File Handling

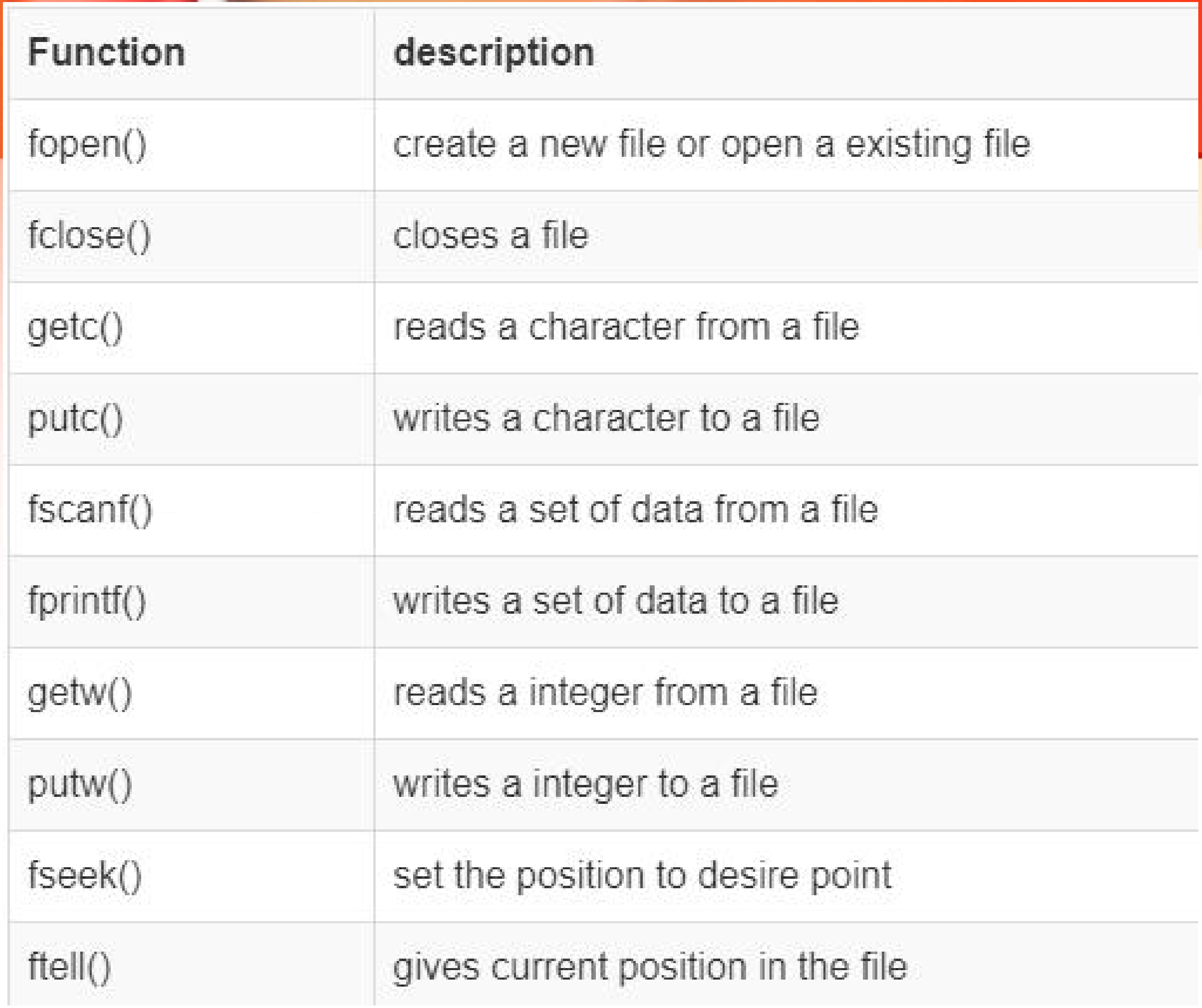
Introduction

- A **file** represents a sequence of bytes on the disk where a group of related data is stored. File is created for permanent storage of data. It is a ready made structure.

