Arkansas CTE

Programming I Java: Grades 9, 10, 11, 12

Adopted 2007

Introduction to Programming and Ethics in Programming

1.1 Define terminology

1. Prepare a list of terms with definitions 1.1.1

1.2 Explain the difference between system and application software

1. Identify various software as either system or application 1.2.1

1.3 Discuss terms related to hardware and software

1. Identify technology as either hardware or software 1.3.1

1.4 Discuss various operating systems and their differences (i.e., Windows, Mac Linux)

1. Tell where each operating system is used most frequently 1.4.1

1.5 Explain the difference between high-level and low-level languages

1. Classify commonly used programming languages as high-level or low-level 1.5.1

1.6 Explain the difference between interpreters and compilers

1. Give an example of how a compiler functions vs. how an interpreter functions 1.6.1

1.7 Explain the difference between executable code and bytecode

1. Draw a diagram of how a Java source code program is translated to bytecode and then to executable code 1.7.1

Programming Techniques and Characteristics of Good Programs

2.1 Define terminology

1. Prepare a list of terms with definitions 2.1.1

2.2 List the steps of the programming process

1. When given an example, be able to identify the correct step 2.2.1

2.3 Identify the syntax of a simple program

1. Key, save, compile, and execute "Hello World" program 2.3.1

2.4 Identify the syntax to output String literals to screen

1. Write programs that use System.out.println with String literals `2.4.1`

2.5 Identify syntax of comments

1. Use appropriate syntax to include comments in programs `2.5.1`

2.6 Explain the characteristics of user-friendly programs

1. Write programs that have clear instructions `2.6.1`
2. Write programs whose output is easy to read and understand `2.6.2`

2.7 Explain the importance of program documentation and maintenance

1. Be able to use // and /* */ to write programs that are well-documented `2.7.1`
2. Update an existing program `2.7.2`

2.8 Explain the importance of algorithm and/or pseudocode in program development

1. Write a psuedocode (algorithm) for a programming problem `2.8.1`

2.9 Identify different types of errors (syntax, semantic, run-time, compile time)

1. When given an example, identify the error type `2.9.1`

2.10 Explain the characteristics of readable programs

1. Explain the characteristics of readable programs `2.10.1`
2. Use descriptive identifiers `2.10.2`
3. Document difficult logic to make it easy to follow `2.10.3`

Data Types and Mathematical Operations

3.1 Define terminology

1. Prepare a list of terms with definitions `3.1.1`

3.2 List the following four primitive types: int, boolean, double, char.

1. Compare the four data types `3.2.1`
2. Determine whether a particular "number" would be considered numeric `3.2.2`
3. Determine whether a number should be treated as an integer or a floating point (i.e. single, double) `3.2.3`
4. Designate data type using correct syntax `3.2.4`

3.3 Explain the use of a String object

1. Write programs that declare and utilize String objects `3.3.1`
2. Determine whether an identification number (such as Social Security Number) should be treated as a string or number `3.3.2`

3.4 Explain the purpose of concatenation

1. Write output lines using + as the concatenation operator `3.4.1`

3.5 Explain the purpose of escape sequences (\n, \t, \\)

1. Write programs that use escape sequences to print strings `3.5.1`

3.6 Explain the advantages of using integer variables whenever possible (faster computation, require less memory, obtain exact answers)

1. Use integer variables in programs where appropriate `3.6.1`

3.7 Explain the advantages and disadvantages of floating-point numbers (round-off errors, more memory, approximate answers, slower computation, size of numbers to be stored, etc.)

1. Use floating point variables in programs where appropriate `3.7.1`

3.8 List arithmetic operations and order of operations (*, /, %, +, -)

1. Write formulas using operators and order of operations `3.8.1`
2. Write programs that use mathematical operations correctly (integer arithmetic vs floating point arithmetic) `3.8.2`

3.9 Explain the difference in promotion and casting

1. Determine the correct answer to math expressions where casting and promotion are involved `3.9.1`
2. Write math expressions correctly that use promotion and casting `3.9.2`

3.10 Explain rules for choosing variable names

1. Write programs that use descriptive variable names `3.10.1`
2. Write programs that use descriptive variable names `3.10.2`

