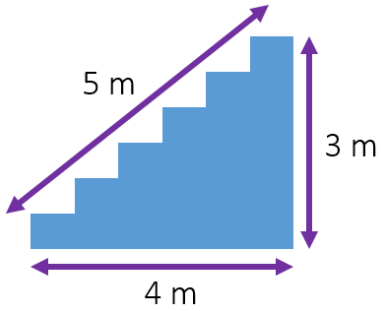
5 | Energy | Review

Name _____ Period _____

1. a. How much work does Bob do on a 12-kg backpack when carrying it up this flight of stairs?



b. How fast (in seconds) would Bob have to climb the stairs to match the power of a 100 W light bulb?

2. Tarzan swings down on a vine to save Jane from the porch of their burning tree house that is 6 m above the jungle floor. If 70 kg Tarzan drops off a 15 m high branch, (initial speed is 0 m/s) how fast must Jane run along their porch to make a perfect pick-up? (That is, how fast is Tarzan moving at porch level?)

3. Little Jimmy was taking his pet rock for a constant velocity walk down at the park. The rock weighs 20 N and he pulls the leash with 50 N at an angle of 40° from the horizontal. They go a full 150 m before Jimmy gets tired. How much work did Jimmy do on the rock?

4. Your frictionless rocket sled has a thrust force of 1500 N and pushes you (from rest) across a 100 meter football field. If you and your sled has a combined mass of 300 kg, what is your final velocity? (Use work-energy theorem)

5. You stretch a rubber band with 15 N of force and it stretches from an unstretched length of 2 meters to a stretched length of 2.4 meters.

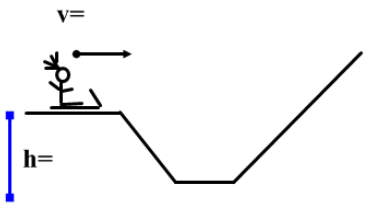
   a. What is the spring constant (k) of this rubber band?

$F = k\Delta x$	$E_p = \frac{1}{2}k\Delta x^2$

   b. How much elastic potential energy is stored?

6. A 55 kg sled and kid are traveling 6 m/s along the top of a 3 meter high frictionless hill. The kid then sleds down into a valley and up the opposite hill.

   a. How fast is the kid going at the bottom of the first hill?



   b. What maximum height will the kid reach on the opposite hill?

7. A 42 kg swimmer climbs up to a 10 m platform.
   (a) How much work did she do against gravity?

   (b) How fast would she need to climb in m s^{-1} to produce the same amount of power as a 60 W lightbulb?

   (c) How much gravitational potential energy does she have at the top? Kinetic Energy?

   (d) She dives off the platform. How much Kinetic Energy and Gravitational Potential Energy does she have when she is 5 meters above the surface of the water?

   (e) What type of energy will the swimmer have the instant before they hit the water? Calculate the speed of the swimmer at this instant.

   (f) If the swimmer comes to a stop 1.45 m under the surface of the water, find the <u>force</u> acting on the swimmer. (Assume a constant deceleration)