CST8284 (21W) Assignment 01

Space Simulation with 2D Array

Instructions

A junior programmer at a software company has been building a space simulator game. However, the project is in trouble, and your boss has called you in to get the current phase of the project completed. The existing program (see starter code, provided) meets the general requirements, but it suffers from code duplication and inappropriate documentation. Additionally, the code lacks the flexibility needed for future expansion. Your immediate task is to update the code provided according to the following guidelines:

Task 1: Change the default package

The junior programmer used the default package, which is not considered good practice. You should refactor the code to use the package com.algonquincollege.cst8284.*section#*.simulation, where *section#* should be replaced with *your* lab section number, e.g. *301*, *311*, etc.

Task 2: Modify the drawSpaceSimulation() method

This method currently draws vertical bars across each of the rows, but this may not always be desirable. Modify the program start-up, as well as SpaceExplorationSimulator, so that the user is asked if they want vertical bars or not. Save the result in a boolean value, which drawSpaceSimulation() will use to determine if the bars should be drawn or not. Note that if the bars are *not* drawn, there should still be a single space (" ") where each of the bars would appear.

Task 3: Modify the moveActors() method

There is currently too much duplicate code in this method, which includes a deeply-nested decision structure. Additionally, there are 'magic numbers' in use within the decision structure, numerical values whose meaning would only be known to someone deeply familiar with the program. Your modifications should include:

- Replace the numerical values with named constants (i.e. use fixed static variables in place of the numerical values).
- Create and use appropriate private methods to remove code duplication, especially when moving the Actors.

Task 4: Chain your constructors()

The junior programmer has not chained their constructors. Since you work for a company that encourages good programming practices, you will want to fix this oversight.

Task 5: UML Class Diagrams

Provide UML Class Diagrams that fully document the structure of all the classes and members in the program, using the correct UML symbols, according to the instructions given in your course textbooks. This should be submitted as an MS Word document as images or as simple MS Word tables each table with either one column and three rows or using MS Word text-box shapes.

Task 6: Documentation

The junior programmer used inline comments as a sort of pseudocode to help him understand the intended program logic. While this may be useful in the early stages of program development, such comments are mostly inappropriate in a properly documented finished project. Therefore, these comments should be removed from the body of each method, edited for clarity, and added to Javadoc comments instead (which are almost entirely missing from the existing program). Hence, in your Assignment 1 submission be sure to:

- Provide Javadoc comments for each class and class member, including all private fields, getters, and setters. (See the Appendix at the end of this section, '*On Your Documentation*.') ;
- check to make certain that all of your comments appear in the hypertext-linked files created in the **doc** folder when you generate Javadoc;
- Each class should include a comment header with your *name*, *student number*, and *section number* at the top

Submission and Demonstration

- You are *not* allowed to change the runSimulation() method at all. (Modifying this method could get you fired.)
- Your lab professor will request that you demonstrate your program in the lab period as part of the grading.
- You may be asked to show parts of your code and asked questions on your code changes.
- Submit all of your code files in a zip file, which should include all project files and folders (including **src** and **doc**), as well as your UML class diagram.
- If provided, follow your lab professor's submission guidelines for your lab section. They take precedence over anything written in this document.

Grading (18 points)

