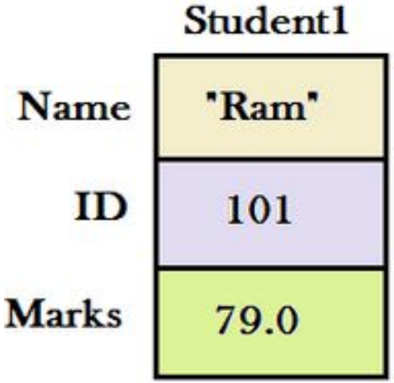


	Student1
Name	"Ram"
ID	101
Marks	79.0

Structures

Week 13

Sumaiyah Zahid

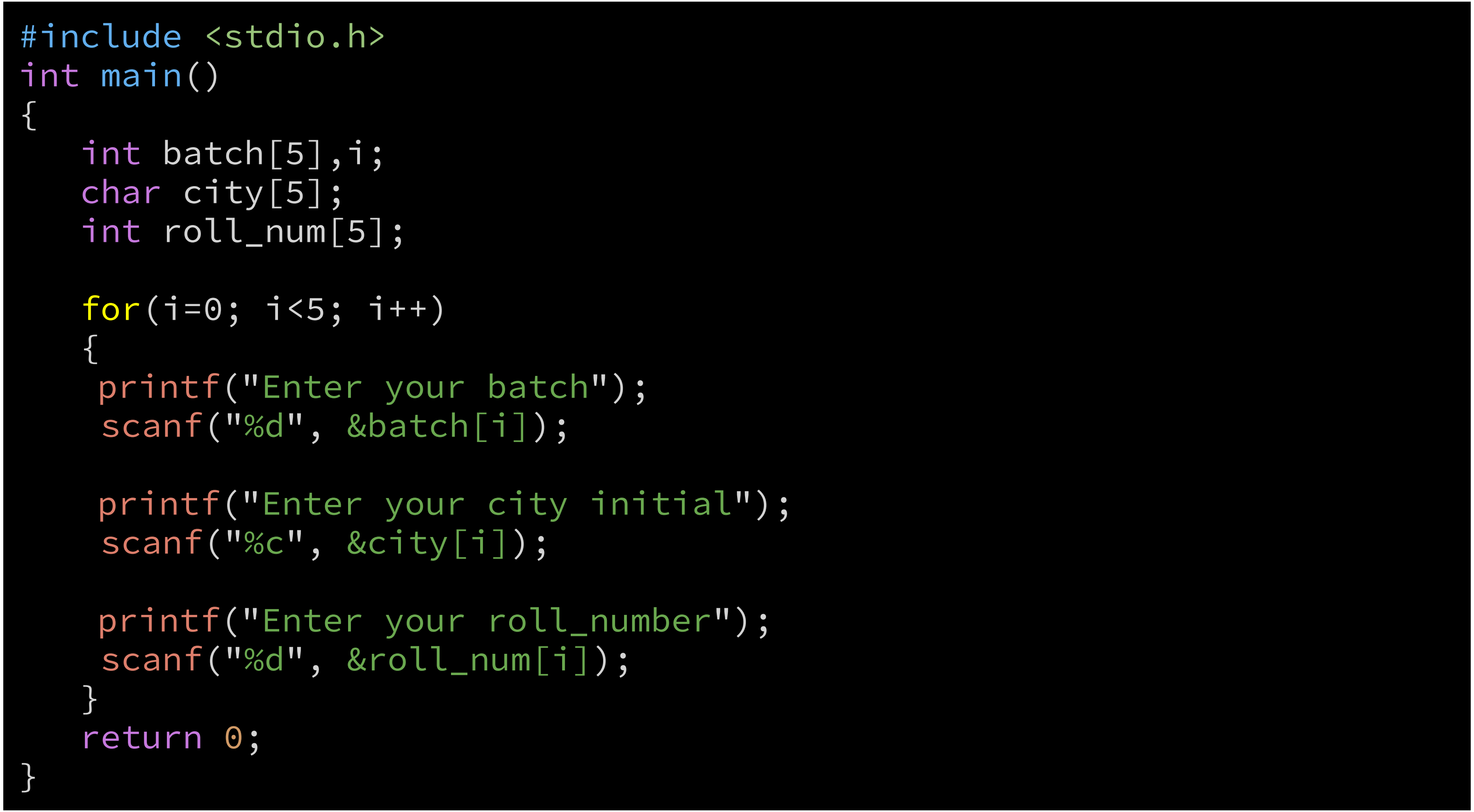
Arrays VS Structures

Array stores multiple data of the same data type under the same name.
Structures store multiple data of different data type under the same name and it can be customized.

Practice Question

Make a c program to store roll number of 5 students in year, city, roll_num variables.

```
batch    =  21
city     =  k
roll_num =  4325
```



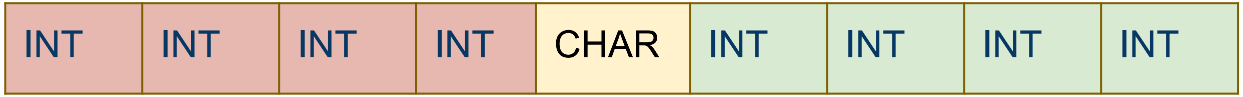
```
#include <stdio.h>
int main()
{
   int batch[5],i;
   char city[5];
   int roll_num[5];

   for(i=0; i<5; i++)
   {
    printf("Enter your batch");
    scanf("%d", &batch[i]);

    printf("Enter your city initial");
    scanf("%c", &city[i]);

    printf("Enter your roll_number");
    scanf("%d", &roll_num[i]);
   }
   return 0;
}
```

Structures

This step is customizing:

i.e. “Defining your own data type”.

```
struct fast_roll_num
{
int batch;
char city;
int roll_num;
};
```



INT	INT	INT	INT	CHAR	INT	INT	INT	INT

Structures

INT	INT	INT	INT	CHAR	INT	INT	INT	INT

```
struct fast_roll_num student1;          // Declaration

student1.batch=21;                      //  Initialization

student1.city='k';

student1.roll_num=2493;


struct fast_roll_num student2={21,'k',2493}; // Declaration &
Initialization
```

