Name _____ Period _____

Friction Homework

1. Fred is pulling a box that weighs 982.6 N across the floor at a constant velocity. A scale attached to the rope Fred is pulling on reads 263.2 N.
   a) Draw a free body diagram
   b) What is the mass of the box?
   c) What is the force of friction on the box?
   d) What is the coefficient of friction on the box?

2. Fred now pulls with the same box across the same floor with a the scale reading 362.1 N.
   a) Draw a free body diagram
   b) What is the net force in the x direction?
   c) What is the acceleration of the box?
   d) If Fred starts from rest, how fast will the box be moving after 15.0 seconds?

3. A car coasts from 15 mph (6.7 m/s) to a stop in 26.3 seconds. The car weighs 15,200 N.
   a) Draw a free body diagram
   b) What is the mass of the car?
   c) What is the acceleration of the car?
   d) What is the force of rolling friction of the car?

4. The same car in #3 (assume the same friction) starts at a stop sign and goes to 15 mph in 2.32 seconds.
   a) Draw a free body diagram
   b) What is the acceleration of the car?
   c) What is the net force of the car?
   d) What is the force from the engine on the car?

5. A student uses a scale to hold a chair in the air. The scale reads 85.2 N.
   a) Draw a free body diagram
   b) Write a net force equation
   c) What is the weight of the chair?

6. A student now pulls this same chair across the floor. The scale parallel to the floor reads 20.4 N.
   a) Draw a free body diagram
   b) Write both net force equations
   c) What is the force of friction on the chair?
   d) What is the normal force on the chair?
   e) What is the coefficient of friction between the chair and the floor?

7. The same student in #5 and #6 pulls the same chair across the floor but now a classmate is sitting in the chair. The scale reads 258 N.
   a) Draw a free body diagram
   b) Write both net force equations
   c) What is the force of friction on the chair and person?
   d) What is the force normal for the chair and person?
   e) What is the weight of the chair and person?
   f) What is the weight of the person?

8. A box that weighs 382 N is pulled across the floor. The scale on the handle of the box says 253 N. The coefficient of friction between the box and the floor is 0.253. If the box starts at rest how far will it have moved in 13.2 seconds?

9. As an arrow enters a target it is moving at 29.3 m/s. It comes to a stop in 28.3 cm. The mass of the arrow is 300 grains (1 gram = 15.43236 **grains**). What is the force of friction on the arrow?

10. Federal "Black Cloud" waterfowl steel shot has a muzzle velocity of 1450 feet per second (1 ¼ oz 3 inch BBB shot if you are interested) and an average of 848 feet per second at 40 yards. What is the force of friction on the shot? You may consider that 1450 feet = 442 meters, 848 feet = 258 m, 40 yards = 36.6 m and 1 ¼ oz = 35.4 grams.

11. If the force of air friction stays the same, what maximum range would still produce an effective 580 feet per second velocity necessary to bring down a typical goose? 580 feet = 177 meters.

12. Indiana Jones picks up a young child in a car seat and pushes them across an ice covered lake. If the weight of the car seat and child is 182 N and the coefficient of friction between the car seat and ice is 0.0262, how far will the car seat and child go before coming to rest if it starts at 2.44 m/s?

13. A particular race car weighs 43,260 N. At 120 mph, the spoiler on the rear of the car produces a downward force of 4,230 N. The friction between the tires and the road provides the traction necessary to accelerate. If the coefficient of friction is 0.653, what is the maximum acceleration that the car can have from the engine at 120 mph (53 m/s)?

14. You are driving in a car with that special someone in the front seat with you (bench seats) but he/she is way over by the other door. Which way should you turn the car to cause him/her to slide closer to you? Why?