



# BATCH RECURSION AND C++

PROGRAMMING MASTERCLASS

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<https://www.hsccrackers.com/>



SCAN ME

# Structure and Union

# What is a Structure?

Structures (also called structs) are a way to group several related variables into one place. Each variable in the structure is known as a member of the structure.

Syntax:

```
Struct MyStructure{ //Declaration
```

```
    Int number; //Member
```

```
    Char letter; //Member
```

```
}; //End With semicolon
```

## Scenario-1

তোমার ভাস্কিটের সব স্টুডেন্টদের ডাটা রাখার জন্য একটা ডাটা টাইপ ক্রিয়েট করতে হবে।

# What is a Structure?

```
1 #include <stdio.h>
2 #include <string.h>
3 struct student{
4     int id;
5     char name[40];
6 };
7 int main(){
8     struct student one;
9     one.id = 100;
10    //one.name = "Awesh Islam"  Cannot assign
11    strcpy(one.name, "Awesh Islam");
12
13    printf("Id of the student: %d\n",one.id);
14    printf("Name of the student: %s\n",one.name);
15 }
16
17
```

```
Id of the student: 100
Name of the student: Awesh Islam
Program ended with exit code: 0
```

# What is a Structure?

```
1 #include <stdio.h>
2 #include <string.h>
3 struct student{
4     int id;
5     char *name;
6 };
7 int main(){
8     struct student one;
9     one.id = 100;
10    one.name = "Awesh Islam"; ⚠
11
12    printf("Id of the student: %d\n",one.id);
13    printf("Name of the student: %s\n",one.name);
14 }
15
```

# Taking Input

```
1 #include <stdio.h>
2 #include <string.h>
3 struct student{
4     int id;
5     char name[40];
6 };
7 int main(){
8     struct student one;
9     printf("Enter the id of the student: ");
10    scanf("%d",&one.id);
11    printf("Enter the name of the student: ");
12    scanf("%s",one.name);
13    printf("Id of the student: %d\n",one.id);
14    printf("Name of the student: %s\n",one.name);
15 }
```

# Taking Input

```
1 #include <stdio.h>
2 #include <string.h>
3 struct nametype{
4     char first[20];
5     char last[20];
6 };
7 struct student{
8     int id;
9     struct nametype name;
10};
11 int main(){
12     struct student one;
13     printf("Enter the id of the student: ");
14     scanf("%d",&one.id);
15     printf("Enter the first name of the student: ");
16     scanf("%s",one.name.first);
17     printf("Enter the last name of the student: ");
18     scanf("%s",one.name.last);
19     printf("Id of the student: %d\n",one.id);
20     printf("Name of the student: %s %s\n",one.name.first,one.name.last);
21 }
```

# Array of struct

```
1 #include <stdio.h>
2 #include <string.h>
3 struct nametype{
4     char first[20];
5     char last[20];
6 };
7 struct student{
8     int id;
9     struct nametype name;
10};
11 int main(){
12     struct student students[5];
13     for(int i = 0 ;i < 5;i++){
14         printf("Enter the id of the %dth student: ",i+1);
15         scanf("%d",&students[i].id);
16         printf("Enter the first name of the %dth student: ",i+1);
17         scanf("%s",students[i].name.first);
18         printf("Enter the last name of the %dth student: ",i+1);
19         scanf("%s",students[i].name.last);
20     }
21     for(int i = 0;i < 5;i++){
22         printf("Id of the %dth student: %d\n",i+1,students[i].id);
23         printf("Name of the %dth student: %s %s\n",i+1,students[i].name.first,students[i].name.last);
24     }
25 }
```

# typedef

```
4 typedef struct{  
5     char first[20];  
6     char last[20];  
7 } nametype;  
8 typedef struct{  
9     int id;  
10    nametype name;  
11 } student;
```

## Scenario-2

তোমার ভার্সিটির সব স্টুডেন্টদের ডাটা রাখার জন্য একটা ডাটা টাইপ ক্রিয়েট করতে হবে।  
ডাটা টাইপে সবার মার্কস এবং গ্রেড রাখা মার্কস অনুযায়ী গ্রেড দাও।

