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.

Ferris Wheel

The PHANTOM Park Ferris wheel was just recently repainted white. This made it difficult to make an accurate sighting against the light haze that had developed. Using sextants and a 10 m baseline, we found the angles of elevation to be:

$$\theta_1 = 60^\circ \qquad \theta_2 = 40^\circ$$

(assume this is for the top)

The period of rotation was about 15 s. At the top of the wheel, the spring accelerometer indicated 0.7 *g*'s, while at the bottom, it was 1.2 *g*'s. During descent, the spring accelerometer showed between 0.8 *g*'s and 0.9*g*'s, while during ascent it averaged about 1.1 *g*'s.

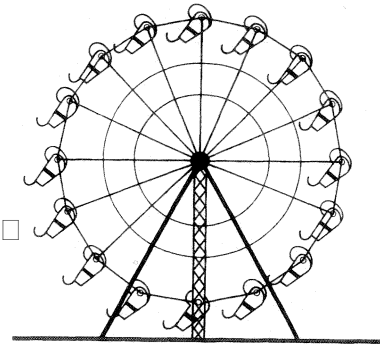


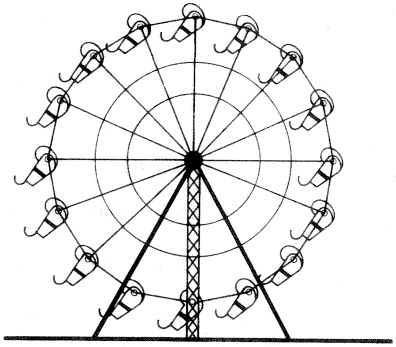
Figure 42.
Ferris Wheel

FERRIS WHEEL

Requirements:
CP: 9 points
AP: 12 points

Group A *1 point problems*

1. Sketch a diagram of the Ferris wheel. Label the points of maximum and minimum force.
2. When do you feel the lightest? heaviest? Why?
3. Measure the period of the Ferris wheel.
4. What does your spring accelerometer read when going up? down? at the top? at the bottom?
5. How do the forces you feel change as the ride gains speed?



Ferris Wheel

Group B *2 point problems*

6. Measure the radius of the Ferris wheel.
7. Draw a scale diagram of the wheel. Label the points of maximum and minimum force.
8. Measure the height of the Ferris wheel.
9. Calculate the circumference of the Ferris wheel.
10. Calculate the tangential speed of the Ferris wheel.
11. Defining the bottom of the Ferris wheel to be 0°, measure the vertical force on a spring accelerometer every 45° for one complete revolution. Calculate the accelerations at each of these points.

Group C *3 point problems*

12. Calculate the average centripetal acceleration of the Ferris wheel using distance and time. What is it in *g*'s?
13. Calculate the potential and kinetic energies of a 50 kg person at the top, the bottom, and halfway up the Ferris wheel.
14. Find the resultant forces at each point in Question 11 above.