ANSWER CIRCULAR MOTION PROBLEMS

Formulas:

Period = T = time per revolution
Frequency = f = revolution per sec (Hertz)
Wavelength = circumference = $2 \pi r$
So Linear Speed = v = $(2 \pi r)*f = (2 \pi r)/T$
Acceleration (centripetal) = $a_c = v^2/r = 4 \pi^2 r/T^2$
$G=9.8\ m/s^2 = a_c$ *for weightlessness*
Force (centripetal) = $F_c = ma_c$

2) Hamlet, a hamster, runs on his exercise wheel, which turns around once every 0.5 sec. What is the frequency of the wheel?
T=.5 sec, f = 2 Hz

3) A sock stuck to the inside of the clothes dryer spins around the drum once every 2.0 sec at a distance of 0.5 m from the center of the drum. What is the socks linear speed?
T= 2 sec, r = .5 m, Circum= 2 pi r =Dist, so V=2 pi r /T = 1.57 m/s

If the drum were twice as wide, but continued to turn with the same frequency, would the linear speed of a sock stuck to the inside be faster, slower, or the same?

Speed twice as fast (circ twice)

4) What is the radius of an automobile that turns with a frequency of 11 Hz and has a linear speed of 20 m/s ?
f= 11 Hz, T = 1/11 sec, V=20 m/s = 2 pi r /T or 2 pi r *f = 2*pi*r*11=20, r = .289 m

6) The earth turns on its axis once every 24 hours. (find the seconds!) . The radius of the earth is 6, 380, 000 meters. If the earth suddenly stopped spinning, with what speed would the earth's inhabitants who live at the equator go flying off the earth's surface? How about at the pole?
24 hrs = 86, 400 sec=T, r = 6, 380, 000 m, v = 2 pi r /T = 464 m/s!, at the pole r=0, v=o!

7) Jessica is riding a merry go round on an outer horse that sits at a distance of 0.8 m from the center of the rid. Jessica's sister Julie, is on an inner horse located 6 m from the ride's center. The merry go round turns around once every 40 sec. Find the linear speed of each sister, find the centripetal acceleration of each sister.

T=1/40 sec, for Jessica r= .8, so v =.126 m/s, a = v^2/r=.019 m/s^s
For Julie r = 6, v= .94 m/s, a = = v^2/r=.14 m/s^s

9) A popular trick of many physics teachers is to swing a pail of water around in a vertical circle fast enough so that the water doesn't spill out when the pail is upside down. If Mr. T's arm is 0.6 m long, what is the minimum speed with which he can swing the pail so that the water doesn't spill out at the top of the path? Draw a picture, showing the forces on the pail at the top and bottom.

A=9.8 m/s^2, = v^2/ .6 so v = 7.67 m/s

12) Roxanne is making a strawberry milkshake in her blender. A tiny, 0.0005 Kg strawberry is rapidly spun around the inside of the container with a speed of 14 m/s, held by a centripetal force of 10 N. What is the radius of the blender at this location?

A-5/6) Sasha's favorite ride at the fair is the ferris wheel that has a radius of 7 m.
a) If the ride takes 20 s to make a full revolution, what is the linear speed of the wheel?

B) What centripetal force will the ride exert on Sasha's 50 kg body?

C) Does Sasha feel as if she is being pulled in or out by the ride?

D) Explain the difference between what she feels and what is really happening at the top and the bottom of the wheel.

E) In order for Shasha to feel weightless at the top of the ride what must her centripetal acceleration be?

At what linear speed must the ferris wheel turn?

At this speed, how much will she weigh at the bottom of the wheel?