Criteria	Missing / Poor (0)	Below Expectations (1)	Meets Expectations (2)
Javadoc Comments	Missing or poorly done.	Javadoc comments are incomplete, and / or may not have been generated as html pages using the Javadoc tool.	Javadoc comments are present in each source code file for classes, fields, constructors and all methods. The Javadoc tool was used to generate html pages that document everything including private members.
UML Class Diagrams	Missing or poorly done.	UML class diagrams are partially correct for each class and / or do not closely follow the code submitted by the student.	UML class diagrams are correct, detailed, and match the source code submitted by the student.
Code: package	Missing or poorly done.	Package name does not follow the instructions in the handout, using the lab section number, and / or not all classes are in the same package.	Package name does follow the instructions in the handout, using the lab section number. All classes are in the same package.
Code: conventions	Missing or poorly done.	Java programming conventions for identifiers, indentation and white space not closely followed.	Java programming conventions for identifiers, indentation and white space are closely followed.
Code: Chained Constructor	Missing or poorly done.	Not all of the needed parts are implemented, chained constructor call, new field for how to render the output, modifications to logic in method drawSpaceSimulation.	Needed parts are implemented, chained constructor call and a new field for how to render the output with modifications to logic in method drawSpaceSimulation() were used.
Code: moveActors()	Missing or poorly done.	One or more private methods were used to split apart the larger moveActors() methods logic but there is still duplicate code within and across the methods.	One or more private methods were used to split apart the larger moveActors() method, duplicate code is minimal.
Demo: Basic Program Run	Missing or poorly done.	Program experiences logic bugs so it does not perform as expected and / or crashes.	Program does not experience logic bugs and runs to completion as expected based on 5 ships leaving the play field.
Demo: Chained Constructor	Missing or poorly done.	Student can show the overloaded constructor, field, and modifications to method drawSpaceSimulation() however cannot adequately answer lab professors questions to demonstrate understanding.	Student can show the overloaded constructor, field, and modifications to method drawSpaceSimulation() and can adequately answer lab professors questions to demonstrate understanding.

Demo: moveActors()	Missing or poorly done.	Student can show the new private methods as well as the modifications within method moveActors() however student cannot adequately answer lab professors questions to demonstrate understanding.	Student can show the new private methods as well as the modifications within method moveActors() and student can adequately answer lab professors questions to demonstrate understanding.

Appendix I: On Your Documentation

Most students lose marks for the documentation they provide in their assignments. There are two reasons for this:

First, students do not check that the Javadoc generator executed correctly, and hence the Javadoc comments they added to their Java code do not appear in the hypertext-linked files in the **doc** folder (i.e. the html files were generated, but the Javadoc comments are missing, often because the Javadoc generator 'choked' during compilation).

Second, the comments added are often meaningless: they state only the obvious. A comment like: "This is the constructor for an Actor" or "this is a setter" add nothing that is not obvious, and hence earn you *no* marks.

To improve your documentation (and, more importantly, the grade for your documentation), imagine what you would need to find in the comments if you had never seen your code before, i.e. look at your code as if someone else had written it, and you were seeing it for the first time. Obviously, a comment like

```
someMethod(++ctr) ;     // increment ctr by 1 and send it to someMethod()
```

Is not terribly useful—it only states the obvious. However, a comment like

```
someMethod(++ctr);   // prefix ctr so that it is greater than zero before it is passed to someMethod(),
                     // to avoid a possible divide-by-zero exception
```

Is far more valuable, since it passes essential information, especially to the programmer unfamiliar with the code. Similarly:

```
/** setter for temperature */
private void setTemp(double temp) {…}
```

This comment example is not much use to a programmer. But:

```
/**Sets temperature in degrees Celsius as a double value.  The value set must be greater than absolute zero (-273.15 C),
  otherwise a BadTemperatureException is thrown.  The access modifier is private because the temperature should
  only be set when the Thermometer object is instantiated; it should not be modified, else it could be called outside
  the Thermometer class.
  In addition to the Thermometer constructor, this setter is chained to the setFahrenheitTemperature(double temp)
  method. */
private void setTemp(double temp) {…}
```

This explains everything the API user needs to know about the 'how' and 'why' of the *setTemp()* method. Of course, such detailed documentation is not possible with every method. However, usually, there is far more to say about any method or constructor than most students are prepared to write. Good documentation is essential, and it requires considerable forethought to do well. However, no one said it was supposed to be fun.