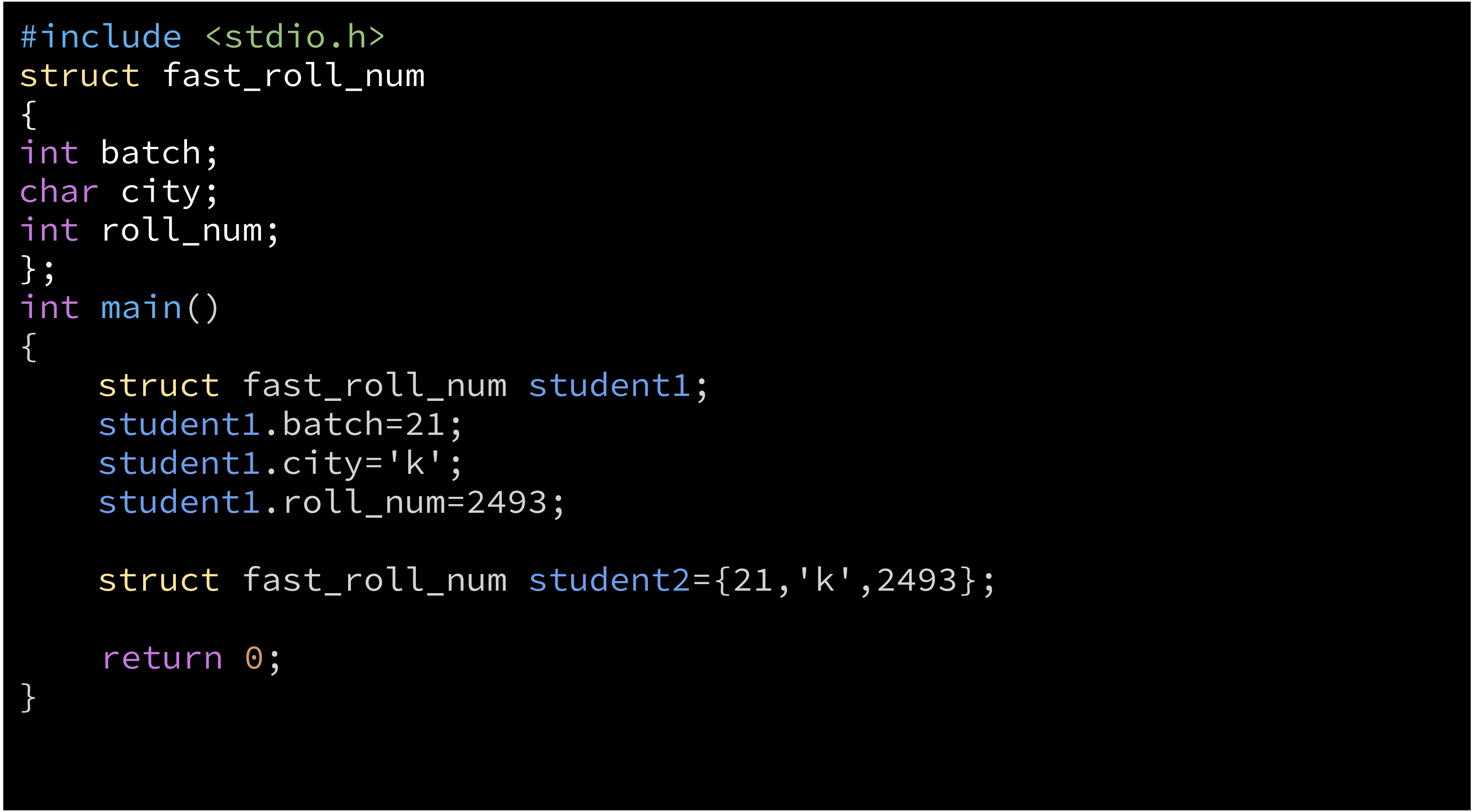
Structures

INT	INT	INT	INT	CHAR	INT	INT	INT	INT

Batch, city & roll_num are known as Members.

(.) operator is known as Member Access Operator.

```
struct fast_roll_num student1;
student1.batch=21;
student1.city='k';
student1.roll_num=2493;

printf (“%d”, sizeof(fast_roll_num)); // What’s the output?
```

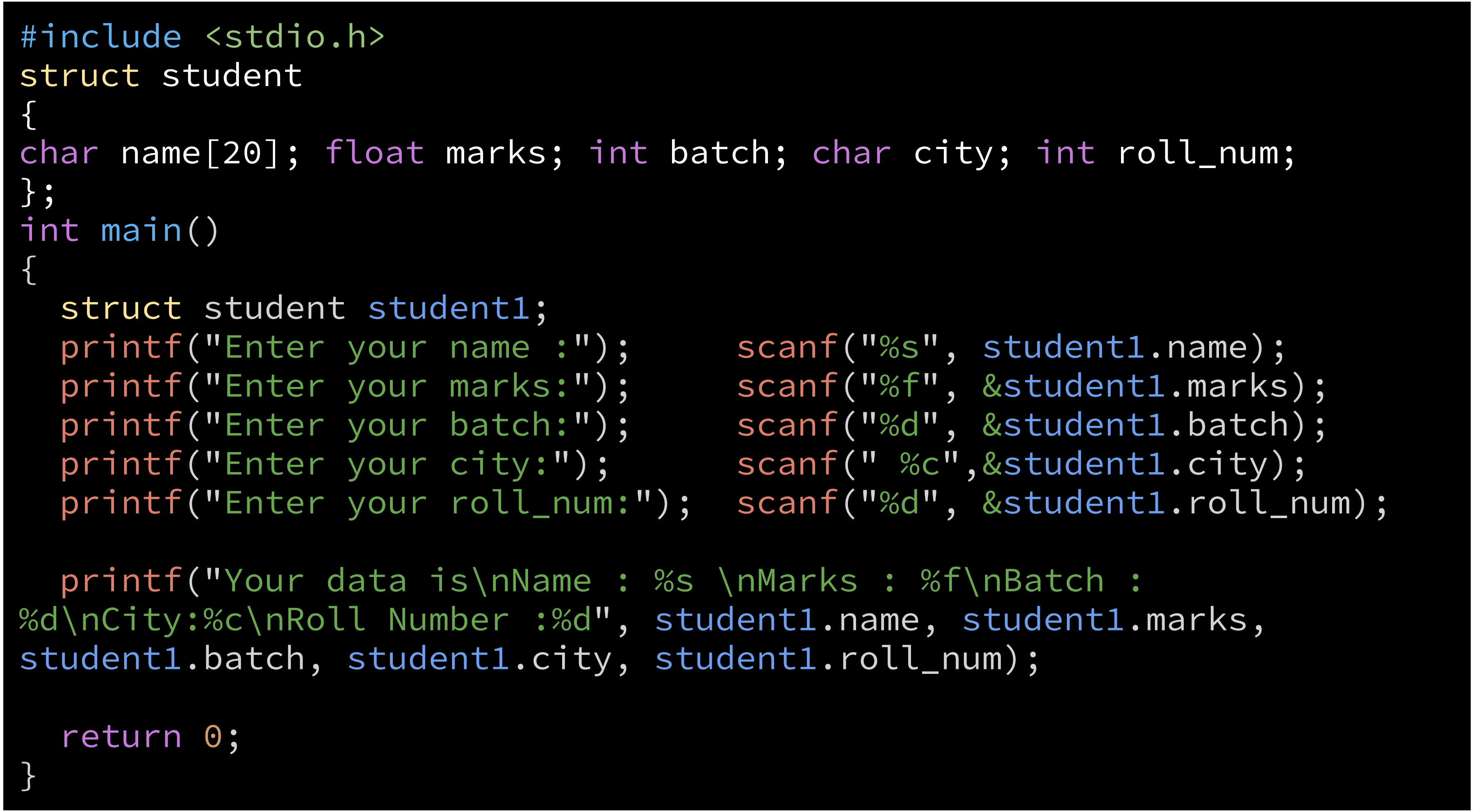


```c
#include <stdio.h>
struct fast_roll_num
{
int batch;
char city;
int roll_num;
};
int main()
{
    struct fast_roll_num student1;
    student1.batch=21;
    student1.city='k';
    student1.roll_num=2493;

    struct fast_roll_num student2={21,'k',2493};

    return 0;
}
```

Practice Question

Make a c program to record data of students which includes their name, marks and roll number.

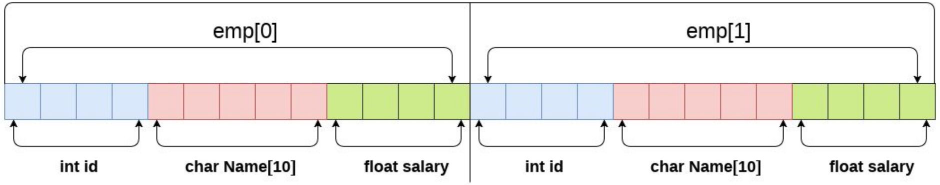
```
name     =  ”Your_Name”
marks    =  45.7
batch    =  24
city     =  k
roll_num =  2493
```



```
#include <stdio.h>
struct student
{
char name[20]; float marks; int batch; char city; int roll_num;
};
int main()
{
  struct student student1;
  printf("Enter your name :");     scanf("%s", student1.name);
  printf("Enter your marks:");     scanf("%f", &student1.marks);
  printf("Enter your batch:");     scanf("%d", &student1.batch);
  printf("Enter your city:");      scanf(" %c",&student1.city);
  printf("Enter your roll_num:");  scanf("%d", &student1.roll_num);

  printf("Your data is\nName : %s \nMarks : %f\nBatch :
%d\nCity:%c\nRoll Number :%d", student1.name, student1.marks,
student1.batch, student1.city, student1.roll_num);

  return 0;
}
```