- In C language, we use a structure **pointer of file type** to declare a file.

```
FILE *fp;
```

- C provides a number of functions that helps to perform basic file operations. Following are the functions,



Function	description
fopen()	create a new file or open a existing file
fclose()	closes a file
getc()	reads a character from a file
putc()	writes a character to a file
fscanf()	reads a set of data from a file
fprintf()	writes a set of data to a file
getw()	reads a integer from a file
putw()	writes a integer to a file
fseek()	set the position to desire point
ftell()	gives current position in the file

Opening a File or Creating a File

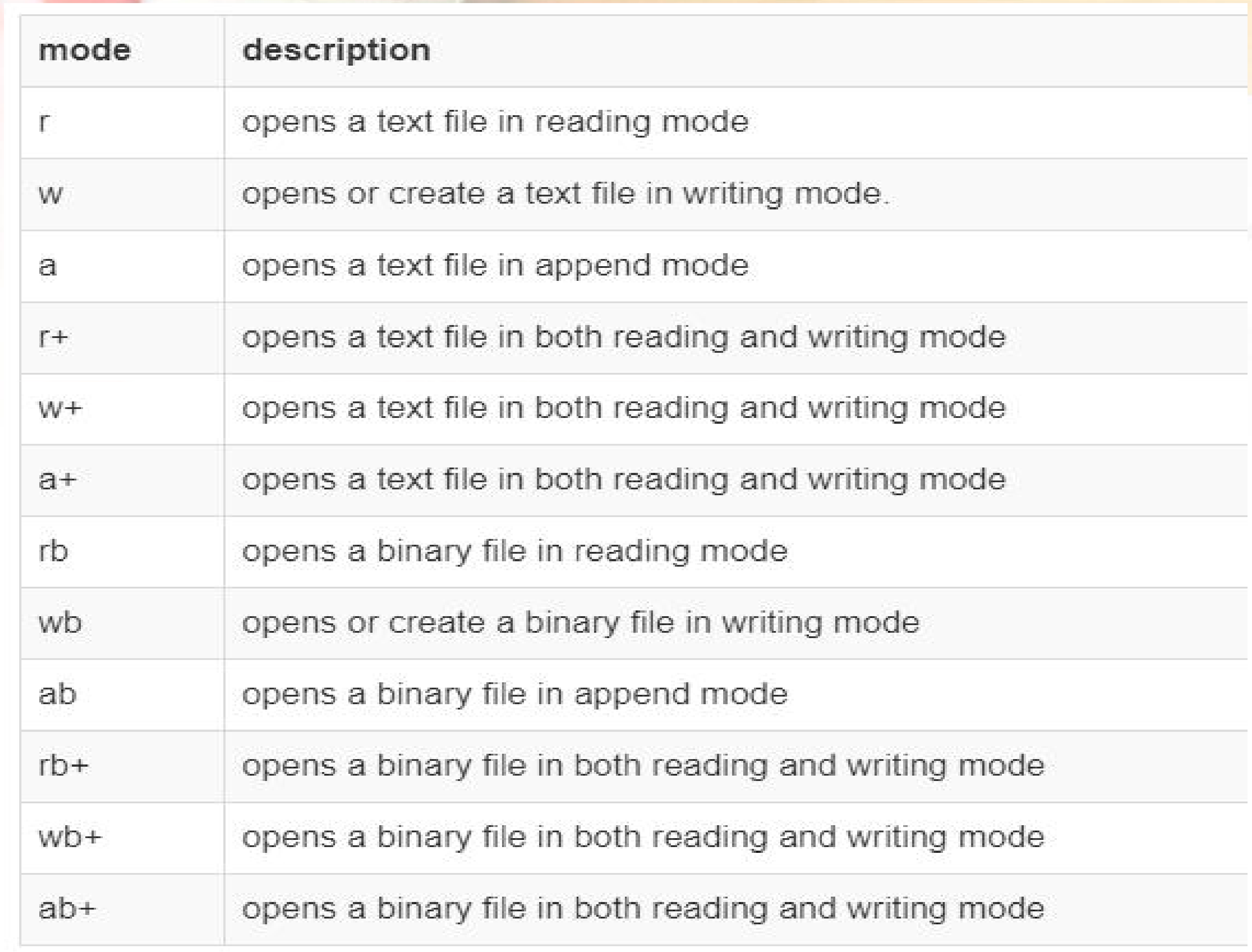
- The fopen() function is used to create a new file or to open an existing file.

  *fp = FILE *fopen(const char *filename, const char *mode);

  Here, *fp is the FILE pointer (FILE *fp), which will hold the reference to the opened(or created) file.

  filename is the name of the file to be opened
  and **mode** specifies the purpose of opening the file.

