Physics Happenings with Amusements, Newton's Laws, Triangulation, and Other Magic Park (PHANTOM Park)

SAMPLE DATA

Students of Shadowville General High School have collected the following data for the rides at PHANTOM Park. Some of this information was measured, while other data were gathered from the ride operators.

Tower

Using a 15.0 m radial baseline, our surveying team found the following two angles for the maximum height of the cabin:

$$\theta_1 = 44^\circ \qquad \theta_2 = 40^\circ$$

To find the distance to the tower, the survey team set up a 15.0 m baseline and measured their angles to be:

$$\theta_1 = 89^\circ \qquad \theta_2 = 74^\circ$$

From this distance, they measured the angular width of the tower, and found it to be 10°.

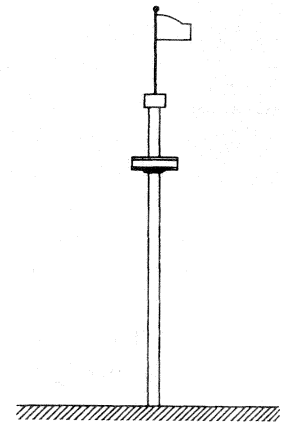


Figure 46. Tower

The time of ascent was found to be 65 seconds, while the time for one rotation was 30 seconds. While standing on the ride, we noted several accelerations with the vertical spring accelerometer, which had a 30.0 g mass attached to it. At the beginning of the ascent, the spring accelerometer read 0.35 N for about 0.5 s. As the cabin was stopping on the ascent, the spring accelerometer read 0.24 N. The horizontal accelerometer was held radially, but the reading was not reliable, as it seemed to be under 3°.

We found one quarter of the circumference of the cabin to be 7 m.

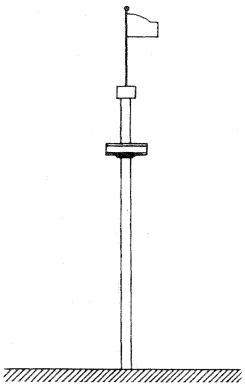
Miscellaneous Rides

TOWER

Group A

1. Describe your sensations during all accelerations you experienced on this ride. Be sure to state the direction of each acceleration. Compare and contrast them.
2. Record all vertical spring accelerometer and radial accelerometer readings.
3. Measure and record the radius of the cabin.

Group B



Tower

4. Determine the vertical rise (the distance the cabin rises) of the ride (*not* the tower).
5. Determine the average vertical speed while ascending (ignore rotation).
6. Determine the average rotational speed (ignore ascent).
7. Determine the average vertical acceleration when beginning to ascend (ignore rotation). Do this by measurement *and* calculation.
8. Determine the average rotational acceleration (ignore ascent).
9. Determine the average vertical force when beginning to ascend (ignore rotation). Do this by measurement *and* calculation.
10. Determine the average rotational force (ignore ascent).
11. Determine the work done and power expended by the ride in lifting *you* up the ride (ignore rotation). Compare these values with the work done and power expended by you on the ride during descent (again, ignore the rotation).

Group C

12. Measure the radius of the ride using triangulation.
13. Using the information in Questions 5 and 6 above, find the resultant velocity during ascent. Be sure to show your method.
14. Using the information in Questions 7 and 8, find the resultant acceleration during the beginning of the ascent.
15. Using the information in Questions 9 and 10, find the resultant force during the beginning of the ascent.