Praktikum Objektorientierte Programmierung in C++ (WS 2023/2024)

A4 Teil 1: Hausaufgabe zur Vorbereitung auf die Präsenz-Gruppe/Part 1: Homework Task for Preparation of the Presence Group

Lernziele: Persistenz von Daten, Lesen und Schreiben von Dateien./
Learning objectives: Persistence of data, reading and writing files.

In A2 Teil 1+2 wurde die Berechnung des Stromverbrauchs für n Haushalte in einem Haus verwaltet, wobei ein Feld von Zeigern auf die einzelnen Haushalte definiert war. In jedem dieser Haushalte konnte eine Liste von Stromverbrauchern gespeichert werden.
In dieser Aufgabe soll Ihr Programm aus A2 Teil 1+2 erweitert werden, so dass die Daten aller Haushalte eines Hauses in einer Datei gespeichert werden können sowie aus einer solchen Datei auch wieder eingelesen werden können.
Das folgende Beispiel **`house4.csv`** zeigt eine solche Datei, in der als Separatorzeichen das Semikolon (`;`) verwendet wird:/
In A2 part 1+2, the calculation of power consumption was managed for n households in a house, with an array of pointers defined to the individual households. A list of power consumers could be stored in each of these households.
In this task, your program from A2 part 1+2 is to be extended so that the data of all households in a house can be saved in a file and can also be read in again from such a file.
The following example **`house4.csv`** shows such a file, in which the semicolon (`;`) is used as a separator character:

```
A4;5;Bergisch Gladbach;0.3
household;2;Bergisch Gladbach;true;5;200
consumer;Washing Machine;2;weekly;2000;0
consumer;Office PC;8.5;Monday to Friday;200;0.5
consumer;Router;24;daily;10;0
household;3;Bergisch Gladbach;false;2;100
consumer;Dish Washer;3.5;daily;250;0
consumer;LED TV;2;Saturday and Sunday;70;0.5
```

In der ersten Zeile der Datei ist **`A4`** als Kennung der Aufgabe gespeichert, danach die (maximale) Anzahl der Haushalte im Haus (Größe Feld), hier `5`, danach die Stadt, in der das Haus sich befindet, hier **`Bergisch Gladbach`**, und der zu berücksichtigende Strompreis für eine Kilowattstunde in EUR, hier `0.3`.
In den weiteren Zeilen folgt jeweils ein Haushalt, sofern dieser existiert, und direkt nachfolgend die Liste aller seiner Stromverbraucher.
Für einen Haushalts folgen nach **`household`** die Nummer im Haus (also der Index im Feld), die Stadt, ob Warmwasser elektrisch bereitet wird (**`true`**) oder nicht (**`false`**), die Anzahl Personen im Haushalt und die Anzahl der Quadratmeter.
Für die Daten eines Stromverbrauchers folgen jeweils auf **`consumer`** dessen Beschreibung, die Anzahl der Betriebsstunden, die Häufigkeit der Benutzung als Zeichenkette **`once`**, **`daily`**, **`Monday to Friday`**, **`Saturday and Sunday`** oder **`weekly`**, der Verbrauch in Watt und der Standby-Verbrauch in Watt.
Ergänzen Sie wie in den Beispielen unten zu sehen Ihre Menüauswahl in **`main`** um die zwei Menüpunkte

`r read data from file`

`w write data into file`

über die nach Eingabe eines Dateinamens und des zu verwendenden Separatorzeichens alle Daten aus der Datei - formatiert wie oben beschrieben - gelesen oder in eine Datei geschrieben werden können./
The first line of the file contains **`A4`** as the task identifier, followed by the (maximum) number of households in the house (length of array), here **`5`**, then the city in which the house is located, here **`Bergisch Gladbach`**, and the power price to be taken into account for one kilowatt hour in EUR, here **`0.3`**.
The next lines contain a household, if it exists, followed directly by a list of all its power consumers.
For a **`household`**, its number in the house (i.e. index in the array), the city, whether hot water is produced electrically (**`true`**) or not (**`false`**), the number of people in the household and the number of square metres follow in a line.
For the data of a power consumer in a line, following **`consumer`** is its description, the number of operating hours, the frequency of use as string **`once`**, **`daily`**, **`Monday to Friday`**, **`Saturday and Sunday`** or **`weekly`**, the consumption in watts and the standby consumption in watts.
As shown in the examples below, add the following two menu items to your menu selection in function **`main`**

`r read data from file`

`w write data into file`

which, after entering a file name and the separator character to be used, can be used to read all data from the file - formatted as described above - or to write into the file.

