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STRINGS

Def: collection of characters or group of characters or set of characters or character array is known as string.

- In c language every string is terminated with null character ('\0').

Declaration of string:

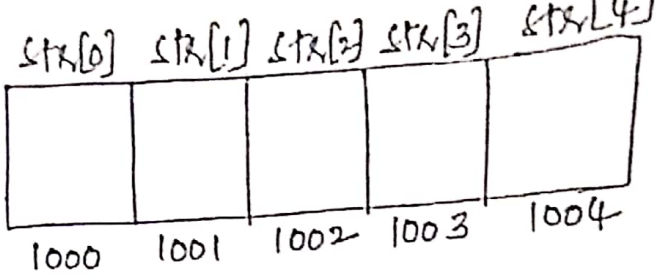
- Declaring a string is as simple as declaring a one dimensional array. Below is the basic syntax for declaring a string.

```
char str_name[size];
```

- In the above syntax str_name is any name given to the string variable and size represents the number of characters to be stored.
- To store a string of length 5, we need to specify 6 as the size (one extra size for null ('\0') character.
- Example for declaring a string is

```
char str[5];
```

- for the above character array str, the memory will be allocated as follows.

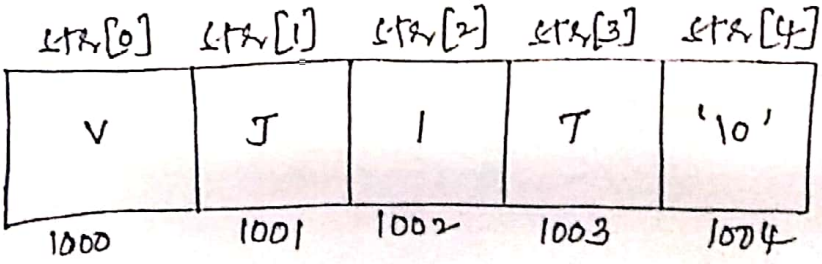


Initializing a string:

- A string can be initialized in the following different ways.

1. char str[5] = "VJIT";

Below is the memory representation of str



- Like we use subscripts & index to access the elements of an array, similarly subscripts are also used to access the elements of the character array.
- The subscript & index starts with zero
- All the elements & characters of character array are stored in successive memory locations.

2. char str[ ] = "VJIT";

- For the above statement the size is assigned by the compiler automatically based on the number of characters in a string.

3. char str[ ] = {'V','J','I','T','\0'};

In this example, we have explicitly added the null character. Here, the compiler will automatically calculate the size based on the number of characters initialized.

4. char str[5] = {'V','J','I','T','\0'};

Reading Strings:

- If we declare a string as

```
char str[5];
```

Then we can read str in 3 ways.

1. By using scanf() function:

```
scanf("%s", str);
```

- The main problem with scanf() function is that the function terminates as soon as it finds a blank space i.e when

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scanf() encounters a white space character, it terminates reading the string further.

- For example if we enter VIT, then str will contain VIT only.

2. By using gets() function:

- The next method of reading a string is by using gets() function.

- gets(str);

gets() is a simple function that overcomes the drawback of scanf() function.

3. By using getchar() function:

getchar() function is used to read a string character by character.

ex:

```
i=0;
ch = getchar();
while (ch != '*')
{
    str[i] = ch;
    i++;
    ch = getchar();
}
str[i] = '\0';
```


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Writing (&) displaying strings:

- We can display strings on screen in 3 ways.

1. By using printf() function:

- A string can be displayed using printf() function as follows:

```
printf("%s", str);
```

where str is character array name.

2. By using puts() function:

The next method of writing a string is by using puts() function. The string can be displayed by writing.

```
puts(str);
```

3. By using putchar() function:

We can display a string by using putchar() function as follows:

```
i=0;
while(str[i] != '\0')
{
    putchar(str[i])
    i++;
}
```


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String handling functions:

- The following are the string handling (or) string manipulation functions:

1. strlen():

This function is used to find length of the string.

