The Wave Swinger

Questions:

(1) What is the speed of a rider on the Wave Swinger?

(2) What amount of centripetal acceleration does the rider experience?

Predictions/Estimations: Choose one ring of swings (inner, middle, or outer) on which to base your predictions.

(1) Watch the ride then estimate the speed of a rider in that ring.

Speed of rider = _____ m/s

(2) Estimate the centripetal acceleration of a rider (in g's).

Centripetal Acceleration = _____ m/s^2

Try It !!:

(I) From the ground: Find the average time for one rotation of the swings (when at <u>full speed</u>). Then, using the data in the Engineering Specifications at the bottom of the next page, calculate the circumference, the speed of a rider, and the rider's acceleration.

Time for 1 revolution = _____ s Circumference = $2 \cdot \pi \cdot r$ = _____ m

Speed of a rider = v = circumference/time for 1 revolution = _____ m/s

Now, calculate the centripetal acceleration of the rider:

$a_c = v^2 / r$ = _____ m/s^2

(II) From the ground: When the ride is at full speed, use the <u>horizontal</u> accelerometer to measure the centripetal acceleration. Hold the top of the accelerometer parallel to the chains holding the swings. Record the angle measurement below. [To find the acceleration, the angle ~~O~~ equals 90° - your angle measurement.]

Angle measurement = _____° Acceleration = tan ~~O~~ = _____ g's

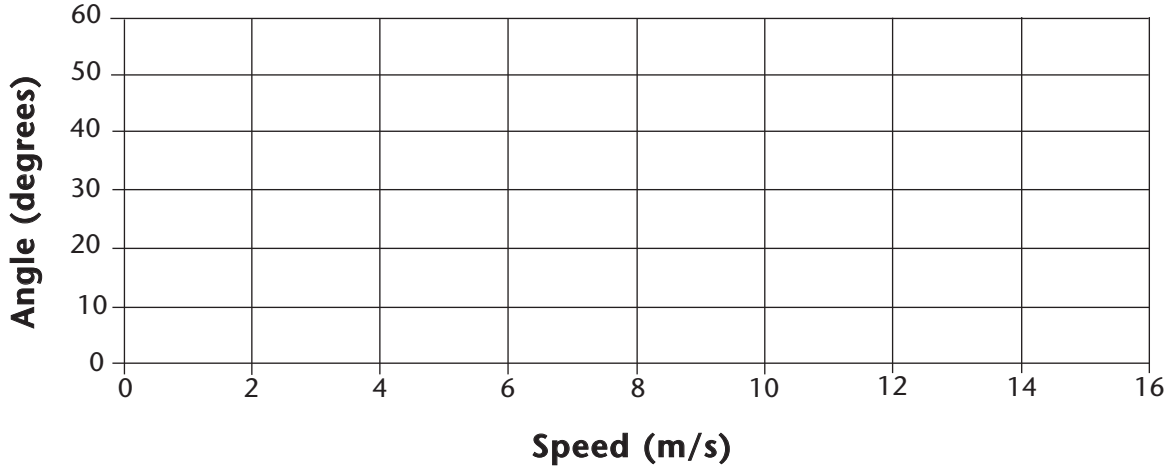
Observations/Conclusions: Were your predictions correct? Is the acceleration a relatively large or small one? How do you decide?

_____

_____

Graph It !!: Draw a rough sketch of the graph that represents how the angle of the swing (from vertical) varies with respect to the speed of the swing around the circle.

SWING ANGLE



Engineering Specifications:

Inner radius = 6.9 meters
Middle radius = 8.1 meters
Outer radius = 9.3 meters