#4 Input Output Instruction

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Input Output device

Computer program can communicates with human with the help of input output devices. You provide input to the program by using various input devices like keyboard, mouse, scanner, touch pad, etc. Similarly computer program can generate output of the processing on output devices like monitor, printer, speaker, etc.

Among all such available input and out devices, monitor is standard output device and keyboard is standard input device.

An instruction which is responsible to handle input from input device is called input instruction. Similarly, an instruction which is responsible to handle output on output device is called output instruction.

Output instruction

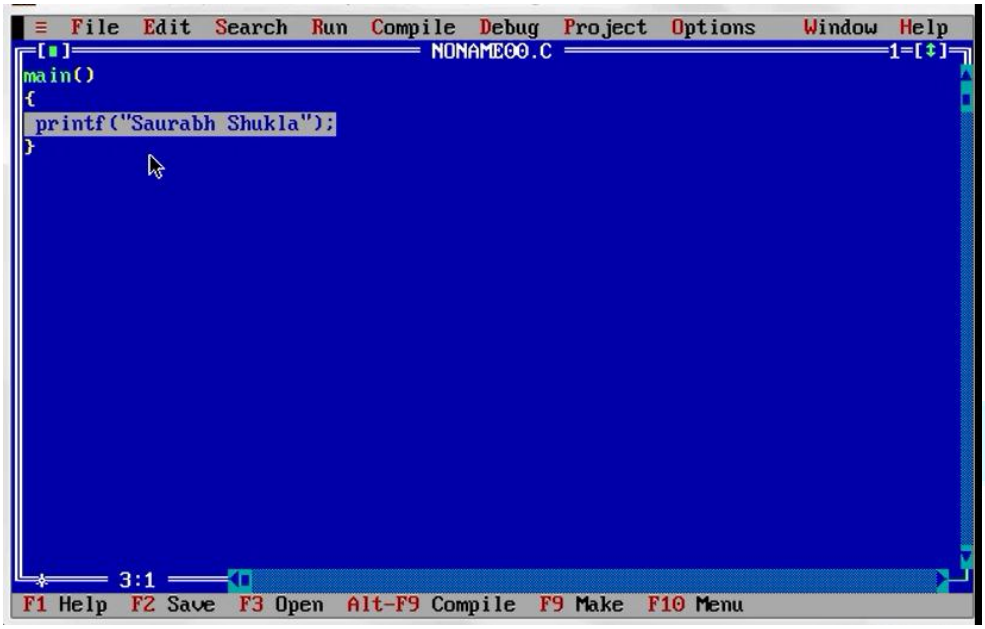
To output any text on the screen of monitor, we use a predefined function called printf().

- printf() is not a keyword
- printf() is a predefined function
- You can print any text message on the screen using printf()
- You can also print variable values and expression results using printf()

What is function? You will come to know about function in great detail in functions chapter. As of now, function is a block of code, designed to perform a task (assume it as a sub program). Function has a name for identification. Function name can be used as a representation of some code.

Function printf() is also a representative of some code residing in the C library. You can invoke that code any number of times by using name printf(). The code is responsible to print something on the screen.

Printing name on the screen



Above screen shot is the program to print name Saurabh Shukla. You can write anything in double quotes inside the parenthesis of printf().

