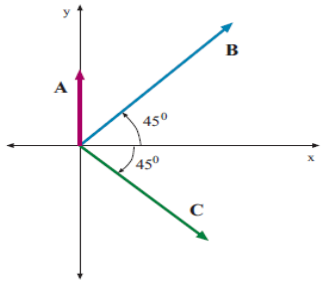
Addis Ababa Science and Technology University
College of Social and Natural Science
Department of Physics

General Physics (Phys1011) Work sheet: #1

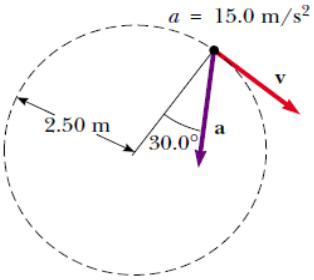
November, 2019

1. Consider the two vectors **A** = 3**i** -2**j** and **B** = -**i** -4**j**. Calculate:
   (a) |**A** + **B**|
   (b) |2**A** - **B**|
   (c) Unit vector of **A** and **B**

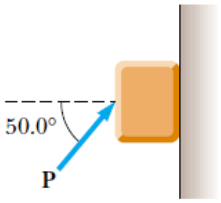
2. Three vectors are oriented as shown below, where |**A**| = 20 units, |**B**| = 40 units, and |**C**| = 30 units. Find (a) the x and y components of the resultant vector and (b) the magnitude and direction of the resultant vector.



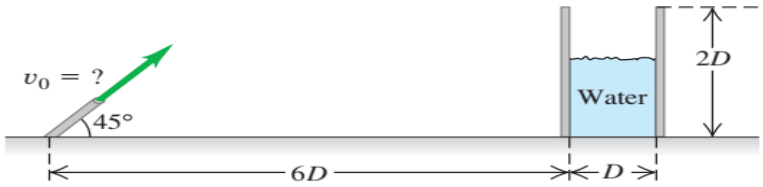
3. Figure below represents the total acceleration of a particle moving clockwise in a circle of radius 2.50 m at a certain instant of time. At this instant, find (a) the radial acceleration, (b) the speed of the particle, and (c) its tangential acceleration.



4. A block of mass 3 kg is pushed up against a wall by a force **P** that makes a 50° angle with the horizontal as shown in Figure below. The coefficient of static friction between the block and the wall is 0.250. Determine the possible values for the magnitude of **P** that allow the block to remain stationary.

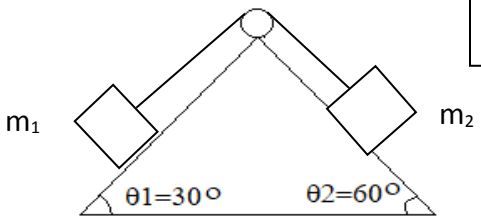


5. A water hose is used to fill a large cylindrical storage tank of diameter D and height 2D. The hose shoots the water at 45° above the horizontal from the same level as the base of the tank and is a distance 6D away (see Fig. below). For what range of launch speeds (Vo) will the water enter the tank? Ignore air resistance, and express your answer in terms of D and g.

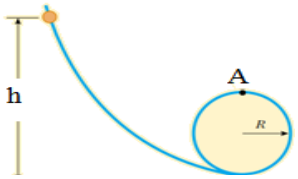


6. Mass m_1 and m_2 are located on inclined planes of angles 30^o and 60^o respectively. They are connected by an inextensible string of negligible mass which passes over a smooth peg at A. The coefficient of friction between the masses and the incline is μ. (See the fig.)
    a) Find the acceleration for any angle Θ_1 and Θ_2.
    b) Using the angles value, determine the direction of motion if $\mu = 0$ and $m_1 = m_2$.

$\sin 30^o = \cos 60^o = 0.50$
$\cos 30^o = \sin 60^o = 0.866$



7. A bead slides without friction around a loop (see fig).
The bead is released from a height h=3.5R.
    a) What is its speed at point A?
    b) How large is the normal force on it if its mass is 5.0gm?



8. When a 4kg object is hung vertically on a certain light spring that obeys Hooke's law, the spring stretches 2.50 cm. If the 4kg object is removed, (a) how far will the spring stretch if a 1.50-kg block is hung on it and (b) how much work must an external agent do to stretch the same spring 4.00 cm from its unstretched position?

9. Four objects are situated along the *y* axis as follows: a 2.00 kg object is at +3 m, a 3kg object is at +2.50 m, a 2.50-kg object is at the origin, and a 4kg object is at -0.5 m. Where is the center of mass of these objects?

10. A billiard ball moving at 5 m/s strikes a stationary ball of the same mass. After the collision, the first ball moves, at 4.33 m/s, at an angle of 30° with respect to the original line of motion. Assuming an elastic collision (and ignoring friction and rotational motion), find the struck ball's velocity after the collision.

11. The center-to-center distance between Earth and Moon is 384 400 km. The Moon completes an orbit in 27.3 days. (a) Determine the Moon's orbital speed. (b) If gravity were switched off, the Moon would move along a straight line tangent to its orbit, as described by Newton's first law. In its actual orbit in 1.00 s, how far does the Moon fall below the tangent line and toward the Earth?