A 0.600 kg hammer is moving horizontally at 4.50 m/s when it strikes a nail and comes to rest after driving it 1.00 cm into a board.

(a) Calculate the duration of the impact.
 s
(b) What was the average force exerted on the nail?
 N (downward)

A 0.0210 kg bullet moving horizontally at 400 m/s embeds itself into an initially stationary 0.500 kg block.

(a) What is their velocity just after the collision?
  m/s
(b) The bullet-embedded block slides 8.0 m on a horizontal surface with a 0.30 kinetic coefficient of friction. Now what is its velocity?
  m/s
(c) The bullet-embedded block now strikes and sticks to a stationary 2.00 kg block. How far does this combination travel before stopping?
  m

Two manned satellites approaching one another at a relative speed of 0.300 m/s intend to dock. The first has a mass of 4.00 **✕** 103 kg, and the second a mass of 7.50 **✕** 103 kg. Assume that the positive direction is directed from the second satellite towards the first satellite.

(a) Calculate the final velocity after docking, in the frame of reference in which the first satellite was originally at rest.
 m/s

(b) What is the loss of kinetic energy in this inelastic collision?
 J

(c) Repeat both parts, in the frame of reference in which the second satellite was originally at rest.
final velocity
 m/s
loss of kinetic energy
 J

Two cars collide at an icy intersection and stick together afterward. The first car has a mass of 1250 kg and was approaching at 5.00 m/s due south. The second car has a mass of 850 kg and was approaching at 20.0 m/s due west.

(a) Calculate the final velocity of the cars. (Note that since both cars have an initial velocity, you cannot use the equations for conservation of momentum along the *x*-axis and *y*-axis; instead, you must look for other simplifying aspects..)
Magnitude
 m/s
Direction
 Â° (counterclockwise from west is positive)

(b) How much kinetic energy is lost in the collision? (This energy goes into deformation of the cars.)
 J

**Additional Materials**