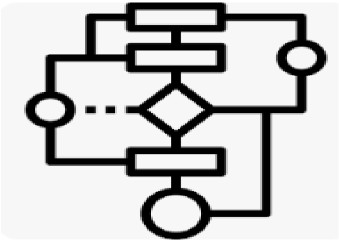
Algorithms and Data Structure 01



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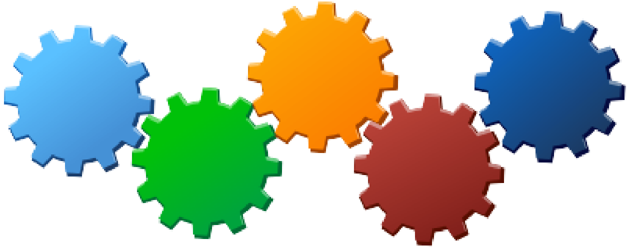


Chapter 06 Structures

In many computer science probelem the data concerns the same entity:

Image a data bout a car :

- Model
- Manifacture
- Date
- Regestration number
- Motor type
- Etc.
-

Chapter 06 Structures

All those information represente a singel **car** in our program, do we need to declare a varaibles for each of those information, knowing that they are in **different type**?

What if we need to manage many **cars** in our program ?

Chapter 06 Structures

We need a machanism that allow us to group informaion which concrerns the same entity in the same place.
We can do this using **Structure** !

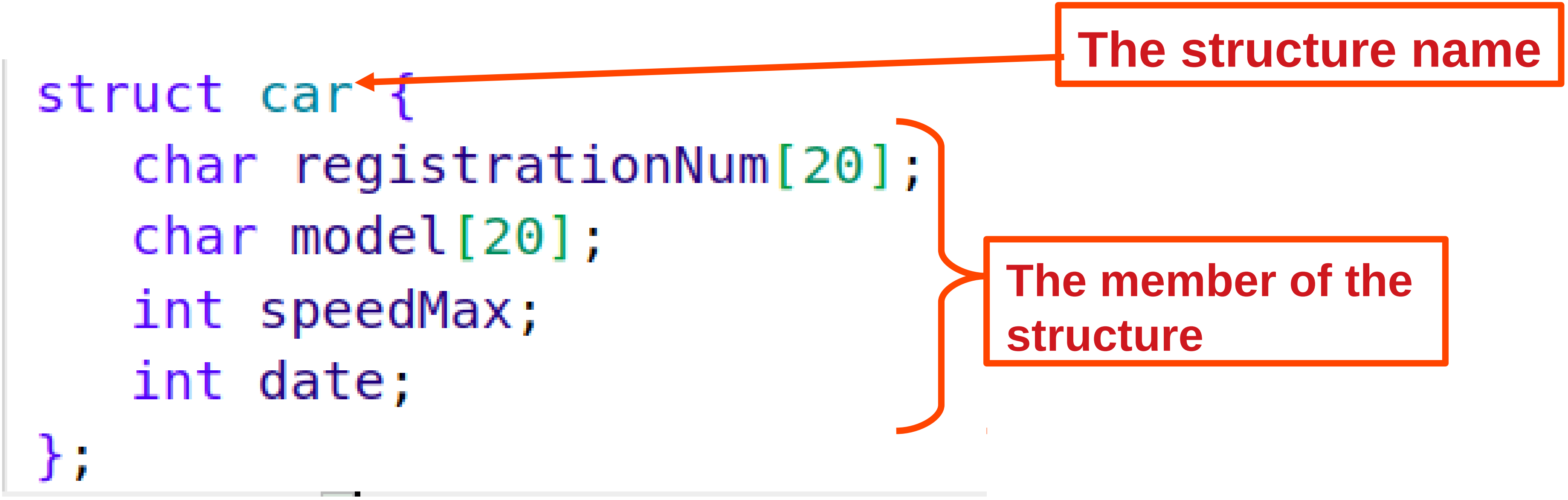
Structures (also called structs) are a way to **group several** related **variables** into **one place**.

Unlike an **array**, a structure can contain many **different data types** (int, float, char, etc.).

How we use structure ?

Structure helps to :

- Group information together
- Declare specific (personalized) data type.



