Name: Mubashar Khan **Assignment #:** 1

Summary of Problem Statement **Problem #** 3

Create a program that will help consumers determine the efficiency of their stoves.

Known / Input

Temp. of water (Initial_temp) [deg F]
Time (Time) [min]
Power (P) [W]

Unknown / Output

Thermal Energy (Q) [J]
Power (Power_Burner) [W]
Efficiency (Burner Efficiency) [%]

Assumptions

Air Pressure will not impact any results.
The pan on the stove does not impact results(by abosrbing heat and also because everyone has different pans at home).
D = 1000 Density of water [Kg/m^3] I put this in assumptions because in real life, the density of water varies at different temps.
C = 4186 = Specific heat of water [J/Kg*°C]

Other Variables

D = Density of water, M = D * V
Convert temp to Celsius: Initial_temp = (Initial_temp -32) / 1.8
Final_temp = 100 [°C]
Delta_temp = (Final_temp - Initial_temp)

Algorithm

Inputs: User defined data about: Temp of water, Name and model of motor, Time is takes for the water to boil and the power that an oven is capable of putting in. Using input method.
Convert temp to Celsius using 5/9(Temp (deg F) -32).
Convert time from min to seconds. Time = Time *60;
Convert volume from gallons into m^3 to solve for mass: V = (1 / .264 * 1000 / 100^3); [m^3]
Define all intermediate values used for final calculations: Specific heat of water, Density of water
Change in temperature (deg C) = 100 - initial temp
Outputs: Thermal Energy of the stove, power output of the burner and efficiency of the stove
Calculations:
Q = M * C * Delta_temp; Thermal Energy [J]
Power_Burner = Q / Time; Power of the burner[W]
Efficiency = (Power_Burner / P) * 100; Percent efficiency of the burner

Test Cases

Using information from the test case with Stove Model: Charbake 5
Temp = (100 - (5/9)(69-32)) = 79.45 [deg C] T = 18*60 = 1,080 [s] V = (1 / .264) * (1000 / 100^3) = .00378 [m^3]
M = 1000 [kg/m^3] * .00378 [m^3] = 3.78 [kg]
Q = 3.7878 [kg] * 4186 [J/Kg*°C] * 79.444 [°C] = 1259642 [J] <<<< This number varies in a range of almost 1000 [J] based on the number of decimal points I use.
Power = 1259642 [J] / 1080 [s] = 1166 [W]
Efficiency = (1166 [W] / 1350 [W]) * 100 = 86.4%