Array Of Structures

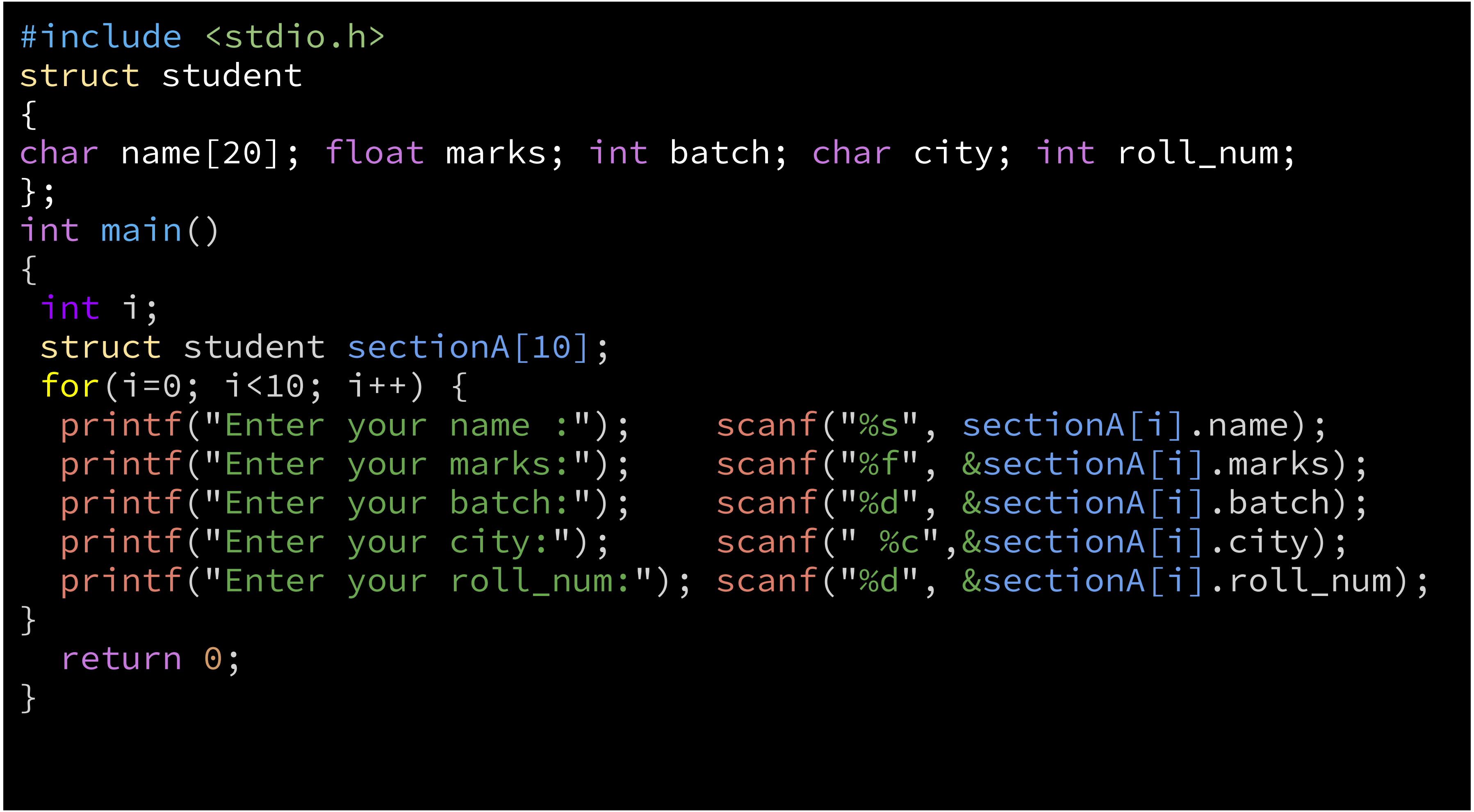
```
struct student
{
char name[20];
float marks;
int batch;
char city;
int roll_num;
};
struct student sectionK[5];
```



Practice Question

Make a c program to record data of 10 students which includes their name, marks and roll number.

```
name     =  ”Your_Name”
marks    =  45.7
batch    =  21
city     =  k
roll_num =  2493
```

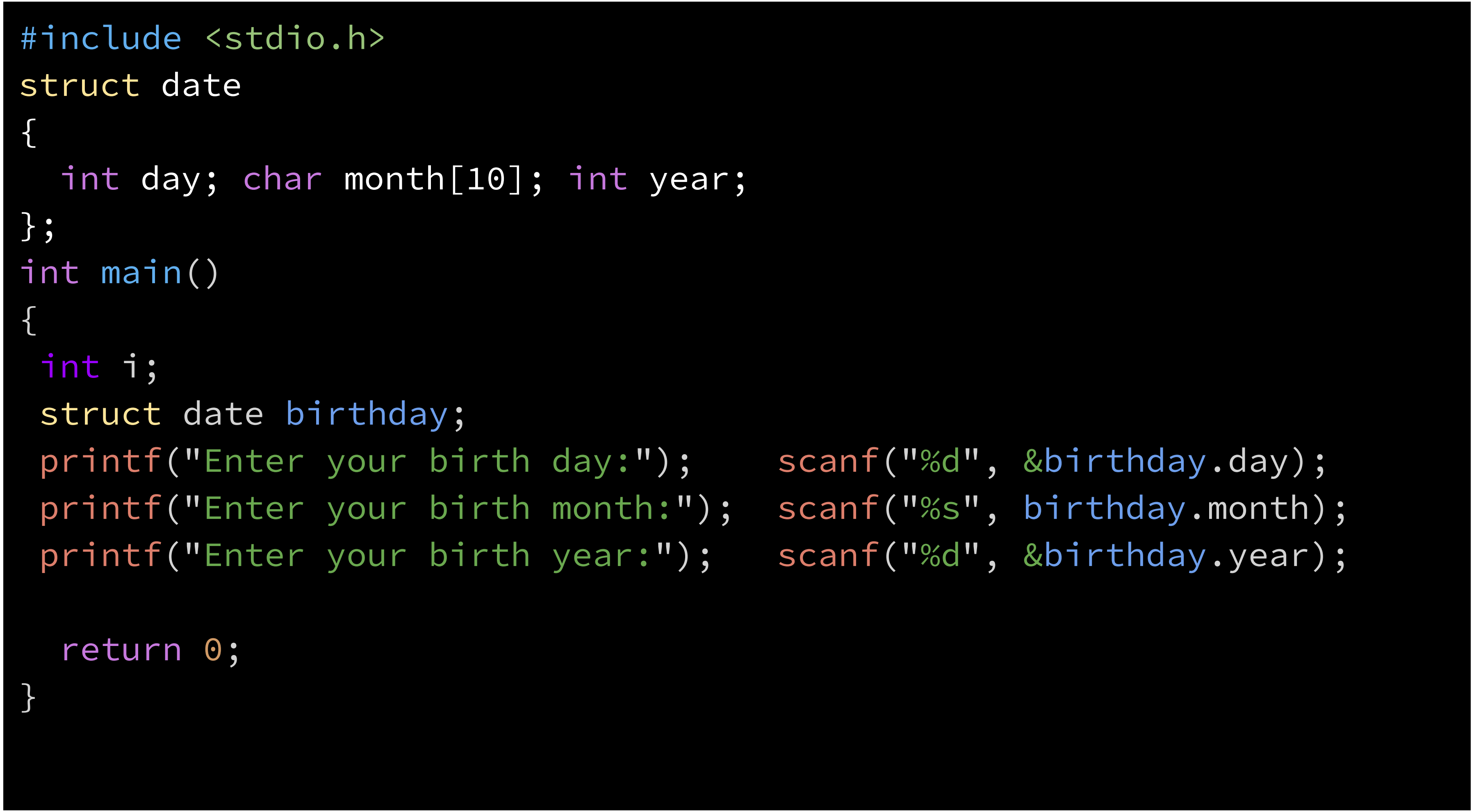


```
#include <stdio.h>
struct student
{
char name[20]; float marks; int batch; char city; int roll_num;
};
int main()
{
 int i;
 struct student sectionA[10];
 for(i=0; i<10; i++) {
  printf("Enter your name :");    scanf("%s", sectionA[i].name);
  printf("Enter your marks:");    scanf("%f", &sectionA[i].marks);
  printf("Enter your batch:");    scanf("%d", &sectionA[i].batch);
  printf("Enter your city:");     scanf(" %c",&sectionA[i].city);
  printf("Enter your roll_num:"); scanf("%d", &sectionA[i].roll_num);
}
  return 0;
}
```