Hinweise zur Lösung/Notes on the Solution

- Programmieren Sie je eine Funktion für das Lesen und eine für das Schreiben einer solchen Datei, die als (Referenz-)Parameter den Dateinamen, das Separatorzeichen, das Feld von Zeigern auf Haushalte, dessen Länge, die Stadt, den Strompreis für eine Kilowattstunde und mögliche weitere benötigte Parameter haben.
  Die Reihenfolge der Verbraucher in jedem Haushalt soll dabei für jeden Haushalt genau gleich wie in der Datei sein./
  Program one function for reading and one for writing such a file, which have the file name, the separator character, the array of pointers to the households, its length, the city, the power price for one kilowatt hour and any further required parameters as (reference) parameters.
  The sequence of consumers in each household should be exactly the same as given in the file.
- Sie dürfen beliebig weitere Funktionen und Operatoren definieren, die Sie benötigen, bspw. einen Ausgabeoperator wie in A3 für die Elemente der Aufzählung `Use`./
  You may define any other functions and operators that you need, e.g. an output operator as in A3 for the elements of the enumeration `Use`.
- Es ist sinnvoll, zuerst nur das Schreiben in eine Datei zu programmieren und an einfachen kleinen Beispielen zu testen (siehe erste Programmläufe unten)./
  It makes sense to first program only the writing to a file and to test it on simple small examples (see first program runs below).
- Beim Einlesen aus der Datei können Sie jeweils über die Funktion `get` Zeichen für Zeichen bis zum Separatorzeichen oder Zeilenende einlesen und jeweils an eine C++-Zeichenkette anhängen, die den Wert für eine Komponente beinhaltet.
  Oder Sie können via `getline` eine gesamte Zeile als C++-Zeichenkette einlesen und über Schleifen aus dieser Teil-Zeichenketten jeweils Zeichen für Zeichen bis zum Separatorzeichen in Variablen für die Werte der Komponenten kopieren.
  Sie benötigen keine zusätzlichen Funktionen zur Verarbeitung von (Sub-)Strings, regulären Ausdrücken, zum Tokenising von Strings oder was Sie sonst noch bei der Suche im Internet hierzu finden würden und nicht in der Lehrveranstaltung erklärt wurde - einfache Kopier-Schleifen auf den Strings reichen hier vollkommen aus./
  When reading from the file, you can use function `get` to read in character by character up to the separator character or the end of line and append each character to a C++ string that contains the value for a component.
  Or you can use `getline` to read in an entire line as a C++ string and use loops to copy parts of strings character by character up to the separator character into variables for the values of the components.
  You do not need any additional functions for processing (sub)strings, regular expressions, for tokenising strings or anything else you would find when searching the Internet that was not explained in the course - simple copy loops on the strings are completely sufficient here.
- Binden Sie die Standard-Bibliothek `<string>` in Ihr Programm ein und rufen
  `double stod(const string)` (string to double) oder
  `int stoi(const string)` (string to integer)
  auf für die Umwandlung einer Zeichenkette mit dem Wert einer Komponente in eine Zahl./
  Include the standard library `<string>` in your program and call
  `double stod(const string) (string to double) or`
  `int stoi(const string) (string to integer)`
  for the conversion of a string with the value of a component to a number.

```
string number1 = "3.14"; double pi = stod(number1);
string number2 = "11"; int n = stoi(number2);
```

- Für das Einlesen der Häufigkeit der Benutzung eines Stromverbrauchers bietet sich an eine weitere Funktion zu programmieren mit einer C++-Zeichenkette als Parameter und einer Rückgabe vom Typ `Use`./
  To read in the frequency of use of a power consumer, it makes sense to program another function with a C++ string as parameter and a return of type `Use`.
- Hilfreich bei der Programmentwicklung kann sein, zusätzliche Test-Ausgaben einzelner gelesener Werte für Komponenten/Teil-Strings während des Einlesens der Daten aus einer Datei zu machen./
  It can be helpful during program development to make additional test outputs of individual read values for components/sub-strings during reading data out of the file.
- Vergessen Sie nicht, die Separatorzeichen selbst in den Zeilen jeweils zu überlesen./
  Do not forget to read over the separator characters themselves in the lines.
- Testen Sie auch mit, Daten in geschriebenen `.csv`-Dateien in einem Texteditor zu ändern, erweitern und löschen und danach wieder einzulesen./
  You can also test changing, extending and deleting data in written `.csv` files in a text editor and then reading it in again.