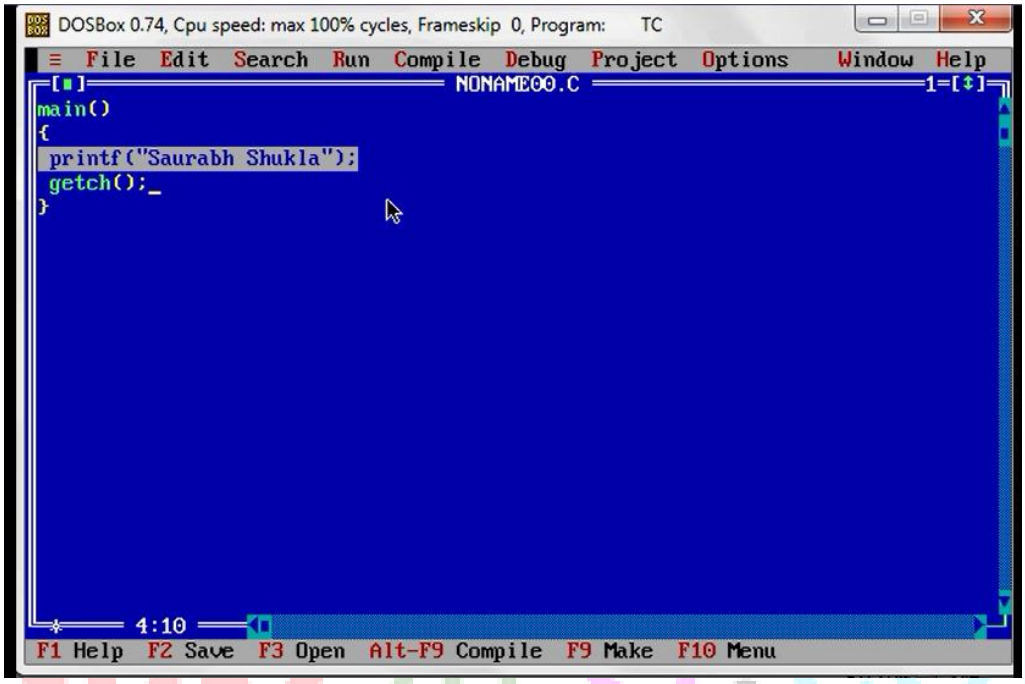
Note:

- () pronounced as parenthesis
- < > Angular brackets
- [ ] Square brackets
- { } Curley braces

About getch()

- getch() is also a predefined function.
- Its job is to take one character from the keyboard
- Its job will be over only when you presses a key from the keyboard

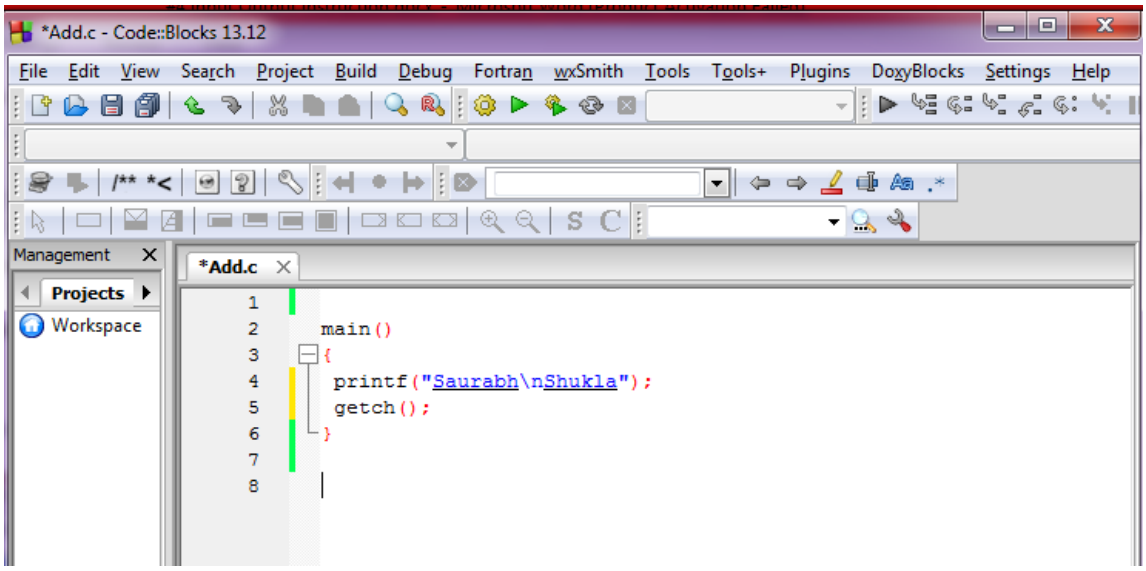
You can use it as a trick. In the previous program, you cannot see output because as soon as the printf() statement completed its job, program terminates, output screen vanishes. There is only one line in the program, so we strategically placed getch() function after printf() to avoid screen termination. Until you presses a key, the last line (getch()) is not over. So you will be able to see output screen, as it will only shut down when the last line finishes its job.



