

Input/output in C

Computing Lab

`https://www.isical.ac.in/~dfslab`

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Basic output to the terminal

- `putchar(int c)` : print `c`, cast to an unsigned char, to stdout (terminal)
- `puts(const char *s)` : print string `s` + newline to stdout
- `printf(const char *format , ...)` : contains zero or more *conversion specifiers*



optional

printf: conversion specifiers

flags	width	precision	length modifier	type
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■ flags

- `0` : right align, with zero padding on the left
- `-` : left align

■ width: *minimum* field width

- precision: usually, number of significant digits (for floating point numbers) /
maximum number of characters to be printed (for string)

■ length modifier: `l`, `ll`, `L`, `z`

■ type: `d`, `i`, `c`, `f`, `s`

section no. in manual

See man pages for detailed documentation, e.g., `$ man 3 printf`

Reading from the “terminal”

Character at a time:

- Functions: `getchar()` OR `fgetc(stdin)` (equivalent)
- Return value: reads the next character and returns it as an `unsigned char` cast to an `int`, or `EOF` on end of file or error.
- Typical usage: `while (EOF != (c = fgetc(fp))) ...`
- Caution: **Do not forget to declare `c` as `int` type.**

If `c` is of type `char`:

- reading from the terminal: will probably work without any problem
- reading from a file: in some (rare) cases, problems could occur

Reading from the “terminal”

Line at a time:

- Function: `fgets(s, n, stdin)`
- Return value
 - reads at most `n-1` characters or one line (whichever is shorter), stores input in character array `s` and terminates `s` using `'\0'`
 - if a newline is read, it is stored in `s`
 - returns `s` or `NULL` on end of file (i.e., there is nothing to be read) or error
- Typical usage: `while (NULL != fgets(s, n, stdin)) ...`
- Caution: **Without exception, do not use `gets()`!**

Reading from the terminal: scanf

Format string:

" ", "\t", "\n" or any sequence of these characters	matches any amount of white space, including none
"%d", "%ld", "%lld"	read an <code>int</code> , <code>long int</code> or <code>long long int</code> , possibly with leading + or - sign
"%u", "%lu", "%llu"	read an <code>unsigned int</code> , <code>unsigned long int</code> or <code>unsigned long long int</code>
"%f", "%lf", "%llf"	read a <code>float</code> , <code>double</code> or <code>long double</code> , possibly with leading + or - sign
"%c"	read a single character (<i>including white-space</i>)

Review questions

1. Write a program that reads the given file (`getc-input.txt`) one character at a time using `fgetc`. After each character is read, print it along with its ASCII value to the screen.

Try storing the return value of `fgetc` in an `int` type variable and a `char` type variable in turn, and report any observed difference in the behaviour of your program.

NOTE: Do NOT open `getc-input.txt` in the browser, and save / copy-paste the content into a local file. Right-click on the link, save the file locally, and run your program on the downloaded file using input redirection (`./a.out < getc-input.txt`).

2. Read, compile, run and understand the programs `basic-io.c` and `robust-scanf.c` on various kinds of mixed input including characters, white-space, digit sequences, punctuation marks, etc.

NOTE: The program has several parts; please read and follow the corresponding comments. For the first part of `basic-io.c`, you may use `test-input-14082024.txt` as a test input file.

Practice problems

1. Write a program that reads text typed at the terminal, and counts
 - the number of occurrences of vowels in the input text;
 - the number of words in the input text. Assume that any contiguous sequence of letters and / or digits forms one word.