# Solution (Wrong)

```
15 void calculate_grade(student s){
16     if(s.marks >= 80) strcpy(s.grade, "A+");
17     else if(s.marks >= 70) strcpy(s.grade, "A");
18     else if(s.marks >= 60) strcpy(s.grade, "A-");
19     else if(s.marks >= 50) strcpy(s.grade, "B");
20     else if(s.marks >= 40) strcpy(s.grade, "C");
21     else strcpy(s.grade, "F");
22 }
23 int main(){
24     student students[5];
25     for(int i = 0 ;i < 5;i++){
26         printf("Enter the id of the %dth student: ",i+1);
27         scanf("%d",&students[i].id);
28         printf("Enter the first name of the %dth student: ",i+1);
29         scanf("%s",students[i].name.first);
30         printf("Enter the last name of the %dth student: ",i+1);
31         scanf("%s",students[i].name.last);
32         printf("Enter the marks of the %dth student: ",i+1);
33         scanf("%d",&students[i].marks);
34         calculate_grade(students[i]);
35     }
36     for(int i = 0;i < 5;i++){
37         printf("Id of the %dth student: %d\n",i+1,students[i].id);
38         printf("Name of the %dth student: %s %s\n",i+1,students[i].name.first,students[i].name.last);
39         printf("Marks of the %dth student: %d\n",i+1,students[i].marks);
40         printf("Grade of the %dth student: %s\n",i+1,students[i].grade);
41     }
42 }
```

# Solution

```
15 void calculate_grade(student *s){
16     if(s->marks >= 80) strcpy(s->grade, "A+");
17     else if(s->marks >= 70) strcpy(s->grade, "A");
18     else if(s->marks >= 60) strcpy(s->grade, "A-");
19     else if(s->marks >= 50) strcpy(s->grade, "B");
20     else if(s->marks >= 40) strcpy(s->grade, "C");
21     else strcpy(s->grade, "F");
22 }
23 int main(){
24     student students[5];
25     for(int i = 0 ;i < 5;i++){
26         printf("Enter the id of the %dth student: ",i+1);
27         scanf("%d",&students[i].id);
28         printf("Enter the first name of the %dth student: ",i+1);
29         scanf("%s",students[i].name.first);
30         printf("Enter the last name of the %dth student: ",i+1);
31         scanf("%s",students[i].name.last);
32         printf("Enter the marks of the %dth student: ",i+1);
33         scanf("%d",&students[i].marks);
34         calculate_grade(&students[i]);
35     }
36     for(int i = 0;i < 5;i++){
37         printf("Id of the %dth student: %d\n",i+1,students[i].id);
38         printf("Name of the %dth student: %s %s\n",i+1,students[i].name.first,students[i].name.last);
39         printf("Marks of the %dth student: %d\n",i+1,students[i].marks);
40         printf("Grade of the %dth student: %s\n",i+1,students[i].grade);
41     }
42 }
```

# Task

NID Card এর জন্য একটি ডাটা টাইপ বানাও



# Union

```
1 #include <stdio.h>
2 #include <string.h>
3
4 struct s {
5     char ch;
6     int n;
7     char str[16];
8 } sv;
9 union u {
10    char ch;
11    int n;
12    char str[16];
13 } uv;
14
15 int main(){
16     int struct_size,union_size;
17     struct_size = sizeof(sv);
18     union_size = sizeof(uv);
19     printf("Structure took %d bytes\n",struct_size);
20     printf("Union took %d bytes\n",union_size);
21 }
```

# Union

```
1 #include <stdio.h>
2 #include <string.h>
3
4 union u {
5     char ch;
6     int x;
7     int y;
8 } uv;
9
10 int main(){
11     uv.ch = 'A';
12     printf("uv.ch = %c\n",uv.ch);
13     uv.x = 16;
14     printf("uv.x = %d\n",uv.x);
15     printf("uv.ch = %c\n",uv.ch);
16     uv.y = 17;
17     printf("uv.y = %d\n",uv.y);
18     printf("uv.x = %d\n",uv.x);
19     printf("uv.ch = %c\n",uv.ch);
20 }
```