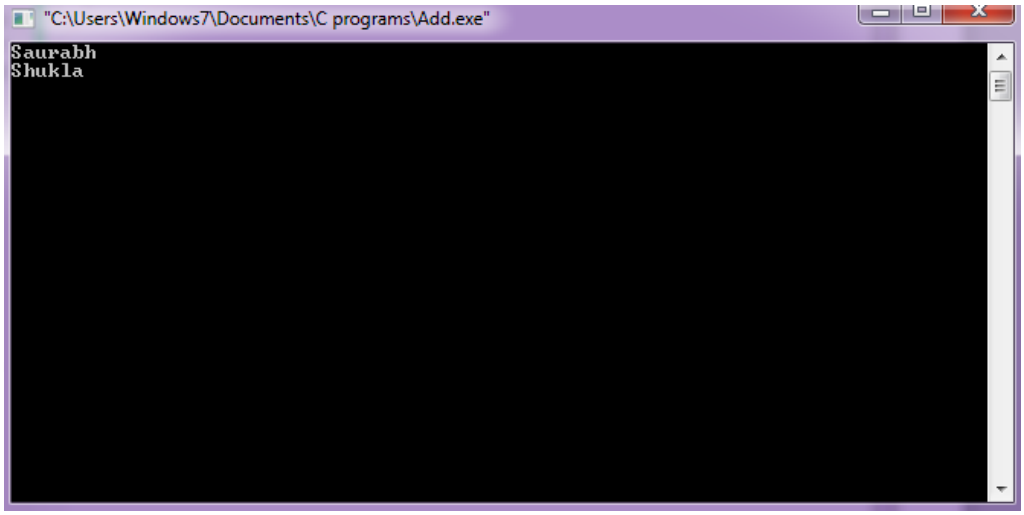
Formatted output using printf()

You can use clrscr() function to clear screen. It erases all the content which is present on the screen. You cannot use clrscr() in code blocks. You can use system("cls") in its place, if you want.

You can print your name on the first line and surname on the second line by using special character '\n'.



Output of the above program is



Remember, using another printf is not going to print surname on the next line. You have to use '\n' which is a special character also known as new line character.

You can experiment other such special characters, known as escape sequences.

Escape Sequences

\n New line character

\b Same as backspace key

\t Same as tab key

\\ to print backslash single time

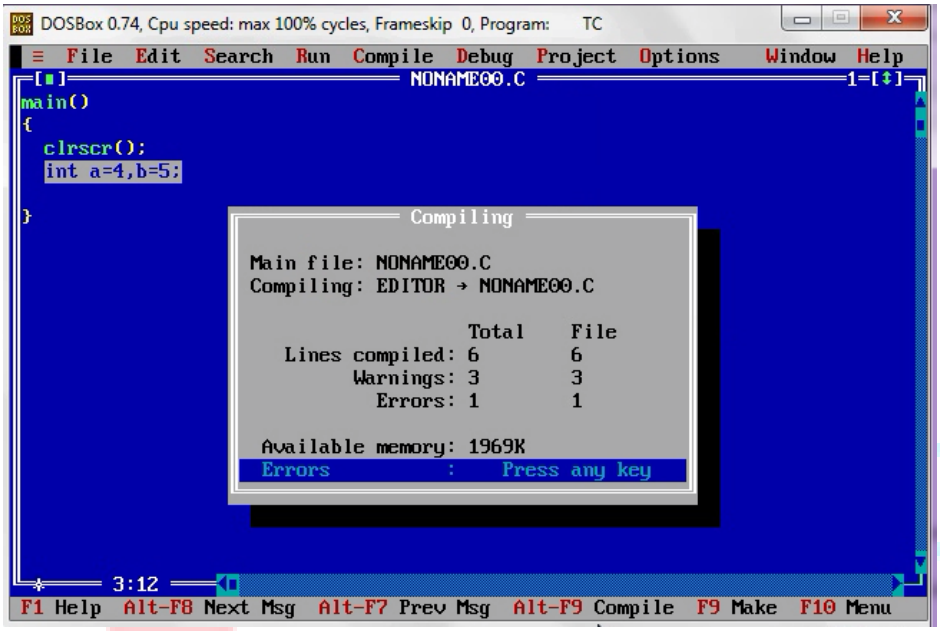
\" to use double quotes as printable character

\r carriage return, it moves cursor at the starting place of the current line

You can experiment these special character by using them in printf and see the output.

Note: gotoxy will not work on code blocks.

Remember: In C language you cannot write declaration statements after action statement. (Although in C++ it is permitted)



Printing values of the variables and expressions

To print values of the variables you have to use format specifiers.

