of the earth in m/s? b) What is the radial acceleration of the earth toward the sun in m/s^2? c) Repeat parts (a) and (b) for the motion of the planet Mercury (orbit radius = 5.79×10^7 km, orbital period = 88.0 days).

3.33 A Ferris wheel with radius 14.0 m is turning about a horizontal axis through its center (Fig. 3.40). The linear speed of a passenger on the rim is constant and equal to 7.00 m/s. What are the magnitude and direction of the passenger's acceleration as she passes through a) the lowest point in her circular motion? b) the highest point in her circular motion? c) How much time does it take the Ferris wheel to make one revolution?

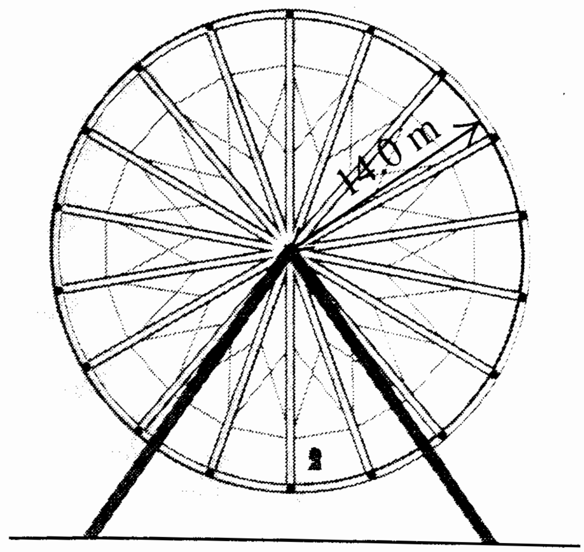


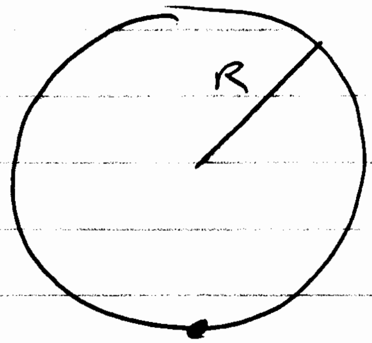
Figure 3.40 Exercises 3.33 and 3.34.

3.34 The Ferris wheel in Fig. 3.40, which rotates counterclockwise, is just starting up. At a given instant, a passenger on the rim of the wheel and passing through the lowest point of his circular motion is moving at 3.00 m/s and is gaining speed at a rate of 0.500 m/s^2. a) Find the magnitude and the direction of the passenger's acceleration at this instant. b) Sketch the Ferris wheel and passenger showing his velocity and acceleration vectors.

3.35 Elliptical Path. A level racetrack has the shape of an ellipse. (See your math textbook, a dictionary, or an encyclopedia for an illustration of an ellipse.) A car drives around this track at a constant speed. a) Draw a picture of the track showing the car's velocity vector and acceleration vector at five or more different places around the track. b) Does the car's acceleration vector always point toward the geometrical center of the ellipse? Explain. c) At what

Fig
3.3
at
wa
do
sa
tio
3.
str
pi
4.
co
in
so
F
3
e
t
c

Young – Ferris wheel



$R = 14.0\ m$

$|\vec{v}| = 7.00\ m/s$

= linear speed.

(a) $a_{bottom} = \frac{v^2}{R} = \frac{49\ m^2/s^2}{14\ m} = 3.5\ m/s^2$, up

(b) $a_{top} = \frac{v^2}{R} =$ $3.5\ m/s^2$, down.

What about gravity?

That's part of the total Force, but ~~too~~ there is also the force of the seat. The Net force (divided by m) gives

$$a = \frac{v^2}{R}$$ in the end.

(c) Period: $T = \frac{2\pi R}{v}$ $\left(v \cdot T = \underset{\text{distance around}}{2\pi R}\right)$

$T = 12.57\ s$

Jargon: f = frequency $= \frac{1}{T} =$

$0.0796 \frac{\text{revolutions}}{s}$ = 0.0796 Hertz
= 0.0796 Hz

$= 4.77 \frac{\text{rev}}{\text{minute}}$ = 4.77 rpm.