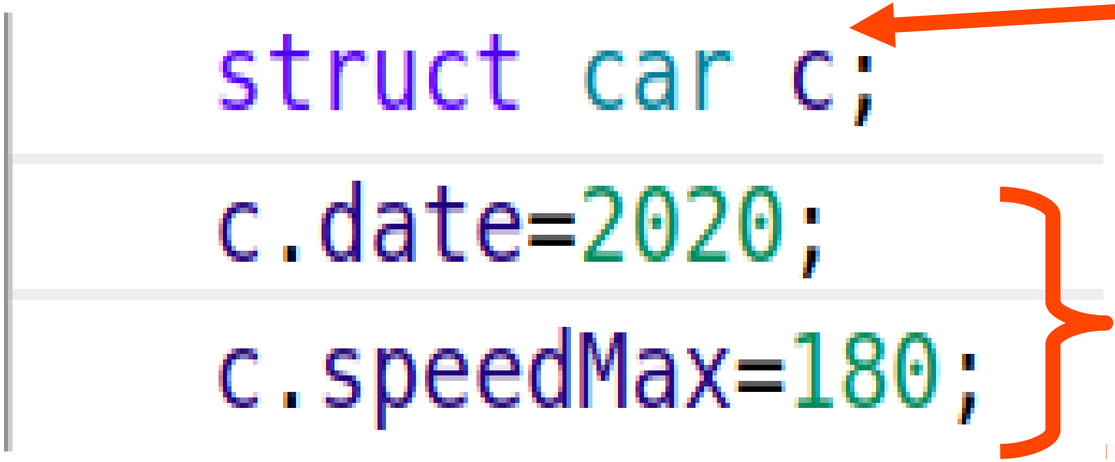
```
struct car {
    char registrationNum[20];
    char model[20];
    int speedMax;
    int date;
};
```

The structure name

The member of the structure

How we use structure ?

Once declared it could be used just like any other type.

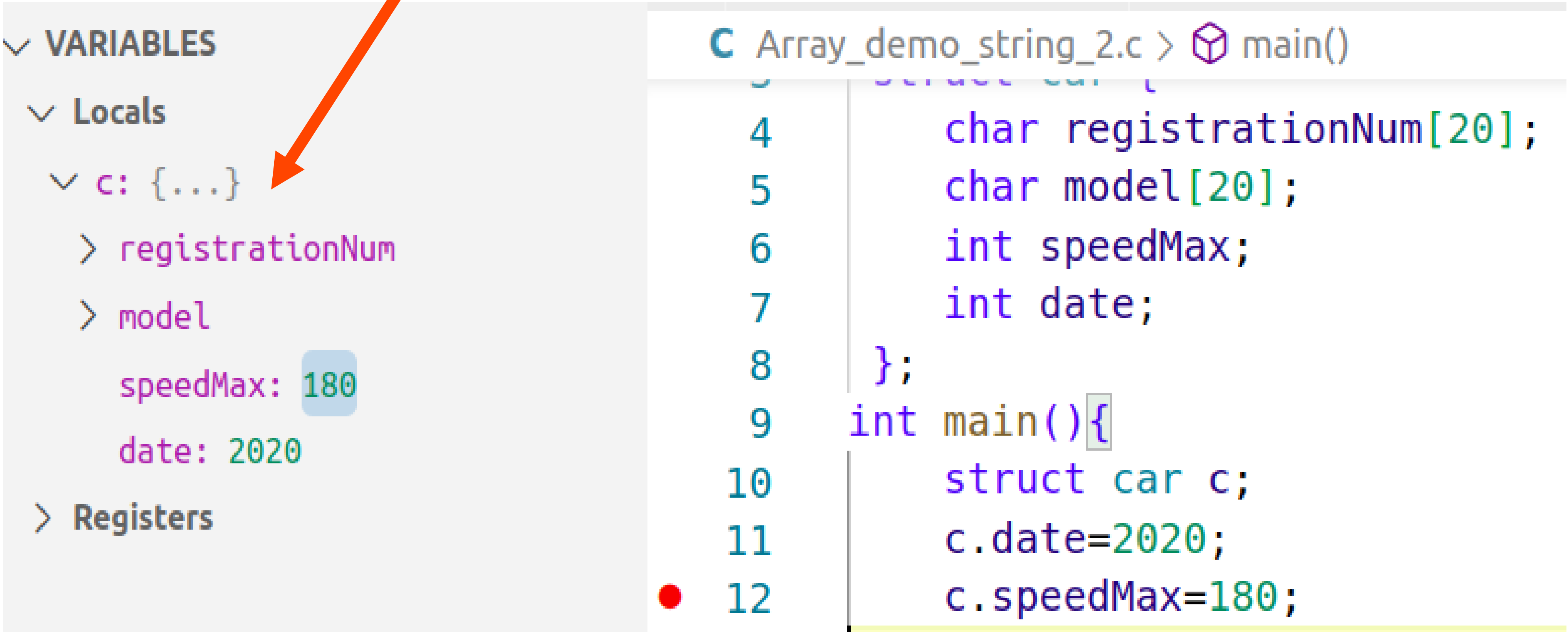


```
struct car c;
c.date=2020;
c.speedMax=180;
```

