Worksheet - Circular Motion

Centripetal Acceleration

$$a = \frac{v^2}{r} \qquad a = \frac{4\pi^2 r}{T^2}$$

1. What is the centripetal acceleration of a car going 21 $m.s^{-1}$ around a corner with a radius of 45 m?
2. What must be the radius of curvature for a curve in a road if cars going 27 $m\ s^{-1}$ never exceed a lateral acceleration of 4.2 $m\ s^{-2}$?
3. My econo-box pulls 0.72 g's (Multiply 0.72 by 9.8) of lateral acceleration going around a corner with a radius of 35 m. What is its speed?
4. A Merry-go-round has a period of 4.20 seconds, and a radius of 2.40 m. What is the centripetal acceleration at its edge?
5. Astronauts trained in a giant centrifuge. What was the radius of the centrifuge if it pulled 4.50 "g"s, and had a period of 2.70 seconds?
6. If you want a 500. m radius space station to generate 9.81 $m.s^{-2}$ of acceleration at its edge, what should be its period of motion?
7. A car can achieve a lateral acceleration of 0.95g. What would be its minimum time around a track with a radius of 23 m?
8. What is the acceleration of the edge of a record that is 15 cm in radius, and is spinning at 45 rpm? (Revolutions per minute...convert it!! - you need to find seconds per revolution – 60 seconds divided into 45 equal parts...)

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9. What is the g force experienced at the tip of a centrifuge that is 5.4 cm from the centre of rotation, and is spinning at a rate of 12,000 rpm? (Find a_c, divide by 9.8 to find "g" force)

Centripetal Force

$$F = ma \qquad F = \frac{mv^2}{r} \qquad F = \frac{m4\pi^2 r}{T^2}$$

10. What centripetal force is needed to make a 5.0 Kg hammer swing 3.4 m s^{-1} in a arc with radius 1.75 m?

10. What centripetal force is needed to make a 65 Kg rider go 15 m s^{-1} on the edge of a ride with a radius of 4.5 m?

11. A 320 kg space probe has jets which can exert a centripetal force of 120 N. What is the sharpest radius of a turn it can make if it is going 520 m s^{-1}?

12. How fast can your 800 Kg car go around a corner with a radius of 13.0 m when the available centripetal force is 6500 N?

13. There is a coefficient of friction of 0.34 between a 1200 kg car and the pavement. What is the force of friction between the road and the tires, and what is the car's maximum speed around a 73 m radius corner?

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14. A 2.0 gram penny is on a turntable 13 cm from the centre. As you gradually speed up the turntable, the penny flies off when it is turning one revolution per second. What is the centripetal acceleration of the penny, and what is the coefficient of friction between the penny and the turntable?
(**Hint**: Set the force of friction equal to the centripetal force)

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