Section 6

files

in C programming, file is a place on your physical disk where information is stored.

**Why files are needed?**

* When a program is terminated, the entire data is lost. Storing in a file will preserve your data even if the program terminates.
* If you have to enter a large number of data, it will take a lot of time to enter them all.  
  However, if you have a file containing all the data, you can easily access the contents of the file using few commands in C.
* You can easily move your data from one computer to another without any changes.

**Types of Files**

When dealing with files, there are two types of files you should know about:

1. Text files
2. Binary files

### 1. Text files

Text files are the normal .txt files that you can easily create using Notepad or any simple text editors.

When you open those files, you'll see all the contents within the file as plain text. You can easily edit or delete the contents.

They take minimum effort to maintain, are easily readable, and provide least security and takes bigger storage space.

### 2. Binary files

Binary files are mostly the .bin files in your computer.

Instead of storing data in plain text, they store it in the binary form (0's and 1's).

They can hold higher amount of data, are not readable easily and provides a better security than text files.

## File Operations

In C, you can perform four major operations on the file, either text or binary:

1. Creating a new file
2. Opening an existing file
3. Closing a file
4. Reading from and writing information to a file

## Working with files

When working with files, you need to declare a pointer of type file. This declaration is needed for communication between the file and program.

FILE \*fptr;

## Opening a file - for creation and edit

Opening a file is performed using the [library function](https://www.programiz.com/c-programming/library-function) in the **"stdio.h"** header file: fopen().

The syntax for opening a file in standard I/O is:

ptr = fopen("fileopen","mode")

For Example:

fopen("E:\\cprogram\\newprogram.txt","w");

fopen("E:\\cprogram\\oldprogram.bin","rb");

* Let's suppose the file newprogram.txt doesn't exist in the location E:\cprogram. The first function creates a new file named newprogram.txt and opens it for writing as per the mode 'w'.  
  The writing mode allows you to create and edit (overwrite) the contents of the file.
* Now let's suppose the second binary file oldprogram.bin exists in the location E:\cprogram. The second function opens the existing file for reading in binary mode 'rb'.  
  The reading mode only allows you to read the file, you cannot write into the file.

| Opening Modes in Standard I/O | | |
| --- | --- | --- |
| **File Mode** | **Meaning of Mode** | **During Inexistence of file** |
| r | Open for reading. | If the file does not exist, fopen() returns NULL. |
| rb | Open for reading in binary mode. | If the file does not exist, fopen() returns NULL. |
| w | Open for writing. | If the file exists, its contents are overwritten. If the file does not exist, it will be created. |
| wb | Open for writing in binary mode. | If the file exists, its contents are overwritten. If the file does not exist, it will be created. |
| a | Open for append. i.e, Data is added to end of file. | If the file does not exists, it will be created. |
| ab | Open for append in binary mode. i.e, Data is added to end of file. | If the file does not exists, it will be created. |
| r+ | Open for both reading and writing. | If the file does not exist, fopen() returns NULL. |
| rb+ | Open for both reading and writing in binary mode. | If the file does not exist, fopen() returns NULL. |
| w+ | Open for both reading and writing. | If the file exists, its contents are overwritten. If the file does not exist, it will be created. |
| wb+ | Open for both reading and writing in binary mode. | If the file exists, its contents are overwritten. If the file does not exist, it will be created. |
| a+ | Open for both reading and appending. | If the file does not exists, it will be created. |
| ab+ | Open for both reading and appending in binary mode. | If the file does not exists, it will be created. |

## Closing a File

The file (both text and binary) should be closed after reading/writing.

Closing a file is performed using library function fclose().

fclose(fptr); //fptr is the file pointer associated with file to be closed.

## Reading and writing to a text file

For reading and writing to a text file, we use the functions fprintf() and fscanf().

They are just the file versions of printf() and scanf(). The only difference is that, fprint and fscanf expects a pointer to the structure FILE.

### Writing to a text file

**Example 1: Write to a text file using fprintf()**

#include <stdio.h>

int main()

{

int num;

FILE \*fptr;

fptr = fopen("C:\\program.txt","w");

if(fptr == NULL)

{

printf("Error!");

exit(1);

}

printf("Enter num: ");

scanf("%d",&num);

fprintf(fptr,"%d",num);

fclose(fptr);

return 0;

}

This program takes a number from user and stores in the file program.txt.

After you compile and run this program, you can see a text file program.txt created in C drive of your computer. When you open the file, you can see the integer you entered.

### Reading from a text file

**Example 2: Read from a text file using fscanf()**

#include <stdio.h>

int main()

{

int num;

FILE \*fptr;

if ((fptr = fopen("C:\\program.txt","r")) == NULL){

printf("Error! opening file");

// Program exits if the file pointer returns NULL.

exit(1);

}

fscanf(fptr,"%d", &num);

printf("Value of n=%d", num);

fclose(fptr);

return 0;

}

This program reads the integer present in the program.txt file and prints it onto the screen.

If you succesfully created the file from **Example 1**, running this program will get you the integer you entered.

Other functions like fgetchar(), fputc() etc. can be used in similar way.

Exercise

Write a c program that reads grades of students and class name from the following file

40 f

100 m

30 f

20 v

50 n

70 m

80 x

Then write the grades for students who pass the exam(grade >=50) in file called pass and failed in file called fail with their class name