Declaring a variable with
The struct type

Accessing the member of the
Declared variable using “.”

How structure are represented in the memory of the coputer

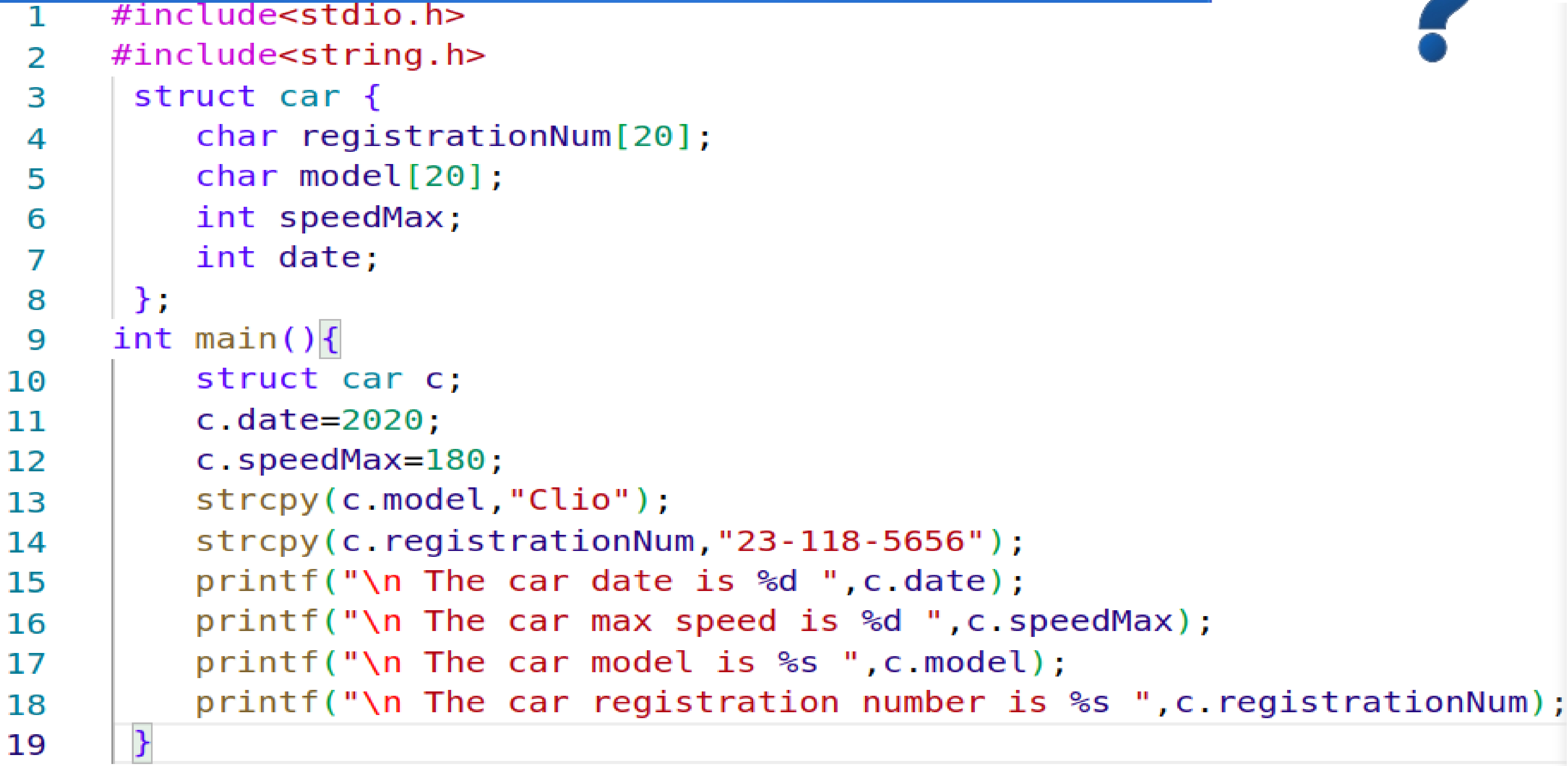


```
VARIABLES
  Locals
    c: {...}
      > registrationNum
      > model
        speedMax: 180
        date: 2020
  > Registers
```

