

Assignment 4: Engineering Mechanics (NMEC101) (Session 2025-26)

Instruction: Figure numbers correspond to the problem numbers.

1. Collar A starts from rest and moves to the right with a constant acceleration. Knowing that after 8 s the relative velocity of collar B with respect to collar A is 610 mm/s, determine (a) the accelerations of A and B, (b) the velocity and the change in position of B after 6 s.
2. At $t = 0$, wedge A starts moving to the left with a constant acceleration of 80 mm/s^2 and block B starts moving along the wedge toward the right with a constant acceleration of 120 mm/s^2 relative to the wedge. Determine (a) the acceleration of block B, (b) the velocity of block B when $t = 3 \text{ s}$.
3. Racing cars A and B are traveling on circular portions of a race track. At the instant shown, the speed of A is decreasing at the rate of 8 m/s , and the speed of B is increasing at the rate of 3 m/s . For the positions shown, determine (a) the velocity of B relative to A, (b) the acceleration of B relative to A.
4. A small 250-g collar C can slide on a semicircular rod which is made to rotate about the vertical AB at a constant rate of 7.5 rad/s . Determine the three values of θ for which the collar will not slide on the rod, assuming no friction between the collar and the rod.
5. A 6-kg block B starts from rest and slides on the 10-kg wedge A, which is supported by a horizontal surface. Neglecting friction, determine (a) the velocity of B relative to A after it has slid 1 m down the inclined surface of the wedge, (b) the corresponding velocity of A.
6. A 0.5-kg block B slides without friction inside a slot cut in arm OA which rotates in a vertical plane at a constant rate $\dot{\theta} = 2 \text{ rad/s}$

At the instant when $\theta = 30^\circ$, $r = 0.6 \text{ m}$ and the force exerted on the block by the arm is zero. Determine, at this instant, (a) the relative velocity of the block with respect to the arm, (b) the relative acceleration of the block with respect to the arm.

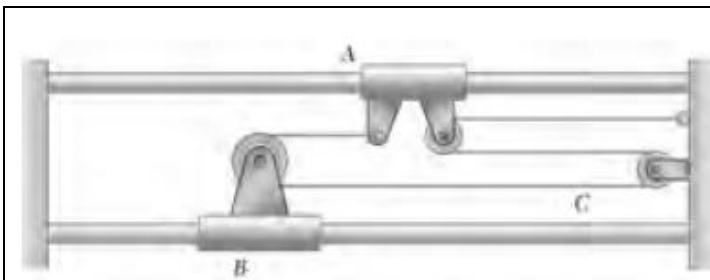


Fig. 1

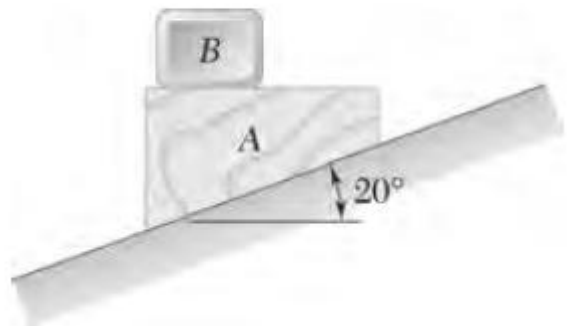


Fig. 2

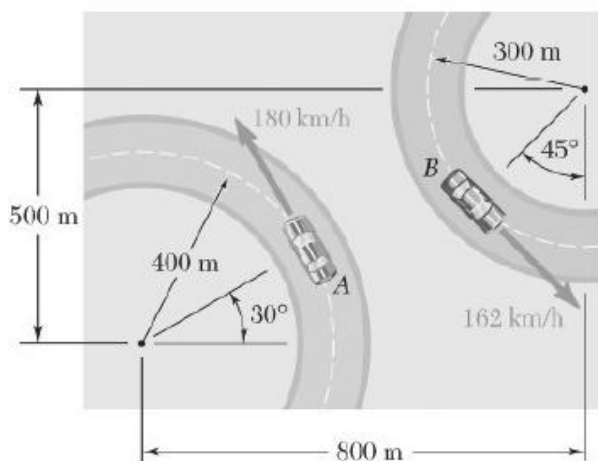


Fig. 3

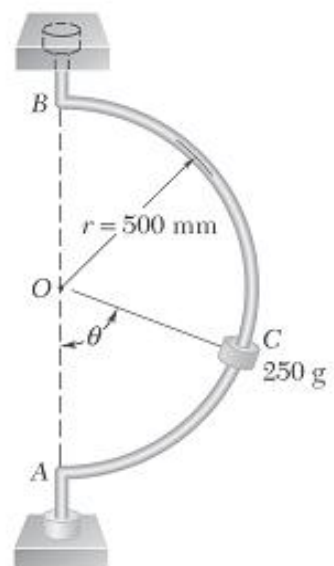


Fig. 4

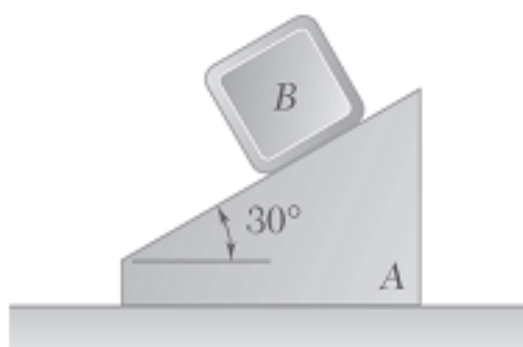


Fig. 5

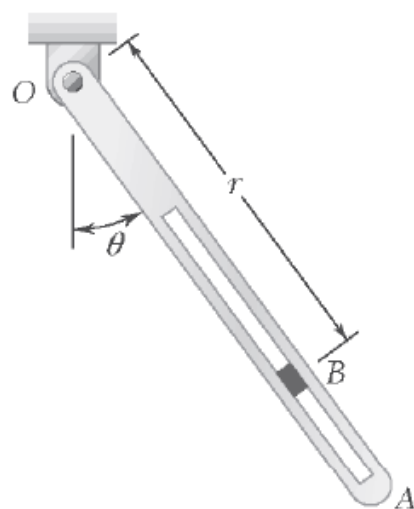


Fig. 6