**CPSC-24500: Object-Oriented Programming**

**Homework Week 5 (version 2)**

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| **Name:** |  | **Score \_\_\_\_\_ / 30** |

Instructions: Fill in your name above and please answer the questions below. Submit your answers via the Blackboard homework submission link by the end of the day Sunday, March 26. This is an individual assignment and answers are not to be shared.

You will need to save a copy of the MS Word file to your local drive, fill out the name and date information, and answer each question by highlighting the best answer, by writing your answer after the question, or my inserting an image. Please let me know if you have difficulties.

1. Which of the following is true of unit tests?
   1. Unit tests are good for verifying that complicated user interaction behaves as expected.
   2. Unit tests are typically used to test small code modules rather than large sections of code.
   3. Unit tests are used to test the performance of a block of code.
   4. Unit tests focus only on state, not on behavior.
2. If I want to test whether an entire application works as it should, rather than just part of it, I would use:
   1. An integration test
   2. A unit test
   3. A performance test
   4. A blood test
3. Which of the following is not an advantage of dividing code into packages.
   1. It groups together classes that serve a similar purpose.
   2. It helps prevent class naming collisions.
   3. It helps code run more efficiently, because the compiler generates optimized code for classes placed in packages.
   4. It provides an opportunity to distribute executable modules without releasing their source code.
4. What is a jar file? Select all that are true.
   1. A java archive.
   2. A group of files all packaged into one file.
   3. Something that can contain both Java-specific files and other files
   4. Something that can be added to the build path or class path so that you can access the class files within it.
5. Suppose I have added the line “package com.pogue.shapes;” at the top of a java file. If I am in the folder c:\temp\, and I compile the file Circle.java using the line “javac –d . Circle.java”, in what folder will Circle.class be written?

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1. What is the purpose of the option “-d” when you compile a file in java?
   1. It tells the compiler to use the current directory as the reference for where to place .class files.
   2. It tells the compiler to use the system’s root directory as the reference for where to place .class files.
   3. It tells the compiler to place all .class files, even those that correspond to classes that belong to various packages, in the current folder.
   4. It tells the compiler to place all .class files, even those that correspond to classes that belong to various packages, in the system root folder.
2. What is the purpose of the build path (also called the classpath) in Java?
   1. It tells the compiler where to place .class files when it compiles them.
   2. It tells the compiler where to find supporting .class files that it might need to import.
   3. It tells the compiler where to copy .java files during the compile process.
   4. It helps the compiler determine where to write javadoc documentation.
3. Suppose I have a class called Snuffleupagus that is contained in a package called sesame.street. Suppose I want to use that class in a new source file that I’m using. Write the line I would have to include in that new source file to be able to use the Snuffleupagus class.

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1. Suppose I have collected the names of people in several separate files based on their starting letter. The names in the first file begin with A through G, the names in the second file begin with H through N, the names in the third file beginning with O through T, and the names in the fourth file contain names beginning with U through Z. None of the files are sorted. instead, the names that appear in each file occur in any order. Describe in detail how I could take advantage of multithreading to create one sorted list of all the names. Make sure you include details such as what your Thread class would do and what your main class that uses the Threads would do. (2 points)

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1. FastPrime Assignment (20 points)

Write a performance optimized command line Java application that will programmatically find prime numbers [[link]](https://en.wikipedia.org/wiki/Prime_number) and store those numbers sorted in an output file.

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| # | Requirement | Points |
| 1 | The application must compile under the standard “javac” command line tools, run with the “java” runtime. | 2 |
| 2 | Take in two command line arguments that represent the start and end number to consider. The application should find all prime numbers within the inclusive range. For example, I could pass in 2 and 1,000,000.  In addition, the application should fail gracefully with a meaningful error message if inappropriate arguments are passed into the application. | 3 |
| 3 | The application should utilize multiple threads. | 3 |
| 4 | An output file should be created in the current folder and named FastPrime.txt or FastPrime.bin (if you chose to store the prime numbers as binary). I should contain a sorted list of the prime numbers that were found. If you use a text file, it should contain one number per line with no other characters. Binary files should include ONLY a sorted list of integers. | 2 |
| 5 | Each prime number should be printed to the console window when it is found along with a reference to the thread that found the number. After the program has completed, it should print to the command prompt (1) the number of prime number found (and stored in the file), (2) the start time, (3) the finish time, and (4) elapsed time. All should be valid, reported to the second, and displayed in a visually appealing format. | 2 |
| 6 | The application should be FAST, this will be scored relative to other timings. | 6 |
| 7 | Submit your assignment as a single Java file named “FastPrime.java”. The file name must be the same as your public class that is run to execute the application. I will be copying the file to a folder, running “javac FastPrime”, and running “java FastPrime” to confirm that that you have completed step one successfully. You should include your full name in a comment at the beginning of the Java file that you submit. | 2 |

If your solution does not compile and execute without errors when it is submitted, you will lose 6 points AND I will send it back to you to fix and resubmit before I attempt to continue grading the assignment.

Do not copy another student’s work. I will use MOSS to detect plagiarism and will not ask for clarification if MOSS concludes you have copied another student’s work.

Tackle this problem gradually and make sure that you review the examples that we cover in class. The main goal of our discussions, lectures, and examples this week are intended to allow you to successfully deliver this application. Also, don’t hesitate to post something on our discussion board or to reach out to me directly if you need assistance.

Pace yourself. Do not attempt to do this in one night.

Good luck!