**Lessons Learned In 18641 Project 1**

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## *Unit 1.*

### 1. What is Java?

There are two meanings for java: Java programming Language, Java Virtual Machine. Java is a general-purpose computer programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible.

Java Virtual Machine is a Runtime Environment for java application.

### 2. What is the first thing I need to do to start a brand new project?

What we have to do when we start a new project is reading the requirement document. We have to clear the 6Ws from the document and draw a class diagram after we analyze the requirement.

### 3. What is OOP?

Object-Oriented Programming is an approach that provides a way of modularizing programs by creating partitioned memory area for both data and functions that can be used as template for creating such modules on demand.

### 4. What is Object in JAVA?

Object is a basic runtime entity in an object-oriented system. May represent a person, a place, a bank account, a table of data or any item that the program may handle.

• Any programming problem is analyzed in terms of objects and the nature of communication between them.

• Objects are chosen such that they match closely with the real-world objects.

An object takes up space in the memory and has an associated address.

• When a program is executed, the objects interact by sending messages to one another.

## *Unit 2.*

### 5. What does containment mean for Java class?

Containment for Java means one class could have the field composed by other class. For example, in the class OptionSet, there is a set of Option object. Containment is a relationship between different class, which can be thought that one class has many class as components, and this one class contain these classes.

**6. What does encapsulation mean for Java class?**

Encapsulation is a designed model and an advantage for JAVA. We can set the data and method as private in the class. And the user can only change them by using setter/getter method. This way can help user avoid touch the class inside and hide the complex inner context of class.

**7. What is Inner Class? Why should we use it?**

Inner class is the class inside another class. In this project, Option class is the inner class of OptionSet class. It makes the work more concise and conceals the detail of implementation of option from outside.

**8. What strategies can be used to design core classes, for future requirements, so that they are reusable, extensible and easily modifiable?**

Modularity is the key of making our code reusable and extensible and easily modifiable. We can break the big object into some small object, and small object only focus on its own business. Also, if some part of object has same actions, they can use interface to summarize them.

**9. Why should we use Serialization?**

If we use serialization, we can easily protect our data. If we store our data by txt file or other else, it is easy for user to modify them and make our routine clash.

**10. What are good conventions for making a Java class readable?**

Giving a good name for the package and put related code into same package, because it is a good behavior for viewing the project organization and compile.

Declaring all the instance variables in order and at first of your class body, because it would help people know what data you set in this class and help people debug easily.

Name your variable in detail and specific, because it would help people easily know what you done in this code when they review your project.

Do not code a line exceed 80 characters, it is too long to read.

Give a comment before your method. Some time, the logic of your code maybe is hard to understand. If you write code with adding comment in important part, that would strongly help your partner understand what you did.

Keeping use only one convention in your project. Although there are many types of convention you can follow, but please only follow one kind of convention and do not change in future, at least in this project.

**11. What are the advantages and disadvantages of reading data from sources such as text files or databases in a single pass and not use intermediary buffering?**

First, if we directly write the data into our code, which use intermediary buffering, when we want to change the data to test the routine, we have to change our code. Once our project is so big, it would take much time to recompile the routine. If we can write our data into txt file, it would easily change the data, and the routine need not to recompile. It is easy for test people to test our routine.

**12. Why should we draw the class diagrams before we start our coding project?**

Drawing the class diagrams is a good way to make us know what we are going to do for this project. Through the class diagrams, we can easily build the idea and discuss it with our partner. That can make whole teammate know that what part they have to focus on. Also, it would save our lots of time when we officially write our code.

**13. What is the good way to test our routine?**

Actually, we can test our routine modularly. We can set the test data into three parts: the low boundary part, the normal part and high boundary part. Once we begin to test our routine, these parts can make our test running in different boundary condition, and tell us whether our routine has robustness or not.

**14. Are there exists any other way to test our routine?**

We can use Junit to test our routine. Actually, Junit is a test framework for Java routine. We can write our Junit file according to the boundary condition test data we set before.