Appendix Sample Run of Starter Code

```
Welcome to Space Simulation
Use enter key to run next turn
Typing anything other than return will end program
|S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 0

|S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
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|S|S| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 0

Use enter key to run next turn
Typing anything other than return will end program

|S|S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
| |S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 1

Use enter key to run next turn
Typing anything other than return will end program

|S|S| | | | | | | | | | | | | | | | | |
| |S| | | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
| |S| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 2

Use enter key to run next turn
Typing anything other than return will end program

|S| |S| | | | | | | | | | | | | | | | |
|S| | | | | | | | | | | | | | | | | |
| |S| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| |S| | | | | | | | | | | | | | |A| |
Ships destroyed: 0
```

```
Ships escaped: 0
Turn number: 3

Use enter key to run next turn
Typing anything other than return will end program

|S| | |S| | | | | | | | | | | | | | |
|S|S| | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | |
| | |S| | | | | | | | | | | | |A| | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 4

Use enter key to run next turn
Typing anything other than return will end program

| |S| | | | | | | | | | | | | | | |
| | | |S| | | | | | | | | | | | | | |
|S|S| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | |S| | | | | | | | | | | |A| | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 5

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | | | | | | | |
|S|S| | |S| | | | | | | | | | | | | |
| | |S| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | |S| | | | | | | | | | |A| | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 6

Use enter key to run next turn
Typing anything other than return will end program

|S| | | |S| | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| |S| | | | | | | | | | | | | | | | |
| | |S| | | | | | | | | | | | | | | |
| | | |S| | | | | | | | | | |A| | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 7

Use enter key to run next turn
Typing anything other than return will end program

| |S| | |S| | | | | | | | | | | | | |
```

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| |S| | | | | | | | | | | | | | | | | |
| | |S| |S| | | | | | | |A| | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 8

Use enter key to run next turn
Typing anything other than return will end program

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| |S| | |S| | | | | | | | | | | | | | |
| |S| | | | | | | | | | | | | | | | |
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| | |S| |S| | | | | | | |A| | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 9

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | | | | | | | | | |
| |S|S| | |S| | | | | | | | | | | | | | |
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| | |S| | | | | | | | | | | | | | | | |
| | | |S| | | | | | | |A| | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 10

Use enter key to run next turn
Typing anything other than return will end program

| | | | | |S| | | | | | | | | | | | | |
| |S| |S| | | | | | | | | | | | | | | |
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| | | |S|S| | | | | | | | | | | | | | |
| | | | | | | | | |A| | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 11

Use enter key to run next turn
Typing anything other than return will end program

| | | | | |S| | | | | | | | | | | | | |
| | |S| |S| | | | | | | | | | | | | | | |
| | | | |S| | | | | | | | | | | | | | |
| | | |S| | | | | | | | | | | | | | | |
| | | | | | | | | |A| | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 12
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Use enter key to run next turn
Typing anything other than return will end program

| | |S| |S| | | | | | | | | | | | | |
| | | | | |S| | | | | | | | | | | | | |
| | | | | |S| | | | | | | | | | | | | |
| | | | |S| | | | | | | | | | | | | | |
| | | | | | | |A| | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 13

Use enter key to run next turn
Typing anything other than return will end program

| | | | | |S| | | | | | | | | | | | | |
| | |S| |S| | | | | | | | | | | | | | |
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| | | | |S|S| | | | | | | | | | | | | |
| | | | | | | |A| | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 14

Use enter key to run next turn
Typing anything other than return will end program

| | |S| |S| |S| | | | | | | | | | | |
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| | | | |S| |S| | | | | | | | | | | | |
| | | | | | | |A| | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 15

Use enter key to run next turn
Typing anything other than return will end program

| | |S| | |S| | | | | | | | | | | | |
| | | | | | |S| | | | | | | | | | | | |
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| | | | | | | |S| | | | | | | | | | |
| | | | |S|A| | | | | | | | | | | | | |
Ships destroyed: 0
Ships escaped: 0
Turn number: 16

Use enter key to run next turn
Typing anything other than return will end program

| | |S| | | | | | | | | | | | | | | |
| | | | | |S| | | | | | | | | | | | | |
| | | | | | | |S|S| | | | | | | | | | |
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| | | | |A| | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 17

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | | | | | | | | | |
| | |S| | | |S| | | | | | | | | | | | | |
| | | | | | |S| |S| | | | | | | | | | | |
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| | | |A| | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 18

Use enter key to run next turn
Typing anything other than return will end program

| | |S| | | |S| | | | | | | | | | | | | |
| | | | | | | | |S| | | | | | | | | | | |
| | | | | | | |S| | | | | | | | | | | | |
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| | |A| | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 19

