Introduction to Computer Science I

Introduction to Programming

Janyl Jumadinova
22-24 January, 2018
What is Computer Science?

- A computation is a sequence of well-defined operations that lead from an initial starting point to a desired final outcome.
What is Computer Science?

A computation is a sequence of well-defined operations that lead from an initial starting point to a desired final outcome.

Computer science is the study of computation.
Computer science is the study of computation
Computer science is the study of computation

- investigating problems that can be solved computationally
Computer science is the study of computation

- investigating problems that can be solved computationally
- programming languages used to describe computations
Computer science is the study of computation

- investigating problems that can be solved computationally
- programming languages used to describe computations
- machines that carry out computations
Computer science is the study of computation

- investigating problems that can be solved computationally
- programming languages used to describe computations
- machines that carry out computations
- theoretical limits of computation (what is or is not computable)
Computer science is the study of computation

- investigating problems that can be solved computationally
- programming languages used to describe computations
- machines that carry out computations
- theoretical limits of computation (what is or is not computable)
- computational solutions to problems in math, science, medicine, business, education, journalism, ...
Computer science is the study of computation

- investigating problems that can be solved computationally
- programming languages used to describe computations
- machines that carry out computations
- theoretical limits of computation (what is or is not computable)
- computational solutions to problems in math, science, medicine, business, education, journalism, ...

Computers play a key role
Applications of Computer Science

Motion Analysis
Applications of Computer Science

Animated Movies ...
Applications of Computer Science

... are made by Computer Scientists
Applications of Computer Science

- Think about your interests ... 
- You can bet computer scientists are working in these areas!
What is a computer?
Hardware/Software relationship:

- Hardware is controlled by software
- Software is the collection of instructions that you issue to the computer to perform actions and make decisions
Simple Structure

- User
- Application
- Operating System
- Hardware
What is Computer Programming?
What is Computer Programming?

- Programming is the act of writing usable and useful software
- A program is a set of instructions
We will use **Java** programming language in this class.

- Java is a programming language originally developed by Sun Microsystems and released in 1995 as a core component of Sun’s Java platform.
HISTORY OF JAVA

- Started development in 1991 at Sun
- Originally called Oak
- Intended for smart consumer-electronic devices
- Derives much syntax/concepts from C++
- BCPL → B → C → C++ → Java
- Development almost halted, but 1993 saw introduction of web; Java was revamped to be able to easily add dynamic content to web pages
- Formally announced and released in May 1995
- Released under GPL to the public in May 2007
Programming in Java

- Java is an **object-oriented** programming language
Programming in Java

- Java is an **object-oriented** programming language
- **Objects** are fundamental elements that make up a program
Programming in Java

- Java is an object-oriented programming language
- **Objects** are fundamental elements that make up a program
- Java has a library of software, called **Java API**, that is available for your use
Java program development process
Simple first Java Program: “Hello World”

// This is the first program people write in a new language, // the "Hello World!". In Java, this file must be named // Welcome.java, with the first part of the name, Welcome, being // the same as the name of the class. The filename itself // (not the class name) must always end in .java to indicate // to the operating system that it’s a java source file.

public class Welcome
{
    public static void main ( String args[] )
    {
        System.out.println ( "Hello World!" );
    }
}
Comments in Java can be one of three styles:

- **Single line:** starts at `//` anywhere on a line, ends at the end of that line

- **Multi-line:** starts with character sequence `/*` anywhere, ends with character sequence `*/` anywhere after that can span multiple lines

- **javadoc:** starts with character sequence `/**` anywhere, ends with character sequence `*/` anywhere, after that uses javadoc utility to create HTML documentation from code
public class Welcome:
  
  - public means that something is available across packages (reserved word)
  - Name of the class has to be the same as the name of the .java file
▶ public class Welcome:
   ▶ public means that something is available across packages (reserved word)
   ▶ Name of the class has to be the same as the name of the .java file
▶ public static void main ( String identifier[] ):
   ▶ The particular form of main is required by Java.
   ▶ JVM starts executing here!
   ▶ main is a static method, it is part of its class and not part of objects.
   ▶ Strings in Java are sequence of characters
public class Welcome:
  public means that something is available across packages (reserved word)
  Name of the class has to be the same as the name of the .java file

public static void main ( String identifier[] ):
  The particular form of main is required by Java.
  JVM starts executing here!
  main is a static method, it is part of its class and not part of objects.
  Strings in Java are sequence of characters

  Braces { } are used to collect statements into a "block"
- public class Welcome:
  - public means that something is available across packages (reserved word)
  - Name of the class has to be the same as the name of the .java file

- public static void main ( String identifier[] ):
  - The particular form of main is required by Java.
  - JVM starts executing here!
  - main is a static method, it is part of its class and not part of objects.
  - Strings in Java are sequence of characters

- Braces { } are used to collect statements into a ”block”
- Statements in Java end with semicolons.
Printing

- `println`: New line after printing
- `print`: No new line
- `printf`: Can specify format - may learn this later
Character Strings

<table>
<thead>
<tr>
<th>String Literal in class String</th>
</tr>
</thead>
<tbody>
<tr>
<td>“ABC”</td>
</tr>
<tr>
<td>“This is interesting”</td>
</tr>
<tr>
<td>“ ”</td>
</tr>
<tr>
<td>“91”</td>
</tr>
</tbody>
</table>
Character Strings

<table>
<thead>
<tr>
<th>string literal in class String</th>
</tr>
</thead>
<tbody>
<tr>
<td>“ABC”</td>
</tr>
<tr>
<td>“This is interesting”</td>
</tr>
<tr>
<td>“ ”</td>
</tr>
<tr>
<td>“91”</td>
</tr>
</tbody>
</table>

- Use `print` or `println` methods to print a character string to the terminal
- `System.out.println(“CMPSC 111”);`
- the string “CMPSC 111” is a parameter: data sent to a method
String Concatenation

Appending one string to the end of another: use + operator

“This is ” + “interesting”
“Your grade is ” + “91”
String Concatenation

Appending one string to the end of another: use + operator

“This is ” + “interesting”
“Your grade is ” + “91”

- + is also used for arithmetic addition
- `System.out.println("Adding " + 12 + 23);` is not the same as `System.out.println("Adding " + (12 + 23));`
Escape sequences, or escape characters, begin with a slash and are immediately followed by another character.

This two-character sequence, inside “ ” allows you to control your output (\n, \t, \b) or output characters you wouldn’t otherwise be able to (\\, \”) inside a string.
### Escape Sequences

<table>
<thead>
<tr>
<th>Seq</th>
<th>Meaning</th>
<th>Example Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>\n</td>
<td>New line</td>
<td><code>System.out.println(&quot;Hi\nThere&quot;);</code></td>
</tr>
<tr>
<td>\t</td>
<td>Horizontal tab</td>
<td><code>System.out.println(&quot;What’s\tup?&quot;);</code></td>
</tr>
<tr>
<td>\b</td>
<td>Backspace</td>
<td><code>System.out.println(&quot;Hi\b Hey&quot;);</code></td>
</tr>
<tr>
<td>\</td>
<td>Backslash</td>
<td><code>System.out.println(&quot;Back\\Slash&quot;);</code></td>
</tr>
<tr>
<td>&quot;</td>
<td>Double quote</td>
<td><code>System.out.println(&quot;Dbl\\&quot;Quote&quot;);</code></td>
</tr>
</tbody>
</table>