Practice Question

Make a c program to record date in a structure having the following format:

```
day      =  1
month    =  “December”
year     =  2021
```



```c
#include <stdio.h>
struct date
{
  int day; char month[10]; int year;
};
int main()
{
 int i;
 struct date birthday;
 printf("Enter your birth day:");     scanf("%d", &birthday.day);
 printf("Enter your birth month:");   scanf("%s", birthday.month);
 printf("Enter your birth year:");    scanf("%d", &birthday.year);

  return 0;
}
```

Structures

Struct variables may be declared at the same time the struct is defined.

```
struct date

{

int day;

char month[10];

int year;

} birthday, college_joining_date;
```

Structures

typedef struct is used to write concise code.

```
typedef struct date
{
int day; char month[10]; int year;
} date; // this is renamed variable
```

Instead of `struct date birthday` you can write `date birthday;`

Structures

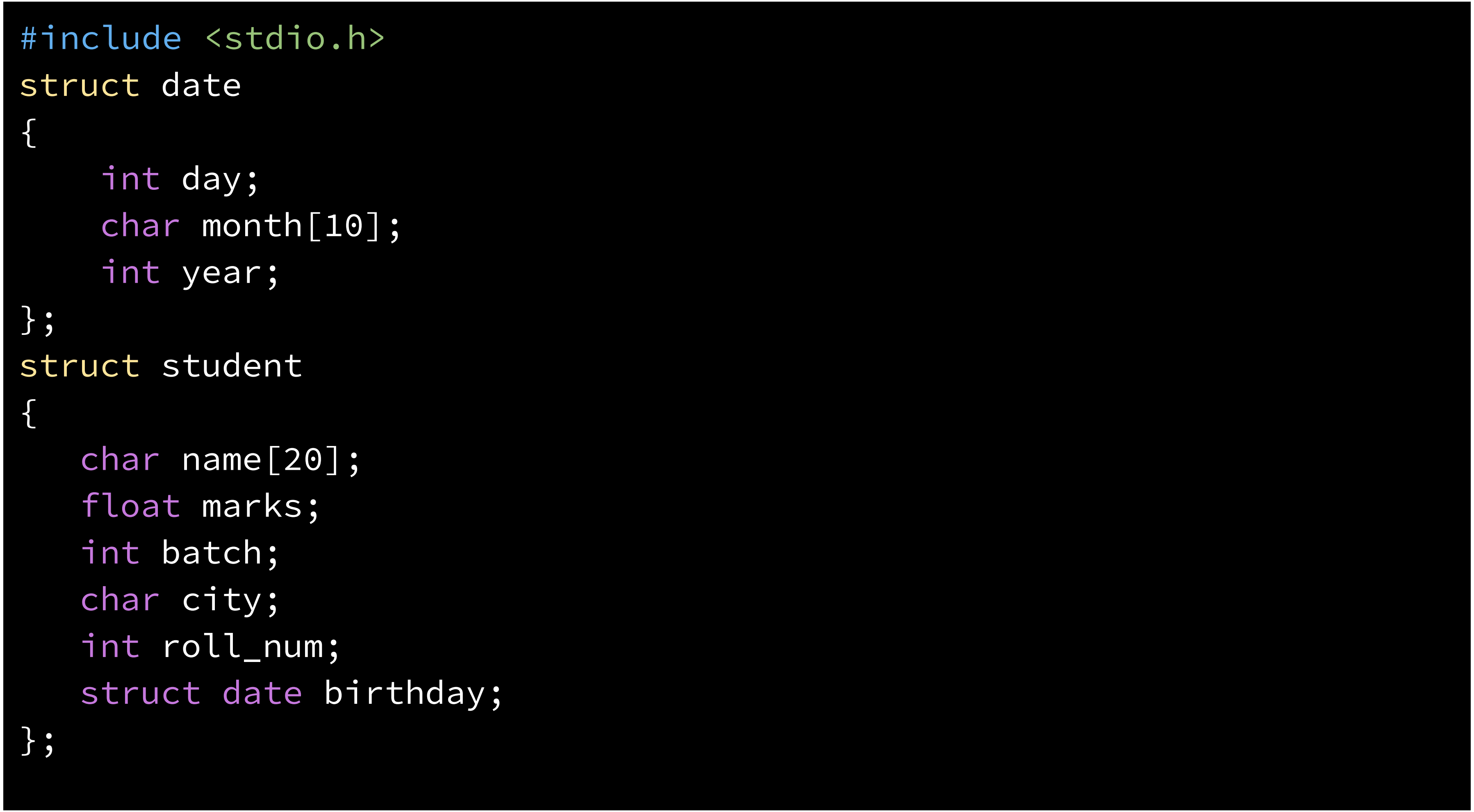
One struct value can be assigned to another by just using =

```
typedef struct date
{
int day; char month[10]; int year;
} date ;

date  college_last_date={10,’May’,2021};
date  university_joining_date = college_last_date;
```

