Power Output of a Student – Push Ups!

Name: _____ Date: _____

Purpose:

In this activity you will be investigating and calculating the **power** generated by individual students while doing push-ups.

What is needed?

Below you will see the proper form used in a push-up. In order to determine the work done to lift your partial body mass during a push up we must determine two things; Δh and the percentage of your weight, F you are lifting.

Measuring Δh:

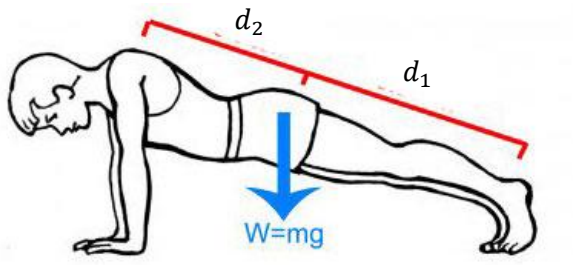
To measure this use a metre stick to measure the change in height, Δh, from the shoulders at the lowest position and the highest position:

$$\Delta h = h_2 - h_1$$

Measure/Calculate the Percentage of body weight lifted:

Method 1: If you have a force scale then you can simply get into a push-up position and place your hands on the force scale to measure the amount of weight you are lifting through the height: This will be your equivalent force, F_{eq}. Proceed to the calculations.

Method 2: If you do not have a force scale you can approximate the percentage of your body weight that you are lifting by using torque.



Without going into the full concept of torque, you can approximate the percentage of your body weight that you are lifting using the following equation.

$$F_{eq} = \left(\frac{d_1}{d_1 + d_2}\right) mg$$

Where, mg, is your weight (force of gravity) and is taken to be at your waist for most adult humans (center of gravity).

Calculate the Power:

In order to calculate the power simple time how long it takes to do 10 push ups. The work done is simply the change in gravitational energy multiplied by 10: $W = 10 \cdot F_{eq}\Delta h$ where F_{eq} is the equivalent force (or weight).

Get your Measurements:

With a partner measure the following:

$\Delta h =$ _____

$d_1 =$ _____ $d_2 =$ _____ $m =$ _____ (method 2)

$F_{eq} =$ _____

$W = \Delta E_g = 10 \cdot F_{eq}\Delta h =$ _____

$\Delta t =$ _____ (required for 10 push ups)

Using the **power equation**, calculate your power output:

YOUR POWER IS: $P = \frac{\Delta E_g}{\Delta t} =$ _____

Convert this to equivalent horse-power units: (1h.p. = 750 W)

$\# \, h.p =$ _____