

Computer Programming 143 – Lecture 9

Functions I

Faculty of Engineering



What is a function?

$$f(x) = \begin{cases} x^2 & \text{when } x > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$y_1 = f(5)$$

$$y_2 = f(-5)$$

arguments

$$x = \sin(\quad)$$

function

arguments

5.2 Introduction to Functions II

Functions we have used:

From `stdio.h`

- Print text on the screen

```
printf( "The value of x is %d\n", x );
```

arguments

- Read input from user

```
scanf( "%d", &x );
```

void.

From `math.h`

- Calculate one number raised to the power of a second number

```
x = pow( 5, 3 );
```

arguments 5^3

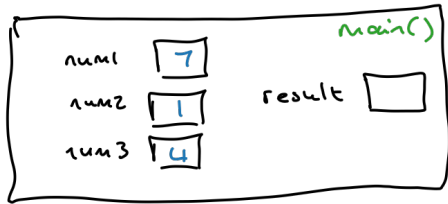
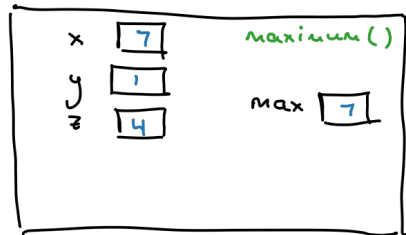
`main()`

- The main function in every C program

Writing your own functions

```
type    functionName (arguments )  
{  
    // Declare variables  
  
    // Statements  
  
    return <>;  
}
```

body



5.6 Function Prototypes II

Promotion rules and conversions

- Casting to different types:
 - Using an integer as a real number: `( float ) int1`
 - Using a real number as an integer: `( int ) float1`
- Converting to “lower” types can lead to errors
- Convert type

```
int mval;  
float a,b,c;  
a = 10.0;  
b = 12.0;  
c = 11.0;  
mval = maximum( ( int ) a, ( int ) b, ( int ) c );
```

5.3 Math Library Functions I

Math library functions

- perform common mathematical calculations
- **#include** <math.h>

Format for calling functions

```
functionName( argument1, argument2, ... );
```

- If multiple arguments, use comma-separated list
- Arguments may be constants, variables or expressions
- Example:

```
double x;  
x = sqrt( 1000.0 );
```

- Calls function sqrt, which returns the square root of its argument
- All math functions return data type **double**

5.3 Math Library Functions II

Commonly used math library functions:

Function	Description	Example
<code>sqrt(x)</code>	square root of x	<code>sqrt(900.0)</code> is 30.0 <code>sqrt(9.0)</code> is 3.0
<code>exp(x)</code>	exponential function e^x	<code>exp(1.0)</code> is 2.718282 <code>exp(2.0)</code> is 7.389056
<code>log(x)</code>	natural logarithm of x (base e)	<code>log(2.718282)</code> is 1.0 <code>log(7.389056)</code> is 2.0
<code>log10(x)</code>	logarithm of x (base 10)	<code>log10(1.0)</code> is 0.0 <code>log10(10.0)</code> is 1.0 <code>log10(100.0)</code> is 2.0
<code>fabs(x)</code>	absolute value of x	<code>fabs(5.0)</code> is 5.0 <code>fabs(0.0)</code> is 0.0 <code>fabs(-5.0)</code> is 5.0

5.3 Math Library Functions III

Commonly used math library functions:

Function	Description	Example
<code>ceil(x)</code>	rounds x to the smallest integer greater than x	<code>ceil(9.2)</code> is 10.0 <code>ceil(-9.8)</code> is -9.0
<code>floor(x)</code>	rounds x to the largest integer less than x	<code>floor(9.2)</code> is 9.0 <code>floor(-9.8)</code> is -10.0
<code>pow(x, y)</code>	x raised to power y (x^y)	<code>pow(2, 7)</code> is 128.0 <code>pow(9, .5)</code> is 3.0
<code>fmod(x, y)</code>	remainder of x/y as a floating point number	<code>fmod(13.657, 2.333)</code> is 1.992
<code>sin(x)</code>	trigonometric sine of x (x in radians)	<code>sin(0.0)</code> is 0.0
<code>cos(x)</code>	trigonometric cosine of x (x in radians)	<code>cos(0.0)</code> is 1.0
<code>tan(x)</code>	trigonometric tangent of x (x in radians)	<code>tan(0.0)</code> is 0.0

Homework

- 1 Study Sections 5.1-5.5 in Deitel & Deitel
- 2 Do Self Review Exercises 5.1(a)-(h), 5.3-5.5 in Deitel & Deitel
- 3 Do Exercises 5.8, 5.15, 5.18, 5.25 in Deitel & Deitel