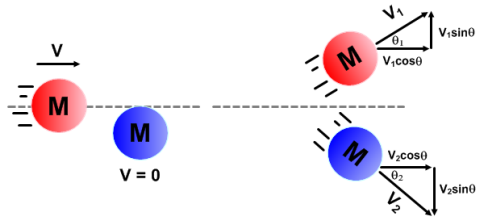
Name: _____ Date:_____

Mr. Croom's Physics Chapter 6: Momentum

Glancing Problems (2D and 3D Problems)

Solve the following problems

1. A 4.0-kg mass traveling at 10.0 m/s strikes another 4.0-kg mass that is initially at rest as shown below. After the collision, the first 4.0-kg travels at 6.0 m/s at an angle of 34°. What is the speed and direction of the second mass after the collision?



2. Remember your vector addition! Two cars enter an icy intersection and skid into each other. The 2500 kg sedan was originally heading south at 20 m/s, whereas the 1450 kg coupe was driving east at 30 m/s. On impact the two vehicles become entangled (Perfect Inelastic) and move off as one at an angle in the southeasterly direction. Determine this angle and the speed at which they initially skid away after crashing. (find v_{fx} and v_{fy}!)

3. (Walker, p.268, #25) Two 75.0-kg hockey players skating at 5.75 m/s collide and stick together. If the angle between their initial directions was 125°, what is their velocity after the collision?

4. (Giancloli, p. 205, #38) A 4.3 kg eagle moving with a speed of 7.8 m/s is on a collision course with a 5.6 kg eagle moving at 10.2 m/s in a direction at a right angle to the first. After they collide they hold onto one another. In what direction and with what speed do they move after the collision.

5. (Giancloli, p. 205, #39) A billiard ball of mass 0.400 kg moving with a speed of 1.8 m/s strikes a second ball intiall y at rest of mass 0.5 kg. As a result of the collision, the first ball is deflected off at the angle of 30.0° with a speed of 1.10 m/s. Taking the x axis to be the original direction of motion of ball A, write down the equations expressing the conservation of momentum for the component in the x and y direction s separately. Solve these equations for the speed and angle of ball B. Do not assume the collision is perfect elastic.

6. (Giancloli, p. 205, #44)Two billiard balls of equal mass move at right angles and meet at the origin of an *x y* coordinate system. One is moving upward along the *y* axis at 2.0 m/s, and the other is moving to the right along the *x* axis with a speed of 3.7 m/s. After the collision (assumed perfect elastic), the second ball is moving along the positive *y* axis. What is the final direction of the first ball, and what are their two speeds?

7. *Two* streets intersect at a *40°* angle. Car A has a mass of *1500 kg* and is travelling at *50 km/h.* Car B has a mass of *1250 kg* and is travelling 60 *km/h.* If they collide in the intersection and remain stuck together, what will be the velocity of the combined mass immediately after impact?

8. A proton travelling with speed 8.2×10^5 *m/s* collides elastically with a stationary proton. One of the protons is observed to be scattered at a *60°* angle. At what angle will the second proton be observed, and what will be the velocities of the two protons after the collision?

9. (Giancloli, p. 205, #42)In order to convert a tough split in bowling, it is necessary to strike the pin a glancing blow as shown in the figure below. Assume that the bowling ball has a mass five times the mass of the pin, and is initially traveling at 12.0 m/s along the *+y* axis. After the collision, the pin goes off at an angle of 80° from the original direction of the ball, as shown. Assume that the collision is elastic and ignore any spin of the ball. Calculate the speed of the pin and the speed of the ball right after the collision. Calculate the angle through which the bowling ball was deflected