C Array_demo_string_2.c > main()

```c
struct car {
    char registrationNum[20];
    char model[20];
    int speedMax;
    int date;
 };
int main(){
    struct car c;
    c.date=2020;
    c.speedMax=180;
```

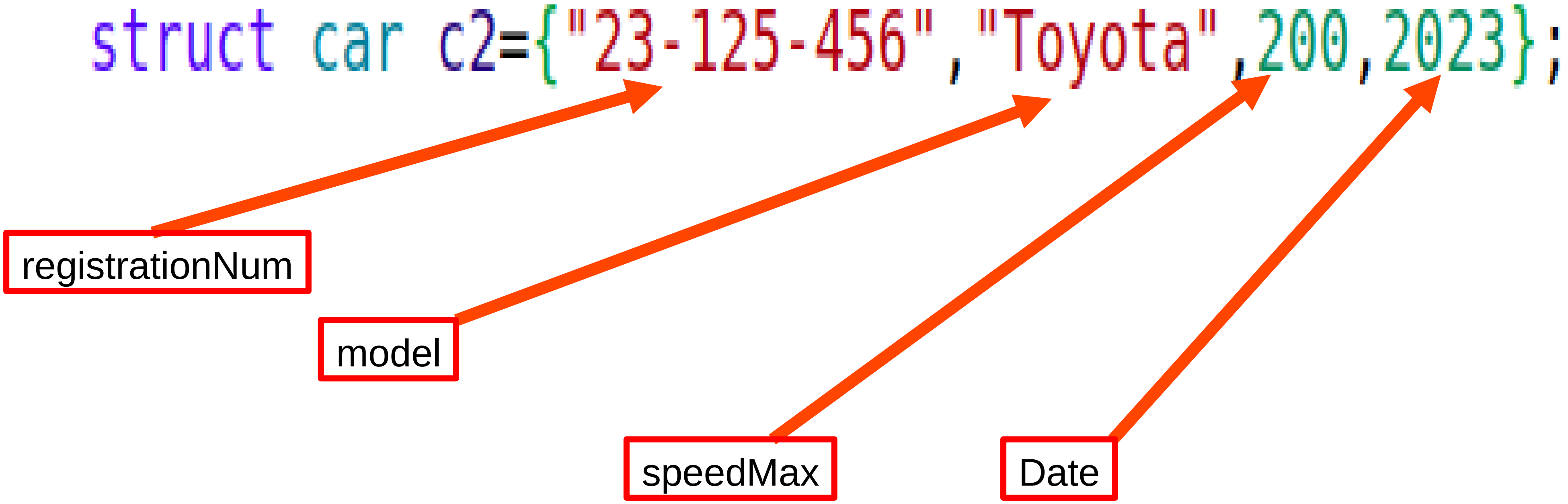
Demonstration #1



```c
#include<stdio.h>
#include<string.h>
 struct car {
    char registrationNum[20];
    char model[20];
    int speedMax;
    int date;
 };
int main(){
    struct car c;
    c.date=2020;
    c.speedMax=180;
    strcpy(c.model,"Clio");
    strcpy(c.registrationNum,"23-118-5656");
    printf("\n The car date is %d ",c.date);
    printf("\n The car max speed is %d ",c.speedMax);
    printf("\n The car model is %s ",c.model);
    printf("\n The car registration number is %s ",c.registrationNum);
 }
```