%d for int

%c for char

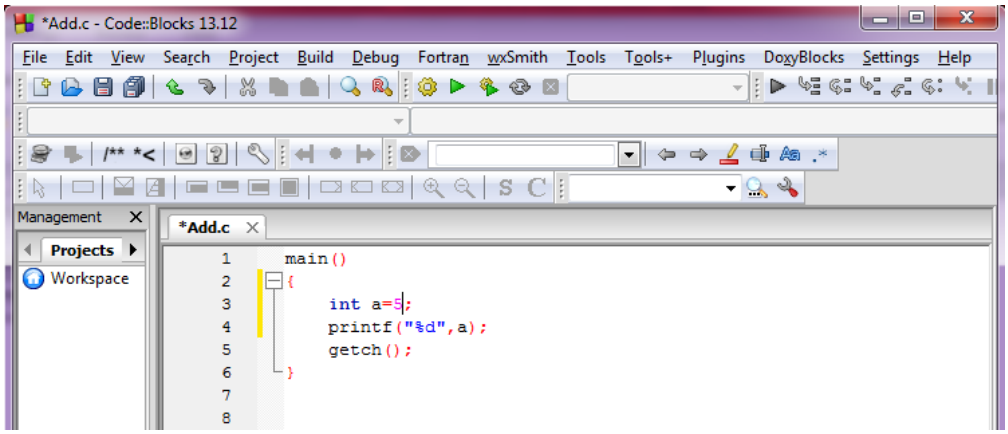
%f for float

%lf for double

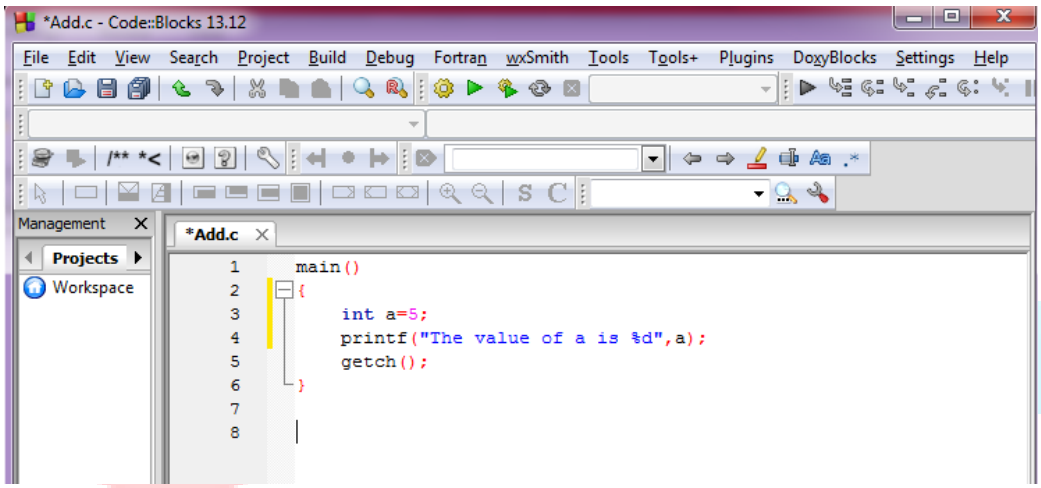
%d, %c, %f, %lf are called format specifiers. They are special symbols used to tell printf about the format in which data should be printed.

printf("%d",a);

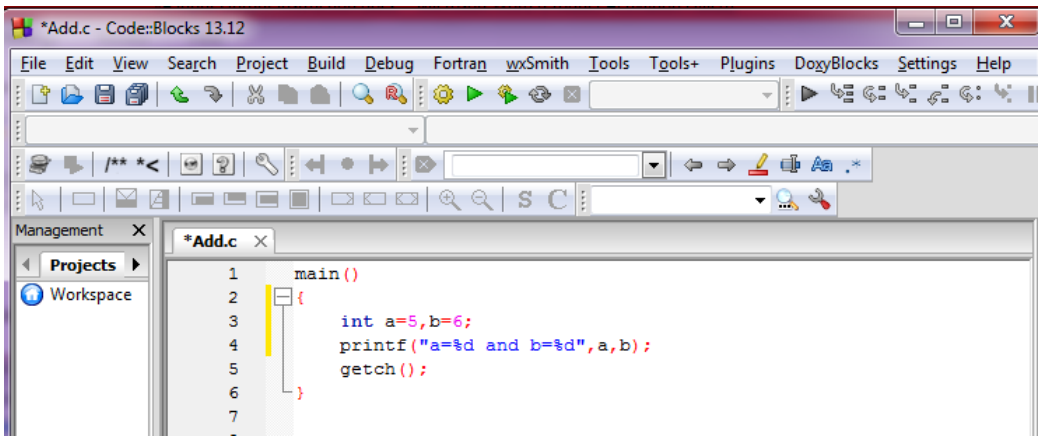
The above statement prints the value of variable a. Here you have to assume that the variable is of int type. Basically %d, tells the printf to print content of a (which is a sequence of 0s and 1s) after converting into a number in base 10, that is decimal number system.



