

Name:

Centripetal Force AP Whiteboarding 2

1. Jake and his kayak have a combined mass of 50 kg. Jake is on the ocean in his kayak. The water is gently rolling such that there are successive dips and swells. Jake's kayak begins descending into a dip at an initial speed of 5 m/s. The dip has radius 6 meters. What is the upward normal force on Jake at the bottom of the dip?
2. Jake and his kayak have a combined mass of 50 kg. Jake is on the ocean in his kayak. The water is gently rolling such that there are successive dips and swells. Jake's kayak begins ascending a swell at an initial speed of 25 m/s. The swell has radius 20 meters. What is the upward normal force on Jake at the top of the swell?
3. A block slides into a 'loop the loop' of radius 2 meters. What is the minimum velocity at the top such that the block will maintain contact with the loop? No friction.
4. An object with mass .5 kg at the end of a rope is whirled horizontally in a .9 meter radius circle. The speed of the mass is 12 m/s. What is the tension in the rope?
5. Tarzan has a mass of 100 kg and reaches a speed of 20 m/s as he swings on a vine. What is the tension in the vine at the bottom of his swing? Vine length is 4 meters.

6. What is the minimum velocity that a bucket of water can be spun vertically (radius $r = 1.2$ meters) such that no water is spilled?

7. A large cylinder is spun at 35 rpm with a person inside. What is the minimum static friction coefficient for which the person will not slide? Radius of the large cylinder is 1 meter.

8. What is the maximum speed with a 2100 kg car can make a turn around a curve of radius 50 meters on a level road without skidding? μ of static friction is .8

9. An 8 kg mass is attached to one end of a rope 4 meters long. If the mass is swung in a vertical circle from the free end of the rope, what is the tension in the rope when the mass is at its (a) highest point if it is swung with a constant speed of 15 m/s? (b) lowest point?

10. A stone-age hunter stands on a cliff overlooking a flat plain. He places a 3 kg rock in a sling and ties it to a 2.5 meter long vine. He swings the rock in a horizontal circle around his head. The plane of motion is 50 meters above the plain below. When the tension in the vine reaches 100 N, the vine snaps. If the rock is moving perpendicular to the cliff edge as the vine snaps, how far out from the cliff will the rock land?