PHY 100S – THE MAGIC OF PHYSICS
Spring Term, 2013

HOMEWORK #1

DUE: **By 11:00 AM, Thursday, January 31, 2013 in the Drop Boxes**
Late penalty = 5% per day (which also applies to weekend days) for a maximum of 7 days, after which homework will not be accepted.

DROP BOXES: The completed homework assignment should be submitted in the *Drop Box* for your tutorial section. There are six Drop Boxes – one for each tutorial section, clearly labelled. The Drop Boxes are located in the basement of the Burton tower of the McLennan Physics building. On the first floor of McLennan there is a stairway with a bust of Newton beside it; the Drop Boxes are at the bottom of that stairway.

TEXTBOOK: All questions are taken from the textbook, *Physics: Concepts and Connections, Fifth Edition*, by Art Hobson, Pearson Education (2010).

INSTRUCTIONS: (1) Make sure your name and student number, and the name of your tutor are on your submitted homework, preferably on all pages in case a page comes loose. Staple all pages together.
(2) Show all your reasoning and work legibly, and draw a box around the final answer where applicable.

MARKING: Marks will be given for reasoning, as well as for final answers. Each question is worth 2 marks. Total marks = 20.

QUESTIONS:

Chapter 3, Conceptual Exercises 6, 14, 18

6. In order to experimentally verify the Law of Inertia, woud you need to be able to measure time? Weight? Distance?

14. In Figure 3.12, suppose the large divisions on the measuring rod are centimetres and that the time intervals each have a duration of 0.20 s. Find the speed of each ball.

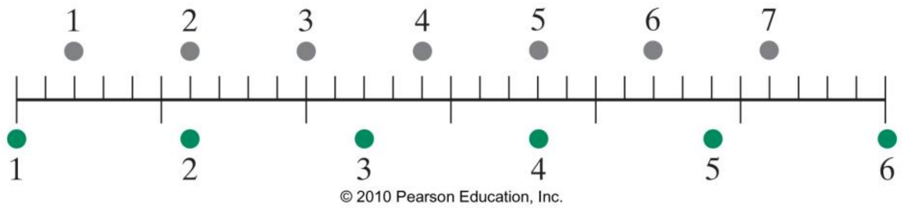

Figure 3.12

18. When you drive a car, might you depress the accelerator pedal without actually accelerating? Could you accelerate without having your foot on the accelerator? Explain.

Chapter 4, Conceptual Exercises 16, 22, 38

16. A 3 kg rock rests on the ice. You kick it, briefly exerting a 60 N force. Assume that a frictional force of 6 N acts on the rock whenever it is moving across the ice. Find the net force on the rock and the rock's acceleration. What can you say about the net force on the rock after your foot is no longer in contact with it?

22. Which has the greater mass, a tonne of feathers or a tonne of iron? Which has the greater weight? Which has the larger volume?

38. A horizontally moving bullet slows down. Is anything exerting a force on it? How do you know? Is it exerting a force on anything? How do you know?

Chapter 5, Conceptual Exercises 8, 22, 32, 40

8. Do you exert a gravitational force on Earth? If so, how large is it, and in what direction is it?

22. If gold were always sold by weight, could you make money buying gold at one altitude above ground (i.e., above sea level) and selling it at a different altitude? Where would you want to buy – at a high altitude or a low altitude? Explain.

32. Suppose that the gravitational force between an apple and an orange placed a few meters apart is one-trillionth (10^{-12}) N. What would be the force be if the mass of the apple were doubled? Tripled? What if the mass of the apple were tripled and the mass of the orange were quadrupled?

40. According to the most widely accepted scientific theory of the creation of the universe, the observable universe during the first few moments (much less than 1 second) of its existence was extremely hot, was full of densely packed matter, and was very tiny—smaller than an atom. What theory or theories would be needed to explain what was happening during these first few moments?