Beispiel Programmlauf 1/Example Program Run 1

```
CALCULATION OF AVERAGE POWER COSTS FOR A HOUSE
how many households does the house have? 5
in which city the house is located? Duisburg
what is the price for one kWh in EUR? 0.3
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> w
input file name: house0.csv
input separator character: ;
output file "house0.csv" opened...
output file "house0.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> q
```

house0.csv

```
A4;5;Duisburg;0.3
```

Beispiel Programmlauf 2/Example Program Run 2

```
CALCULATION OF AVERAGE POWER COSTS FOR A HOUSE
how many households does the house have? 2
in which city the house is located? Essen
what is the price for one kWh in EUR? 0.3
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> r
input file name: house0.csv
input separator character: ;
input file "house0.csv" opened...
file contains up to 5 households, but here only 2 are supported
input file "house0.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> q
```

Beispiel Programmlauf 3/Example Program Run 3

```
CALCULATION OF AVERAGE POWER COSTS FOR A HOUSE
how many households does the house have? 8
in which city the house is located? Essen
what is the price for one kWh in EUR? 0.5
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> r
input file name: house1.csv
input separator character: ;
input file "house1.csv" opened...
input file "house1.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> a
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> n
number of household? 1
how many square metres does the household have? 100
how many persons live in this household? 3
is hot water heated using electricity? (y(es) or n(o)) y
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> a
H O U S E H O L D   N O   1   P O W E R   C O N S U M P T I O N
------------------------------------------------------------------------
                            city: Bergisch Gladbach (at address: 0x10a1a30)
                price for one kWh: 40.00 ct/kWh
                    square metres: 100 qm
                          persons: 3
     water heated using electricity: yes
                list of consumers
------------------------------------------------------------------------
------------------------------------------------------------------------
    power consumption square meters: 900.0 kWh
      power consumption all persons: 1650.0 kWh
     total annual power consumption: 2550.0 kWh
           total annual power costs: 1020.0 EUR

q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
```

```
>> w
input file name: house2.csv
input separator character: ;
output file "house2.csv" opened...
output file "house2.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> q
```

house1.csv

```
A4;5;Bergisch Gladbach;0.4
```

house2.csv

```
A4;8;Bergisch Gladbach;0.4
household;1;Bergisch Gladbach;true;3;100
```

Beispiel Programmlauf 4/Example Program Run 4

```
CALCULATION OF AVERAGE POWER COSTS FOR A HOUSE
how many households does the house have? 8
in which city the house is located? Mülheim an der Ruhr
what is the price for one kWh in EUR? 0.5
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> r
input file name: house2.csv
input separator character: ;
input file "house2.csv" opened...
input file "house2.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> a
H O U S E H O L D   N O   1   P O W E R   C O N S U M P T I O N
------------------------------------------------------------------------
                             city: Bergisch Gladbach (at address: 0x26bef50)
                price for one kWh: 40.00 ct/kWh
                    square metres: 100 qm
                          persons: 3
    water heated using electricity: yes
                list of consumers
------------------------------------------------------------------------
------------------------------------------------------------------------
   power consumption square meters: 900.0 kWh
     power consumption all persons: 1650.0 kWh
    total annual power consumption: 2550.0 kWh
          total annual power costs: 1020.0 EUR

q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> n
number of household? 2
how many square metres does the household have? 50
how many persons live in this household? 2
is hot water heated using electricity? (y(es) or n(o)) n
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> a
H O U S E H O L D   N O   1   P O W E R   C O N S U M P T I O N
------------------------------------------------------------------------
                             city: Bergisch Gladbach (at address: 0x26bef50)
                price for one kWh: 40.00 ct/kWh
                    square metres: 100 qm
                          persons: 3
    water heated using electricity: yes
                list of consumers
------------------------------------------------------------------------
```

```
------------------------------------------------------------------------
    power consumption square meters: 900.0 kWh
      power consumption all persons: 1650.0 kWh
     total annual power consumption: 2550.0 kWh
           total annual power costs: 1020.0 EUR

H O U S E H O L D   N O   2   P O W E R   C O N S U M P T I O N
------------------------------------------------------------------------
                             city: Bergisch Gladbach (at address: 0x26bf100)
                 price for one kWh: 40.00 ct/kWh
                     square metres: 50 qm
                           persons: 2
     water heated using electricity: no
                 list of consumers
------------------------------------------------------------------------
------------------------------------------------------------------------
    power consumption square meters: 450.0 kWh
      power consumption all persons: 400.0 kWh
     total annual power consumption: 850.0 kWh
           total annual power costs: 340.0 EUR

q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> i
number of household? 1
what is the description of the power consumer? LTE Router
how many watt it will have? 24
how many watt standby it will have? 0
how often it will be used?
daily  (d)
mo_fr  (m)
once   (o)
sa_su  (s)
weekly (w)? d
how many hours it will be operating then? 24
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> a
H O U S E H O L D   N O   1   P O W E R   C O N S U M P T I O N
------------------------------------------------------------------------
                             city: Bergisch Gladbach (at address: 0x26bef50)
                 price for one kWh: 40.00 ct/kWh
                     square metres: 100 qm
                           persons: 3
     water heated using electricity: yes
                 list of consumers
------------------------------------------------------------------------
                               1: LTE Router (at address: 0x26bf140)
                 power consumption: 24.00 W
          power consumption standby: 0.00 W
                annual hours of use: 8760.00 h
             annual hours of standby: 0.00 h
                  annual consumption: 210.2 kWh
                        annual costs: 84.10 EUR
------------------------------------------------------------------------
    power consumption square meters: 900.0 kWh
      power consumption all persons: 1650.0 kWh
     total annual power consumption: 2760.2 kWh
           total annual power costs: 1104.1 EUR

H O U S E H O L D   N O   2   P O W E R   C O N S U M P T I O N
------------------------------------------------------------------------
```

```
                            city: Bergisch Gladbach (at address: 0x26bf100)
                price for one kWh: 40.00 ct/kWh
                    square metres: 50 qm
                          persons: 2
    water heated using electricity: no
                list of consumers
-----------------------------------------------------------------------
-----------------------------------------------------------------------
    power consumption square meters: 450.0 kWh
      power consumption all persons: 400.0 kWh
     total annual power consumption: 850.0 kWh
           total annual power costs: 340.0 EUR

q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> w
input file name: house3.csv
input separator character: #
output file "house3.csv" opened...
output file "house3.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> q
```