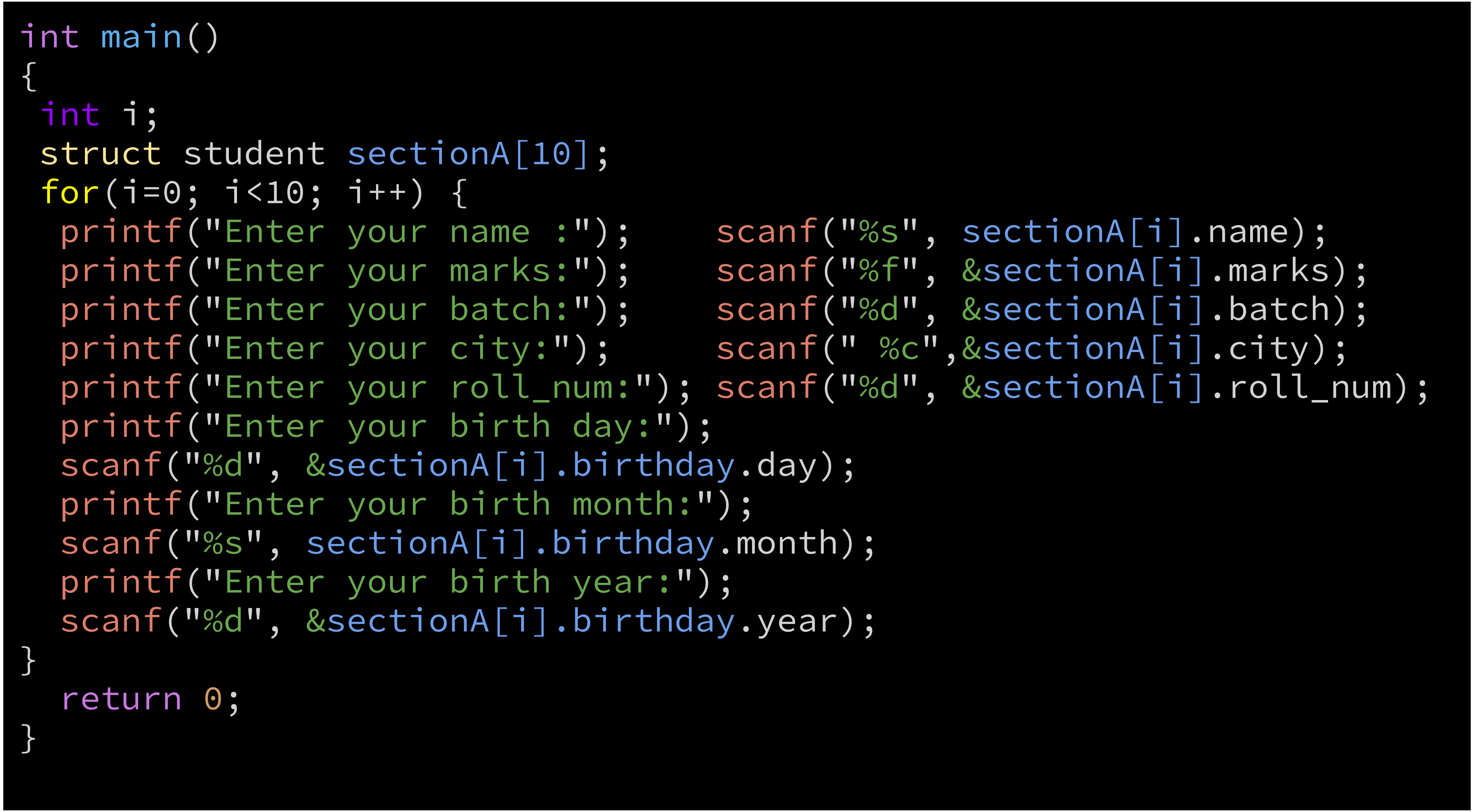
Nested Structures

A struct can contain another struct as well.

```
struct date
{ int day; char month[10]; int year;  } ;

struct student
{
char name[20]; float marks; int batch; char city;
int roll_num; struct date birthday;
};
```



```c
#include <stdio.h>
struct date
{
    int day;
    char month[10];
    int year;
};
struct student
{
   char name[20];
   float marks;
   int batch;
   char city;
   int roll_num;
   struct date birthday;
};
```



```c
int main()
{
 int i;
 struct student sectionA[10];
 for(i=0; i<10; i++) {
  printf("Enter your name :");    scanf("%s", sectionA[i].name);
  printf("Enter your marks:");    scanf("%f", &sectionA[i].marks);
  printf("Enter your batch:");    scanf("%d", &sectionA[i].batch);
  printf("Enter your city:");     scanf(" %c",&sectionA[i].city);
  printf("Enter your roll_num:"); scanf("%d", &sectionA[i].roll_num);
  printf("Enter your birth day:");
  scanf("%d", &sectionA[i].birthday.day);
  printf("Enter your birth month:");
  scanf("%s", sectionA[i].birthday.month);
  printf("Enter your birth year:");
  scanf("%d", &sectionA[i].birthday.year);
}
  return 0;
}
```

Practice Questions

Create a structure called library to hold accession number, title of the book, author name, price of the book, and flag indicating whether book is issued or not.

Author Name should be another structure which holds author first name, middle name and last name separately.

Practice Questions

Make a program to display all students whose birthday is in January.

Make a program to display name of students who have marks greater than 50.

Display the count of students who are enrolled in Karachi campus.

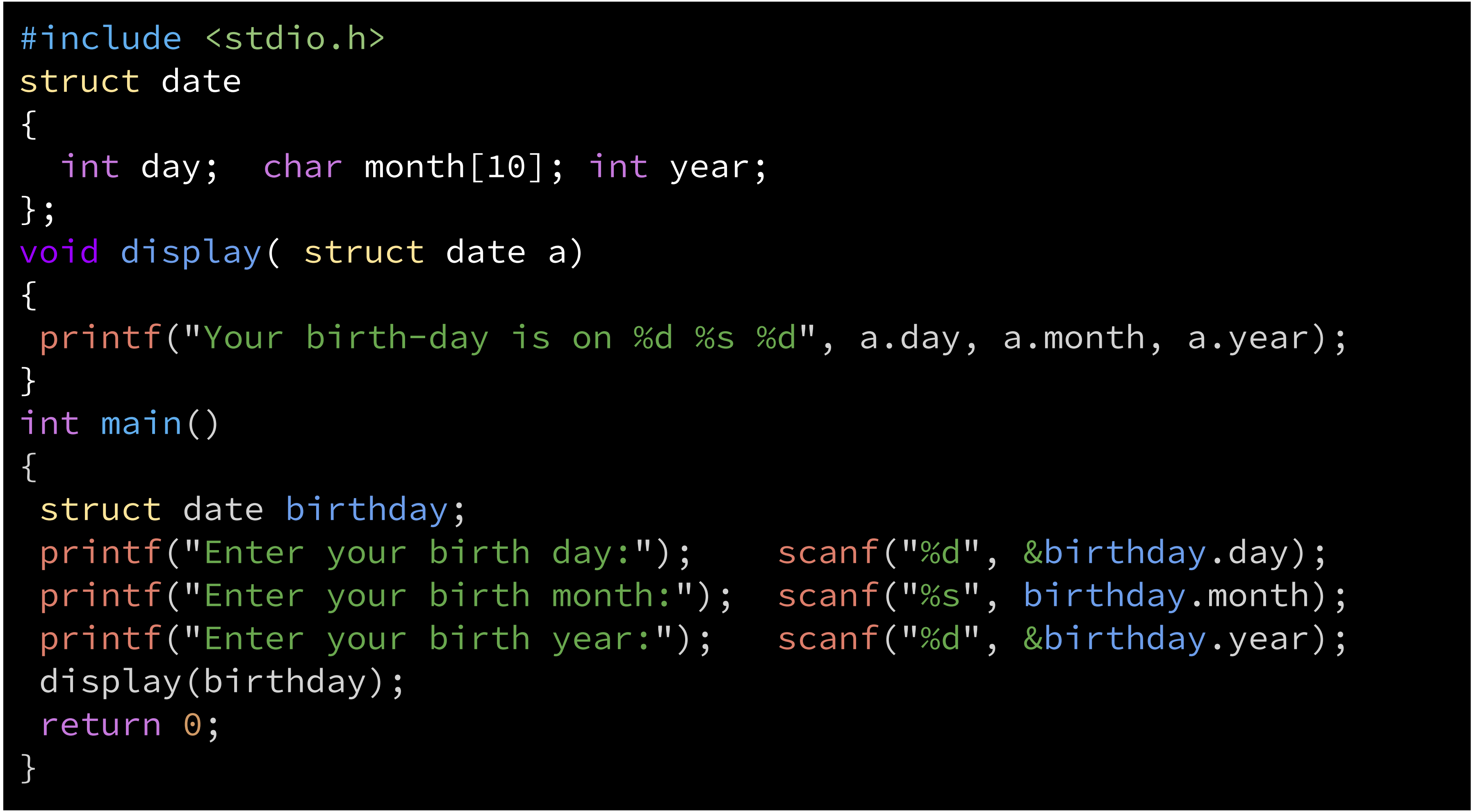
Home Assignment

1. Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank.

2. A record contains name of cricketer, his age, number of test matches that he has played and the average runs that he has scored in each test match. Create an array of structure to hold records of 20 such cricketer and then write a program to read these records and arrange them in ascending order by average runs.

