Going The (Vertical) Distance
SPH4C

Purpose: Determine your work done and your power output while walking or running up a flight of stairs. (Note that you must use a complete flight of stairs, from one floor to the next, ignoring the landing.)

The formula you will use to calculate your work done is $W = mg\Delta d$ where:

      m = your weight in kilograms = _____

      g = 9.8 m/s²

      Δd = the height of a complete flight of stairs in metres = _____

(It may be easiest to measure the height of one stair and multiply by the number of stairs.)

So $W = mg\Delta d$

      = (_____)(9.8 m/s²)(_____)

      = _____ (Remember units!)

Will this work done be the same whether you are walking or running up the stairs? _____

Given the conversion 1 food Calorie = 4184 J:

Calculate the number of food Calories you burn off while walking or running up the stairs once:

$$W = \underline{\quad} J \times \left(\frac{1\,Cal}{4186\,J} \right) = \underline{\quad} Cal$$

Calculate the number of times you would need to walk or run up the stairs to burn off one Big Mac hamburger (approximately 600 Calories).

$$\frac{600\,Cal}{1\,Big\,Mac} \times \left(\frac{1\,time}{\underline{\quad}Cal} \right) = \underline{\quad} \frac{times}{Big\,Mac}$$

Given that you do not walk up stairs this often during the day, how do you burn most of the Calories you consume during the day?

_____

_____

The formula you will use to calculate your power output is $P = \dfrac{W}{\Delta t}$ where:

W (previously calculated) = _____

Δt_{walk} = average Δt while walking = _____

(You may wish to walk up the stairs more than once and average your time measurements.)

So P_{walk} = $\dfrac{W}{\Delta t_{walk}}$ =   =   (Remember units!)

Δt_{run} = average Δt while running = _____

So P_{run} = $\dfrac{W}{\Delta t_{run}}$ =   =   (Remember units!)

Compare your power output to the power output of at least three other students.

	Me	Person #1	Person #2	Person #3
Power output while walking				
Power output While running				

Calculate your power output in horsepower using the conversion factor 1 hp = 745.7 W.

While walking:

$$P = \underline{\quad} W \times \left(\frac{1hp}{745.7W} \right) = \underline{\quad} hp$$

While running:

$$P = \underline{\quad} W \times \left(\frac{1hp}{745.7W} \right) = \underline{\quad} hp$$