**Force Problems**

1. (2 points) Draw a free-body diagram of a shoe sitting on the floor.
2. (2 points) Draw a free-body diagram of a bowling ball free falling.
3. (4 points) Draw a free-body diagram of book sitting on a ramp.
4. (3 points) Draw a free-body diagram of a wagon being pulled at an angle of 64 degree to the horizontal.
5. (7 points) A truck pulls a trailer on a flat stretch of road. The forces acting on the trailer are the force due to gravity (250,000 N downward), the force exerted by the road (250,000 N upward), and the force exerted by the cable connecting the trailer to the truck (20,000 N to the right). The forces acting on the truck are the force due to gravity (80,000 N downward), the force exerted by the road (80,000 N upward), the force exerted by the cable (20,000 N to the left), and the force causing the truck to move forward (26,400 N to the right).
   1. Draw a free-body diagram of the trailer
   2. Draw a free-body diagram of the truck
6. (4 points) A man is pulling on his dog with a force of 70.0 N directed at an angle of 30.0 degrees to the horizontal. Find the x and y components of this force.
7. (4 points) A gust of wind blows an apple from a tree. As the apple falls, the gravitational force on the apple is 2.25N downward, and the force of the wind on the apple is 1.05 N to the right. Find the magnitude and direction of the net force on the apple.
8. ( 3 points) Roberto and Laura are studying across from each other at a wide table. Laura slides a 2.2kg book toward Roberto. If the net force acting on the book is 1.6N to the right, what is the book’s acceleration?
9. ( 3 points) The net force on a golf cart is 390N north. If the cart has a total mass of 270kg, what are the magnitude and direction of the cart’s acceleration?
10. (4 points) Two Olympic ice skaters, Jana and Bob, are practicing for the finals. They come to a part in their routine where they push off of each other and fly off in opposite directions. Jana has a mass of 56kg and moves backward with an acceleration of 3.6m/s2. Bob has a mass of 80kg. What is his acceleration after being push by Jana?
11. (2 points) What is your mass? (1kg = 2.2 pounds).
12. ( 3 points) What is your weight on Earth? ( F=ma)
13. (3 points) What is your weight on the moon?
14. (3 points) What is your weight on Mars?
15. (10 points) Compare your weight on Mars and your weight on Earth. When scientists finally colonize Mars, let’s say one scientist gets pregnant and has her baby on Mars. The baby grows up happy and healthy for 3 years on Mars. Could that baby come back to Earth to visit his grandparents? Defend your answer.