Use enter key to run next turn
Typing anything other than return will end program

| | |S| | | | |S| | | | | | | | | | | | |
| | | | | | | | | |S| | | | | | | | | | |
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| | | | | | | |S| | | | | | | | | | | | |
| | |A| | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 20

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | |S| | | | | | | | | | |
| | |S| | | | | | | |S| | | | | | | | | |
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| | | | | | | | |S| | | | | | | | | | | |
|A| | | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 21

Use enter key to run next turn
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Typing anything other than return will end program

| | | | | | | | | | |S| | | | | | | | |
| | | |S| | | | |S| | | | | | | | | | |
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| | | | | | | | |S| | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 22

Use enter key to run next turn
Typing anything other than return will end program

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| | | | |S| | | | |S|S| | | | | | | | |
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| | | | | | | | | |S| | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 23

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | | | | | | | | |
| | | | | |S| | | | | |S| | | | | | | |
| | | | | | | | | |S| | | | | | | | | |
| | | | | | | | | |S| | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 24

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | |S| | | | | | | | |
| | | | | | |S| | |S| | | | | | | | | |
| | | | | | | | | |S| | | | | | | | | |
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| | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 25

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | |S| | | | | | | | | |
| | | | | | | |S| |S| |S| | | | | | | |
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```
Ships destroyed: 1
Ships escaped: 0
Turn number: 26

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | |S| |S| |S| | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | |S| | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 27

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | |S| | | |S| | | | | | | |
| | | | | | | | | |S| | | | | | | |A| |
| | | | | | | | | |S| | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 28

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | |S| | | | | | | | | |A| |
| | | | | | | | | |S| |S| | | | | |A| | |
| | | | | | | | | | | |S| | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 29

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | |S| | | | | |A| | |
| | | | | | | |S| | | | | | | | |A| | | |
| | | | | | | | | |S| |S| | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 30

Use enter key to run next turn
Typing anything other than return will end program
```

```
| | | | | | | | | | | |S| | | | |A| | | |
| | | | | | | | |S| | | | | |A| | | | |
| | | | | | | | | | | |S| | | | | | |
| | | | | | | | | |S| | | | | | | | |
| | | | | | | | | | | | | | | | | | |
Ships destroyed: 1
Ships escaped: 0
Turn number: 31

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | |S| | |A| | | | |
| | | | | | | | | | | |S| |A| | | | | |
| | | | | | | | |S|S| | | | | | | | |
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| | | | | | | | | | | | | | | | | |A| |
Ships destroyed: 1
Ships escaped: 0
Turn number: 32

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | |S| |A| | | | | |
| | | | | | | | | | | | |A| | | | | | |
| | | | | | | | |S| |S| | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |A| | |
Ships destroyed: 2
Ships escaped: 0
Turn number: 33

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | | | | |A| | | | | | |
| | | | | | | | |S| |S| |A| | | | | | | |
| | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | |A| | |
Ships destroyed: 3
Ships escaped: 0
Turn number: 34

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | |S| | | |A| | | | | | |
| | | | | | | | | | | |A| | | | | | | |
| | | | | | | | | | |S| | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |A| | | |
Ships destroyed: 3
Ships escaped: 0
```

```
Turn number: 35

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | |S| | |A| | | | | | | |
| | | | | | | | | | |A| | | | | | | | |
| | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | |A| | | | | |
Ships destroyed: 4
Ships escaped: 0
Turn number: 36

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | |S| |A| | | | | | | | |
| | | | | | | | | |A| | | | | | | | | |
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| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | |A| | | | | |
Ships destroyed: 4
Ships escaped: 0
Turn number: 37

Use enter key to run next turn
Typing anything other than return will end program

| | | | | | | | | |A| | | | | | | | | |
| | | | | | | | |A| | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | |A| | | | | |
Ships destroyed: 5
Ships escaped: 0
Turn number: 38

Use enter key to run next turn
Typing anything other than return will end program

Thanks for using the simulation
```