**1. Compare and contrast data types, abstract data types, and data structures**

**Datatype** is a group of values, and the operations defined within a programming language.

**Abstract data type** is a data type whose values and operations are not define within a programming language and must be define by the programmer.

**Data structures** is a collection of objects that organized and stored in groups so that this data can be use efficiently**.**

**2. List the collections in the Java Collections API and mark the ones that are covered in this text**

The Java collections API is a set of classes that represent specific types of collections and their implementation in various ways.

Almost all collections in Java are grouped in the java. until package and are derived from the java. util. Collection interface

**types of collections**

* **Lists:** They are always ordered and may contain duplicates and can be handled the same way as usual arrays
* **Sets:** They cannot contain duplicates and provide random access to their elements
* **Queues:** They are objects that are processed in first-in, first-out fashion
* **Maps:** They connect unique keys with values, provide random access to its keys and may host duplicate values

**3. Define the concept of abstraction and explain why it is important in software development**

Abstraction: we use Abstraction to reduce complexity and allow efficient design and implementation of complex software systems.

And It is important because, it is used to reduce the complexity of the design and implementation process of software

**4.** **Hand trace a stack X through the following operations**

**X.push(new Integer(4));**

**X.push(new Integer(3));**

**Integer Y = X.pop();**

**X.push(new Integer(7));**

**X.push(new Integer(2));**

**X.push(new Integer(5));**

**X.push(new Integer(9));**

**Integer Y = X.pop();**

**X.push(new Integer(3));**

**X.push(new Integer(9));**

**Answer**

4

4, 3

4

4, 7

4, 7, 2

4, 7, 2, 5

4, 7, 2, 5, 9

4, 7, 2, 5

4, 7, 2, 5, 3

4, 7, 2, 5, 3, 9

**5. Given the resulting stack X from the previous exercise, what would be the result of each of the following?**

a. Y = X.peek();

b. Y = X.pop();

Z = X.peek();

c. Y = X.pop();

Z = X.peek();

**Answer**

X = 4, 7, 2, 5

Y = 3

Z = 5