Passing Structure to Function - Pass By value

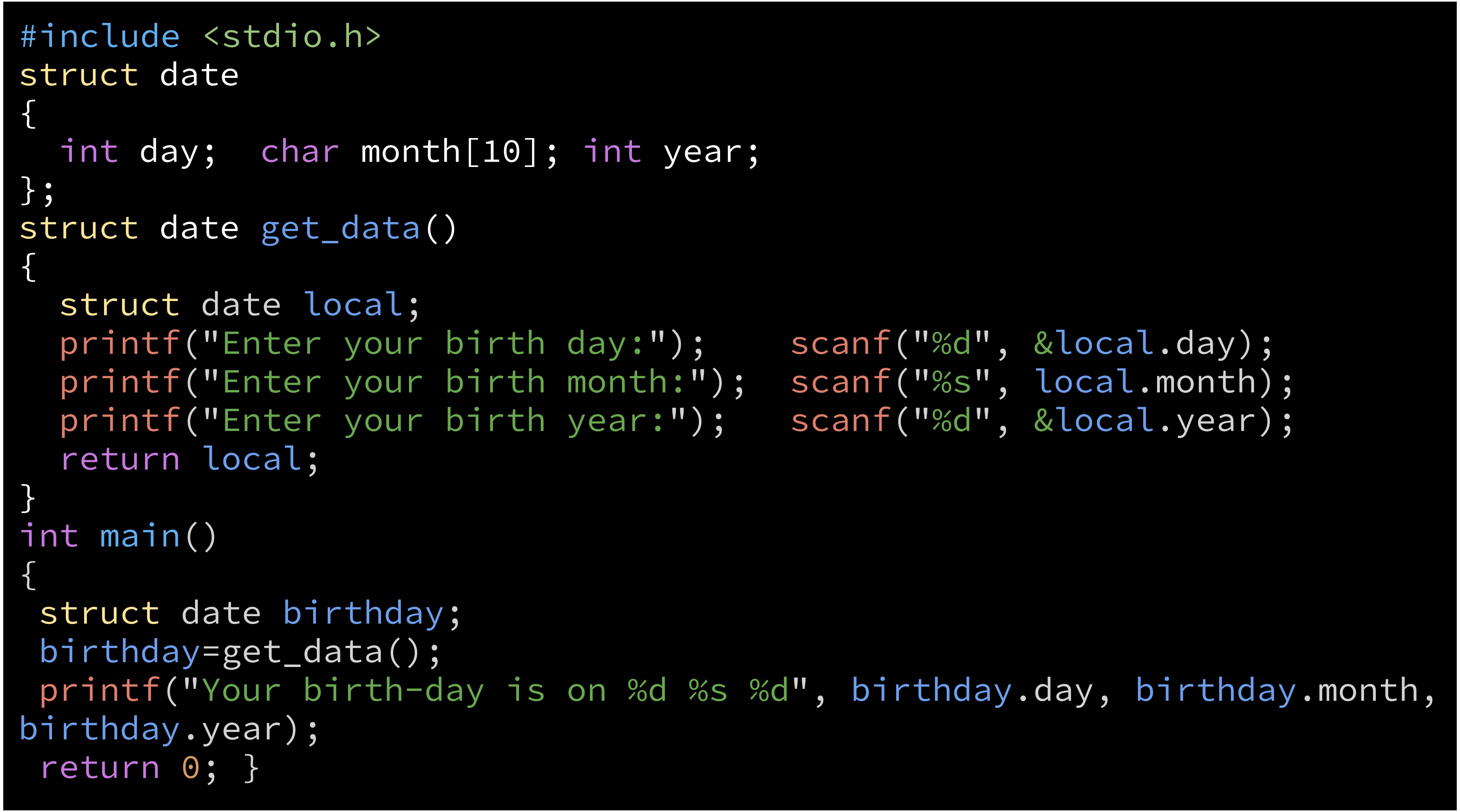
```
void function( struct date a);

function( birthday);
```



```c
#include <stdio.h>
struct date
{
  int day;  char month[10]; int year;
};
void display( struct date a)
{
 printf("Your birth-day is on %d %s %d", a.day, a.month, a.year);
}
int main()
{
 struct date birthday;
 printf("Enter your birth day:");     scanf("%d", &birthday.day);
 printf("Enter your birth month:");   scanf("%s", birthday.month);
 printf("Enter your birth year:");    scanf("%d", &birthday.year);
 display(birthday);
 return 0;
}
```

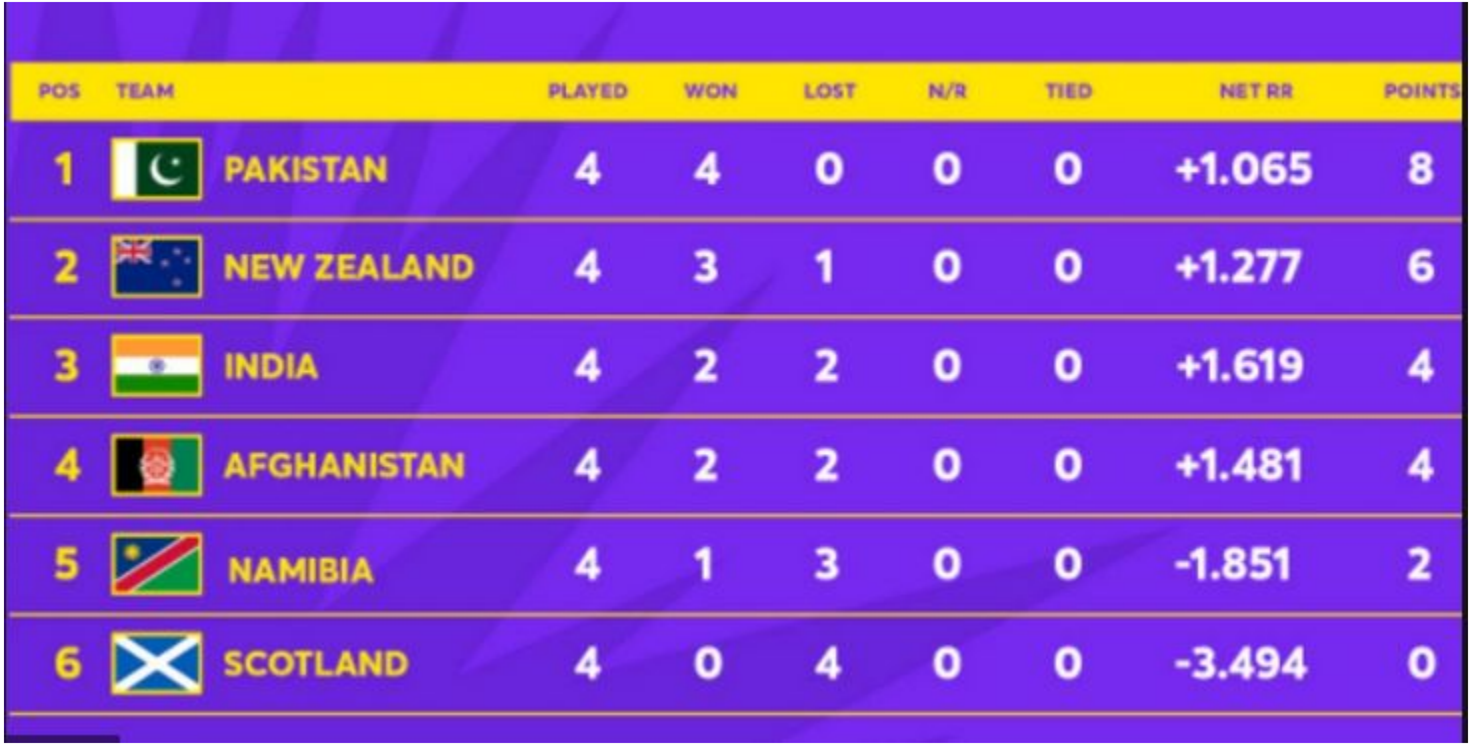
Returning Structure From a Function

```
struct date function();

function();
```



```c
#include <stdio.h>
struct date
{
  int day;  char month[10]; int year;
};
struct date get_data()
{
  struct date local;
  printf("Enter your birth day:");   scanf("%d", &local.day);
  printf("Enter your birth month:"); scanf("%s", local.month);
  printf("Enter your birth year:");  scanf("%d", &local.year);
  return local;
}
int main()
{
 struct date birthday;
 birthday=get_data();
 printf("Your birth-day is on %d %s %d", birthday.day, birthday.month,
birthday.year);
 return 0; }
```