**15. Where can inheritance be used?**

When you want to create a class, which is related to the former class you created before, you can use inheritance. For example, the AutoMobile class can be parent class for car, SUV class.

**16. Where can polymorphism be used?**

Use the example for the 15 question. If the Automobile class is parent class for car, SUV, and they all has same method, driver(), so we can use a instance of Automobile to call the driver() method by different class. The routine would find the proper class to execute.

**17. What is the limitation of interface?**

Interface is a good way to help class inherits many methods, which was declared in other interface. It also would easily break the OOP design. So we have to use it carefully.

## *Unit 3*

**18. What role(s) does an interface play in building an API?**

API is abbreviation of Application Program Interface, which is a set of function that user could use without knowing how does it work. Java interface is like a combination of method and play the role like window from user to the inside of program. For example, interface allows multi-inheritance for class, and in this project, BuildAuto class implement UpdateAuto, CreateAuto and FixAuto interface, which enable BuildAuto to inherit multiple set of methods. These interface required the BuildAuto class must implement their inside method, and this method would be used from outside user, as known as the Driver. Driver outside is ensured by the interfaces that all method it would use are implemented inside the program, but Driver do not have to know how actually methods work inside the program, which do User a convenient.

**19. What is the best way to create a framework, for exposing a complex product, in a simple way and at the same time making your implementation extensible?**

Using interface. You can design many good interfaces and different class can cooperate with it without create complex logic.

In another perspective, this will help make your work extensible. If you want to add specific method for specific user, you could just add an interface with this method, and make instance limit within the new interface for this user, without knowing other methods for the class who implement this interface.

**20. What is the advantage of exposing methods using different interfaces?**

For OOD, interface can help organize functions of different class part. And it is simple to use and extensible. Different interfaces can be regarded as different sets of related functions that help to keep the code organized.

**21. How to hide codes in abstract class?**

Just like in this project, we build an abstract class ProxyAutomobile, and the buildAuto() can extend a abstract class without implement. But we can implement it in class ProxyAutomobile.

**22. Is there any advantage of creating an abstract class, which contains interface method implementations only?**

It can splits internal code and external code clearly. And make sure there is no inner instance would be built.

**23. What is the advantage of LinkedHashMap over HashMap?**

They all support key-value pair insertion and search. It would save our much to do searching and insertion. For this project, use this collection we can easily search the specific car by using their name.

**24. How can you create a software architecture, which addresses the needs of exception handling and recovery?**

We can create our own exception class to fix the exception instead of using the default exception class which java supported.

**25. What is the advantage of exposing fix methods for exception management?**

If we do that, we can handle more possible exception and fix different situation.

**26. Why did we have to make the Automobile object static in ProxyAutomobile class?**

It is easy way to share the data to the whole project with only one instance.

**27. What is the advantage of adding choice variable in OptionSet class?**

It is useful for extend the project in feature. Once we deal with different kinds of clients, choice is used for customer to configure a car and see the price of their configuration.

**28. What measures had to be implemented to expose the choice property in Auto class?**

First, you have to show different options for user. Second, user can select option by themselves. Third, user can update the choice. Fourth, user can get the whole price from the option.

**29. What is enumeration used for?**

In Java, enumeration can create a name-value pair for our project. Enums are lists of constants. When you need a predefined list of values which do not represent some kind of numeric or textual data, you should use an enum. For instance, in a chess game you could represent the different types of pieces as an enumeration.

## *Unit 4*

**30. What is the best way to setup multithreading in an Enterprise Class application?**

In order to set up the multithreading, the best way is use the multithreading in small scope. Since multithreading would easily cause the whole program clash, we have to make the method which multithreading do is independent, so that it would not effect other threading even the main thread.

**31. What is race condition for multi-threading program?**

For multi-thread program, all threads for one process are sharing the context, so race between threads may happen. Like two different thread may want to change the same Automobiles optionset name, but to different names. This will bring in race conditions and corrupt the data for this object.

