Ch 11 Math Practice Problems

1. A 30.0 kg child running at 7.00 m/s jumps onto a 10.0 kg sled which was initially at rest. What will be the velocity of the child plus the sled immediately after the child jumps on the sled? 5.25 m/s

2. A 1500. kg car traveling at 15.0 m/s collides with a 500. kg moose which is at rest. If the moose is knocked backward at 20.0 m/s, what happens to the car's velocity? 8.33 m/s (Draw a picture)

3. A 1500. kg car traveling 5.00 m/s in an easterly direction collides head on with a 3000. kg truck traveling 7.00 m/s in the opposite direction. If the bumpers lock, what is the velocity of the two vehicles together immediately following the collision? -3.00 m/s

4. A 70.0 kg astronaut floating in an orbiting space station throws a 1.00 kg water bottle across the room at a speed of 8.00 m/s. What is the magnitude of the astronaut's recoil velocity? -.114 m/s

5. On April 15, the luxury cruiseliner *Titanic* sank after running into an iceberg. What momentum would the 4.23×10^8 kg ship have imparted to the iceberg if it had hit head-on with a speed of 11.6 m/s?
4.91×10^9 kgm/s

6. A rocket engine exerts a force of 500. N on a space probe (in outer space!) for 5.50 seconds. If the space probe increases its velocity from rest to 21.0 m/s . What is the mass of the space probe? 131 kg

7. When jumping straight down, you can be seriously injured if you land stiff-legged. One way to avoid injury is to bend your knees upon landing to reduce the force of the impact. A 75.0 kg man just before contact with the ground has a velocity of 6.40 m/s. In a still-legged landing he comes to a halt in 2.00×10^{-3} s and when he bends his knees, he comes to a halt in .10s. Find the average force in each situation.
Stiff-legged 2.40×10^5 N bent legs 4800 N

8. During July 1994 the comet Shoemaker-Levy 9 smashed into Jupiter in a spectacular fashion. The comnet actually consisted of 21 distinct pieces, the largest of which had a mass of approximately 4.0×10^{12} kg and a speed of 6.0×10^4 m/s. What is the impulse that the comet imparted on Jupiter? 2.4×10^{17} Ns

9. If an elephant has a mass of 5550 kg and slowly walks toward the stack of peanuts with a velocity of 10.1 m/s, what is the momentum of the elephant? 5.61×10^4 kgm/s

10. If the tennis ball applies a force of 20.9 N to the floor over a time of .0234 s, what is the impulse?
.489 Ns

11. A tennis racket hits a ball with a force of 125 N. The ball has a mass of 6.05 kg and leaves the racket with a velocity of 21 m/s, What is the impact time of the racket on the ball? 1.0 s

12. The Marcus volleyball player spikes the volleyball giving it a forward velocity 21.0 m/s. If the volleyball has a mass of 0.35 kg, what is the momentum of the volleyball? 7.4 kgm/s