Functions

Chapter 6, page 303

Functions

- "A collection of statements that perform a specific task", p 303
  - And can be accessed at any point in the code through a *function call* and optionally produce a value

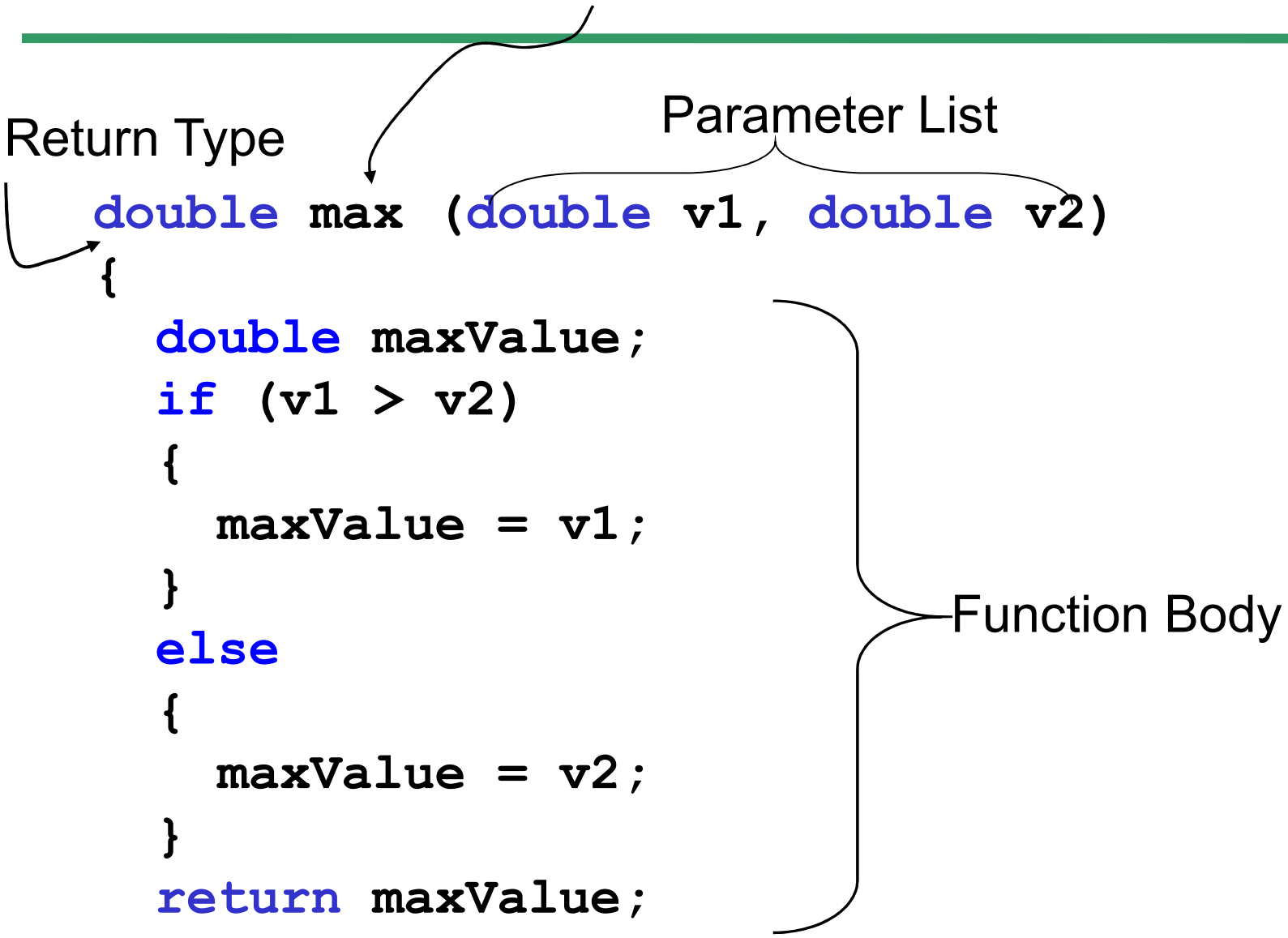
```
#include <cmath>

x = pow(2.0, 3);
x = pow(4.0, 0.32);
```

