# CS150 Intro to CS I

Fall 2014

# Chapter 6
# Functions

- Reading: pp. 324-334, 348-354
- Good Problems to Work: p. 334 [6.11, 6.14]; p. 353 [6.23]; p. 363 [1 - 7] important; p 366 [56, 57]

# Functions calling other functions

- Write a complete C++ program that allows the user the ability to enter the numerator and denominator of a fraction. Print the fraction and the reduced fraction.
- The C++ driver for this problem is on the next slide.
- You are to write each of the function definitions for each of the function prototypes.
- You will have functions calling other functions!!!!!

# Reduced Fraction Driver

```
void printFraction (int, int);
int minimum (int, int);
int getPositiveInt ();
int greatestCommonDivisor (int, int);
void printFractionReduced (int, int);

int main ()
{
  int numerator, denominator;

  numerator = getPositiveInt ();
  denominator = getPositiveInt ();

  printFraction (numerator, denominator);
  cout << " reduced is ";
  printFractionReduced (numerator, denominator);
  cout << endl << endl;

  return EXIT_SUCCESS;
}
```

# Passing Arguments

- Pass by value
  - arguments are **copied** into the parameter list
  - changes made in the function will **not** be reflected in the calling function
- Pass by reference
  - changes made in the function **are** reflected in the calling function

# Example

```
#include <iostream>

using namespace std;

void ValTest (int parm1, int parm2)
{
  parm1 = 33;
  parm2 = 44;
}

void RefTest (int &parm1, int &parm2)
{
  parm1 = 77;
  parm2 = 88;
}

int main ()
{
  int val1 = 0, val2 = 0, val3 = 0, val4 = 0;

  ValTest (val1, val2);
  cout << "val1 = " << val1 << ", val2 = " << val2 << endl;

  RefTest (val3, val4);
  cout << "val3 = " << val3 << ", val4 = " << val4 << endl;

  return EXIT_SUCCESS;
}
```

# Example

```
void swap (int &num1, int &num2);
int main ()
{
  int i, j;
  cin >> i >> j;
  swap (i,j);
  cout << i << j;
  return EXIT_SUCCESS;
}

void swap (int &num1, int &num2)
{
  int temp;
  temp = num1;
  num1 = num2;
  num2 = temp;
  return;
}
```

# Practice
# What is the output?

```
void changeIt (int, int&, int&);
int main ()
{
  int i, j, k, l;
  i = 2;
  j = 3;
  k = 4;
  l = 5;
  changeIt (i, j, k);
  cout << i << j << k << endl;
  changeIt (k, l, i);
  cout << i << k << l << endl;
  return EXIT_SUCCESS;
}
```

```
void changeIt (int j,
               int& i,
               int& l)

{
  i++;
  j += 2;
  l += i;
}
```

# Rules for Parameter Lists

- Same number of arguments as parameters
- Arguments & parameters are matched by position
- Arguments & parameters are matched by type
- The names of the arguments and parameters may be the same or different
- For reference parameters only, the parameter must be a single, simple variable

# Practice

- Given the following function prototype:
```
void checkIt (float &, float &, int, int, char &);
```

And declarations in main:
```
float x, y;

int m;

char next;
```

Which are legal?
```
checkIt (x, y, m+3, 10, next);
checkIt (m, x, 30, 10, 'c');
checkIt (x, y, m, 10);
checkIt (35.0, y, m, 12, next);
checkIt (x, y, m, m, c);
```

# Practice

- Write a function to calculate the area of a rectangle. This function should produce a value and return it to the calling function.
- Write another function to calculate the area of a circle.
  - What data type should each function return?
  - What parameters should each function accept?

# Practice

- Build a small program that asks the user for either a rectangle or circle and displays the area of the selection shape.  Use the functions we just defined.
- Continue asking for input until the user types an ‘r’ or ‘c’.
- The main function should be small and mostly function calls. Is this true of your main? Is an additional function needed?