Syntax:

```
n = strlen(string);
```

Ex: `n = strlen(str);`

where n is an integer variable which receives the value of the length of the string.

2. strcat():

This function is used to concatenate two strings.

Syntax:

```
strcat(str1, str2);
```

where str1 and str2 are character arrays.

- When strcat() function is executed, str2 is appended to str1.

- we must make sure that the size of str1 is large enough to accommodate the final string.
- strcat() function may also append a string constant to a string variable.

Ex: strcat (str1, "Hyd");

- C language permits nesting of strcat() functions.

Ex:

strcat (strcat (str1, str2), str3);

is allowed and concatenates all the 3 strings together. The resultant string is stored in str1.

3. strcmp() function:

- strcmp() function compares two strings and it will returns a value 0 (zero) if two strings are equal. If two strings are not equal, then it will returns the numeric difference between the first nonmatching characters.

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Syntax:

strcmp (string1, string2);

Ex:

strcmp (str1, str2);

- In the above syntax string1 and string2 may be string variables or string constants.

Ex:

strcmp (str1, str2);

strcmp (str1, "Hyd");

strcmp ("vjit", "Hyd");

- strcmp ("15eit", "15ece");

will returns a value of -9 which is the numeric difference between ASCII "i" and ASCII "R" i.e i minus R in ASCII code is -9.

4. strcpy():

- This function is used to copy one string into another string.

Syntax:

strcpy (string1, string2);

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Ex: strcpy (str1, str2);

will copy str2 string into str1 string.

- In the above example str2 may be a character array or string constant.

Ex: strcpy (str1, str2);

strcpy (str1, "VJIT");

5. strrev() function:

This function is used to reverse the given string.

Syntax: strrev (string);

Ex: strrev (str);

```
#include <stdio.h>
#include <string.h>
void main()
{
    char str[10];
    printf("Enter any string \n");
    gets(str);
    strrev(str);
    printf("\n reversed string = %s", str);
}
```


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STRUCTURES

Def:

A Structure is a user defined data type, which is a collection of elements of different types.

- When we want to represent multiple values of different types as a single unit then we use structures.

Structure declaration & definition:

- A structure is declared using the keyword struct followed by a structure name.
- Syntax to define a structure is as follows.

```
struct structure-name (or) structure tag
{
    datatype member1;
    datatype member2;
      .
      .
      .
    datatype membern;
};
```


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Eg: 1

```
struct student
{
    int rno;
    char name[10];
    float fees;
};
```

Eg: 2.

```
struct employee
{
    int eid;
    char name[10];
    float sal;
};
```

- All the variables of the structure are declared within the structure.
- Each variable declared within a structure is called a member of the structure.

structure variable declaration:

- The structure declaration does not allocate any memory & consume storage space.

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- memory is allocated for the structure when we declare a variable of the structure.
- There are 2 ways in which we can declare a variable of structure. i.e

1. We can declare a variable to the structure at the time of structure declaration.

Ex:

```
struct student
{
    int rno;
    char name[10];
    float alt;
} s1, s2;
```

- In the above example s1 and s2 are variables of student type structure.
- When we declare variables of the structure, separate memory is allocated for each structure variable as shown below.

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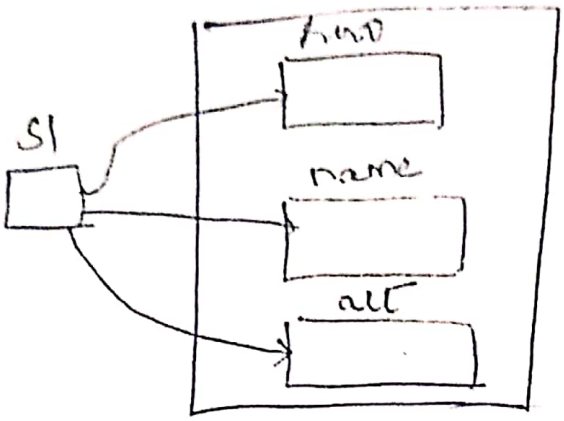

