

CS 102

Introduction to  
Programming Using C++

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Chapter 4

Looping-Part 2

# Homework and Programs

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- Homework
- R4.1, 2, 3, 5, 7, 8, 10, 12, 13, 17, 18, 19, 23, 24
- Programs
- p. 178, P4.1, 2, or 3.
- Also one of P4.18, 19, 20, and 25.



# The break Statement Again

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- The break statement has another use
- It can end a loop early

```
for (int i=0; i<10; i++)  
{  
    if (i==5)  
        break;  
    cout << i << endl;  
}
```

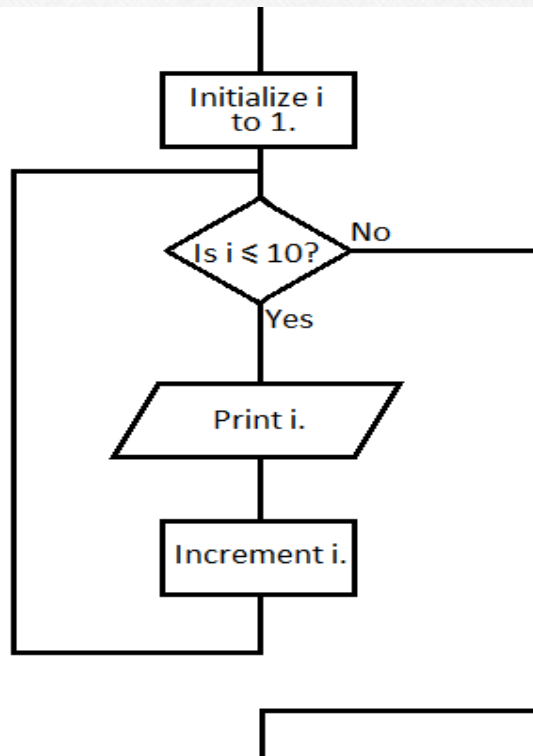
- Many people avoid it
- See the textbook's comment at the bottom of page 153

# Structured Programming (Again)

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- The three structures of structured programming are
  - 1. Sequence
  - 2. Decision
  - 3. Repetition

# Drawing Flow Charts



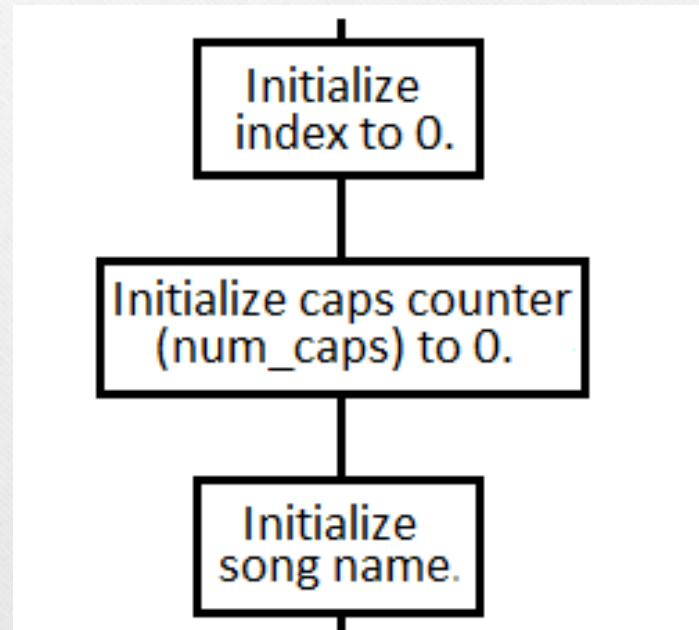
```
int i = 1;
while (i <= 10)
{
    cout << i << endl;
    i++;
}
```



