

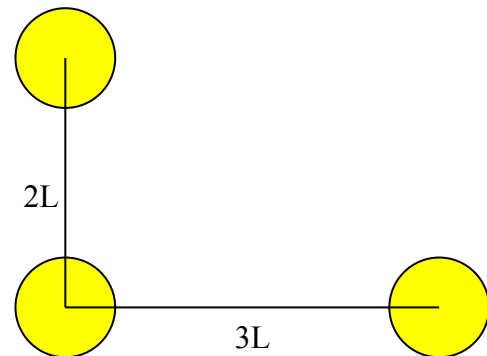
A1. How often do we on Earth observe a comet that orbits our Sun with a closest radius of 0.90 AU and a furthest radius of 325 AU? (10,10)

A2. Years from now you are visiting a distant planet. You know that the planet has a mass roughly twice Earth but a different radius. To find this radius you drop a ball and notice that it takes 0.12 s to fall the 0.50 m to the ground. What is the radius of the planet? (5,15)

A3. Two masses, $m_1=22.5\text{kg}$ and $m_2=33.2\text{kg}$, are connected by a light rope that hangs over a pulley. The pulley is a uniform cylinder of radius 0.300m and mass 8.80kg. Initially, m_1 is on the ground and m_2 rests 2.50m above the ground. If the system is now released determine the speed of m_2 just before it strikes the ground. Assume the pulley is frictionless. (10,20)

A4. Three balls are arranged as shown to the right. Each ball has the same mass. What is the gravitational attraction on the top ball due to the other two? (10,20)

A5. Student T sits next to student S in class. Student T has a mass of 70.0kg and student S has a mass of 77.0kg. What is the gravitational attraction between these two students if their centers are 78.0cm apart? (5,15)



A6. What angle to the horizontal should an exit ramp from the highway be banked if the speed limit is 45 mph, 20.1m/s? (10,20)

A7. Two objects roll down an incline plane, at the same acceleration. One is a hoop of radius 30.0cm and mass M. The other is a solid disk of the same mass. What is the radius of the solid disk? (10,10)

A8. A meter stick is allowed to pivot about a horizontal axis through the zero centimeter mark. It is hold horizontally and then let go. What is the tangential acceleration of the 100cm end? (15,15)

A9. What is the momentum of inertia of the moon? (5,15)

A10. Convert these angle measurements to units of radians. (0,1)

A. 37.0°

B. 91.0°

C. 283°

D. 179°

E. 77.0°

B1. What is the momentum of inertia for a top to the right if the sphere has mass 150.0g and a radius of 5.00cm, the top disk has a mass of 70.0g and a radius of 5.00cm and the bottom disk has mass of 210.0g and a radius of 15.0cm? (5,15)

B2. What is the maximum torque produced by a person who can exert a force of 125N on a wrench of length 38.0cm? (5,5)

B3. A ball of mass 1.28kg is spun in a vertical circle of radius 2.05m with a period of 13.2ms. What are the maximum and minimum tensions in the cord attached to the ball? (10,10)

B4. How far would a planet that had a period of rotation of 29.5 earth years orbit our sun? (5,10)

B5. What force needs to be applied to the outside of a hoop of mass 0.56 kg and radius 75.0cm to get it to stop in 3.20 s from a speed of 300 rpm? (10,10)

B6. You are taking a flat corner in a racecar traveling at 27.0m/s. If the coefficient of static friction between the car's tires and the road is 0.94, what is the minimal radius of the curve for your car to not slip? (10,10)

B7. You want to do the old trick of spinning a bucket full of water over your head without getting wet. If your arm is 0.65m long and the bucket has a handle 20.0cm long and will hold 2.47L of water, with what speed do you need to spin the bucket? (10,10)

B8. Prove Kepler's Third law starting with the orbital condition. (0,20)

B9. A "wall" is built in space the same distance from the Sun as earth and completely circling the Sun. With what period would this "wall" need to rotate so that people living on its inner surface would experience Earth like simulated gravity? (10,20)

