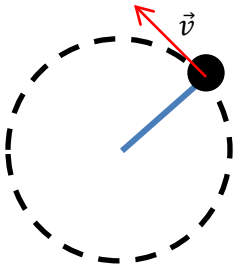
Circular motion examples: dynamics

a)

A block attached to a string on a frictionless horizontal table is moving in a circle at constant speed. Draw a free body diagram of the block. What is $\vec{F}_{net}$? What is the direction of the acceleration $\vec{a}$?

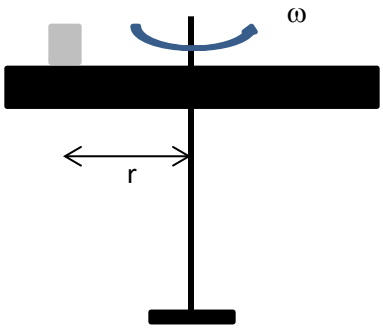


top view

b) A marble is moving on the inside of a frictionless horizontal cylindrical container at a constant speed. Draw a FBD of the marble.

side view

c) A block of mass m is placed on a horizontal turntable that is rotating at a constant angular velocity ω. The block is a distance r from the center of the turntable. Find the minimum value of r for which the block will slip. The coefficients of static and kinetic friction between the block and the turntable are μ_s and μ_k respectively.



d) A person is rotating a mass m at the end of a string of length L above her head. The mass is moving in a horizontal circle at a constant angular velocity ω. Find the tension in the string.

e) A marble is placed in a frictionless glass right circular cone. The marble rotates in a horizontal circle at a constant angular velocity ω. Find ω if the marble is at a height h from the apex of the cone, and if the angle of the cone is α.