ES 105 Homework Assignment 1 Name: _____

Do these problems on these sheets. Use the backs of the sheets if needed. Be sure to clearly label the problems by number if you use the back. Show the equations you used to solve these problems. Be sure to include units for full credit. This homework is due January 19.

1. Find the net force produced by a 30 N force and a 20 N force if both forces are acting in the same direction.

2. Find the net force produced by a 30 N force and a 20 N force if the forces are acting in opposite directions.

3. Calculate the average speed of a tennis ball that travels the full length of a tennis court (24 meters) in 0.5 seconds.

4. If you were riding a bicycle along a straight road at $7.5 \frac{\text{meters}}{\text{second}}$, how far would you go in 5.0 minutes?

5. When a bicycle rider starts from a standing stop, and is traveling $2 \frac{\text{meters}}{\text{second}}$ after 1 second, what is the acceleration of the bicycle?

6. What is the acceleration of a ball rolling down a ramp, if the ball gains $25\frac{\text{meters}}{\text{second}}$ of speed in 5 seconds.

7. Suppose you push a 2 kg can of coffee along a horizontal surface, with a horizontal force of 20 N. If there is a frictional force of 12 N acting on the coffee can, what is the net force on the coffee can? What is its acceleration?

8. If you exert a force of 10.0 N on a 6.67 kg shopping cart for 3.0 seconds, what is its acceleration?

Circle the information given above that do you not need to solve this problem.

9. A 5 kg bag of groceries is tossed onto a table at $4\frac{\text{meters}}{\text{second}}$ and slides to a stop in 3 seconds. What is the force of friction between the table and the grocery bag?

10. When an 80 kg firefighter slides down the fire pole and accelerates $4\frac{\text{m}}{\text{s}^2}$, what frictional force acts between the firefighter and the pole? In what direction does it act?

11. When a test car crashes into a wall at $25 \frac{\text{meters}}{\text{second}}$ and stops in 0.1 seconds, what is the force exerted on a 75 kg test dummy by the seat belt?

12. If you push the end of a lever 1.2 meters with a force of 50 N, and the load at the other end of the lever moves 0.2 meters, what is the weight of the load (in N)?

13. A pulley system is employed to lift a 5,000 N piano. What force is required to lift the piano if the piano rises 0.2 meters for every 2 meters of rope pulled?

14. When a ball is thrown straight up with an initial velocity of $30 \frac{\text{meters}}{\text{second}}$, how long will it go up? How far will it go up?

15. A cart is pushed and undergoes a certain acceleration. How the acceleration would compare if it were pushed with twice the net force while its mass increased by four?