Internship Object-Oriented Programming in C++ (WS 2023/2024)

A1 Part 1: Homework task for preparation for the presence group/Part 1: Homework Task for Preparation of the Presence Group

Learning objectives : C++ inputs from the keyboard, C++ outputs to the console output (window), repetitions constant and variable, structure, loop.

In the context of the climate crisis and rising energy costs, it makes sense to be clear about your own private electricity needs and the electricity costs for it. A first step in calculating the average total electricity consumption per year is a simple formula developed by the Association of Energy Consumers, which will be the focus of this internship task:/ In the context of the climate crisis and rising energy costs, it makes sense to be clear

about one's own private electricity needs and the electricity costs for them. A first step to calculate the average annual total power consumption is offered by a simple formula developed by the Association of Energy Consumers, which will be the focus of this practical assignment:

Formula 1/ Formula 1

Electricity consumption in kWh =
    (number of people * annual average consumption per person)
  + (living space in square meters * annual average consumption per square meter)
  + (number of (larger) devices in the household * annual average consumption per (larger) electrical device)
where
annual average consumption per person: 200 kWh.
annual average consumption per square meter: 9 kWh.
Annual average consumption per (larger) electrical device: 200 kWh.

Power consumption in kWh =
    (number of persons * annual average consumption per person)
  + (living space in square meters * annual average consumption per square meter)
  + (number of (major) devices in the household * annual average consumption per (major) electrical appliance)
whereby
annual average consumption per person: 200 kWh.
annual average consumption per square meter: 9 kWh.
annual average consumption per (major) electrical device : 200 kWh.

Formula 2/ Formula 2

Power costs in EUR = consumption * electricity price.
Power costs in EUR = consumption * electricity price

1. Define three global integer constant variables for the three annual average consumption values
   above.
2. Define a structure called `household` with the following components:
   - C++ string for the name of the city in which the household is located.
   - integer number of people in the household.
   - integer number of square meters of the household.
   - integer number of (larger) electrical devices in the household./
   Define a structure called `household` with the following components:
   - C++ string for the name of the city in which the household is located.
   - integer number of persons in the household.
   - integer number of square meters of the household.
   - integer number of (larger) electrical devices in the household.

3. Write a function to calculate <u>the annual electricity consumption</u> for a household with a structure of type **household** above as a parameter and a floating point number as a return. In the body, implement the corresponding formula above ./
Write a function to calculate <u>the annual power consumption</u> for a household with a structure of the above type **household** as parameter and a floating point number as return. Implement the corresponding formula above in its body.

4. Write a function to calculate <u>the annual electricity cost</u> for a household with a structure of type **household** above as the first parameter, the price of a kilowatt hour as the second parameter, and a floating point number as the return. Implement the corresponding formula above in the body and call the function from the previous subtask 3./ Write
a function for calculating <u>the annual power costs</u> for a household with a structure of the above type **household** as the first parameter, the price for a kilowatt-hour as the second parameter and a floating point number as the return. Implement the corresponding formula from above in its body and inside call the function from the previous subtask 3.

5. Write a function called **print_household** with a structure of type **household** above as the first, the price of a kilowatt hour as the second parameter, and no return. In the body, just like in the examples below, the character string **AVERAGE POWER COSTS** should be underlined with an equal sign, then line by line the values of all components, the price for a kilowatt hour, the annual electricity consumption and the annual electricity costs should be set to the standard character output current (i.e. in the screen window) . /
Write a function called **print_household** with a structure of the type **household** above as the first parameter, the price for one kilowatt-hour as the second parameter and without return. In its body, just as in the examples below, the string **AVERAGE POWER COSTS** underlined with equal signs, then line by line the values of all components, the price for one kilowatt-hour, the annual power consumption and the annual power costs shall be written to the standard character output stream (ie to the screen window).

6. Write a C++ **main** function.
   ○ Define a variable of the **household** structure type above and any other variables you need.
   ○ After outputting the character string **CALCULATION OF AVERAGE POWER COSTS FOR A HOUSEHOLD,** read in the city, the number of square meters and the number of electrical devices as values of the structure variable as well as the price for a kilowatt hour in this city - your outputs and inputs should be exactly as in the example look below.
   ○ Define a loop with values n = 1 , 2, .., 5 people, set the number of people in the body of the loop to the value of n and call your function **print_household** from subtask 5 appropriately./

Write a C++ **main** function.
   ○ Define a variable of the above structure type **household** as well as all other variables you need.
   ○ After outputting the string **CALCULATION OF AVERAGE POWER COSTS FOR A HOUSEHOLD** , read in the city, the number of square meters and the number of electrical devices as values of the structure variable as well as the price for a kilowatt-hour in this city - your outputs and inputs should look exactly like in the example below.
   ○ Define a loop with values n = 1, 2, ..., 5 persons, set the number of persons in the body of the loop to the value of n and call your function **print_household** from subtask 5 appropriately.

7. Test your program for different example data
   .

Only use the C++ input operator **>>** and the output operator **<<** , i.e. neither the **scanf** nor **printf** or other C functions! **/**
Only use the C++ input operator **>>** and the output operator **<<** , neither the functions **scanf** nor **printf** or others from C!

Example Program Run

```
CALCULATION OF AVERAGE POWER COSTS FOR A HOUSEHOLD
in which city is the household located? Duisburg
how many square meters does the household have? 120
how many (major) electrical devices does the household have? 8th
how many EUR does one kWh in Duisburg cost? 0.3
AVERAGE POWER COSTS
===================
household in: Duisburg
square meters: 120
persons: 1
(major) electrical devices: 8
price for one kWh: 0.3 EUR
annual power consumption: 2880 kWh
annual power costs: 864 EUR

AVERAGE POWER COSTS
===================
household in: Duisburg
square meters: 120
persons: 2
(major) electrical devices: 8
price for one kWh: 0.3 EUR
annual power consumption: 3080 kWh
annual power costs: 924 EUR

AVERAGE POWER COSTS
===================
household in: Duisburg
square meters: 120
persons: 3
(major) electrical devices: 8
price for one kWh: 0.3 EUR
annual power consumption: 3280 kWh
annual power costs: 984 EUR

AVERAGE POWER COSTS
===================
household in: Duisburg
square meters: 120
persons: 4
(major) electrical devices: 8
price for one kWh: 0.3 EUR
annual power consumption: 3480 kWh
annual power costs: 1044 EUR

AVERAGE POWER COSTS
===================
household in: Duisburg
square meters: 120
persons: 5
(major) electrical devices: 8
price for one kWh: 0.3 EUR
annual power consumption: 3680 kWh
annual power costs: 1104 EUR
```

Last modified: Friday, October 6, 2023, 5:58 p.m

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