Worksheet 5.1 – Centripetal Force and Centripetal Acceleration I

*Remember there are TWO equations for Centripetal Acceleration (and therefore force). One is shown to the right… do you know the other one?*

1. What is the centripetal acceleration of the Moon towards the Earth? (Hint: you might need to look a few things up!)
2. Calculate the centripetal force acting on a 925 kg car as it rounds an unbanked curve with a radius of 75 m at a speed of 22 m/s.
3. A small plane makes a complete circle with a radius of 3282 m in 2.0 min. What is the centripetal acceleration of the plane?
4. A car with a mass of 833 kg rounds an unbanked curve in the road at a speed of 28.0 m/s. If the radius of the curve is 105 m, what is the average centripetal force exerted on the car?
5. An amusement park ride has a radius of 2.8 m. If the time of one revolution of a rider is 0.98 s, what is the speed of the rider?
6. An electron (m=9.11x10-31 kg) moves in a circle whose radius is 2.00 x 10-2 m. If the force acting on the electron is 4.60x10-14 N, what is its speed?
7. A 925 kg car rounds an unbanked curve at a speed of 25 m/s. If the radius of the curve is 72 m, what is the minimum coefficient of friction between the car and the road required so that the car does not skid?
8. A 2.7x103 kg satellite orbits the Earth at a distance of 1.8x107 m from the Earth’s centre at a speed of 4.7x103 m/s. What force does the Earth exert on the satellite?
9. A string can withstand a force of 135 N before breaking. A 2.0 kg mass is tied to the string and whirled in a horizontal circle with a radius of 1.10 m. What is the maximum speed that the mass can be whirled at before the string breaks?
10. A 932 kg car is traveling around an unbanked turn with a radius of 82 m. What is the maximum speed that this car can round this curve before skidding:

a) if the coefficient of friction is 0.95?

b) if the coefficient of friction is 0.40?

1. A motocross rider at the peak of his jump has a speed such that his centripetal acceleration is equal to *g*. As a result, he does not feel any supporting force from the seat of his bike, which is also accelerating at rate *g*. Therefore, he feels if there is ni force of gravity on him, a condition described as apparent weightlessness. If the radius of the approximately circular jump is 75.0 m, what is the speed of the bike?

Worksheet 5.1 - Answers:

1. 2.72 x 10-3 m/s2
2. (6.0x103 N)
3. (9.0 m/s2)
4. (6.2x103 N)
5. (18 m/s)
6. (3.18x107 m/s)
7. (0.89)
8. (3.3x103 N)
9. (8.62 m/s)
10. a. (28 m/s) b. (18 m/s)
11. 27 m/s