Stair Climbing Power Lab

**Purpose:** To gain an understanding of power, work and force by measuring your power output.

**Procedure:**

1. Determine the vertical displacement you will run in meters. Record.
2. Calculate your weight in Newtons. Record.
3. Find the work that will be done when you climb the stairs. Record.
4. Have your lab partners record how many seconds it takes you to climb the stairs. You must climb one stair at a time. Record.
5. Calculate your power output. Record.
6. Calculate your horsepower. Horsepower is a unit of power and is equal to 750 J/s or 750 Watts. Record.
7. Convert your power output in Watts to kilowatts. Record.

**Data Table:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Your Data** | **Partner 1****Name:**  | **Partner 2****Name:** | **Partner 3****Name:** |
| Height climbed (m) |  |  |  |  |
| Your weight (N) |  |  |  |  |
| Work (J) |  |  |  |  |
| Time (s)  |  |  |  |  |
| Power Output (W) |  |  |  |  |
| Power Output (kW) |  |  |  |  |
| Power Output (hp)  |  |  |  |  |

**Analysis:**

1. Did the student in your group who climbed the stairs in the shortest time also use the most power? ***Explain***.

2. When James Watt was trying to sell his steam engine, he was repeatedly asked how the power of his engine compared to the power of a horse. He determined how much work an average horse could do in one second and defined this as one horsepower. In this lab, you determined your work output as horsepower. Horses can maintain their work output for over half an hour. Do you think you could do the same? ***Explain***.

3. How are force, work and power related? ***Describe*** how the formulas we have been using in class relate to one another.

4. How did your power output compare to that of a 100 W light bulb?

5. How did your power output compare to that of an average horse?

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