

C Library Functions

COP 3223C – Introduction to Programming with C

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Predefined C Functions

- Principle of **code reuse** where we reuse program fragments already written and tested
- In C, header files (.h files) contain these functions
- For example, stdio.h has printf () and scanf ()

The Math Library

The `math.h` library contains predefined math functions

Function	Standard Header File	Purpose	Argument(s)	Result
<code>abs(x)</code>	<code><stdlib.h></code>	Absolute Value	int	int
<code>ceil(x)</code>	<code><math.h></code>	Round Up	double	double
<code>cos(x)</code>	<code><math.h></code>	Cosine	double (radians)	double
<code>exp(x)</code>	<code><math.h></code>	Natural Exponent	double	double
<code>floor(x)</code>	<code><math.h></code>	Round Down	double	double
<code>log(x)</code>	<code><math.h></code>	Natural Logarithm	double	double
<code>log10(x)</code>	<code><math.h></code>	Base 10 Logarithm	double	double
<code>pow(x, y)</code>	<code><math.h></code>	x^y	double	double
<code>sin(x)</code>	<code><math.h></code>	Sine	double	double
<code>sqrt(x)</code>	<code><math.h></code>	Square Root	double	double
<code>tan(x)</code>	<code><math.h></code>	Tangent	double	double



Practice

Convert the following math formula to a valid C statement?

Use the appropriate function(s), if necessary

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

(numerator) / (denominator)

$$\frac{(-b) + (\sqrt{(b \times b) - (4 \times a \times c)})}{(2 \times a)}$$

$$\sqrt{(b \times b) - (4 \times a \times c)}$$

$$\frac{(-b + \sqrt{(b \times b) - (4 \times a \times c)}))}{(2 \times a)}$$

Your Turn!

Write a complete C program that prompts the user to enter three integers representing the coefficients **a**, **b**, and **c**. The program should then calculate and display the two solutions for **x** using the quadratic formula. You may assume the inputs will always result in two real solutions. Format the result to show three digits after the decimal point.

Sample Run

Enter a: 2

Enter b: 5

Enter c: -3

x = 0.500 and x = -3.000

The Character Type Library

The `ctype.h` contains functions that deal with the `char` type

✓
✓

Function	What it does...
islower ()	Checks to see if a character is lowercase.
isupper ()	Checks to see if a character is uppercase.
tolower ()	Converts a character to its lowercase version.
toupper ()	Converts a character to its uppercase version.
isalpha ()	Checks to see if a character an alphabet.
isdigit ()	Checks to see if character is a digit.
isspace ()	Checks to see if character is a whitespace.
isalnum ()	Checks to see if character is either alphabet or number.
ispunct ()	Checks to see if character is punctuation.

Practice

Write a program that prompts the user to enter a lowercase letter from the English alphabet. The program should then display this letter converted to uppercase.

Sample Run

Enter Letter: a

Your Letter is A

Challenge

Write a program that prompts the user to enter a lowercase letter from the English alphabet. The program should then display the next letter in the alphabet, converted to uppercase. You may assume the input will never be 'z'.

Sample Run

Enter Letter: a

Your Letter is B

Your Turn!

What if, instead of printing the next letter, you wanted to display the letter that is **N** positions ahead of the one entered by the user? For example, if the user enters 'a' and 3, the output is 'D'.

Sample Run

Enter Letter: a

Enter Number: 3

Your Letter is D

The Standard Library

- The `stdlib.h` contains functions for various purposes
- Example:
 - Generating a “random” number (pseudo), use `rand()`
 - Dynamic memory allocation, use `malloc()`
- More during the latter part of the semester

Practice

Generate a random number between 0 and 99, inclusive

Discussion

- The `rand()` generates a pseudo-random integer between 0 and `RAND_MAX`, inclusive
- We often pair this with seeding the random that is tied to the time via `srand(time(NULL))` ;
- How do we change the range of numbers? Say, 0 to 99, inclusive?

Questions?