

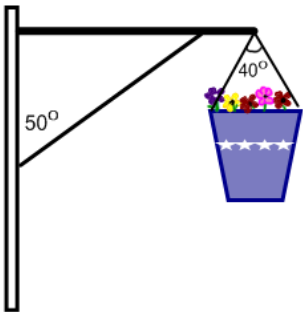
Physics 12

Assignment #7

Conservation of Momentum and Energy

Due Thursday, Dec 20, 2018

1. Cally is driving her 2006 Pontiac G5 at 72km/h in a direction of $N15^{\circ}E$ when she collides with Trevor (intentionally). Trevor is driving a 2001 Ford F-150 at 90km/h in a direction of $E15^{\circ}N$. After the collision Cally is travelling at 75km/h in a direction of $E5^{\circ}N$. a) What Trevor's velocity after the collision if truck has a mass of 4000kg and Cally's car has a mass of 3200kg? b) After the collision each car comes to a halt. Cally's car has good tires and the coefficient of friction is 0.45 but Trevor's tires are not as good and the coefficient of friction is 0.30. How far away from the point of the collision does each car stop?



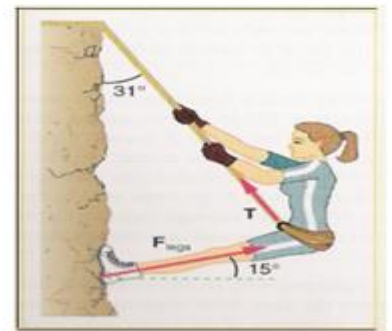
2. What is the weight of the pot that is hanging in the diagram to the left. The pot is attached to a solid horizontal beam that is 4ft long and weighs 5lbs. Another rod that is applying a force of 30lbs is attached at a point 3ft from the wall supports the beam. The support rod is angled at 50° from the vertical post.

3. A stunt rider is attempting to jump her motorcycle over a line of buses parked end to end by driving up a 30° ramp at a speed of 30m/s. a) How many buses can she clear if the top of the takeoff ramp is at the same height as the bus tops and the buses are 20.0m long? b) If the launch angle was changed to 50° could she jump more? Support your answer.

Practice Problems

4. A bomb, sitting at rest, having a mass of 18.0 kg explodes into three pieces that fly out horizontally in opposite directions. One piece was found to have a mass of 3.00 kg and flew off with a speed of 80 m/s west. The mass of the second piece was 5.0 kg, and flew off with a velocity of 60 m/s at 112° . State the direction and velocity of the third piece.
5. a) Determine the force of tension in the rope supporting the mountain climber in figure to the right if the climber weighs 700N. a) Determine the force of tension in the rope supporting the mountain climber in figure to the right if the climber weighs 700N.

b) Determine the coefficient of friction between the climber's boots and the rock face. Hint: Draw FBDs for each part and look at the forces at the point of interest. (ie do a FBD at the connection point of the rope and one at the wall where her feet hit the wall)



6. Albert has mass of 100kg and wants to play on the teeter totter with his brother Jimmie and his sister Emma. The problem is Jimmie only has a mass of 50kg and Emma has a mass of 40kg so even together they can't get Albert up in the air. Assuming that Jimmie sits on the end and Emma sits 40cm in front of him, determine what they could do to reach equilibrium with Albert if the length of the teeter totter is 4m. The mass of the pole they are sitting on is 20kg. **(1.64m)**

7. A car with a mass of 1750kg slows down to 30km/h to avoid hitting a dog crossing the road. A pickup truck with a mass of 2580kg isn't paying attention and runs into the back of the car. The investigation of the accident reveals that the two vehicles locked together moved 10m after the collision. The coefficient of friction between the road and the tires is determined to be 0.630. Determine the speed of the pickup truck before the collision. **(46.7m/s)**

8. Rocky, the squirrel, is riding in a small cart with a mass of 20kg when he hits an inclined plane. The cart makes it up the ramp a distance of 3m along the surface. Using conservation of energy determine the velocity at the start of the ramp, if the angle of the ramp is 40° and the force of friction is 22.50N. **(6.68m/s)**