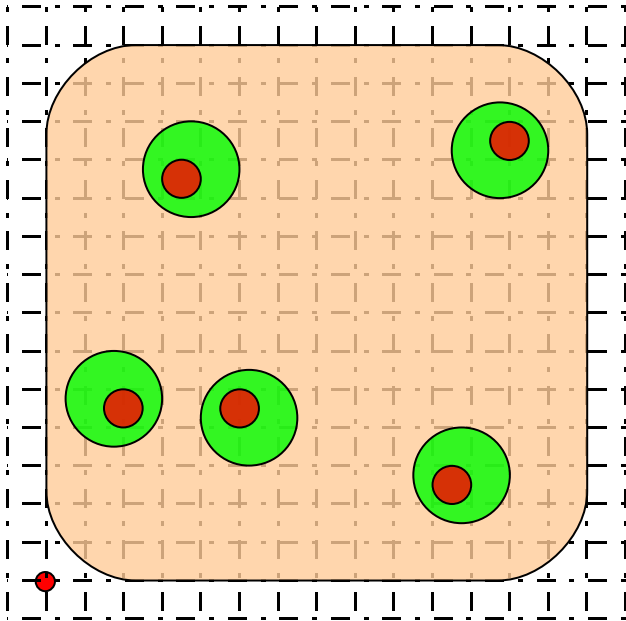


A1.



A2. Ask for the demonstration and explain in terms of momentum the motion of the balls. (RO)(10)

A3. For this problem reference the picture of the piece of olive loaf to the left. The grid is a 1.00cm grid, each olive has a mass of 3.00g, each pimento has a mass of 0.75g and the meat has a mass of 40.0g. Use the external dot as your reference point.

Dale and Steph were having a discussion about center of mass one day during lunch. As a demonstration Dale picked out a piece of olive

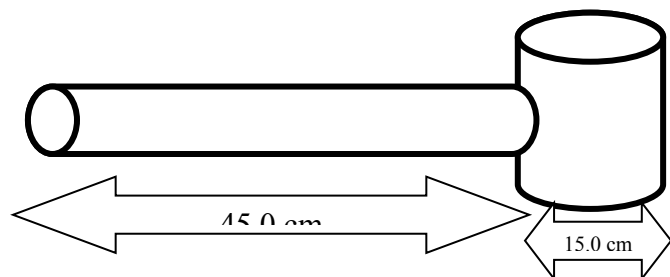
loaf from her sandwich and threw it like a Frisbee across the café. Around what point did the olive loaf rotate? (40)(SO)

A4. Two cars of equal masses are approaching an intersection. Car A is traveling West at 12.0 m/s and Car B is traveling South at 9.00 m/s when they enter the intersection. If they undergo a complete inelastic collision with each other what velocity do they have afterwards? (20)

A5. A 45.0 g ball is released from a height of 2.13 m above a surface. If the ball collides with the surface and rebounds in 0.123 s what is the force on the surface? (10)

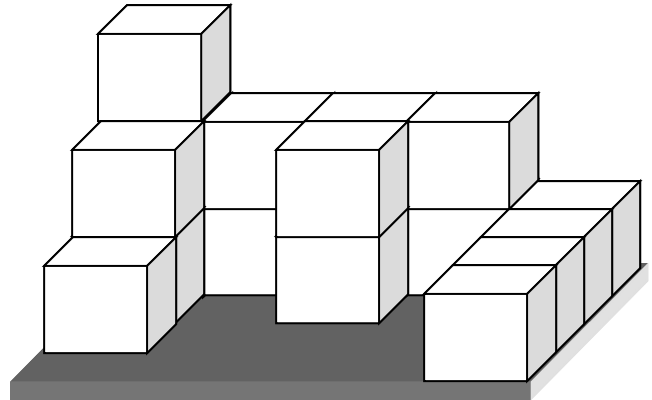
A6. Find the center of mass of the hammer shown below. It handle has a mass of 250 g and the head of the hammer has a mass of 1.35 kg. (20)(SO)

A7. You, mass 70.0 kg are riding your bike, mass 5.50 kg, with your best friend, mass 53.0 kg, and you are traveling forward at 3.55 m/s when you hit a bump and your friend flies off the bike backwards at 2.00 m/s. What happens to you and your bike? (20)



A8. A spaceship of mass 4000 kg that is traveling at 16.50 m/s ejects 18.0 kg of gas perpendicularly to its path of travel at a velocity of 260 m/s. By how much does the rockets direction of travel change? (30)

B1. Find the center of mass of the pallet stacked with boxes of mass M and sides L if the pallet has by itself has a mass of $\frac{1}{2} M$ and a height of $\frac{1}{8} L$. (40)(SO)



B2. A 35.0 g bullet travels at 430 m/s and hits a 1.78 kg block of wood hanging from a long thin cord. How high does the block swing with the bullet embedded in the block? (20)

B3. A block of Swiss cheese has a mass of 4.00 kg and is a perfect cube of sides 75.0 cm. The block contains 3 “bubbles” of air; each of these bubbles has a volume of 500 cm^3 . The center of one bubble is located 20.0 cm in all directions from the bottom left corner of the block. The center of another bubble is located 10.0 cm down, 15.0 cm to the left and 25.0 cm in front of the top back right hand corner of the block. The center of the last bubble is located 12.0cm up from the very center of the block. Where is the center of mass of the block of cheese? (40)(SO)

B4. Ian is sitting in a canoe that has $\frac{1}{3}$ his mass. If he stands up and walks East at V , how does the canoe react? (10)

B5. How much time does it take friction to stop a 3.50 kg block of wood traveling at 4.40 m/s if the coefficient of sliding friction between the block and the level surface is 0.84? (10)

B6. Find the center of mass of this object. The larger circle has a radius of $5R$ and the smaller circles have radius of R and are made of a material half the density of the material in the larger circle. The centers of the two smaller circles are located 135° apart on the perimeter of the circle. (20)(SO)

B7. Do this ranking task. Put your answer on this sheet. (20)