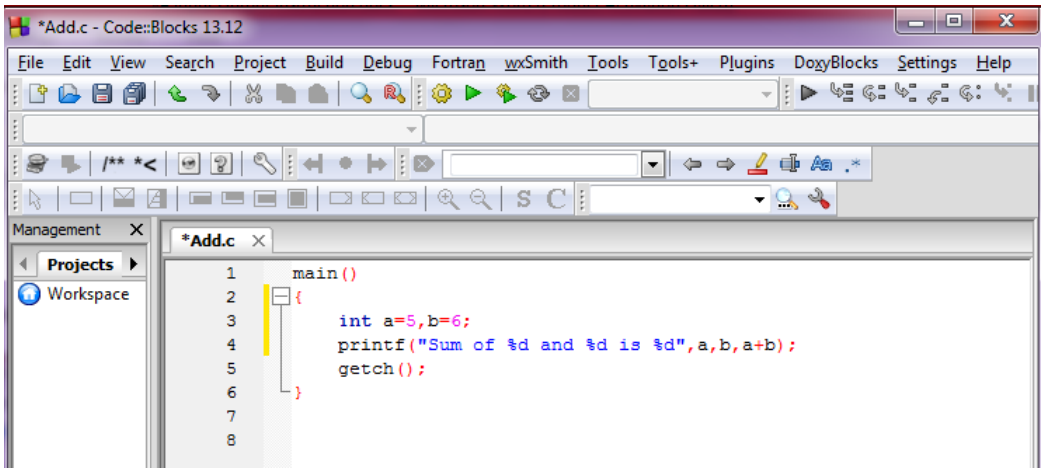
You can print a mixed message which contains your text as well as value of variable.



You can also print values of multiple variables in a single statement.



You can also print value of an expression.



Input Instruction

Most of the time you want to process data which is provided by user through keyboard. You expect from user to provide needful data through keyboard, which you can take in program's variables, and then use them in processing task. To achieve this goal you need to write some instruction, better known as input instruction.

scanf() function

Just like printf, scanf is also a predefined function. The job of scanf() to input data from keyboard. (Actually, data which comes from keyboard, settled in a standard input buffer, from where scanf() pulls data and convert it to the specified format, which you have mentioned during call of scanf)

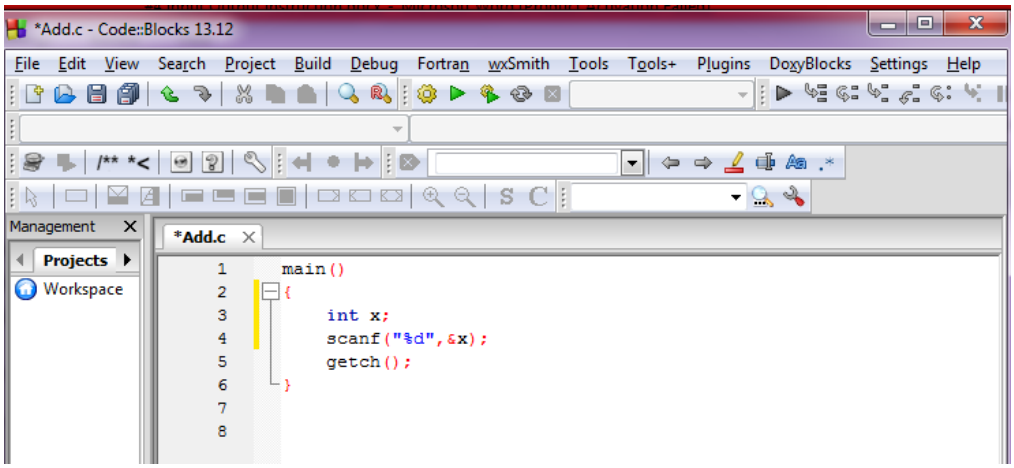
Syntax of scanf()

scanf("format specifier", address of variable);

