Name_____ Date_____ ____

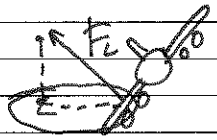
Period_____ Points available: 20

Physics

Worksheet – Centripetal Problems

1. In the following situations, identify what force is acting as the centripetal force.
   a. A car going around a corner Friction
   b. An airplane flying in a horizontal circle Lift / Wings
   c. An airplane pulling out of a vertical dive Same
   d. A car going very quickly over the crest of a hill Gravity
2. Why do airplanes bank when they turn?

   So they can have a centrip. Force.



3. You are swinging a can at the end of a string horizontally over your head. In what direction is the net force acting on the can?

   Towards your hand.

4. Twin sisters are on a merry-go-round. Jane is riding on the outside row and Mary is riding on the row inside her. Which twin has the greater centripetal force acting on them?

   $a_c = \frac{v^2}{r} = \frac{(2\pi r)^2}{r} = \frac{4\pi^2 r^2}{r} = 4\pi^2 r$ As r goes up, a_c goes up. If a_c goes up F_c goes up. So Jane.

5. A boy is swinging a 1.6 kg toy plane around his head on a string. The string is 2.4 m long. If the speed of the plane is 4.3m/s, how hard is the boy pulling on the rope?

6. How fast can the boy swing the plane in the previous problem if the maximum tension the rope can withstand without breaking is 30 N?

7. What is the fastest a 1,350 kg car can go around corner with a radius of 64 m if the μ_s is .75?

8. A 54 kg boy is sitting on the floor of a merry-go-round with a radius of 4.3 m. The merry-go-round is just starting and is slowly speeding up. Right when the boy gets to a speed of 5.7 m/s, the boy begins to slide off the ride. What is μ_s between the boy and the floor?

9. A space station has a radius of 37 m. How fast must it rotate to recreate 1g at the outer edge?(1g is equal to the acceleration due to gravity)

	K	U
5.	$m = 1.6\,kg$ $R = 2.4\,m$ $V = 4.3\frac{m}{s}$	F

$$F = m\frac{v^2}{R}$$
$$= 1.6\,\frac{4.3^2}{2.4}$$
$$\boxed{F = 12.3\,N}$$

	K	U
6.	$F_{max} = 30$ Same as above	V_{max}

$$F = m\frac{v^2}{R}$$
$$30 = 1.6\,\frac{v^2}{2.4}$$
$$\boxed{V_{max} = 6.7\frac{m}{s}}$$

	K	U
7.	$m = 1350$ $R = 64$ $\mu = 0.75$	V_{max}

$$F = m\frac{v^2}{R}$$
$$F_{fr} = m\frac{v^2}{R}$$
$$\mu mg = m\frac{v^2}{R}$$
$$.75(48) = \frac{v^2}{64}$$
$$\boxed{V_{max} = 21.7\frac{m}{s}}$$

	K	U
8.	$m = 54\,kg$ $R = 4.3\,m$ $V = 5.7\frac{m}{s}$	$\mu_s =$

$$F = m\frac{v^2}{R}$$
$$F_{fr} = m\frac{v^2}{R}$$
$$\mu mg = m\frac{v^2}{R}$$
$$\mu(9.8) = \frac{5.7^2}{4.3}$$
$$\boxed{\mu = 0.77}$$

9.	$R = 37\,m$ $a_c = 9.8\frac{m}{s^2}$	V

$$a_c = \frac{v^2}{R}$$
$$9.8 = \frac{v^2}{37}$$
$$\boxed{V = 19\frac{m}{s}}$$