**WORK & POWER**

H.P.3A.1 Use mathematical and computational thinking to determine the work done by a constant force (W=Fd).

H.P.3A.2 Use mathematical and computational thinking to analyze problems dealing with the work done on or by an object and its change in energy.

H.P.3A.4 Plan and conduct controlled scientific investigations to determine the power output of the human body.

**Purpose:** To investigate the work done and power developed by a person during walking & running up the steps.

Apparatus: ruler, stop-watch, scale, and person.

Theory: Here we will look at WORK as defined below. We will assume that work only occurs when the force is sufficient to move the object. Work is a measure of what is done, not the effort applied in attempting to move the object. Work can be said to be energy in transit. Work has the same unit as energy.  
  
Work = Force X Distance;    Power = Work/Time;    1 horse power = 1 hp = 746 W.

|  |  |
| --- | --- |
| Business man Climbing Success Stair | wp |
| <http://www.gograph.com/vector-clip-art/stair.html> |

UNITS:   ([SI Units](http://physics.nist.gov/cuu/Units/units.html))

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Time** | **Distance** | **Mass** | **Weight** | **Velocity** | **Acceleration** | **Work & Energy** | **Power** |
| cgs | s | cm | g | dyne | cm/s | cm/s2 | erg | erg/s |
| SI | s | m | kg | newton, N | m/s | m/s2 | joule,J | J/s = W |
| BE/USC | s | ft | slug | pound, lb | ft/s | ft/s2 | ft.lb | ft.lb/s |

PROCEDURE

1. Find the weight of the person who is going to do the walking and running.

2. Walk out to the steps and measure the height of each steps, # of steps, and determine the height for one level.

3. Time the walking and running.

4. Repeat 1-3 for two levels, and complete the data table.  
  
DATA: (Use SI units) Same person needs to do all the walking and running.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | From 1st floor to 2nd floor | | From 1st floor to 3rd floor | |
| Walking | Running | Walking | Running |
| Weight of the person |  |  |  |  |
| Height between floors |  |  |  |  |
| Time |  |  |  |  |
| Work |  |  |  |  |
| Power |  |  |  |  |
| Horse Power |  |  |  |  |

Conclusion: