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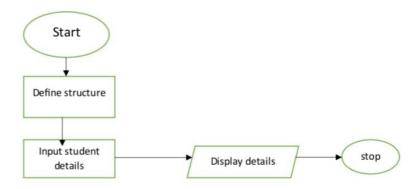
# Structures and unions

# 1. Program to store and display student details using structures

## Algorithm

- 1. Start
- 2. Define a structure Student with members: name, roll, marks.
- 3. Declare a variable of type Student.
- 4. Input values for name, roll, and marks.
- 5. Display the values.
- 6. Stop

#### Flow-chart



# 2. Program to store and display details of N students

## Algorithm

- 1. Start
- 2. Define structure Student.
- 3. Declare an array of Student.
- 4. Input n (number of students).
- 5. Loop through and input details for each student.
- 6. Loop again to display details.
- 7. Stop

# 3. Program to find student with highest marks

## Algorithm

- 1. Start
- 2. Define structure Student.
- 3. Input n and student details.
- 4. Initialize maxMarks = s[0].marks.
- 5. Traverse array: if any student's marks > maxMarks, update maxMarks and store index.
- 6. Print the student with highest marks.
- 7. Stop

## 4. Program to store and display employee details

- 1. Start
- 2. Define structure Employee with id, name, salary.
- 3. Input employee details.
- 4. Display details.
- 5. Stop



## 5. Program to find employee with highest salary

#### Algorithm

- 1. Start
- 2. Define structure Employee.
- 3. Input n employees.
- 4. Initialize maxSalary = e[0].salary.
- 5. Loop through employees: if salary > maxSalary, update.
- 6. Print employee with highest salary.
- 7. Stop

# 6. Program to sort students by marks

## Algorithm

- 1. Start
- 2. Define Student structure.
- 3. Input n and student details.
- 4. Use a sorting algorithm (bubble sort) to sort by marks.
- 5. Print sorted list.
- 6. Stop

# 7. Program to merge employee records

## Algorithm

1. Start

- 2. Define Employee structure.
- 3. Input n1 employees into array1.
- 4. Input n2 employees into array2.
- 5. Merge both arrays into array3.
- 6. Display merged list.
- 7. Stop

# 8. Program to search a student by roll number

## Algorithm

- 1. Start
- 2. Define Student structure.
- 3. Input n students.
- 4. Input roll number to search.
- 5. Loop through array, compare roll.
- 6. If found, display student; else display not found.
- 7. Stop

## 9. Program to store and display book details

# Algorithm

- 1. Start
- 2. Define Book structure with id, title, author, price.
- 3. Input details of books.
- 4. Display them.
- 5. Stop

## 10. Program to find costliest book

- 1. Start
- 2. Define Book structure.
- 3. Input n books.
- 4. Initialize max = first book price.
- 5. Traverse array; if higher price found, update.
- 6. Print book with max price.
- 7. Stop

# 11. Program to search a student by roll number using structure

#### Algorithm

- 1. Start
- 2. Define Student structure with roll, name, marks.
- 3. Input n students.
- 4. Input roll number to search.
- 5. Loop through array and compare roll number.
- 6. If found, display student details. Else, print "Not found".
- 7. Stop

# 12. Program to sort students by marks using structure

## Algorithm

- 1. Start
- 2. Define Student structure.
- Input n students.
- 4. Use bubble sort to sort by marks descending.
- 5. Display sorted list.
- 6. Stop

# 13. Program using nested union (employee bonus and allowance)

#### Algorithm

- 1. Start
- 2. Define union Bonus with amount or percentage.
- 3. Define union Allowance with travel or medical.
- 4. Define structure Employee with id, name, bonus (union), allowance (union).
- 5. Input employee details.
- 6. Display all details.
- 7. Stop

# 14. Program to calculate total salary including bonus using union

# Algorithm

- 1. Start
- 2. Define union Bonus with amount or percentage.
- 3. Define structure Employee with id, name, basic salary, bonus (union), bonus type.
- 4. Input employee details.
- 5. Calculate total salary (add bonus).
- 6. Display total salary.
- 7. Stop

# 15. Program to find maximum marks using array of structures

- 1 Start
- 2. Define Student structure with name and marks.
- 3. Input n students.
- 4. Initialize max = first student marks.
- 5. Loop through array and update max if higher found.
- 6. Display student with maximum marks.
- 7. Stop

7. Stop

## 16. Program to calculate average marks using array of structures

## Algorithm

- 1. Start
- 2. Define Student structure with name and marks.
- 3. Input n students.
- 4. Loop through array and sum marks.
- 5. Calculate average = total/n.
- 6. Display average marks.
- 7. Stop

## 17. Program to store multiple bonuses using nested union

#### Algorithm

- 1. Start
- 2. Define union Bonus with amount or percentage.
- 3. Define structure Employee with id, name, basic salary, and array of bonuses (union).
- 4. Input employee details and multiple bonuses.
- 5. Calculate total salary including all bonuses.
- 6. Display total salary.
- 7. Stop

## 18. Program to calculate total marks for multiple subjects using nested structures

#### Algorithm

- 1. Start
- 2. Define structure Subjects with marks1, marks2, marks3.
- 3. Define structure Student with name, roll, and subjects.
- 4. Input n students with marks.
- 5. Calculate total marks for each student.
- 6. Display total marks.
- 7. Stop

# 19. Program to find employee with maximum salary using union

## Algorithm

- 1. Start
- 2. Define union Salary with monthly or weekly.
- 3. Define structure Employee with id, name, salary (union), type.
- 4. Input n employees.
- 5. Convert weekly salary to monthly and find maximum.
- 6. Display employee with maximum salary.
- 7. Stop

#### 20. Program to combine structure array and union to store multiple employee types

- 1. Start
- 2. Define union Salary with monthly or weekly.
- 3. Define structure Employee with id, name, salary (union), type.
- 4. Input n employees.
- 5. Display all employee details, converting weekly → monthly if needed.
- 6. Stop

```
#include <stdio.h>
struct Complex {
   float real;
   float imag;
};
int main() {
   struct Complex c1, c2, sum;
    printf("Enter first complex number (real imag): ");
   scanf("%f %f", &c1.real, &c1.imag);
    printf("Enter second complex number (real imag): ");
   scanf("%f %f", &c2.real, &c2.imag);
   sum.real = c1.real + c2.real;
   sum.imag = c1.imag + c2.imag;
   printf("Sum = \%.2f + \%.2fi\n", sum.real, sum.imag);
   return 0:
supriya@ubuntu:~/Desktop/c/chp10$ ./com
Enter first complex number (real imag): 4 9
Enter second complex number (real imag): 2 3
Sum = 6.00 + 12.00i
```

//Program to add two complex numbers using structures

```
//Program to multiply two complex numbers
#include <stdio.h>
struct Complex {
   float real:
   float imag;
};
int main() {
   struct Complex c1, c2, prod;
   printf("Enter first complex number (real imag): ");
   scanf("%f %f", &c1.real, &c1.imag);
   printf("Enter second complex number (real imag): ");
   scanf("%f %f", &c2.real, &c2.imag);
   prod.real = c1.real * c2.real - c1.imag * c2.imag;
   prod.imag = c1.real * c2.imag + c1.imag * c2.real;
   printf("Product = %.2f + %.2fi\n", prod.real, prod.imag);
   return 0:
}
supriya@ubuntu:~/Desktop/c/chp10$ ./mul
Enter first complex number (real imag): 5 7
Enter second complex number (real imag): 2 3
Product = -11.00 + 29.00i
```

```
//Program to store time in hours, minutes, seconds and add two times
#include <stdio.h>
struct Time {
    int hr;
    int min;
    int sec;
int main() {
    struct Time t1, t2, sum;
    printf("Enter first time (hh mm ss): ");
    scanf("%d %d %d", &t1.hr, &t1.min, &t1.sec);
    printf("Enter second time (hh mm ss): ");
    scanf("%d %d %d", &t2.hr, &t2.min, &t2.sec);
    sum.sec = t1.sec + t2.sec;
    sum.min = t1.min + t2.min + sum.sec / 60;
    sum.hr = t1.hr + t2.hr + sum.min / 60;
    sum.sec %= 60;
    sum.min %= 60;
    printf("Sum = %02d:%02d:%02d\n", sum.hr, sum.min, sum.sec);
    return 0;
supriya@ubuntu:~/Desktop/c/chp10$ ./time
Enter first time (hh mm ss): 2 34 7
Enter second time (hh mm ss): 1 46 8
Sum = 04:20:15
```

```
//Program to add two distances (feet, inches)
#include <stdio.h>
struct Distance {
   int feet;
   float inch;
int main() {
   struct Distance d1, d2, sum;
   printf("Enter first distance (feet inch): ");
   scanf("%d %f", &d1.feet, &d1.inch);
   printf("Enter second distance (feet inch): ");
   scanf("%d %f", &d2.feet, &d2.inch);
   sum.inch = d1.inch + d2.inch;
   sum.feet = d1.feet + d2.feet + (int)(sum.inch / 12);
   sum.inch = (int)sum.inch % 12 + (sum.inch - (int)sum.inch);
   printf("Sum = %d feet %.2f inches\n", sum.feet, sum.inch);
   return 0:
supriya@ubuntu:~/Desktop/c/chp10$ ./dis
Enter first distance (feet inch): 6 4
Enter second distance (feet inch): 5 1
Sum = 11 feet 5.00 inches
```

```
//Program to find average marks of students
#include <stdio.h>
struct Student {
   char name[50];
   float marks;
int main() {
   int n, i;
   float sum = 0, avg;
   struct Student s[100];
   printf("Enter number of students: ");
   scanf("%d", &n);
   for (i = 0; i < n; i++) {
       printf("Enter name and marks for student %d: ", i+1);
       scanf("%s %f", s[i].name, &s[i].marks);
       sum += s[i].marks;
   avg = sum / n;
   printf("Average marks = %.2f\n", avg);
   return 0;
supriya@ubuntu:~/Desktop/c/chp10$ ./avg
Enter number of students: 2
Enter name and marks for student 1: riya 45 50
Enter name and marks for student 2: priya 48 49
Average marks = 22.50
```

```
#include <stdio.h>
union Data {
    int i;
    float f;
    char c;
};
int main() {
   union Data d;
    d.i = 10;
    printf("Integer: %d\n", d.i);
    d.f = 3.14;
    printf("Float: %.2f\n", d.f);
    d.c = 'A';
    printf("Char: %c\n", d.c);
    return 0;
}
supriya@ubuntu:~/Desktop/c/chp10$ ./uni
Integer: 10
Float: 3.14
Char: A
```

//Program to demonstrate union (storing int, float, char)