Simpler Syntax

By employing this syntax, we can initialize a struct by specifying the value of each member.



```
struct car c2={"23-125-456","Toyota",200,2023};
```

registrationNum

model

speedMax

Date

Demonstration #2

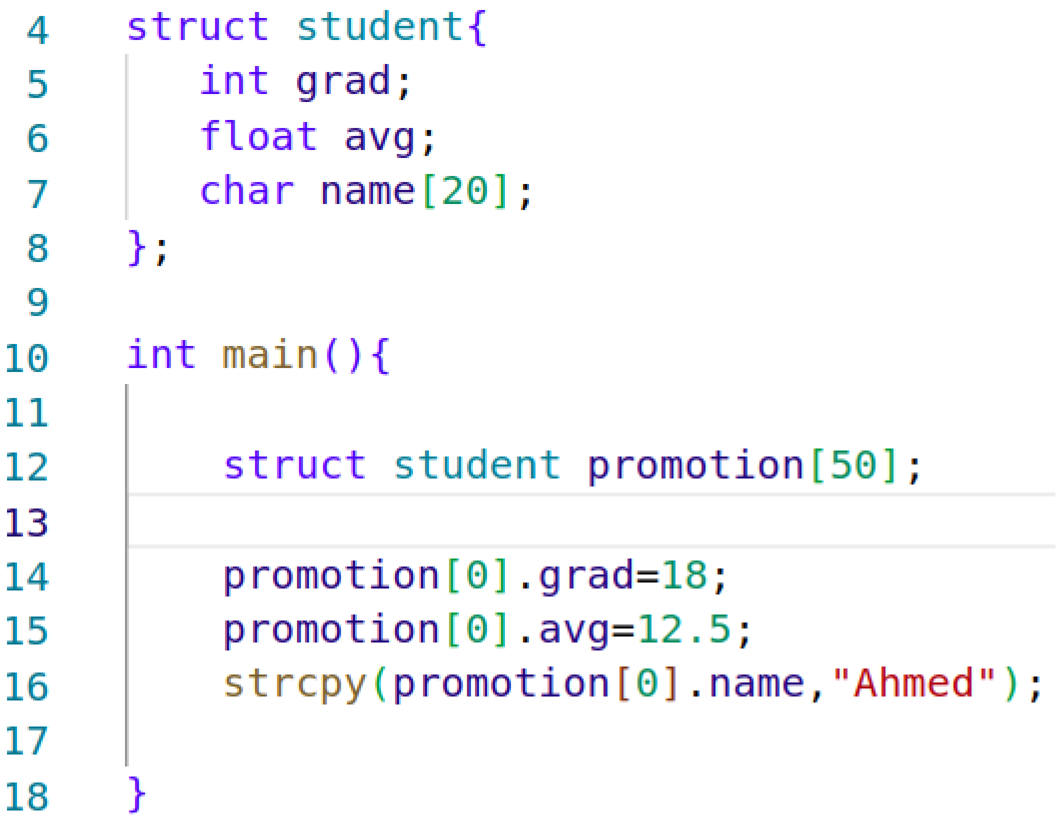
Write a program which use structure to store data about the student :

- **Speciality**
- **Date first registration**
- **Immatriculation**
- **First name**
- **Last name**
- **Age**

Using Structures in arrays

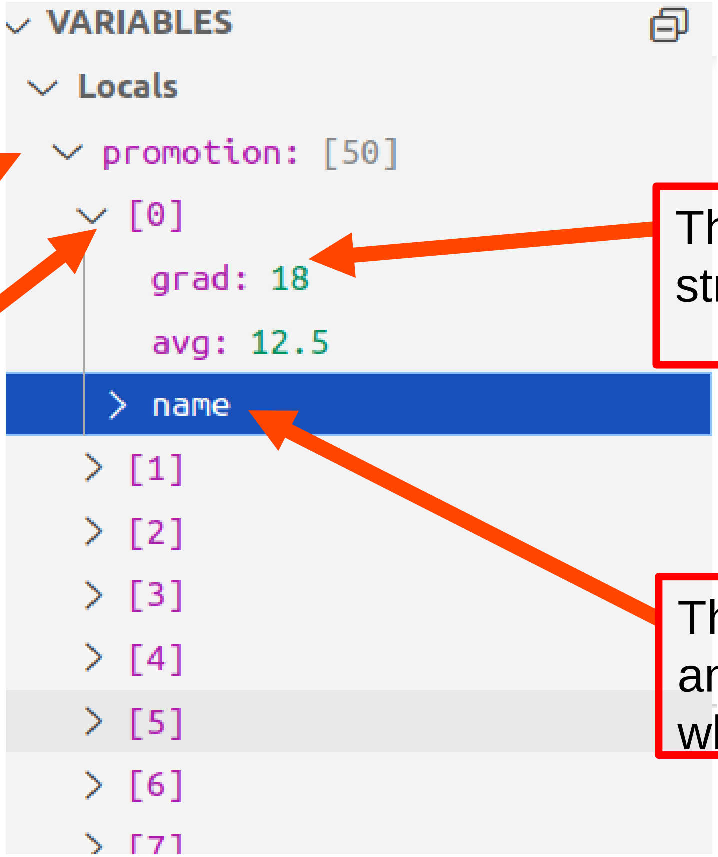
The structure once declared can be used as any other types, including the use them in array. We can declare an array in which every cell contains a structures. See the example,