**32. What can we do when we have to deal with the race condition?**

In java, we can use the synchronizing to avoid the race condition. Add the key word before we implement the related method and instance.

**33. What is deadlock for the thread programming?**

Deadlock describes a situation where two or more threads are blocked forever, waiting for each other.

**34. For multi threaded program, what does synchronized modifier used for?**

To set synchronized modifier for methods in class, when this class is instantiated, only one thread from multiple thread have the right to access these methods, and other threads will wait for this thread. So it would easily to avoid race condition happen in our program.

**35. What implementation strategy can be used for creating a race condition for testing Multithreading?**

For our project, we can make two thread to access into same instance and change it from different value, such as name or price. Run the routine many times, we can found that the final result would be different because they cause race condition.

**36. How does Synchronization work in JVM? What are the performance consequences of synchronizing?**

Synchronization would lock a method or an object in program. The synchronization would solve the race condition but or make the time consuming increase.

**37. Why should not synchronize every method in class?**

Because it is not necessary to synchronize every method because synchronize would lock the method or instance when single thread access it. It would totally slow down speed of our routine.

## *Unit 5*

**38. How to read in a ".Properties" file?**

We can use the pattern "key=value" to get the value, and JAVA also provide related function to read it.

**39. What is socket?**

Socket is a "tools" making our routine communicate with other device, even the whole network.

**40. How to identify a socket when you want to communicate?**

Each socket would has identify hostname and port.

**41. How to transfer .txt file through socket?**

We can use socket object stream. We have to set up a buffer object and save moderate amount of data in this buffer, and transfer it with buffer stream attached to an object stream, and send or receive with buffer.

**42. What is protocol? How to write protocol program?**

Protocol can regard as a contract when different routine communicating. If the routine wants to communicate with other, they have to follow this rule.

**43. How could one server handle several clients?**

Actually, we can use multithreading to deal with several clients. Once a client contact with our server, the server would set up a new thread to deal with the client, so that the server can handle several clients.

**44. How to keep a client thread non-stop working if you want? And how to stop this client?**

Actually, we can use a while(true) statement to implement this. When the client would to be stop, it can send a massage to server, once server recipe this “stop” massage, it would close the inputstream and outputstream, and stop the thread what it handling.

**45. What is the difference between JSP and Java Servlet?**

Java servlet is precompiled java application. But JSP just a kind of webpage, it would include many other languages.

**46. What is Tomcat ?**

Tomcat is an open-source web server and servlet would run in this server.

**47. What is HTML and CSS.**

HyperText Markup Language, commonly referred to as HTML, is the standard markup language used to create web pages.It is written in the form of HTML elements consisting of tags enclosed in angle brackets. Web browsers can read HTML files and render them into visible or audible web pages. Browsers do not display the HTML tags and scripts, but use them to interpret the content of the page. HTML describes the structure of a website semantically along with cues for presentation, making it a markup language, rather than a programming language.

Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a markup language.

## *Unit 6*

**48. What is Normalization Theory?**

Normalization theory involves relations (tables), attributes (columns) and dependency of attributes upon one another. With normalization, you can minimize redundant and inconsistent data and avoid update anomalies.

**49. What are three rules of Normalization?**

First Normal Form : First normal form (1NF) says that arrays or other repeating fields should not be used.

Second Normal Form : For a table to qualify for second normal form, it should be in first normal form (1NF) and all of the data in the table must be dependent on the value of the primary key.

Third Normal Form : For a table to qualify for third normal form, it must be in 2NF, 1NF and each of columns in that table except those used as keys, must not be interdependent.

**50. Why we should use Normalization Therory?**

It would help us design schema easily and clearly, make the database less redundant and make us handle it conveniently.

**51. How to connect to MySQL via Java?**

Using the JDBC jar package.

**52. Why do we need a primary key?**

Because the primary key is the unique for a record, we can search it by using primary key easily.