Mode can be of following types,



mode	description
r	opens a text file in reading mode
w	opens or create a text file in writing mode.
a	opens a text file in append mode
r+	opens a text file in both reading and writing mode
w+	opens a text file in both reading and writing mode
a+	opens a text file in both reading and writing mode
rb	opens a binary file in reading mode
wb	opens or create a binary file in writing mode
ab	opens a binary file in append mode
rb+	opens a binary file in both reading and writing mode
wb+	opens a binary file in both reading and writing mode
ab+	opens a binary file in both reading and writing mode

Closing a File

- The fclose() function is used to close an already opened file.

General Syntax :

```
int fclose( FILE *fp);
```

Here fclose() function closes the file and returns **zero** on success, or **EOF** if there is an error in closing the file. This **EOF** is a constant defined in the header file **stdio.h**.

Input/Output operation on File

- In the above table we have discussed about various file I/O functions to perform reading and writing on file. getc() and putc() are the simplest functions which can be used to read and write individual characters to a file.

```
#include<stdio.h>
int main() {
FILE *fp;
char ch;
fp = fopen("one.txt", "w");
printf("Enter data...");
while( (ch = getchar()) != EOF) {
putc(ch, fp); }
fclose(fp);
fp = fopen("one.txt", "r");
while( (ch = getc(fp)! = EOF)
printf("%c",ch); // closing the file pointer
fclose(fp);
return 0;
 }
```

Reading and Writing to File using fprintf() and fscanf()

```
#include<stdio.h>
struct emp {
char name[10];
int age; };
void main() {
struct emp e;
FILE *p,*q;
p = fopen("one.txt", "a");
q = fopen("one.txt", "r");
printf("Enter Name and Age:");
scanf("%s %d", e.name, &e.age);
fprintf(p,"%s %d", e.name, e.age);
fclose(p);
do {
fscanf(q,"%s %d", e.name, e.age);
printf("%s %d", e.name, e.age); }
while(!feof(q)); }
```

- In this program, we have created two FILE pointers and both are refering to the same file but in different modes.
- fprintf() function directly writes into the file, while fscanf() reads from the file, which can then be printed on the console using standard printf() function.

Difference between Append and Write Mode

- Write (w) mode and Append (a) mode, while opening a file are almost the same. Both are used to write in a file. In both the modes, new file is created if it doesn't exists already.
- The only difference they have is, when you **open** a file in the **write** mode, the file is reset, resulting in deletion of any data already present in the file. While in **append** mode this will not happen. Append mode is used to append or add data to the existing data of file(if any). Hence, when you open a file in Append(a) mode, the cursor is positioned at the end of the present data in the file.

Reading and Writing in a Binary File

- A Binary file is similar to a text file, but it contains only large numerical data. The Opening modes are mentioned in the table for opening modes above.
- fread() and fwrite() functions are used to read and write is a binary file.

  fwrite(data-element-to-be-written, size_of_elements, number_of_elements, pointer-to-file);
- fread() is also used in the same way, with the same arguments like fwrite() function. Below mentioned is a simple example of writing into a binary file

```
const char *mytext = "The quick brown fox jumps over
    the lazy dog";
FILE *bfp= fopen("test.txt", "wb");
if (bfp)
{
fwrite(mytext, sizeof(char), strlen(mytext), bfp);
fclose(bfp);
}
```

fseek(), ftell() and rewind() functions

- fseek(): It is used to move the reading control to different positions using fseek function.
- ftell(): It tells the byte location of current position of cursor in file pointer.
- rewind(): It moves the control to beginning of the file.

Array of pointers to structure

- Create an array of structure variable

  In the following example we are considering the student structure that we created in the previous tutorial and we are creating an array of student structure variable std of size 3 to hold details of three students.

- // student

structure struct student

{ char id[15];

char firstname[64];