Functions

- Functions are a way of building *modules* in your program
- Encapsulate some calculation
- Less repetitive code
- Example:

```
x = pow(4.0, 2.2);
cout << x << endl;
```

Functions


Function Name
Return Type
Parameter List
double max (double v1, double v2)
{
double maxValue;
if (v1 > v2)
{
maxValue = v1;
}
else
{
maxValue = v2;
}
return maxValue;
}
Function Body

Calling a function

```
int main()
{
  double value1, value2;

  // must match data types & parameters
  value1 = max(4.2, 2.4);
  value2 = max(value1, 2.4);

  cout << value1 << " " << value2;

  return 0;
}
```

`void` Functions

- Not all functions need to produce a value

```
void printDayOfWeek (int day)
{
  if ( SUNDAY == day )
  {
    cout << " Sunday ";
  }
  else if (MONDAY == day )
  {
    cout << " Monday ";
  }
  . . .
  return; // no return value!
}
```

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

// place the function at the top of the file
void printSquares (int value, int value2)
{
cout << value * value << " ";
cout << value2 * value2 << endl;
  return;
}

int main()
{
  int x = 3, y = 2;
  printSquares(x, y);
  printSquares(y, x);
  return 0;
}
```

Practice

- Write a function that will calculate the average of three integers and print the result to the screen.
- What parameters do you need?
- What should the return type be?

- Write some C++ statements to call this function to determine the average of three integers given by the user.

Practice

- Write a function to calculate the factorial of a given integer.
- Remember: N! = n * (n-1) .... 2 * 1

- Write some C++ statements to use the function to print 4! to the screen

Commenting a function declaration

```
/*********************************************

Function:    max

Description: finds the maximum value of two doubles

Parameters:  value1 - a double, first of the pair
               value2 - a double, second of the pair

Returned:    the maximum of two values given

*********************************************/

double max (double value1, double value2)
```

Compiling Functions

- The function declaration *must* be placed above the function's first use in the file

```
double max (double v1, double v2) // declaration
{
   . . .
   return maxValue;
}

int main()
{

   double value1 = 4.2;
   cout << max(value1, 2.4); // use
   return 0;
}
```

The compiler needs to check to ensure that the function is being called with the correct data types.

Compiling Functions, part 2

- Or, the a *function prototype* must be given before the function is used

```
double max (double v1, double v2);

int main()
{

  double value1 = 4.2;
  cout << max(value1, 2.4);
  return 0;
}

double max (double v1, double v2)
{
  . . .
  return maxValue;
}
```

Practice

- Write a function that flips the case of a letter. When an upper case letter is given, return the lower case version. When a lower case letter is given, return the upper case version.
- If a punctuation or numeric character is given, just return that character.
- What parameters do you need?
- What should the return type be?

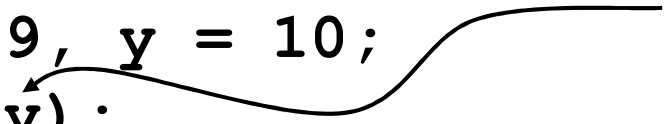
Passing Arguments

- Arguments are passed into functions
- Parameters are evaluated in the order given
- A **copy** of the argument is made in the parameter
- If a parameter is changed in the function, is that reflected in main?

What will happen?

```
void swap (int value, int value2)
{
  int tmp = value;
  value = value2;
  value2 = tmp;
  cout << value << " " << value2 << endl;
  return;
}

int main()
{
  int x = 9, y = 10;
  swap(x, y);
  cout << x << " --- " << y << endl;
  return 0;
}
```

parameters



arguments