www.thephysicsaviary.com/Physics/Programs/Labs/ClassicCircularForceLab/index.html)

**Experiment One: Speed (v) and Inward Acting Force (Fi)**

In this experiment you will keep the spinning radius constant and change the weight of the hanging mass (washers). Start with the least amount of washers and record it. Each washer has a mass of .010 kg.

A. Set the mass at the end of the rope and record it.

B. Adjust the string (r) so that it is between 1.0 m to 2.0 m and record its length.

C. Swing the rope for at least 10 revolutions and record the elapsed time and number of revolutions.

D. Add a few washers to your hanging mass and repeat step C. Once you have five data points, you have completed this part of the data collection.

**Experiment Two: Speed (v) and Radius (r)**

In this experiment you will keep the hanging mass and the mass on the end of the rope constant, and change the length of the rope.

A. Hang about 15-25 washers on rope and record.

B. Set the mass on the swinging end of the rope between 100-200 g and record.

C. Choose a rope length and record it. Remember to use a wide range of lengths.

D. Swing the rope for at least 10 revolutions and record the elapsed time and number of revolutions.

E. Chang your rope length and return to step D. Once you have five data points, you have completed this part of the data collection.

**Experiment Three: Speed (v) and the Circling Mass (m)**

In this experiment you will keep the hanging mass and rope length constant, but change the mass on the end of the rope.

A. Hang about 15-25 washers on rope and record.

B. Set the length of the rope between 1.0 m – 2.0 m and record.

C. Choose small mass to begin with on the end of the rope and record it. Remember to use a wide range of mass.

D. Swing the rope for at least 10 revolutions and record the elapsed time and number of revolutions.

E. Chang your mass on the end of the rope and return to step D. Once you have five data points, you have completed this part of the data collection.

NAME:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period. \_\_\_\_ AM/PM

DATA COLLECTION SHEET

Part 1: Speed (v) vs Inward Acting Force (Fi)

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| Hanging Mass (kg) | Mass on rope end (kg) | Radius (m) | Revolutions | Time (s) | Period (s) |  |  |  |
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Part 2: Speed (v) vs Radius (r)

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| Hanging Mass (kg) | Mass on rope end (kg) | Radius (m) | Revolutions | Time (s) | Period (s) |  |  |  |
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Part 3: Speed (v) vs Circling Mass (M2)

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| M1:Hanging Mass (kg) | M2: Mass on rope end (kg) | Radius (m) | Revolutions | Time (s) | Period (s) |  |  |  |
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