Promotion is an array of 20, each cell contains a strcuture as declared **struct student**



```
struct student{
   int grad;
   float avg;
   char name[20];
};

int main(){

    struct student promotion[50];

    promotion[0].grad=18;
    promotion[0].avg=12.5;
    strcpy(promotion[0].name,"Ahmed");

}
```

Using Structures in arrays



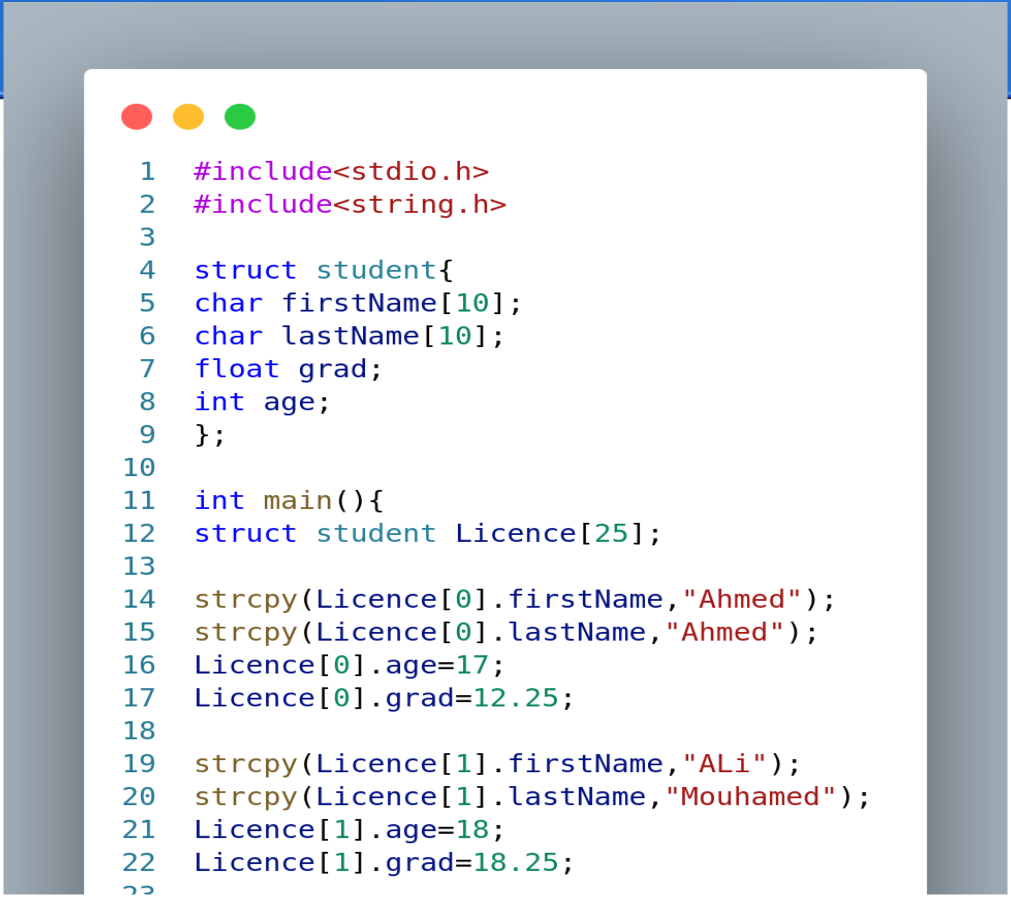
```
VARIABLES
  Locals
    promotion: [50]
      [0]
        grad: 18
        avg: 12.5
        > name
      > [1]
      > [2]
      > [3]
      > [4]
      > [5]
      > [6]
      > [7]
```