house3.csv

```
A4#8#Bergisch Gladbach#0.4
household#1#Bergisch Gladbach#true#3#100
consumer#LTE Router#24#daily#24#0
household#2#Bergisch Gladbach#false#2#50
```

Beispiel Programmlauf 5/Example Program Run 5

```
CALCULATION OF AVERAGE POWER COSTS FOR A HOUSE
how many households does the house have? 5
in which city the house is located? Bochum
what is the price for one kWh in EUR? 0.25
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> r
input file name: house4.csv
input separator character: ;
input file "house4.csv" opened...
input file "house4.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> n
number of household? 1
how many square metres does the household have? 50
how many persons live in this household? 2
is hot water heated using electricity? (y(es) or n(o)) y
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> c
number of household from which to copy consumers? 2
number of household to copy to? 1
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> c
number of household from which to copy consumers? 3
number of household to copy to? 1
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> a
H O U S E H O L D   N O   1   P O W E R   C O N S U M P T I O N
-----------------------------------------------------------------------
                            city: Bergisch Gladbach (at address: 0x6ef1f0)
                price for one kWh: 30.00 ct/kWh
                    square metres: 50 qm
                          persons: 2
    water heated using electricity: yes
                list of consumers
-----------------------------------------------------------------------
```

```
                          1: Dish Washer (at address: 0x6ef320)
         power consumption: 250.00 W
power consumption standby: 0.00 W
       annual hours of use: 1277.50 h
  annual hours of standby: 7482.50 h
        annual consumption: 319.4 kWh
              annual costs: 95.81 EUR
                          2: LED TV (at address: 0x6ef370)
         power consumption: 70.00 W
power consumption standby: 0.50 W
       annual hours of use: 208.00 h
  annual hours of standby: 8552.00 h
        annual consumption: 18.8 kWh
              annual costs: 5.65 EUR
                          3: Washing Machine (at address: 0x6ef230)
         power consumption: 2000.00 W
power consumption standby: 0.00 W
       annual hours of use: 104.00 h
  annual hours of standby: 8656.00 h
        annual consumption: 208.0 kWh
              annual costs: 62.40 EUR
                          4: Office PC (at address: 0x6ef280)
         power consumption: 200.00 W
power consumption standby: 0.50 W
       annual hours of use: 2210.00 h
  annual hours of standby: 6550.00 h
        annual consumption: 445.3 kWh
              annual costs: 133.58 EUR
                          5: Router (at address: 0x6ef2d0)
         power consumption: 10.00 W
power consumption standby: 0.00 W
       annual hours of use: 8760.00 h
  annual hours of standby: 0.00 h
        annual consumption: 87.6 kWh
              annual costs: 26.28 EUR
------------------------------------------------------------------------
    power consumption square meters: 450.0 kWh
      power consumption all persons: 1100.0 kWh
     total annual power consumption: 2629.1 kWh
           total annual power costs: 788.7 EUR

H O U S E H O L D   N O   2   P O W E R   C O N S U M P T I O N
------------------------------------------------------------------------
                           city: Bergisch Gladbach (at address: 0x6eef50)
         price for one kWh: 30.00 ct/kWh
             square metres: 200 qm
                   persons: 5
    water heated using electricity: yes
         list of consumers
------------------------------------------------------------------------
                           1: Washing Machine (at address: 0x6eefc0)
