

Midterm Review

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Problem Solving using Java

- Problem solving method/process
- Java language basics
- Using Java API classes
- Algorithms and programming patterns

Problem Solving Method/Process

- Analyze the problem
 - A kind of computational problem that we solve by writing a computer program
 - Input Data → Program → Output Data
- Design algorithm/solution (a Java program)
- Implement Java program
 - Removing compilation errors
 - Removing runtime/logic errors
- Verification and validation

Java Language Basics

- JDK and JRE
- Define Java class with the main method
- Variables and data types
- Control structures

Data and Variables

- Input Data → Program → Output Data
- Use variables to store input, output, and intermediate data
 - Data are stored in the computer's memory
- Variable: named allocation of the computer's memory
 - In Java, named and typed

Variables and Data Types

- In java:
 - Primitive data types
 - Numerical types (integer and floating point)
 - Character
 - Boolean
 - Reference data types
 - String
 - Scanner
 - Declare and use variables
 - Operations

Control Structures

- Selection/branching
 - the if statement and variations
 - the switch statement
- Iteration/loop
 - the while loop
 - the for loop
 - the do-while loop

Java API Classes

- Math
- Character
- String

Algorithms and Programming Patterns

- Learning from solutions to known problems
 - Numerical algorithms and programming patterns
 - Logical algorithms and programming patterns
 - String algorithms and programming patterns
 - Data input algorithms and programming patterns
 - Ordered type algorithms (numerical and String) and programming patterns
 - Sequence of Input algorithms and programming patterns

Numerical Algorithms and Programming Patterns

1. Absolute value; toggling: $0 \leftrightarrow 1$ and $-1 \leftrightarrow 1$; parity; divisibility; primality
2. Root finding

Logical algorithms and Programming Patterns

- Toggling true \leftrightarrow false
- Logical disjunction and conjunction

String Algorithms and Programming Patterns

- Picking out tokens from whitespace
- Finding the nth word in a String
- Counting substrings
- Replacement

Data Input Algorithms and Programming Patterns

- Organized data with header (count prefix)
- End of data (e.g., using sentinel, i.e., trailing token)
- Sum and average of multiple inputs

Ordered type Algorithms and Programming Patterns

1. Maximum (minimum) of two
2. Maximum (minimum) of three
3. Checking for ascending (descending) order of two
4. Checking for ascending (descending) order of three
5. Sorting two or three values (numerical or Strings)

Sequence of Input Algorithms and Programming Patterns

- Counting items having a common property
- Accumulations. (sum and average)
- Checking for ascending (descending)

Questions?