# Up and Down (Work and Power)

A mini-lab by Nick Forrest

The objective of this lab is to determine the work and power used and produced while doing everyday tasks, like climbing up and sliding down a slide, or going on a bike ride. For my experiment, I determined the work and power used and produced  while climbing up and then sliding down a slide. To accomplish this, I first found a slide and determined its height. Second, I found my mass in kilograms, and multiplied it by 9.8 to find how the force of gravity affected me as I climbed up the slide. Then I used a stopwatch to time how long it took to climb up the slide. Then I used the stopwatch to time how long it took to slide down to the bottom of the slide, assisted only by gravity.

I used lots of different equations to determine the values I used in this experiment. For example:

Weight ÷ 2.2 = Mass in Kilograms

Mass ✕ 9.8 = Force of Gravity in Newtons

Force of gravity ✕ Height = Work in Joules

Work ÷ time = Power in Watts

## Starting Values

| Units | Values |
|---|---|
| Weight (pounds) | 182 |
| Mass (kilograms) | 82.7 |
| Height of slide (meters) | 1.9 |
| Time up the slide (seconds) | 14.18 |
| Time down the slide (seconds) | 2.76 |

# Equations

**1.** 182 ÷ 2.2 = 82.7          **2.** 82.7 × 9.8 = 810.46

**3.** 810.46 × 1.9 = 1539.874          **4.** 1539.874 ÷ 14.18 = 108.59

**5.** 1539.874 ÷ 2.76 = 557.93

      The equations I used represent the results of my experiment. Equation 1 is the calculation of my mass in kilograms. I weighed myself and I was 182 pounds, so I divided that by 2.2 to convert it to kilograms. Equation 2 is my mass multiplied by 9.8 to find out the amount of force that gravity exerts on me. This force is measured in newtons, and comes out to about 810 newtons. In Equation 3, I multiplied 810 newtons, the force of gravity, by the height I traveled in meters, 1.9. The result of this was the amount of work I used in Joules. Climbing up the slide, I used about 1,539 joules of work. Equation 4 is finding the amount of power in watts I exerted climbing up the slide. It took me 14.18 seconds to get up the slide. There were other factors like friction, but I didn't have enough information to put this into an equation. To find power, I simply took work (1,539 joules) and divided it by time (14.18 seconds), resulting in 108.59 watts of power. Equation 5 is finding the power that gravity exerted on me while I slid down the slide. This was found in the same way, dividing work (1,539 joules) over time (2.76 seconds)

# Final values

| Unit | Value |
|---|---|
| Force of gravity (newtons) | 810.46 |
| Work used by me (Joules) | 1,539 |
| Power exerted by me (Watts) | 108.59 |
| Power exerted by gravity (Watts) | 557.93 |

# Conclusion

      I completed the objective of this experiment, and found that I exerted 108.59 watts of power and used 1,539 joules of work climbing up a slide. When I slid down the slide, gravity was exerting 557.93 watts of power on me. This makes sense because gravity exerts more power than I do, making it harder to travel upwards and easier to travel downwards. During this experiment, I found out how much work and power I exert

during an everyday action, and I have also found out how to calculate the amount of work and power exerted during any sort of action that requires them.