Weight as a Force and Mechanical Work:
The Harvard Step Test
http://www.topendsports.com/testing/video/step-test-harvard.htm

Weight is a force, commonly measured in *pounds* (English system) or *newtons* (metric system). At the Earth's surface, 9.8 newtons are required to uphold a 1 kg mass [according to Newton's 2nd Law, F=ma, where the acceleration of gravity (again, on Earth's surface) is approximately 9.8 m/sec^2].

Mechanical work is found by multiplying the distance through which an applied force acts by the magnitude of the force itself [or, W = F$_{app}$ x distance]. For metric system calculations, force (in newtons) x distance (in meters) = work (in "joules").

In this experiment, you will calculate the mechanical work that you would perform in *joules* if you performed the Harvard Step Test. The chart below will help you calculate this amount of mechanical work.

#1 Your weight (in pounds):_____

#2 Your weight (in newtons… at Earth's surface, 2.2 pounds = 1 newton):_____

#3 Distance in one vertical "step": <u>20 inches</u>

　　　　Caution: Conversion Ahead… Dimensional Analysis Primer:

- Write down what you're given (number and unit)
- Multiply by a fraction having the given unit in the denominator
- Identify a new unit for the numerator…something for which a conversion factor is known or "lookuppable"
- Insert the conversion factors
- Cancel the original and denominator units
- Recycle to the second step (if necessary)

　　20 inches $_x$ <u>　2.54 cm　</u> $_x$ <u>1 meter</u>
　　　　　　　　　1 inch　　　　100 cm

#4 Distance in one vertical "step" in meters:_____

#5 Mechanical work done in 1 vertical step in joules:_____

#6 Mechanical work done in one minute (@ 30 vert. steps/min):_____

#7 Mechanical work done in five minutes of the H.S.T:_____