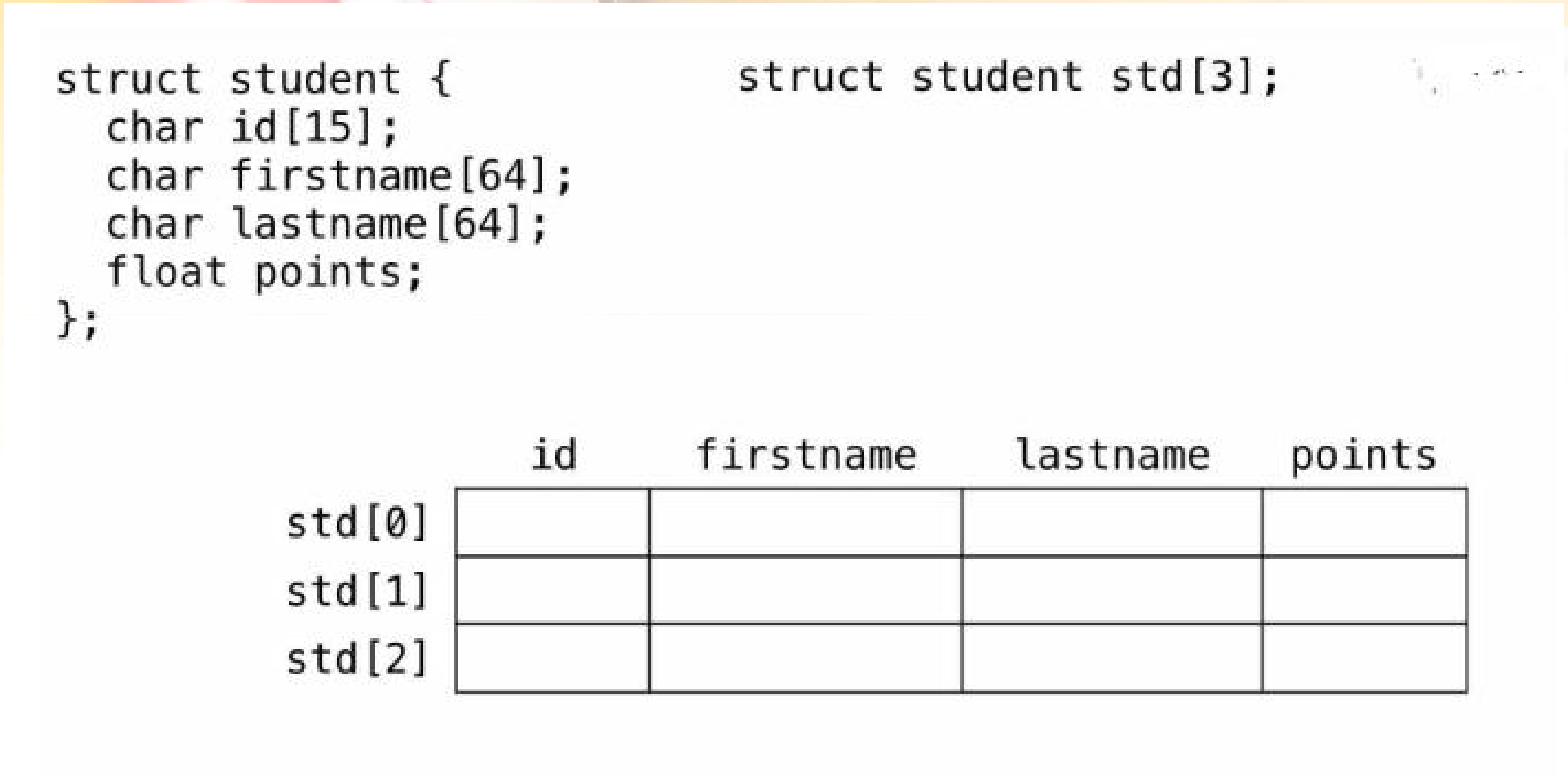
char lastname[64];

float points; };

// student structure variable

struct student std[3];

We can represent the std array variable as following



```
struct student {
  char id[15];
  char firstname[64];
  char lastname[64];
  float points;
};
```

```
struct student std[3];
```

	id	firstname	lastname	points
std[0]				
std[1]				
std[2]				

- Create pointer variable for structure
- Now we will create a pointer variable that will hold the starting address of the student structure variable std.

```
// student structure pointer variable
struct student *ptr = NULL;

// assign std to ptr
ptr = std;
```

Note: std is an array variable and the name of the array variable points at the memory location so, we are assigning it to the structure pointer variable ptr.

Accessing each element of the structure array variable via pointer

- For this we will first set the pointer variable ptr to point at the starting memory location of std variable. For this we write ptr = std;.
- Then, we can increment the pointer variable using increment operator ptr++ to make the pointer point at the next element of the structure array variable i.e., from str[0] to str[1].
- We will loop three times as there are three students. So, we will increment pointer variable twice. First increment will move pointer ptr from std[0] to std[1] and the second increment will move pointer ptr from std[1] to std[2].
- To reset the pointer variable ptr to point at the starting memory location of structure variable std we write ptr = std;

- For Example – refer the code file named **struct_array_pointer.c**

Sorting

- I have discussed clearly in notes, please refer notes.