For example, if there is a variable x of type int, now you want to allow user to input an integer value through keyboard and then your program can store it to variable x. The job can be done as:

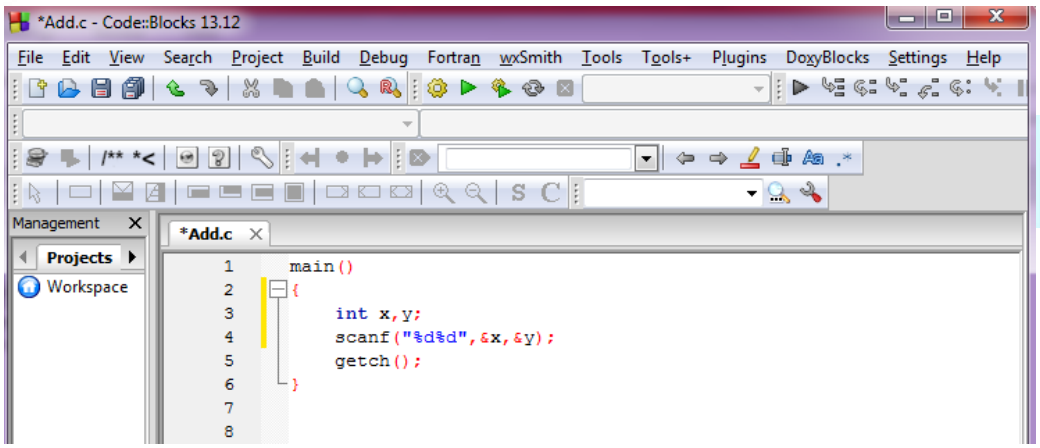
scanf("%d",&x);

In the above statement, '&' is a dereferencing operator which you will see later in pointers chapter. It should be read as 'address of'.



Remember: Do not forget to mark address of operator before variable name in scanf function, it is important. Also, do not accidently use address of operator in printf. You will understand its usage in pointers chapter.

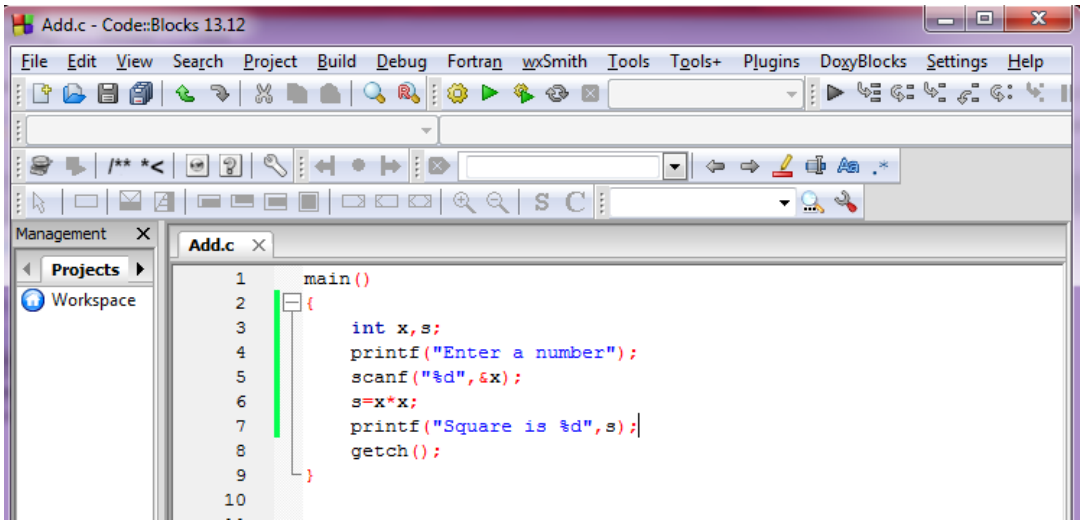
You can input more than one value using single scanf statement.



Remember:

- User proper format specifier in printf and scanf, according to the need and type of variable
- Do not forget to use address of (&) operator in scanf before variable name
- Do not write any symbol between two %d when used in scanf, like comma, it will then not work according to expectation.

Here is a sample program to calculate square of a number, where number is given by user.