Structures

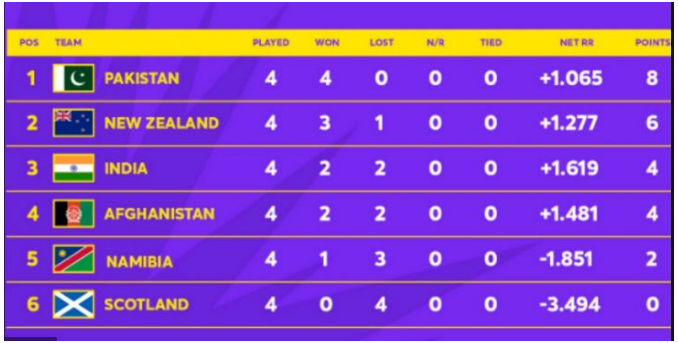


POS	TEAM	PLAYED	WON	LOST	N/R	TIED	NET RR	POINTS
1	PAKISTAN	4	4	0	0	0	+1.065	8
2	NEW ZEALAND	4	3	1	0	0	+1.277	6
3	INDIA	4	2	2	0	0	+1.619	4
4	AFGHANISTAN	4	2	2	0	0	+1.481	4
5	NAMIBIA	4	1	3	0	0	-1.851	2
6	SCOTLAND	4	0	4	0	0	-3.494	0

Structures

```
struct T20
{ int position;
  char country[20];
  int played;
  int won;
  int lost;
  float netRR;
  int points;
};
```

```
struct T20 group2[6]= { {1, "Pakistan",4,4,0,1.065,8},
                        {2, "NewZealand",4,3,1,1.277,6},
                        {3, "India",4,2,2,1.619,4},
                        {4, "Afghanistan",4,2,2,1.481,4},
                        {5, "Namibia",4,1,3,-1.851,2},
                        {6, "Scotland",4,0,4,-3.494,0}
                       };
```



POS	TEAM	PLAYED	WON	LOST	N/R	TIED	NET RR	POINTS
1	PAKISTAN	4	4	0	0	0	+1.065	8
2	NEW ZEALAND	4	3	1	0	0	+1.277	6
3	INDIA	4	2	2	0	0	+1.619	4
4	AFGHANISTAN	4	2	2	0	0	+1.481	4
5	NAMIBIA	4	1	3	0	0	-1.851	2
6	SCOTLAND	4	0	4	0	0	-3.494	0

Structures

Make a program to display all team names who have won at least 2 matches.

Structures

Make a function to display all team names who have won at least 2 matches and their run rate is greater than 1.5.

```
void func( struct T20 a[]) // passing structure array to function

{

    ……

}

func(group2);  // Function Call
```

Structures

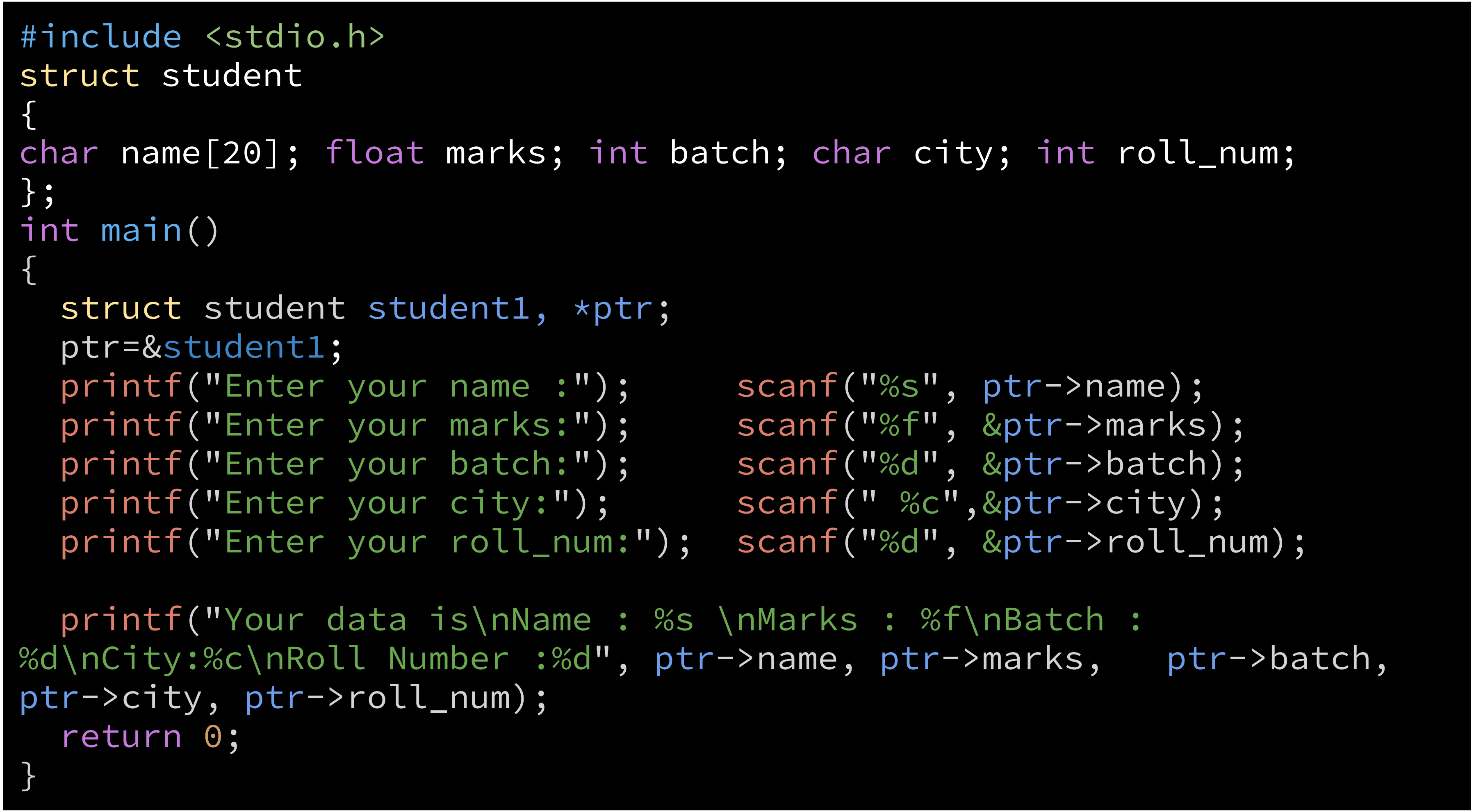
Make a function to return count of teams who have lost at least 2 matches.

```
void func( struct T20 a[]) // Function Definition
{
    ……
   return count;
}
a=func(group2);  // Function Call
```