The array

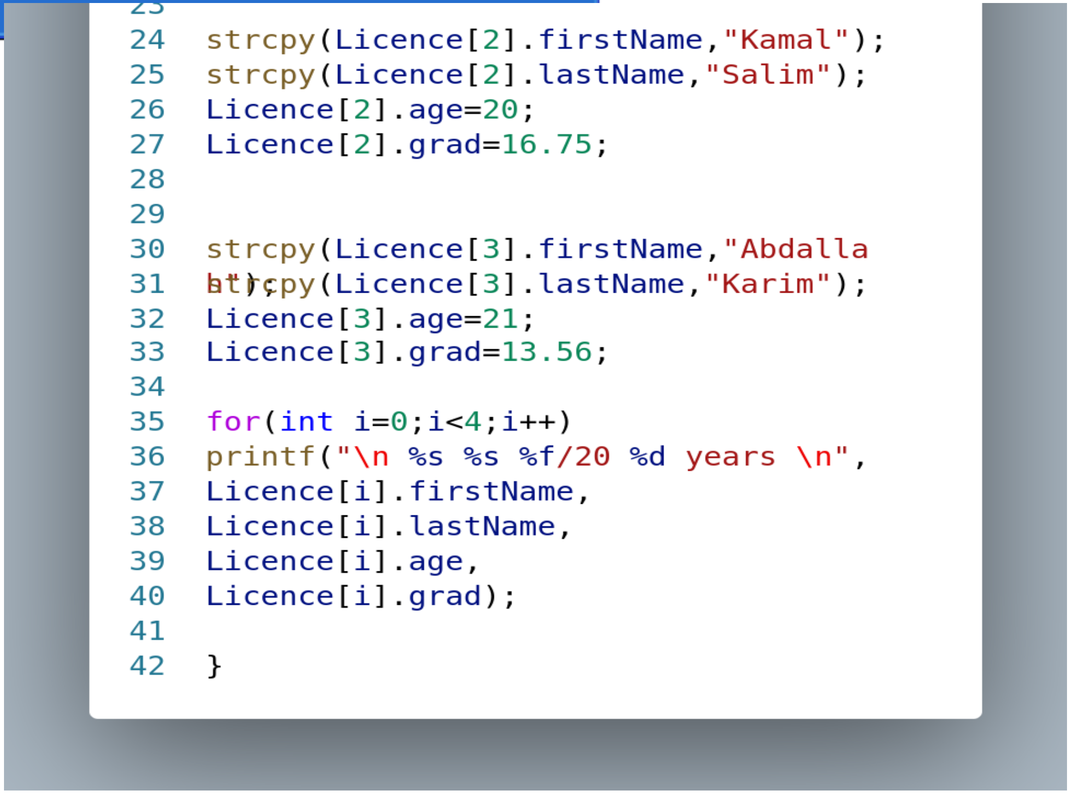
The content of a cell

The members of the structure

The members here is an array of char, which is a string.



```c
#include<stdio.h>
#include<string.h>

struct student{
char firstName[10];
char lastName[10];
float grad;
int age;
};

int main(){
struct student Licence[25];

strcpy(Licence[0].firstName,"Ahmed");
strcpy(Licence[0].lastName,"Ahmed");
Licence[0].age=17;
Licence[0].grad=12.25;

strcpy(Licence[1].firstName,"ALi");
strcpy(Licence[1].lastName,"Mouhamed");
Licence[1].age=18;
Licence[1].grad=18.25;
```



```c
strcpy(Licence[2].firstName,"Kamal");
strcpy(Licence[2].lastName,"Salim");
Licence[2].age=20;
Licence[2].grad=16.75;


strcpy(Licence[3].firstName,"Abdallah");
strcpy(Licence[3].lastName,"Karim");
Licence[3].age=21;
Licence[3].grad=13.56;

for(int i=0;i<4;i++)
printf("\n %s %s %f/20 %d years \n",
Licence[i].firstName,
Licence[i].lastName,
Licence[i].age,
Licence[i].grad);

}
```