Name: ______________________________

Work and Power

CAN AIR DO WORK?

1. Invent a machine that will lift a weight off the ground using wind power.
2. Use a meter stick to measure how high the weight was lifted.
3. Use a stopwatch to measure how long it took to lift the weight.
4. Use the data you collected to calculate the **work** that was done and the **power** that was generated.

DEFINITIONS

mass - the measurement of the amount of matter an object has in it (You have the same amount of mass while on the earth, the moon or in space.)

weight - a measurement of the gravitational force pulling objects to the earth, moon or other celestial body (The more mass a planet has, the greater the gravitational pull of that planet will be. An object weighs more on the earth than it does on the moon because the earth has more mass than the moon.)

force - a push or pull

Newton - a metric system unit used to measure force (1 Newton = 1 kg-m/s^2)

energy - the capacity to do work

work - applying a force through a distance (Pushing a book across a desk is work, pushing on a wall that doesn't move isn't work.)

Joule - a metric system unit used to measure energy or work (1 Joule = 1 Newton-meter = 1 kg-m^2/s^2)

power - the rate at which work is being done (Picking up a box off the floor and putting it on a table requires a certain amount of work, the faster the work is done, the more power is required.)

Watt - a metric system unit used to measure power (1 Watt = 1 Joule/s = 1 kg-m^2/s^3)

horsepower - an English system unit used to measure power (1 Horsepower = 746 Watts)

Trial Number	Number of Dice	Height (cm)	Time (sec)

Work and Power Data and Calculations - Trial 1

Number of dice used	How high did it go?	How long did it take?
	cm	s

How much mass was lifted?

(Number of dice used [ ] x Mass of one die 5.5 g) + Mass of the cup 2.5 g = Total Mass Lifted [g]

Conversions!

Height Lifted [cm] = Height Lifted [m]

Total Mass Lifted [g] = Total Mass Lifted [kg]

How much work was done?

Total Mass Lifted [kg] x Height Lifted [m] x Gravity $10\ m/s^2$ = Work [J]

How much power was generated?

Work [J] ÷ Time [s] = Power [W]

Work and Power Data and Calculations - Trial 2

Number of dice used	How high did it go?	How long did it take?
	cm	s

How much mass was lifted?

(Number of dice used [ ] x Mass of one die 5.5 g) + Mass of the cup 2.5 g = Total Mass Lifted [g]

Conversions!

Height Lifted [cm] = Height Lifted [m]

Total Mass Lifted [g] = Total Mass Lifted [kg]

How much work was done?

Total Mass Lifted [kg] x Height Lifted [m] x Gravity $10\ m/s^2$ = Work [J]

How much power was generated?

Work [J] ÷ Time [s] = Power [W]

Work and Power Data and Calculations - Trial 3

Number of dice used	How high did it go?	How long did it take?
	cm	s

How much mass was lifted?

(Number of dice used [ ] x Mass of one die 5.5 g) + Mass of the cup 2.5 g = Total Mass Lifted [g]

Conversions!

Height Lifted [cm] = Height Lifted [m]

Total Mass Lifted [g] = Total Mass Lifted [kg]

How much work was done?

Total Mass Lifted [kg] x Height Lifted [m] x Gravity $10\ m/s^2$ = Work [J]

How much power was generated?

Work [J] ÷ Time [s] = Power [W]

QUESTIONS TO THINK ABOUT

1. What could you do to make your machine do more work faster?

2. If your machine could produce electricity, how many of them would you need to power a 5 Watt night-light?

3. If your machine could produce electricity, how many of them would you need to power Jefferson Lab's accelerator? It takes about 1 Megawatt (1,000,000 Watts) to power Jefferson Lab's accelerator.