**Week 4: Assignment 4 - Answers with Explanations**

**1. Which of these access specifiers must be used for main() method?**

* **Answer:** b. public
* **Reasoning:** The main method must be public so that the Java Virtual Machine (JVM) can access and execute it from outside the class.

**2. What will be the output if the program is executed?**

* **Answer:** a. It will give compile-time error
* **Reasoning:** The Math class methods, such as cos() and PI, are not directly available. You need to use the static class name to access them, such as Math.cos() and Math.PI. Without this, the compiler will not be able to find the methods and variables.

**3. What will be the output of the code given above?**

* **Answer:** c. 10 Java\n01 Java
* **Reasoning:** The Person class constructor is called first, which prints 10 Java. Then, the Employee constructor is called. It prints 01 Java. Since a and b in the Employee class are instance variables, they shadow the variables in the Person class.

**4. In Java, can a subclass in a different package access a superclass's protected method?**

* **Answer:** d. Yes, but only through inheritance (i.e., using super or this, not via an object)
* **Reasoning:** A protected member is accessible within its own class, its package, and by subclasses (even if the subclass is in a different package). However, a subclass can only access a protected member on an object of its own type or via inheritance. It cannot access it on an object of the superclass's type from outside the package.

**5. A package is a collection of:**

* **Answer:** d. classes, methods and interfaces
* **Reasoning:** A package is a grouping of related types, including classes, interfaces, enumerations, and annotations.

**6. Choose the best option among the following for the code snippet given above.**

* **Answer:** a. Both pre-increment and post-increment operators become pre-increment during print.
* **Reasoning:** When the increment (++) and a variable are in the same println statement, the Java compiler evaluates all the pre-increment operators first, followed by the print statement, and finally the post-increment operators. This means that both number++ and ++number effectively act as pre-increment operators in this specific context. The result for Main1 will be 11+11=22 and for Main2 it will be 11+12=23 because in Main1 the variable number is not incremented.

**7. How many errors does this program contain?**

* **Answer:** b. 1
* **Reasoning:** The main method has a private access specifier. The main method must be public for the JVM to execute the program.

**8. What is the output of the above Java Code Snippet with protected access modifier?**

* **Answer:** c. Compiler error
* **Reasoning:** The showMarks() method in the Teacher class is protected. The Student class is in a different package (nptel2 vs nptel1). The subclass can access protected members only through inheritance. In the show() method, the call showMarks() is valid. However, the show() method has default access, which means it cannot be accessed by the main method in the Student class from a different package. The problem is also that the Student class cannot access the Teacher class because the import is invalid.

**9. Choose the correct syntax of a Java Package below.**

* **Answer:** a. package PACKAGE\_NAME;
* **Reasoning:** The package statement is a keyword followed by the package name, and it must be the first non-comment, non-whitespace statement in a Java file.

**10. What is the process by which we can control what parts of a program can access the members of a class?**

* **Answer:** c. Encapsulation
* **Reasoning:** Encapsulation is the process of bundling data (variables) and the methods that operate on that data into a single unit (a class). It allows you to control the access level of the members of a class using access specifiers like public, private, and protected.