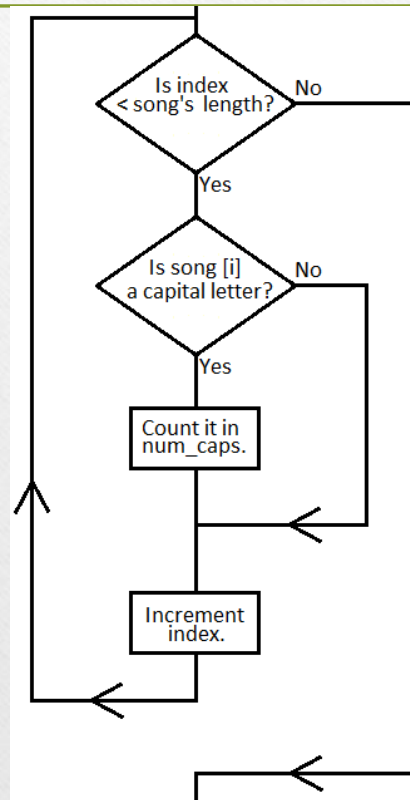
# A Flow Chart for Counting the Number of Capital Letters in a String

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- The initialization



# A Flow Chart for Counting the Number of Capital Letters in a String



# Analyzing the Flow Chart

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- Let's identify the structures
- There is always the sequence structure
  - And, of course, there are many of those
- There is a loop
- Inside the loop there is an if statement
- Can we see the structures?



# I/O Redirection

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- I/O stands for input and output
- These ideas are for commands entered at the command prompt
- Input can be redirected using <
- Output can be redirected using >
- There are other ways to use redirection
- Some examples are
  - `dir` vs. `dir >filelist`
  - `more <filename`
- When writing programs, you should consider this

# Applications of Loops-1

## Calculating a Sum and Average

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```
double total = 0;
double input;
while (cin >> input)
{
    total = total + input;
}
cout << total;
```



# Changes for an Average

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- For an average, you have to count the items
- Declare a counter:  
`int count;`
- Increment the counter in the loop:  
`count++;`
- Then you have to calculate the average  
`average = total / count;`
- There are two potential bugs with this code
- Can we find them?

# Shortcut Math Operators

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- There are several shortcut operators
- These are the same

`total = total + count;`    $\leftrightarrow$    `total += count;`

- The same idea works for `-=`, `*=`, `/=`, `%=`
- What does `var *=2;` do?



# string vs. char: substr vs. []

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- Strings are very common in programming
  - A string is just a list of characters
- Let's start with: `string str;`
- Then we can do `str.substr (0,1)`
  - We can also do `str [0]` or `str.at [0]`
- What's the difference?
- The book uses the substring function
- I will use the character versions

# Applications of Loops-2

## Counting Spaces in a String

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```
string str = "...";  
int spaces = 0;  
for (int i=0; i<str.length(); i++)  
{  
    if (str [i] == ' ')  
    {  
        spaces++;  
    }  
}
```



# Applications of Loops-3

## Finding the first match

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```
string str = "...";  
bool found = false;  
int position = 0;  
while (!found && position < str.length())  
{  
    if (str[position] == ' ')  
        found = true;  
    else  
        position++;  
}
```

# Applications of Loops-4

## Finding the Maximum and Minimum

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```
double largest;  
cin >> largest;  
double input;  
while (cin >> input)  
{  
    if (input > largest)  
    {  
        largest = input;  
    }  
}
```



# Applications of Loops-5

## Checking If Adjacent Values Are Equal

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```
double input;
double previous;
cin >> previous;
while (cin >> input)
{
    if (input == previous)
    {
        cout << "Duplicate input" << endl;
    }
    previous = input;
}
```

# The for Loop Again

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- The for loop is very versatile
- The middle expression can be any condition
- An example follows
- Before looking at the example, remember readability is important
- It should be considered before adding “wrinkles” to code



# Another Example of the for Loop

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```
bool found = false;
int posn;
for (posn=0; !found && posn<str.length(); posn++)
    if (str [posn] == ' ')
    {
        found = true;
    }
```

- Why did I not code `for (int posn=0; ...?`

# Questions?

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- Are there any questions?