Structures & Pointers

Struct pointer

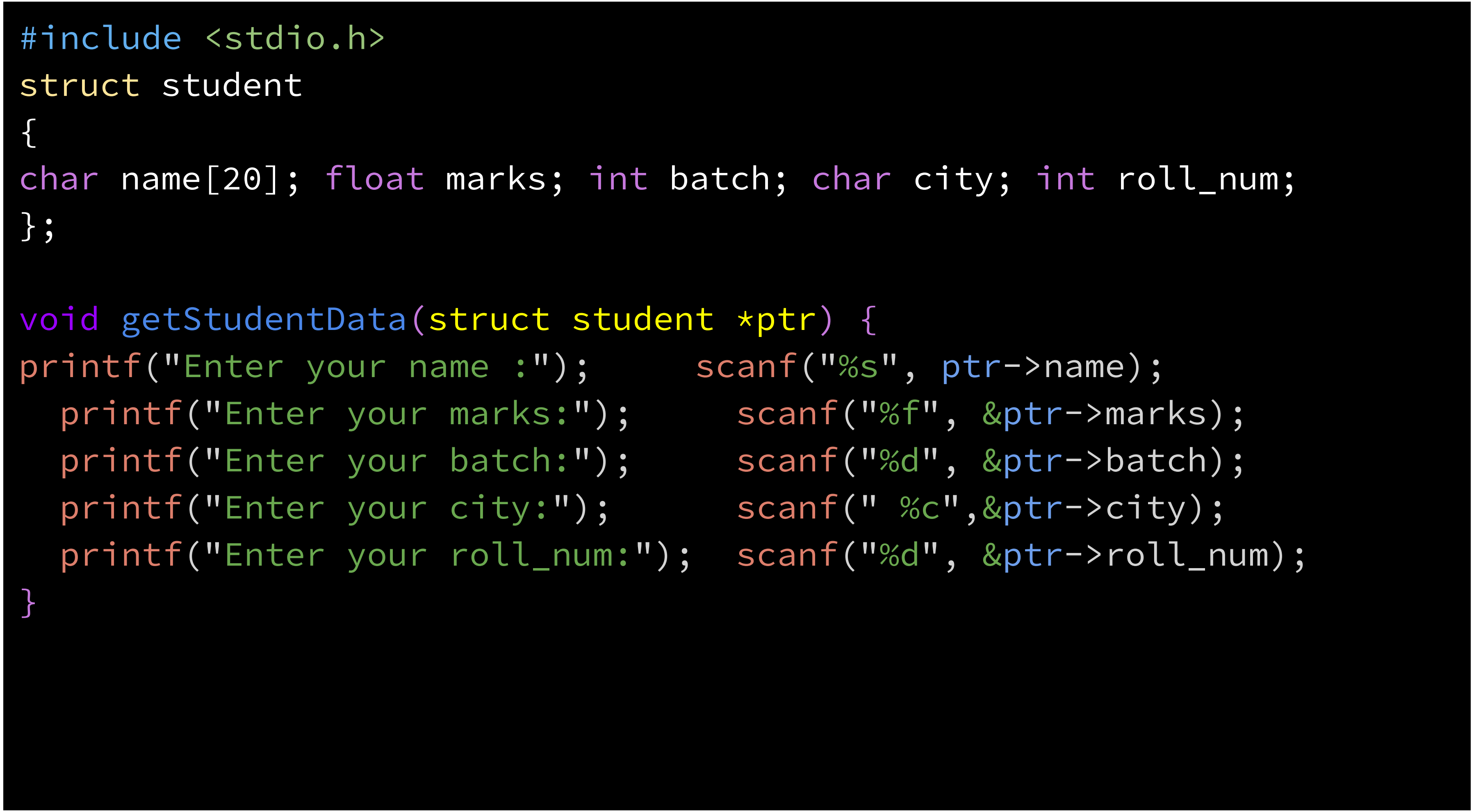
```
struct student {
char name[20]; float marks;int batch; char city; int roll_num; };


struct student *ptr, student1;
ptr=&student1;
(*ptr).batch= ptr->batch
-> member access operator for pointers
```



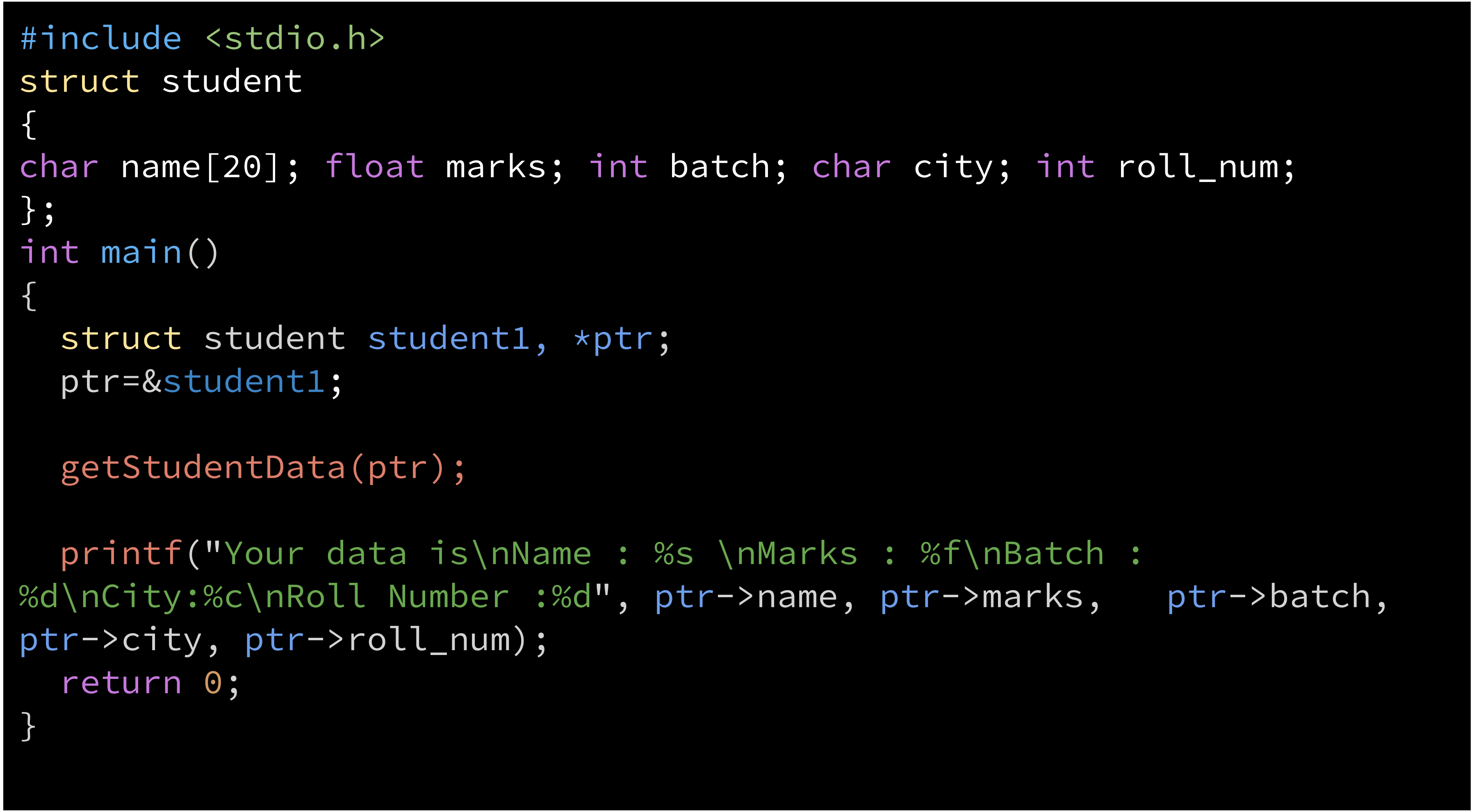
```c
#include <stdio.h>
struct student
{
char name[20]; float marks; int batch; char city; int roll_num;
};
int main()
{
  struct student student1, *ptr;
  ptr=&student1;
  printf("Enter your name :");     scanf("%s", ptr->name);
  printf("Enter your marks:");     scanf("%f", &ptr->marks);
  printf("Enter your batch:");     scanf("%d", &ptr->batch);
  printf("Enter your city:");      scanf(" %c",&ptr->city);
  printf("Enter your roll_num:");  scanf("%d", &ptr->roll_num);

  printf("Your data is\nName : %s \nMarks : %f\nBatch : 
%d\nCity:%c\nRoll Number :%d", ptr->name, ptr->marks,   ptr->batch, 
ptr->city, ptr->roll_num);
  return 0;
}
```

Passing Structure to Function - Pass By reference

```
struct student function(struct *ptr);

function(&student1);
```



```c
#include <stdio.h>
struct student
{
char name[20]; float marks; int batch; char city; int roll_num;
};

void getStudentData(struct student *ptr) {
printf("Enter your name :");     scanf("%s", ptr->name);
  printf("Enter your marks:");     scanf("%f", &ptr->marks);
  printf("Enter your batch:");     scanf("%d", &ptr->batch);
  printf("Enter your city:");      scanf(" %c",&ptr->city);
  printf("Enter your roll_num:");  scanf("%d", &ptr->roll_num);
}
```



```
#include <stdio.h>
struct student
{
char name[20]; float marks; int batch; char city; int roll_num;
};
int main()
{
  struct student student1, *ptr;
  ptr=&student1;

  getStudentData(ptr);

  printf("Your data is\nName : %s \nMarks : %f\nBatch :
%d\nCity:%c\nRoll Number :%d", ptr->name, ptr->marks,   ptr->batch,
ptr->city, ptr->roll_num);
  return 0;
}
```