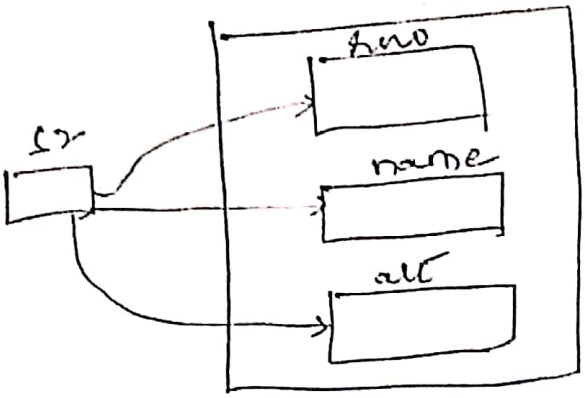

2. we can declare variable to the structure by using the following syntax.

struct structure-name structure-var.name;

Ex:

struct student s1;

Initialization of structures:

- Initializing a structure means assigning some values to the members of the structures.

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- The syntax to initialize a structure variable is as follows:

```
struct structure_name
{
    datatype member1;
    datatype member2;
      :
    datatype membern;
} structure_variable = { constant1, constant2,
  constant3 .... };
```

(or)

```
struct structure_name
{
    datatype member1;
    datatype member2;
      :
    datatype membern;
};
struct structure_name structure_var
  = { constant1, constant2, constant3.... };
```


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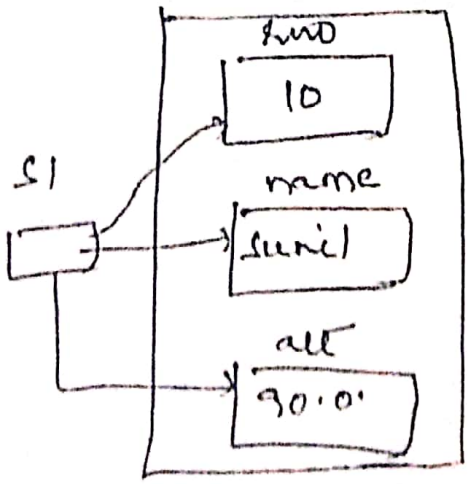
Ex:

```
struct student
{
    int rno;
    char name[10];
    float att;
} s1 = {10, "sunil", 90.0};
```

(OR)

```
struct student
{
    int rno;
    char name[10];
    float att;
};
struct student s1 = {10, "sunil", 90.0};
```

```
struct student
{
char name[10];
int rno;
float att;
};
struct student s = {"sunil",
                    10, 90.0};
```



Accessing the members of a structure:

- We can access structure member by using a . (dot) operator.
- The syntax to access members of a structure is as follows:

structure-variable.membername;

Ex:

s1.name
s1.sno
s1.all.

(OR)

```
struct student
{
    char name[10];
    int sno;
};
struct student s1;
s1.name = "Ravi";
s1.sno = 10;
```

The above is an example to assign value to the individual data members.

struct student
{
char name[10];
int sno;
};

struct student s1;
s1.name = ravi;
s1.sno = 50;

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- To read the values of structure members from keyboard we use the following code.

```
scanf("%s", s1.name);
scanf("%d", &s1.rno);
```

- To print & display values of structure members we use the following code.

```
printf("name = %s", s1.name);
printf("Rno = %d", s1.rno);
```

- Another way of accessing structure members by using → (arrow) operator.

Note:

- When we want to access structure members by using structure variable then we use . (dot) operator.
- When we want to access structure members by using structure pointer then we use → (arrow) operator.

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Nested Structures:

- A structure can be placed within another structure i.e a structure may contain another structure as its member.
- A structure that contain another structure as its member is called a nested structure.

Ex:

```
struct student
{
    char name[10];
    int rno;
    struct DOB
    {
       int day;
       int month;
       int year;
    }d;
}s;
```

- In the above example we are defining DOB structure as a member of student structure.
- In the above example student is outer structure and DOB is inner structure.

