

# Physics 21 Problem Set 1

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due Monday, Jan. 10 at 5pm

**Course Announcements:** The reading for this problem set is KK Chap. 4, pp. 152-173, and RHK4 Chapters 7 and 8. We will follow RHK4 in lecture.

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1. KK 4.6. This problem was also on the final... know this problem and solution thoroughly.
2. A rubber ball dropped from a height of exactly 6 feet bounces (hits the floor) several times, losing 10% of its kinetic energy after each bounce. After how many bounces will the ball subsequently not rise above 3 feet? (RHK4 7.32).
3. A 57-kg woman runs up a flight of stairs having a rise of 4.5 m in 3.5 s. What average power must she supply? (RHK4 7.35)
4. Starting a race, a 68.2 kg sprinter runs the first 7.04 m in 1.60 s, starting from rest and accelerating uniformly. (RHK4 7.38)
  - (a) What is the sprinter's speed at the end of the 1.60 s?
  - (b) What is the sprinter's final kinetic energy?
  - (c) What average power does the sprinter generate during the 1.60 s interval?
5. Show that the speed  $v$  reached by a car of mass  $m$  that is driven with constant power  $P$  is given by

$$v = \left( \frac{3xP}{m} \right)^{1/3}$$

(RHK4 7.52). Assume that the car starts from rest and that  $x$  is the distance that the car travels. Imagine car B has an engine with twice the power of car A, that car A and car B have the same mass, and both cars travel the same distance  $x$ . By what factor is car B's final speed bigger than car A's?

6. KK 4.10.
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