3.11 Explain the circumstances and give examples of appropriate occasions to use constants

1. Use constants when appropriate in programs `3.11.1`

Using Selected Standard Classes

4.1 Define terminology

1. Prepare a list of terms with definitions `4.1.1`

4.2 Explain the purpose of the compiler directive import

1. Write programs that import the selected classes `4.2.1`

4.3 Give examples of meaningful prompts

1. Write programs with meaningful prompts `4.3.1`

4.4 Describe how to instantiate a Scanner object. (java.util.Scanner)

1. Write a program that instantiates a Scanner object `4.4.1`

4.5 Describe how to read the following data types from the keyboard using the Scanner object: nextLine(), nextInt(), nextDouble() (java.util.Scanner)

1. Expand the program above so that it reads Strings, ints and doubles from the keyboard `4.5.1`

4.6 Describe how to close a Scanner object (java.util.Scanner)

1. Revise the program above so that it closes the scanner object `4.6.1`

4.7 Describe how to set up a variable to print currency or percents using NumberFormat and how to use the format method (java.text.NumberFormat)

1. Write a program that displays the output in currency and percent formats `4.7.1`

4.8 Describe how to instantiate a DecimalFormat object and how to use # and 0 to print the specified digits (java.text.DecimalFormat)

1. Write a program that instantiates a DecimalFormat object `4.8.1`

4.9 Describe how to print using a specific number of digits before and/or after the decimal place with the format method from DecimalFormat (java.text.DecimalFormat)

1. Write a program that displays the output with a specified number of decimal places `4.9.1`

4.10 Describe how to use the Math class to get a square root, power and/or absolute value (sqrt , pow , abs methods)

1. Write a program that uses sqrt, pow, and abs Math functions in calculations `4.10.1`

4.11 Describe how to obtain a random double and explain the range of possible values (Math class)

1. Write a program that obtains and uses random numbers using Math.Random() `4.11.1`

4.12 Describe how to obtain an integer random integer in the range of 0…N or 1…N inclusive (Math class)

1. Write a program that obtains and uses random integers in the ranges 1…N and 0…N using (int) ((high - low + 1) * Math.Random() + low) formula `4.12.1`

Decision Structure

5.1 Define terminology

1. Prepare a list of terms with definitions `5.1.1`

5.2 List relational operators

1. Write boolean expressions that use the appropriate relational operator 5.2.1

5.3 Describe the process of comparing two strings

1. When given two strings, determine if they are equal, the first is smaller, or the first is larger 5.3.1

5.4 Explain how to use the compareTo() and equals() methods from the String class

1. Write boolean expressions that compare strings for equality and order 5.4.1

5.5 Explain the syntax and logic of if statements

1. Write programs that use if statements 5.5.1
2. Write programs that use braces correctly to form block if statements 5.5.2

5.6 Explain the syntax and logic of if-else statements

1. Write statements that use if-else to make the correct decision based on the data; use braces where needed to block the statements 5.6.1

5.7 Explain the syntax and logic of nested statements

1. Write programs using block if-else for 3 or more alternatives 5.7.1

5.8 Explain the use of logical operators and , or , and not (&&, ||, !)

1. Write programs which require the use of &&, ||, and ! 5.8.1
2. Write a program that requires the use of short-circuit and (&&) and short-circuit or (||) 5.8.2

Loops

6.1 Define terminology

1. Prepare a list of terms with definitions 6.1.1

6.2 Describe the purpose and syntax of for loops

1. Write programs that use for loops 6.2.1

6.3 Explain the procedure to use for loops to count in increments/decrements other than one

1. Write counting for loops with increments other than 1 6.3.1

6.4 Explain the syntax of nested loops

1. Determine the output of a nested loop 6.4.1
2. Write programs that use nested loops for 6.4.2

6.5 Explain the logic of while loops

1. Write programs that use loops while 6.5.1

6.6 Explain the process of using counters with loops

1. Write programs that use counters with loops `6.6.1`

6.7 Explain the logic of using accumulators with loops

1. Write programs that use accumulators with loops `6.7.1`

6.8 Explain the difference in the effect of a while loop (entrance condition loop) and a do while (exit condition loop) loop

1. Write programs that use do while loops `6.8.1`