Lecture 38

- Covers
  - Review

Topics covered

- Computer systems and structure
  - Hardware / software
  - Components of a computer: CPU / memory / bus / peripherals
  - Files and directories
  - Memory addresses, bits and bytes
  - Programs and programming languages
  - Algorithms
  - Types of software

Topics covered

- Operating systems and Unix
  - Files and directories
  - pathnames (relative vs absolute)
  - Shells
  - Unix commands
  - Compiling and running Java programs
  - JVM
  - vi editor

Topics covered

- Object-oriented concepts
  - Objects, classes
  - Attributes
  - Operations
  - Methods, messages and message passing
  - Information hiding, encapsulation
  - Inheritance and polymorphism
  - Algorithms

Topics covered

- Program components
  - Keywords
  - Input / output
  - Variables, identifiers
  - Statements
  - Comments
  - Starting point (main method)
  - White space

Topics covered

- Solving problems on computers
  - Understand the problem
  - Design the solution (write an algorithm)
  - Implement the solution
  - Test the solution
- Testing and debugging
  - Syntax errors
  - Run-time errors
  - Logical errors

Topics covered

- Control structures
  - Sequence
  - Selection
  - Repetition (2 versions)
  - Functions (methods)
  - Pseudocode
- Object-oriented analysis

Topics covered

- Java programming
  - Variables
  - Identifiers
  - Keywords
  - Declarations
  - Primitive data types
  - Assignment statements

Topics covered

- Java programming
  - Literals
  - Operators and operands
  - Arithmetic expressions
  - Input/output (Scanner class)
  - Increment and decrement unary operators
  - Mathematical functions (in the Math class)

Topics covered

- Internal representation of primitive data types
  - Binary
  - One's complement, two's complement
  - Range and precision of numeric types
  - Storage of integers and floating point numbers
  - Characters and unicode
  - Boolean
  - Strings of characters

Topics covered

- Explicit and implicit type conversion
- Narrowing and widening conversions
- Integer division
- % operator
- Precedence and associativity of operators

Topics covered

- The String class
  - Concatenation
  - Escape sequences
  - String declarations
  - String instantiation
  - Alternate construction of strings
  - Dot operator
  - String length
  - String immutability

Topics covered

- The String class
  - String indexes
  - Comparing String objects
    - equals( )
    - equalsIgnoreCase( )
    - compareTo( )
  - String operations
    - replace( )
    - substring( )
    - toUpperCase( )
    - toLowerCase( )
    - trim( )

Topics covered

- Screen output
  - System.out
  - print( )
  - println( )
- Keyboard input
  - Scanner class
  - Methods

Topics covered

- Programming style
  - Naming conventions
  - Comments and documentation
  - White space and indentation
  - Naming constants
- DecimalFormat class
  - Construction
  - format method

Topics covered

- Branching statements
  - if statement
  - if…else statement
  - Compound statements
- Boolean expressions
  - Relational operators
  - Boolean operators
  - Equality of Strings
- Bitwise operators

Topics covered

- Branching statements
  - Nested if…else statements
  - Multiway branching statements
  - switch statement
    - default:
    - break;
    - missed break;
  - Conditional operator
  - Blocks and scope

Topics covered

- Looping statements
  - while statement
  - do…while statement
  - for loops
  - Infinite loops
  - break statement in loops
  - exit( ) method
  - Off-by-1 errors
  - Nested loops
  - Designing loops
  - Count controlled vs event controlled

Topics covered

- Boolean expressions
  - Boolean logic
  - Precedence
  - Short circuit evaluation
  - Relational operators
  - Distribution over relational operators
  - De Morgan's Laws
  - Double negation
  - Commutativity and associativity
  - Exclusive or
  - Boolean I/O

Topics covered

- Object-oriented programming
  - Writing classes, attributes, and methods
  - Instantiation of objects and constructors
  - Calling methods in the same object
  - Java files and compilation
  - Methods that return a value
  - void methods
  - The return statement

Topics covered

- Object-oriented programming
  - Parameter passing (call by value)
    - With arguments of primitive type
    - With arguments of class type
  - toString( ) method
  - Encapsulation, access modes
  - Accessor and mutator methods
  - Interfaces and javadoc

Topics covered

- Object-oriented programming
  - Objects and references
  - Testing for object equality
  - The this reference
  - Helper methods (and making them private)
  - static (class) attributes and methods
  - Procedural abstraction, top-down design
  - Drivers and stubs
  - Testing strategies

Topics covered

- Object-oriented programming
  - Overloading methods
  - Overloading methods vs automatic type conversion
  - Overloading constructors
  - Constructors calling other constructors
  - Default constructors
  - Automatically created default constructors
  - Privacy leaks
  - Returning copies of objects (and cloning)
  - Packages

Topics covered

- Arrays
  - Array variables
  - Array objects
  - Array length
  - Indexing
  - Subscript operators
  - Initialising arrays
  - Array indexes out of bounds

Topics covered

- Arrays
  - Array arguments
  - Returning arrays
  - Arrays as attributes
  - String[ ] argument to main( )
  - Arrays of objects
  - Null references
  - Searching arrays (sequential search)
  - Sorting arrays (selection sort)

Topics covered

- Arrays
  - Multidimensional arrays (arrays of arrays)
  - Ragged arrays
  - Partially filled arrays

Topics covered

- Inheritance
  - extends
  - Inheriting attributes and methods
  - Overriding methods
  - References to the superclass
  - Referring to objects collectively
  - Abstract methods
  - Abstract classes

Topics covered

- Applets
  - HTML basics
  - paint( ) method
  - Coordinate systems
  - Colours
  - Displaying text
  - Displaying shapes
  - Polygons
  - Rectangles

Topics covered

- Applets
  - The applet's lifecycle
  - Getting the applets size
    - getWidth( ), getHeight( )
  - The init( ) method
  - Fonts and font metrics
  - Arrays in applets
  - Event handling and Java's delegation model
  - Mouse events
  - Regular events (the Timer class)
  - Listeners

Topics covered

- Standard Java I/O
  - InputStreamReader
  - BufferedReader
  - Integer.parseInt and Double.parseDouble
  - String Tokenizer
  - Throwing and handling exceptions
  - Checked vs unchecked exceptions
  - IOExceptions and NumberFormatExceptions