

- 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) $vX : vY$
- 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.
 - a) Find the lateral force exerted on the wheels.
 - b) 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?