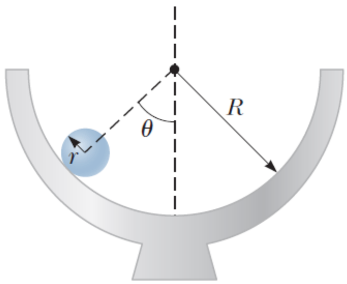
Kelompok 1

1. The angular position of a point on the rim of a rotating wheel is given by $\theta = 4.0t - 3.0t^2 + t^3$, where θ is in radians and *t* is in seconds. What are the angular velocities at (a) t = 2.0 s and (b) t = 4.0 s? (c) What is the average angular acceleration for the time interval that begins at t = 2.0 s and ends at t = 4.0 s? What are the instantaneous angular accelerations at (d) the beginning and (e) the end of this time interval?

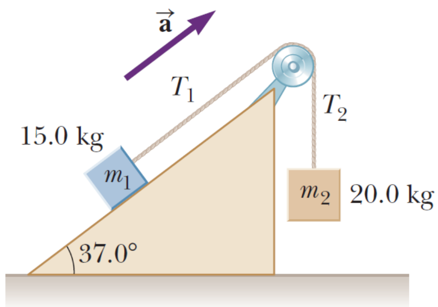
2. A uniform solid sphere of radius r is placed on the inside surface of a hemispherical bowl with radius *R*. The sphere is released from rest at an angle *θ* to the vertical and rolls without slipping (see the figure). Determine the angular speed of the sphere when it reaches the bottom of the bowl.



Kelompok 2

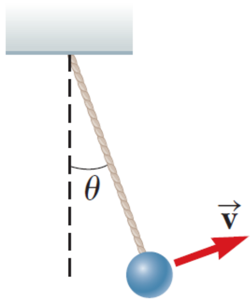
1. A bend road with a radius of curvature of 30 m is made with a certain angle of inclination so that a car traveling at 13 m/s can pass through it safely without depending on the frictional force. What is the slope angle of the road to be made?

2. As shown in the Figure, two blocks are connected by a string of negligible mass passing over a pulley of radius r = 0.250 m and moment of inertia I. The block on the frictionless incline is moving with a constant acceleration of magnitude $a = 2.00\ m/s^2$. From this information, we wish to find the moment of inertia of the pulley. (a) Find the tension T_1. (b) Similarly, find the tension T_2. (c) Find a symbolic expression for the moment of inertia of the pulley in terms of the tensions T_1 and T_2, the pulley radius r, and the acceleration a. (d) Find the numerical value of the moment of inertia of the pulley.



Kelompok 3

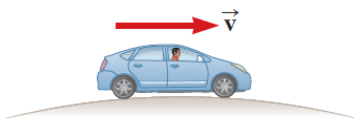
1. One end of a cord is fixed and a small 0.500-kg object is attached to the other end, where it swings in a section of a vertical circle of radius 2.00 m as shown in the Figure. When $\theta = 20^o$, the speed of the object is 8.00 m/s. At this instant, find (a) the tension in the string, (b) the tangential and radial components of acceleration, and (c) the total acceleration. (d) Is your answer changed if the object is swinging down toward its lowest point instead of swinging up? (e) Explain your answer to part (d).



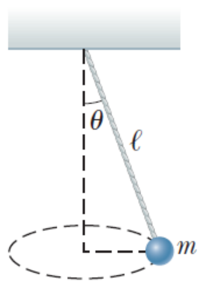
2. A wheel 2.00 m in diameter lies in a vertical plane and rotates about its central axis with a constant angular acceleration of 4.00 rad/s^2. The wheel starts at rest at t = 0, and the radius vector of a certain point P on the rim makes an angle of 57.3^o with the horizontal at this time. At t = 2.00 s, find (a) the angular speed of the wheel and, for point P, (b) the tangential speed, (c) the total acceleration, and (d) the angular position.

Kelompok 4

1. Disturbed by speeding cars outside his workplace, Nobel laureate Arthur Holly Compton designed a speed bump (called the “Holly hump”) and had it installed. Suppose a 1800-kg car passes over a hump in a roadway that follows the arc of a circle of radius 20.4 m as shown in the Figure. (a) If the car travels at 30.0 km/h, what force does the road exert on the car as the car passes the highest point of the hump? (b) What is the maximum speed the car can have without losing contact with the road as it passes this highest point?



2. A conical pendulum consists of a bob of mass m in motion in a circular path in a horizontal plane as shown in the Figure.

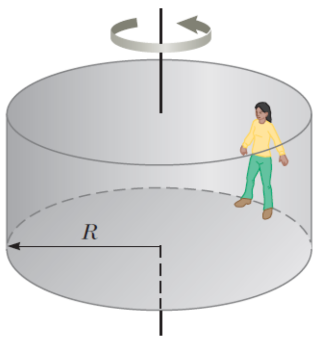


During the motion, the supporting wire of length ℓ maintains a constant angle θ with the vertical. Show that the magnitude of the angular momentum of the bob about the vertical dashed line is

$$L = \left(\frac{m^2 g \ell^3 \sin^4 \theta}{\cos \theta}\right)^{1/2}$$

Kelompok 5

1. An amusement park ride consists of a large vertical cylinder that spins about its axis fast enough that any person inside is held up against the wall when the floor drops away (see the Figure). The coefficient of static friction between person and wall is μ_s, and the radius of the cylinder is R. (a) Show that the maximum period of revolution necessary to keep the person from falling is $T = (4\pi^2 R\mu_s/g)^{1/2}$. (b) If the rate of revolution of the cylinder is made to be somewhat larger, what happens to the magnitude of each one of the forces acting on the person? What happens in the motion of the person? (c) If the rate of revolution of the cylinder is instead made to be somewhat smaller, what happens to the magnitude of each one of the forces acting on the person? How does the motion of the person change?



2. A centrifuge in a medical laboratory rotates at an angular speed of 3 600 rev/min. When switched off, it rotates through 50.0 revolutions before coming to rest. Find the constant angular acceleration of the centrifuge.