Physics 117 HW #11 Problems

Ch 14 Q: 11, 15, 19; Ex: 11, 15, 23

Ch 15 Q: 3, 5; Ex: 3, 9.

11. Explain how the following simplified statements of the first and second laws of thermodynamics are consistent with the versions given in this chapter.

First: You cannot get ahead.
Second: You cannot even break even.

15. Heat engine A operates between 20°C and 300°C, whereas heat engine B operates between 80°C and 300°C. Which engine has the greater possible theoretical efficiency? Explain.

19. How is the following statement equivalent to the heat-engine form of the second law of thermodynamics? The efficiency of a heat engine must be less than 1.

11. An ideal heat engine has a theoretical efficiency of 60% and an exhaust temperature of 27°C. What is its input temperature?

15. How much work per second (power) is required by a refrigerator that takes 800 J of thermal energy from a cold region each second and exhausts 1500 J to a hot region?

***23.** The total number of possible states for three dice is $6 \times 6 \times 6 = 216$. What is the probability of throwing a sum equal to 5?

3. A mass is oscillating up and down on a vertical spring. When the mass is above the equilibrium point and moving down, what direction is the net force on the mass? When the mass is above the equilibrium point and moving up, what direction is the net force on the mass?

5. A mass is oscillating up and down on a vertical spring. If the mass is increased, will the period of oscillation increase, de-

3. A Foucault pendulum with a length of 9 m has a period of 6 s. What is its frequency?

9. By what factor would you have to increase the spring constant to double the frequency for a mass on a spring?