Lab 9

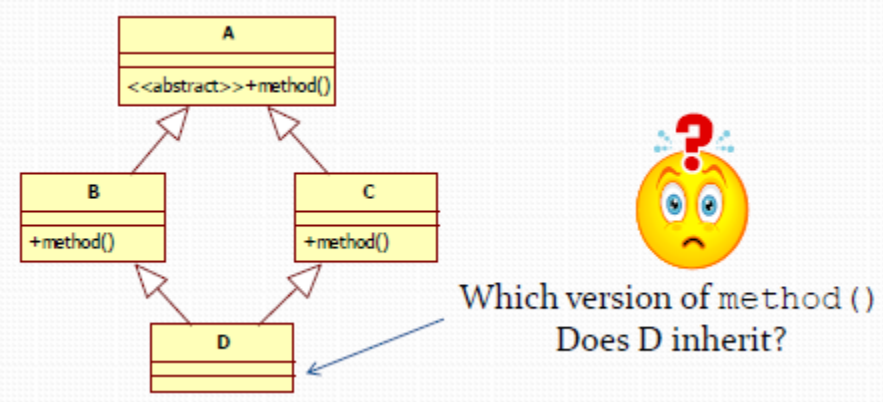
1. Short Answer

   A. Java's `ArrayList` implements 6 interfaces and extends one class. What are they?

   Parts B – D of this Problem refer to code in package `lesson09.labs.prob1`, in which you are trying to remove duplicates from a List and then test that your output is correct. All three attempts to solve this problem are incorrect in some way (when you run the code, output message indicates that the procedure fails). Explain, in each case, what is wrong with the solution. Place each of your answers in a text file in the relevant package.

   E. Lesson 5 introduced the Diamond Problem that must be handled by any language that supports multiple inheritance. Java SE 8 now supports "behavioral" multiple inheritance (but not "data" multiple inheritance). Explain how features of Java 8 handle the Diamond Problem by considering two scenarios:

      i. When the type D is a class
      ii. When the type D is an interface.



2. Problem Statement:

   Design a system that represents and evaluates **arithmetic expressions** composed of:

   - **Constants** (like 5)
   - **Addition** (like 3 + 4)
   - **Multiplication** (like 2 * (3 + 1))

   Use a **sealed interface** to define the top-level Expr type. Then use **Java records** to implement different expression types:

   - Constant for a single integer value
   - Add for representing the sum of two expressions
   - Multiply for representing the product of two expressions

   Your goal is to:

1. Define the data model using a sealed interface and records.
2. Write a recursive method eval(Expr expr) that computes the result of an expression.
3. Demonstrate your system by evaluating a complex expression like:
   $(2+3)*4$

The expected output for this expression should be 20.