

1. A 61 kg skater cuts a circle of radius 4.0 m on the ice. If her speed is 4.00 m/s, what is the centripetal force? What exerts this force?
2. A body of mass 5.0 kg, lying on a smooth horizontal surface, is whirled at a constant speed of 2.0 m/s on the end of a string of length 35 cm, the other end of the string being fixed.
 - a) What is the centripetal acceleration?
 - b) What is the tension in the string?
 - c) What is the period of the motion?
3. A body is whirled in a horizontal circle on the end of a string of length 40. cm, the other end of the string being tied to a peg. The body has a mass of 0.50 kg and makes 3.0 rev/s.
 - a) What is the acceleration of the body?
 - b) What is the tension in the string?
 - c) What is the magnitude and direction of the force which the string exerts on the peg.
4. Body X has mass m and moves at constant speed in a circular path of radius r . Body Y has mass $2m$ and moves at constant speed in a circular path of radius $2r$. If X and Y have the same period of rotation, find the values of the ratios:
 - a) $a_{cX} : a_{cY}$ (b) $F_{cX} : F_{cY}$ (c) $v_X : v_Y$
5. A body of mass 3.0 kg is whirled on the end of a string in a vertical circle of radius 1.5 m at a constant speed of 20. m/s. Find the tension in the string when:
 - a) the body is at the lowest point in its path
 - b) the body is at the highest point in its path
6. A bicycle rider has a mass of 70. kg. He passes over a semi-circular hump with a radius of 5.0 m at a speed of 5.0 m/s.
 - a) Find the force which the seat exerts on the cyclist, as the bicycle reaches the top of the hump.
 - b) If the same rider experiences no force from the seat as he passes over the top of the hump, find the speed at which he must be travelling.
7. Tarzan is swinging on a vine that will break if the force exceeds 2.0×10^3 N. If the length of the vine is 5.0 m and Tarzan's mass is 1.00×10^2 kg, what is the highest speed he can safely travel while swinging on the vine?
8. A 1200 kg car rounds a curve of radius 50.0 m at a speed of 80.0 km/h.
 - a) What is the centripetal acceleration of the car?
 - b) How much centripetal force is needed to cause this acceleration?
 - c) If the coefficient of friction is 0.25 on a slippery road, will the force of friction between the road and the wheels of the car be enough to keep the car from skidding?

9. A vehicle of mass 1.0×10^3 kg moves around a horizontal circular track of radius 40. m at a speed of 48 km/h.
- Find the lateral force exerted on the wheels.
 - If the same vehicle moves at the same speed around a circular track of radius 40. m, but this second track is banked, find the angle of banking if the track exerts only a normal reaction on the vehicle (i.e., no friction is required for the vehicle to negotiate the turn).
10. A highway curve is designed to handle vehicles travelling 50 km/h safely. Assuming the coefficient of kinetic friction between the rubber tires and the road is 0.60, what is the minimum radius of curvature allowable for the section of road?