```cpp
1: /*
2:   Chaitanya Dubey
3: */
4:
5: #include <iostream> //lets us use cout and cin
6:
7: using namespace std;
8:
9: int main()
10: {
11:     //Defining the variables:
12:     float c_p = 4.2;
13:     float HV = 45.0;
14:
15:     float mass_water = 100.0;
16:     float change_in_temp = 65-5;
17:     float energy_out = 0.0;
18:     float efficiency = 0.0;
19:
20:     float mass_gas = 0.0;
21:     float cost_per_GJ = 2.25;
22:     float total_J = 0.0;
23:     float total_cost = 0.0;
24:
25:     //Taking in the input:
26:     cout << "What is the efficiency of the water heater? ";
27:     cin >> efficiency;
28:
29:     //Calculating the mass of the natural gas:
30:     energy_out = mass_water*c_p*change_in_temp;
31:     mass_gas = energy_out/(efficiency*(HV * 1000)); // converting MJ/kg to kJ/kg
32:
33:     //Calculating the total cost:
34:     total_J = mass_gas * (HV/1000); //MJ to GJ --> kg * GJ/kg (HV) --> kg cancels out
35:     total_cost = cost_per_GJ * total_J;
36:
37:
38:     //Printing the output:
39:     cout << "The mass of natural gas needed is " << mass_gas << " kg." << endl;
40:     cout << "The total cost of the natural gas is $ " << total_cost;
41:
42:     return 0;
43: }
44:
45: /*
46:
47: TEST 1:
48:
49: What is the efficiency of the water heater? 0.7
50: The mass of natural gas needed is 0.8 kg.
51: The total cost of the natural gas is $ 0.081
52: -------------------------------
53: Process exited after 4.913 seconds with return value 0
54: Press any key to continue . . .
55:
```

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56:
57: TEST 2:
58:
59: What is the efficiency of the water heater? 0.8
60: The mass of natural gas needed is 0.7 kg.
61: The total cost of the natural gas is $ 0.070875
62: ---------------------------------
63: Process exited after 3.795 seconds with return value 0
64: Press any key to continue . . .
65:
66:
67: TEST 3:
68:
69: What is the efficiency of the water heater? 0.9
70: The mass of natural gas needed is 0.622222 kg.
71: The total cost of the natural gas is $ 0.063
72: ---------------------------------
73: Process exited after 3.664 seconds with return value 0
74: Press any key to continue . . .
75:
76:
77: TEST 4:
78:
79: What is the efficiency of the water heater? 0.95
80: The mass of natural gas needed is 0.589474 kg.
81: The total cost of the natural gas is $ 0.0596842
82: ---------------------------------
83: Process exited after 5.703 seconds with return value 0
84: Press any key to continue . . .
85:
86:
87: TEST 5:
88:
89: What is the efficiency of the water heater? 0.99
90: The mass of natural gas needed is 0.565657 kg.
91: The total cost of the natural gas is $ 0.0572727
92: ---------------------------------
93: Process exited after 4.126 seconds with return value 0
94: Press any key to continue . . .
95:
96: */
```