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- Another way of defining nested structure is as follows.

```
struct DOB
{
    int day;
    int month;
    int year;
};
struct student
{
    char name[10];
    int hno;
    struct DOB d;
};
```

- To access members of inner structure we use the following syntax.

outerstructure_var.innerstructure_var.membername;

Eg:

s.d.day

s.d.month

s.d.year

- To access outer structure members, we use the following code.

s.name , s.hno.

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Typedef :

- The typedef keyword enables the programmer to create a new data type name from an existing data type.
- By using typedef, no new data type is created, rather an alternate name is given to a known data type.
- The syntax of typedef is as follows:

typedef existingdatatype newdatatype;

- Ex:

```
typedef int INTEGER;
```

INTEGER is the new name of data type int.

- To declare a variable using the new name we write the following statement.

```
INTEGER V;
```

- The following is an example to define structure using typedef.

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```
typedef struct student
{
    char name[10];
    int rno;
}, stud;
```

In the above example stud is the synonym to the structure name student.
- By using stud we can declare a variable of student structure

Ex: stud s;

Enumerated data type:

- The enumerated data type is a user-defined type based on the standard integer type.
- An enumeration consists of a set of named integer constants. In other words, in an enumerated type, integer value is assigned to each identifier.
- To define enumerated data type, we use the keyword enum.

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- The syntax of creating an enumerated data type is as follows.

enum enumeration-name { identifier1, identifier2, ... identifiern };

Eg:

enum day { sun, mon, Tue, wed, Thur, fri, & sat };

- In the above syntax identifier1, identifier2, ... identifiern are also known as enumeration constants.
- If we do not assign any value to an identifier, the default value is assigned.
- The default value to the first identifier is 0. The rest of the undefined identifiers have a value 1 more than its previous one.
- for example, in sun, 0 is assigned, mon = 1, Tue = 2, wed = 3, Thur = 4, fri = 5, sat = 6.

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- If we want to assign values explicitly, then we can assign as follows:

```
enum day { sun, mon, Tue=5, wed,
    Thur, Fri, Sat };
```

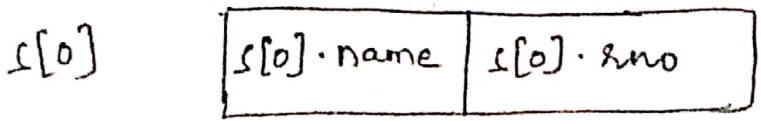
Array of structures:

- Declaring an array of structures is same as declaring an array of fundamental types.
- In an array of structures, each element of an array is of the structure type.

Eg:
```
struct student
{
    char name[10];
    int sno;
};
```

The following is the statement by which we can declare an array of structure student.

```
struct student s[3];
```



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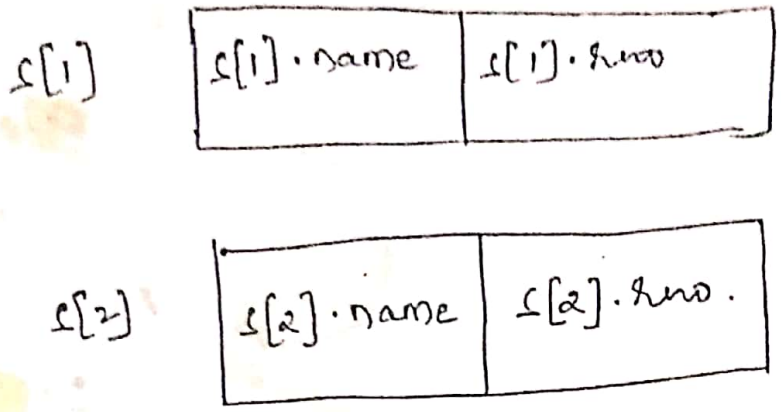

- array of structures is nothing but collection of structures.

Array within structure:

- sometimes, array may be the member within structure, this is known as array within structure.
- using array inside the structure (as a member of the structure) is known as array within structure.

Ex:

```
struct student
{
    char name[10];
    int sno;
    int m[6];
};
```

- m[6] is now a member of structure student and to access this array we can we use . (dot) operator.

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