**Week 3: Assignment 3 - Answers with Explanations**

**1. In Java, what is the role of the public static void main(String args[]) method?**

* **Answer:** b. Execution entry point
* **Reasoning:** The main method is the starting point of any Java application. The JVM begins execution from this method.

**2. What is the output of the above code?**

* **Answer:** a. Static Method
* **Reasoning:** A static method belongs to the class itself, not to a specific object instance. Therefore, you can call First.staticMethod() directly on the class name, even if the object first is null. The line First first = null; has no effect on the call to the static method.

**3. What is the output of the above code?**

* **Answer:** d. Compilation Error
* **Reasoning:** The code attempts to access a private member variable y from outside its class (access obj = new access(); ... obj.print();). Private members are only accessible within the class they are declared in, so this will cause a compilation error.

**4. Members which are not intended to be inherited are declared as**

* **Answer:** c. Private members
* **Reasoning:** private members of a class cannot be accessed by subclasses, thus they are not inherited. public and protected members are intended for inheritance.

**5. Which type of inheritance leads to the diamond problem?**

* **Answer:** c. Multiple
* **Reasoning:** Multiple inheritance is when a class inherits from two or more base classes. The "diamond problem" occurs when a class D inherits from classes B and C, and both B and C inherit from class A. When a method in D calls a method defined in A, it's ambiguous which path to take (A->B->D or A->C->D). Java avoids this problem by not supporting multiple inheritance for classes.

**6. What is the output of the above code?**

* **Answer:** a. error: func() in subDemoClass cannot override func() in superDemoClass
* **Reasoning:** The final keyword prevents a method from being overridden by a subclass. The code attempts to override the final method func() in superDemoClass with a new version in subDemoClass, which will result in a compilation error.

**7. What is the output of the above code?**

* **Answer:** a. 15
* **Reasoning:** Java uses block-level scoping. The main method has an x with value 10. Inside the inner block {}, a new x is declared with value 15. The System.out.println(x) statement inside this inner block will print the value of the most locally scoped variable, which is 15.

**8. What is the output of the above code?**

* **Answer:** c. 120
* **Reasoning:** The fun() method is a recursive function that calculates the factorial of a number. When called with fun(5), it will calculate 5⋅4⋅3⋅2⋅1, which equals 120.

**9. If a variable of primitive datatype in Java is declared as final, then**

* **Answer:** b. Its value cannot be changed
* **Reasoning:** The final keyword makes a variable a constant. Once it is initialized, its value cannot be reassigned.

**10. What is the output of the above code?**

* **Answer:** c. 79
* **Reasoning:**
  + obj1 and obj2 are created. The static variables x and y are shared by all instances. They are initially 0.
  + obj1.add(a, a+1) is called, where a is 2. x becomes 2 + (2+1) = 5. y becomes 5 + (2+1) = 8.
  + obj2.add(5, a) is called, where a is still 2. x becomes 5 + 2 = 7. y becomes 7 + 2 = 9. These assignments overwrite the previous values of the static variables.
  + The System.out.println(obj1.x + " " + obj2.y) statement prints the new value of obj1.x (which is static x, so 7) and obj2.y (which is static y, so 9). The output is 7 9.