         power consumption: 2000.00 W
power consumption standby: 0.00 W
       annual hours of use: 104.00 h
  annual hours of standby: 8656.00 h
        annual consumption: 208.0 kWh
              annual costs: 62.40 EUR
                          2: Office PC (at address: 0x6ef010)
         power consumption: 200.00 W
power consumption standby: 0.50 W
       annual hours of use: 2210.00 h
  annual hours of standby: 6550.00 h
        annual consumption: 445.3 kWh
              annual costs: 133.58 EUR
                          3: Router (at address: 0x6ef090)
         power consumption: 10.00 W
power consumption standby: 0.00 W
       annual hours of use: 8760.00 h
  annual hours of standby: 0.00 h
        annual consumption: 87.6 kWh
              annual costs: 26.28 EUR
------------------------------------------------------------------------
    power consumption square meters: 1800.0 kWh
      power consumption all persons: 2750.0 kWh
     total annual power consumption: 5290.9 kWh
           total annual power costs: 1587.3 EUR
```

```
H O U S E H O L D   N O   3   P O W E R   C O N S U M P T I O N
-----------------------------------------------------------------------
                            city: Bergisch Gladbach (at address: 0x6ef0e0)
                price for one kWh: 30.00 ct/kWh
                    square metres: 100 qm
                          persons: 2
    water heated using electricity: no
                list of consumers
-----------------------------------------------------------------------
                               1: Dish Washer (at address: 0x6ef150)
                power consumption: 250.00 W
          power consumption standby: 0.00 W
                annual hours of use: 1277.50 h
            annual hours of standby: 7482.50 h
                 annual consumption: 319.4 kWh
                       annual costs: 95.81 EUR
                               2: LED TV (at address: 0x6ef1a0)
                power consumption: 70.00 W
          power consumption standby: 0.50 W
                annual hours of use: 208.00 h
            annual hours of standby: 8552.00 h
                 annual consumption: 18.8 kWh
                       annual costs: 5.65 EUR
-----------------------------------------------------------------------
    power consumption square meters: 900.0 kWh
      power consumption all persons: 400.0 kWh
     total annual power consumption: 1638.2 kWh
           total annual power costs: 491.5 EUR

q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> w
input file name: house5.csv
input separator character: ,
output file "house5.csv" opened...
output file "house5.csv" closed
q quit
i input power consumer
u move up power consumer
p print household
a print all households
n new household
c copy all consumers (added to already existing ones)
r read data from file
w write data into file
>> q
```

house4.csv

```
A4;5;Bergisch Gladbach;0.3;;
household;2;Bergisch Gladbach;true;5;200
consumer;Washing Machine;2;weekly;2000;0
consumer;Office PC;8.5;Monday to Friday;200;0.5
consumer;Router;24;daily;10;0
household;3;Bergisch Gladbach;false;2;100
consumer;Dish Washer;3.5;daily;250;0
consumer;LED TV;2;Saturday and Sunday;70;0.5
```

house5.csv

```
A4,5,Bergisch Gladbach,0.3
household,1,Bergisch Gladbach,true,2,50
consumer,Dish Washer,3.5,daily,250,0
consumer,LED TV,2,Saturday and Sunday,70,0.5
consumer,Washing Machine,2,weekly,2000,0
consumer,Office PC,8.5,Monday to Friday,200,0.5
consumer,Router,24,daily,10,0
household,2,Bergisch Gladbach,true,5,200
consumer,Washing Machine,2,weekly,2000,0
consumer,Office PC,8.5,Monday to Friday,200,0.5
consumer,Router,24,daily,10,0
household,3,Bergisch Gladbach,false,2,100
consumer,Dish Washer,3.5,daily,250,0
consumer,LED TV,2,Saturday and Sunday,70,0.5
```

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