Concept Quiz:

1. If the speed and mass of an object are both doubled, which of the following two are true?
   A) The momentum of the object is doubled
   B) The kinetic energy of the object is doubled
   C) The momentum of the object is quadrupled
   D) The kinetic energy of the object is multiplied by 8
   E) The momentum and the kinetic energy of the object are quadrupled

2. Two objects A and B have velocities $v_1$ and $v_2$ and masses $m_1$ and $m_2$. If $|v_1| < |v_2|$ and the two objects have equal kinetic energies, which of the following is true?
   A) The two objects have momenta with equal magnitudes
   B) The magnitude of the momentum of A is greater than the magnitude of the momentum of B
   C) The magnitude of the momentum of A is smaller than the magnitude of the momentum of B
   D) The two objects have equal masses
   E) Mass of object A is smaller than mass of object B

3. Two object A and B of velocities $v_1$ and $v_2$ have momenta with equal magnitude. If $|v_1| < |v_2|$, which of the following two are true?
   A) The two objects have equal kinetic energies
   B) The two objects have equal masses
   C) The kinetic energy of A is greater than the kinetic energy of B
   D) The kinetic energy of B is greater than the kinetic energy of A
   E) Mass of object A is greater than mass of object B

4. Determine the momentum of …
   a. … an electron ($m = 9.1 \times 10^{-31} \text{ kg}$) moving at $2.18 \times 10^6 \text{ m/s}$
   b. … a 0.45 Caliber bullet ($m = 0.162 \text{ kg}$) leaving the muzzle of a gun at 860 m/s.
   c. … a 110-kg professional fullback running across the line at 9.2 m/s.
   d. … a 360,000-kg passenger plane taxiing down a runway at 1.5 m/s
5. Kaylee was applying her makeup when she drove into South's busy parking lot last Friday morning. Unaware that Lizzy was stopped in her lane 30 feet ahead, Kaylee rear-ended Lizzy's Jeep. Kaylee's 1300-kg car was moving at 11 m/s and stopped in 0.14 seconds.
   a. Determine the momentum change of Kaylee's car.
   b. Determine the impulse experienced by Kaylee's car.
   c. Determine the magnitude of the force experienced by Kaylee's car.

6. Jaclyn plays singles for South's varsity tennis team. During the match against North, Jaclyn won the sudden death tiebreaker point with a cross-court passing shot. The 57.5-gram ball hit her racket with a northward velocity of 26.7 m/s. Upon impact with her 331-gram racket, the ball rebounded in the exact opposite direction (and along the same general trajectory) with a speed of 29.5 m/s.
   a. Determine the pre-collision momentum of the ball.
   b. Determine the post-collision momentum of the ball.
   c. Determine the momentum change of the ball.
   d. Determine the velocity change of the racket.

7. A metallic sphere of mass 1 kg and radius 5 cm is welded to the end B of a thing rod AB of length 50 cm and mass 0.5 kg as shown above. This rod with the sphere will balance horizontally on a knife edge placed at a distance “x” from the end A of the rod “x” is equal to…

   a. 35 cm
   b. 40 cm
   c. 45 cm
   d. 48 cm
   e. 52 cm

8. Two objects, of masses 6 kg and 8 kg, are hung from the ends of a stick that is 70 cm long and has marks every 10 cm, as shown below. If the mass of the stick is negligible, at which of the points indicated should a cord be attached if the stick is to remain horizontal when suspended from the cord?
9. Find the location of the center of mass of the object below