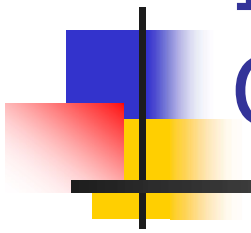

# Introduction to Computer Programing
# C++ Ch3 Functions

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# Functions Defined in <cmath>

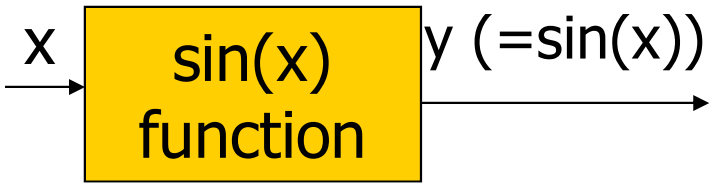
Check: http://www.cplusplus.com/reference/cmath/

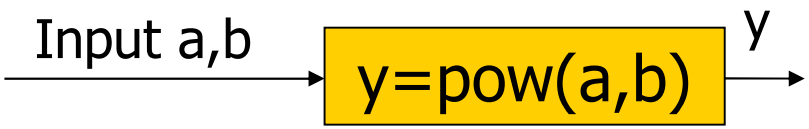
| Syntax | Meaning |
|---|---|
| exp(x) | $e^x$ |
| sqrt(x) | x^(1/2), only for positive x |
| log(x) | ln(x) |
| log10(x) | log(x) |
| sin(x) | sin(x), x in degree or radius? |
| pow(a,b) | $a^b$ |
| …. | |

# What is a Function?

Think about sin(x)…

- No need to worry about how it is calculated.
- Wherever you go, sin(x) is sin(x): no need to worry about duplication of variables.
- Simple format – only one line gets what you want.




y: return value (output)
pow: function name
(a, b): argument (function input)

# User Defined Functions: Example 1

Write a function that calculates x*y + x/y

(1) Function declaration

(2) Function call
(note for sin(x) or pow(x,y))

(3) Function definition
Function header
Function body

```
#include <iostream>
using namespace std;

double funtest(double, double);

int main(){
    cout << funtest(2,3) << endl;
    return 0;
}

double funtest(double x, double y)
{ //this function returns value of xy+x/y
    double a;
    a=x*y+x/y;
    return a;
}
```

# User Defined Functions: Example 1

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#include <iostream>
using namespace std;

double funtest(double, double);

int main(){
    cout << funtest(2,3) << endl;
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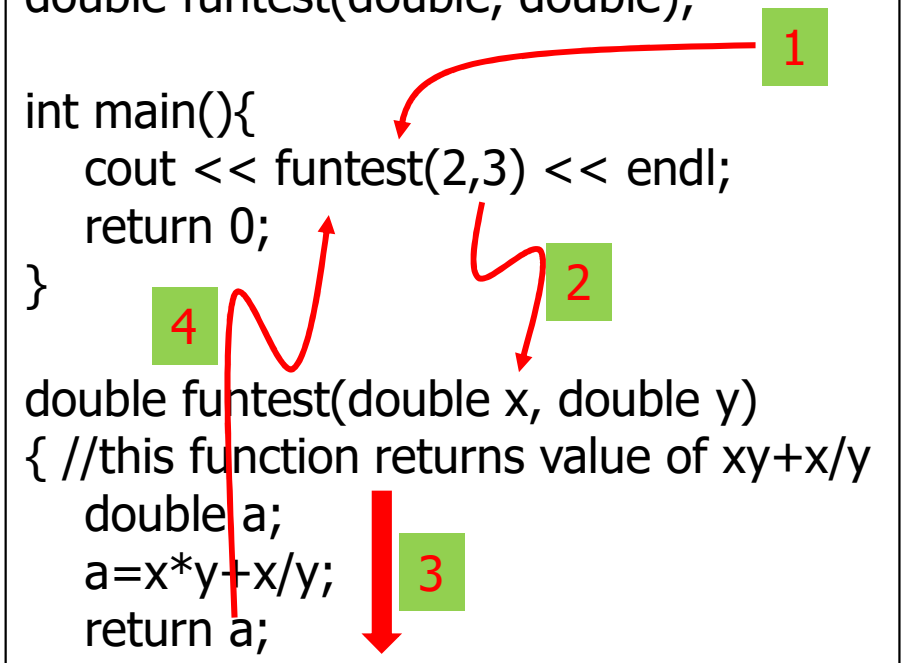


# User Defined Functions: Example 2

Write a function that calculates x^y

(1) Function declaration

(2) Function call
(note for sin(x) or pow(x,y))

(3) Function definition
Function header
Function body

```
#include <iostream>
using namespace std;

int funpower(int, int);

int main(){
    cout << funpower(3,4)<<endl;
    return 0;
}

int funpower(int x, int y)
{ // returns x^y
    int i, p=1;
    for (i=1;i<=y;i++){
    p=p*x;
    }
    return p;
}
```

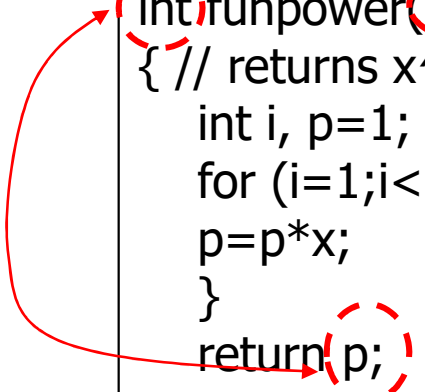
# User Defined Functions: Example 2

```
#include <iostream>
using namespace std;

int funpower(int, int);

int main(){
    cout << funpower(3,4)<<endl;
    return 0;
}

int funpower(int x, int y)
{ // returns x^y
    int i, p=1;
    for (i=1;i<=y;i++){
    p=p*x;
    }
    return p;
}
```



# Test Your Understanding

- Write a function that calculates the factorial of an integer (N!)
  - Input N, Output N!
- Write a function that calculates the value of a quadratic function
  - Input a, b, c, x, output ax^2+bx+c
- Write a function with input Re and Output $C_D$

$$C_D = \frac{24}{Re} \quad \text{for} \quad Re < 0.1$$

$$C_D = \frac{24}{Re}(1 + 0.14\,Re^{0.7}) \quad \text{for} \quad 0.1 \le Re \le 1000$$

$$C_D = 0.44 \quad \text{for} \quad 1000 < Re \le 350000$$

$$C_D = 0.19 - 8\times10^4/Re \quad \text{for} \quad 350000 < Re$$