Try to answer following questions:

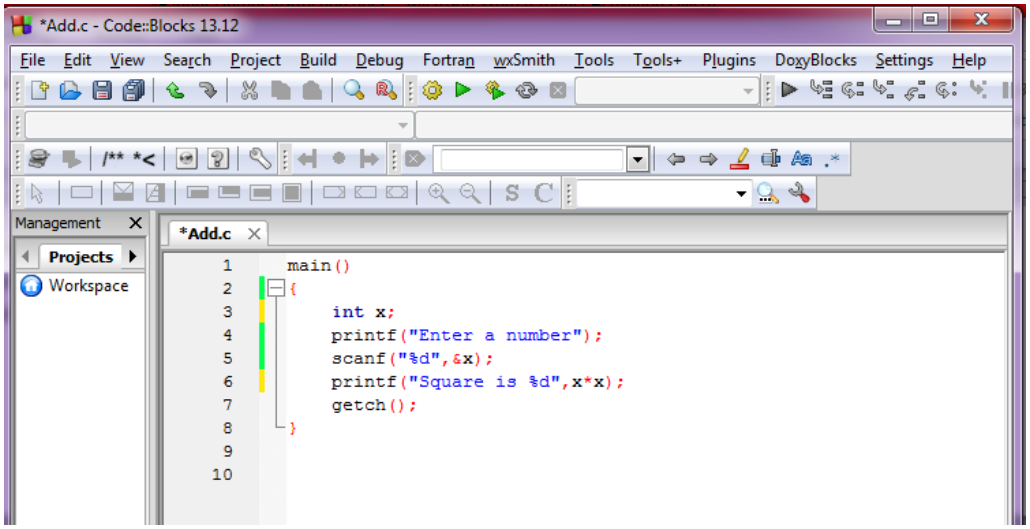
- Why we are using printf just above scanf?
- Can't we write statement s=x*x; just after declaration statement?
- Can you make the same program without using variable s?

Answers

Program lines executes line by line. If we write scanf without prior printf, you would see a blank output screen. No message (no direction) for the user. So it is a nice idea to guide user what he should do. Printing a message like "Enter a number" makes your program more users friendly.

Statement s=x*x; should processed only when you received value in variable x. So writing statement s=x*x just after declaration and before scanf is a big mistake, as in that case it would be processed before getting value in variable x.

Yes you can make the same program without using variable s.



References

- Format Specifier Chart

Data Type	Format Specifiers	Size	Range
Signed char	%c	1Byte	-128 to 127
Unsigned char	%c	1Byte	0-255
Int or Long int or Signed Long Int	%d	4 Bytes	-2147483648 to 2147483647.
Unsigned int Or unsigned long int	%u	4 Bytes	0 to 4 Gigabyte.
Short int	%hd	2 Bytes	-32768 to 32767.
Unsigned short int	%hu	2 Bytes	0 to 65535.
float	%f	4 Bytes	3.4E-38 to 3.4E+38
double	%lf	8 Bytes	1.7E-308 to 1.7E+308
Long Double	%Lf	10 Bytes	3.4E-4932 to 1.1E+4932.

YouTube Video Links

- Lecture 4 Input Output Instruction part-1
  - https://www.youtube.com/watch?v=dw889ubtFR8&feature=youtu.be&list=PL7ersPsTyYt2Q-SqZxTA1D-melSfqBRMW
- Lecture 4 Input Output Instruction part-2
  - https://www.youtube.com/watch?v=FZE_uBFkbqU&feature=youtu.be&list=PL7ersPsTyYt2Q-SqZxTA1D-melSfqBRMW
- Lecture 4 Input Output Instruction part-3
  - https://www.youtube.com/watch?v=iKyYV-BbPCg&feature=youtu.be&list=PL7ersPsTyYt2Q-SqZxTA1D-melSfqBRMW
- Lecture 4 Input Output Instruction part-4
  - https://www.youtube.com/watch?v=gIxYS1n00g0&feature=youtu.be&list=PL7ersPsTyYt2Q-SqZxTA1D-melSfqBRMW

Exercise

1. Write a program to print Name on the first line and surname on the second line

2. Write a program to print mysirg in double quotes (“mysirg”)
3. Write a program to print \n
4. Write a program to print %d
5. Write a program to add two numbers. Numbers should be taken from user.
6. Write a program to calculate square of a number. Number should be taken from user.
7. Write a program to calculate area of a circle. Radius should be taken from user.
8. Write a program to see the use of all escape sequences. (for self-learning)
9. Write a program to calculate area of rectangle.
10. Write a program to calculate simple interest
11. Write a program to calculate cube of a number
12. Write a program to calculate perimeter of a triangle.