# Chapter G - Problems

### Blinn College - Physics 2425 - Terry Honan

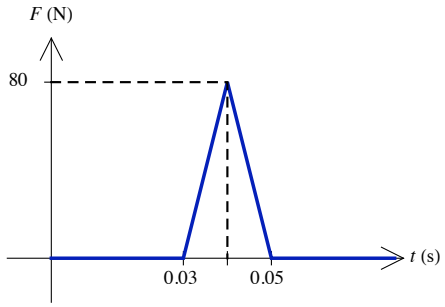
## Problem G.1

A 0.12 kg ball dropped from a height of 2.0 m rebounds to 1.8 m.

(a) What is the change in the ball's momentum during its collision with the floor?

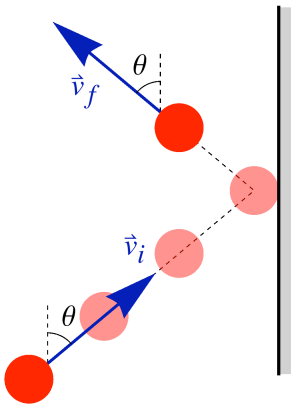
(b) Suppose the ball is in contact with the floor for 0.08 s. What is the average force of the floor on the ball?

## Problem G.2




The graph above is the force vs. time for some collision on a 0.25 kg ball that is initially at rest.
(a) What is the impulse given to the ball?
(b) What is the average force acting on the ball during the collision?
(c) What is the velocity of the ball after the collision?

## Problem G.3




A ball of mass $m$ bounces elastically with a wall. The ball's speed is $v$ before and after the collision and $\theta$, the angle the ball makes with the wall, is the same before and after the collision. It the ball is in contact with the wall for a time $T$, then what is the average fore of the wall on the ball?

## Problem G.4

A 2 kg mass has a velocity of $\langle 4, -3\rangle\, m/s$ and a 3 kg mass has a velocity of $\langle -1, 5\rangle\, m/s$. What is the total momentum of the system and what is the velocity of the center of mass?

## Problem G.5

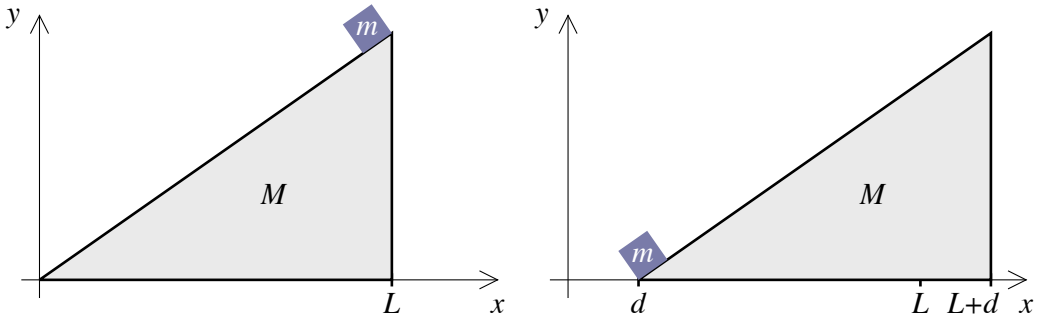
A 5 kg mass is at (0, 3m), a 2 kg mass is at (-2m, 0) and a 3 kg mass is at (1m, -4m). What are the coordinates of the center of mass?

## Problem G.6

The distance between hydrogen and chlorine atoms in an HCl molecule is $1.3\times10^{-10}\, m$. Where is the center of mass of this molecule, measured from the hydrogen atom? Chlorine is about 35 times more massive than hydrogen.

## Problem G.7

A small block of mass $m$ sits at the top of a triangular wedge of mass $M$. The wedge has a base of width $L$ and slides without friction on a horizontal surface. If the block is released from rest from the top of the wedge, then how far has the wedge moved d, when the block has reached the bottom of the wedge? Neglect the size of the small mass compared to the wedge.




Before After

## Problem G.8

A 75 kg man stands on a frozen ice rink (taken to be frictionless) next to a wall. He throws a 0.5 kg ball at 12 $\frac{\text{m}}{\text{s}}$ toward the wall and catches it after it rebounds elastically (at the same speed.) Ignoring the projectile motion of the ball, how fast is he moving after he catches it.

## Problem G.9

A 40 gram bullet is fired into a stationary 2 kg block. The bullet embeds in the block and they both move off at $5\,m/s$. What is the velocity of the bullet before hitting the block?

## Problem G.10

Two masses $m$ and $3\,m$ move toward each other (in opposite directions) at the same speed $v$. If they collide elastically and bounce so thaat they stay in the same line of motion, then what are both final velocities?

## Problem G.11

A bullet of mass $m_1$ is fired into a stationary block of mass $m_2$. The bullet embeds in the block and they both slide on a horizontal surface with a coefficient of friction $\mu$. The bullet and block both slide a distance $d$ before stopping. What is the speed of the bullet *before* it hits the block?

## Problem G.12

A 10 kg mass moving in the $x$ direction at $5\,m/s$ collides with a 6 kg mass moving in the negative $y$ direction at $20\,m/s$. If the two masses stick together then what is their final velocity after the collision?

## Problem G.13

A particle of mass $m$ moving with speed $v$ collides elastically with an identical particle initially at rest. Show that after the collision the velocities of the two particles are perpendicular.