Homework and Reading Assignment for Chapters 1-5

Homework Assignments will be due at the beginning of class on the day indicated. Note that we will do chapters 1, 3, 2 and 4 in that order. **Staple multiple pages together and SHOW YOUR WORK!**

### Assignment for chapter 1
- Read chapter 1 by Thursday, August 27. Note the difference between a scientific hypothesis and a “non-scientific” one.
- Be prepared to **discuss** the four questions below. (**I’m NOT asking you to hand these in.**)
  1. What is the difference between a scientific fact and a scientific theory?
  2. Which of the following are scientific hypotheses?
     a) The moon is made of cheese
     b) The earth rotates about its axis because living things need an alternation of light and darkness
     c) Tides are caused by the moon.
  3. When a plant grows, where does the material incorporated into the plant come from? (Think about the size of a redwood tree.) Aristotle hypothesized that it came from the soil. Do you think that is correct? Propose an experiment that could test this hypothesis.

### Assignment for chapter 3: Linear Motion
- Read chapter 3 by Thursday, August 27. Pay special attention to the concepts of position, speed, velocity and acceleration.
- **Turn in** the Questions below on **Thursday, September 3**.
  1. Can a car go around a curve at a constant speed of 10m/s without accelerating? (Explain the reasoning behind your answer.)
  2. What is the difference between the speed of an object and its velocity?
  3. If I run 10 km with an average speed of 5m/s, how long will it take? (How many meters is 10km?)
  4. If I need to go 1km in 4min, how fast must I run? (Give the answer in m/s.)
  5. In the figure below you have recorded the position of the box at 3s time intervals.
     a) What is the average speed of the box between the time 0s and 3s? What is it between 3s and 6s and between 6s and 9s?
     b) Is the box accelerated? If so, what is the acceleration?

6. In the figure below you have recorded the position of the box at 3s time intervals.
   a) What is the average speed of the box between the time 0s and 3s? What is it between 3s and 6s? What is it between 6s and 9s?
   b) Is the box accelerated? If so, what is the acceleration?
7. If the acceleration of the box in #6 above continues for another 3s, what will the average speed be for the time interval from 9s to 12s?
8. (Extra Credit) What will the box’s position be at the end of 12s? (See if you can work it out.)
9. A car accelerates from rest to a speed of 18m/s with an acceleration of 3m/s\(^2\). How long does it take for the car to reach a speed of 18m/s?
10. A car is going 30m/s and slows to a stop in 5s as it travels 75m.
   a) What is its average acceleration?
   b) What is its average speed during this time interval?

Assignment for Chapters 2, and 4  (Use \(g = 10\text{m/s}^2\) on the earth unless told otherwise.)

- **Turn in** the problems below on **Tuesday, Sept. 15**.
  1. I am standing on two scales, with one foot on each one. One reads 300N. I actually weigh 800N. What will the second scale read?
  2. All objects near the earth’s surface will experience the same acceleration in freefall, \(a \approx 10\text{m/s}^2\). Explain why.
  3. The box at the right experiences three forces as shown. (The forces are in the directions of the arrows.) The box experiences an acceleration of magnitude 0.6m/s\(^2\).
     a) What is the net force on the box?
     b) What is the mass of the box?
     c) What is the direction of the acceleration (Left or Right)?
  4. I am exerting a force of 100N to pull a wagon that weighs 250N along at a constant velocity through sand. What is the net force on the wagon?
  5. I am exerting a force of 200N to drag a box that weighs 600N along with a constant acceleration of 0.3m/s\(^2\). What is the net force on the box?
  6. I throw a ball upward with a speed of 20m/s.
     a) What will its speed be after 1s?
     b) What will its speed be after 3s? (Hint: How much will its velocity change in 3s?)
  7. I throw a 0.4kg ball upward with a speed of 15m/s. When it reaches the top of its trajectory, its speed will reach 0m/s and it will start back down. At the instant its speed is zero,
     a) What is its acceleration?
     b) What is the force on the ball?
  8. Can I run around a curve with a constant speed while the net force on me is zero? Explain!
  9. What is the difference between mass and weight? What does each measure?
 10. I can punch a balloon with my hand without pain, but if I punch a bowling ball it hurts. Explain why.

Assignment for Chapter 5

- **Turn in** the Questions below on **Thursday, Sept. 17**.
- Start reading chapter 6 by Tuesday, Sept. 15.
1. A person drops a mass of 8kg. As it is falling,
   a) What force does the earth exert on it? (I want the magnitude and direction of the force.)
   b) What force does it exert on the earth? (I want the magnitude and direction of the force.)
2. Two cars collide. Car A has a mass of 1500kg and car B has a mass of 2000kg. They both exert forces on each other.
   a) Which car will experience the larger force?
   b) Which will experience the larger acceleration? Why?
3. Explain the concept of terminal velocity. Use an example of a ping pong ball dropped of a tall building. I want you to explain why it reaches a terminal velocity.
4. An object on the moon weights 24N, but its mass is 15kg, what is g for the moon, i.e. what is its acceleration in freefall?
5. My mass is 80kg and I’m in an elevator that is moving up with a constant speed. If I’m standing on a scale, the scale will register a force that is less than my weight, more than my weight, equal to my weight? (Which one of these is correct?)
6. If my mass is 80kg and I’m in an elevator that is moving, what can you tell me about its motion if I’m standing on a scale that registers a force of 740N?