Physics 122

Practice Midterm – November 2015

Name - _____ Date - _____

Do these problems on your own paper. Show your work.

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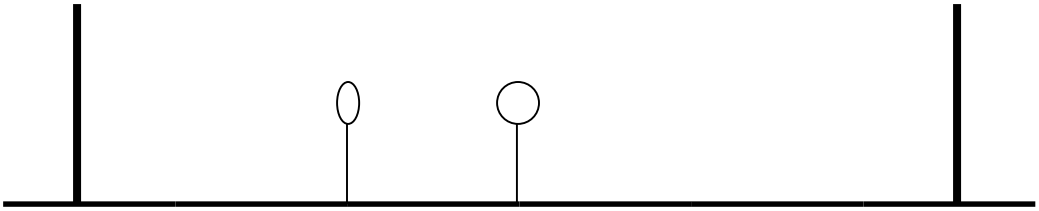
1. A 15.0 kg object is moving south at a speed of 9.0 m/s when it collides with a 13.8 kg stationary object. After the collision, the 15.0 kg object is travelling at a velocity of 4.75 m/s, 18.0° south of east. What is the velocity of the 13.8 kg object after the collision?

2. A gardener pushes a 60 kg lawnmower by means of a handle that makes a 32° angle with respect to the horizontal. A force of 178 N is applied along the handle and the lawnmower moves with constant velocity. What is the coefficient of friction between the tires and the grass?

3. A boat that can travel 7.5 km/h relative to the water starts on the northern shore and aims straight for the opposite bank of a river that is 141 m wide. If the current's velocity is 10.7 km/h east, how far downstream is the boat when it reaches the opposite side? Include a labeled sketch showing the vectors involved.

4. Two painters are above the first floor of a house on a scaffold which has a mass of 40.8 kg, is 3.0 m long and is supported by two ropes attached 0.250 m in from each end. The first painter whose mass is 80.0 kg is standing at the center, while the second painter, of mass 65.0 kg, stands 1.00 m from the left of the scaffold. Calculate the tension in the left-hand rope. The diagram is not to scale.



5. A 23 g bullet traveling 230 m/s penetrates a 2.0 kg block of wood and emerges cleanly at 70 m/s.
   a) If the block is stationary on a frictionless surface when hit, what is its velocity after the bullet emerges?
   b) What type of collision occurred? Justify your answer mathematically.

6. A 10.0 kg box accelerates at 2.00 m/s^2 as it slides down a ramp that makes an angle of 25.0° with the horizontal. Find the coefficient of kinetic friction.