Local and Instance Variable in Java

In Java, local variables and instance variables are two types of variables with different scopes and lifetimes within a class or method.

Local Variables:

- Local variables are declared within a method, constructor, or block.
- They are only accessible within the scope in which they are declared.
- Local variables must be initialized before they are used.
- Local variables are created when a method is invoked and destroyed when the method execution completes.
- Each time the method is called, a new copy of the local variable is created.

Example (Java):

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```java
public class LocalVariableExample {
    public void calculateSum() {
        int a = 5; // local variable
        int b = 10; // local variable
        int sum = a + b; // local variable
        System.out.println("Sum: " + sum);
    }

    public static void main(String[] args) {
        LocalVariableExample example = new LocalVariableExample();
        example.calculateSum();
    }
}
```

In the above example, the variables a, b, and sum are local variables within the calculateSum() method. They are only accessible within the method and are destroyed once the method execution is complete.

Instance Variable:

- Instance variables are declared within a class but outside any method, constructor, or block.
- They are associated with objects of the class and have separate copies for each instance (object) of the class.
- Instance variables are initialized with default values if not explicitly initialized.
- They can be accessed and modified by any method or constructor within the class.

Example (Java):

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```java
public class InstanceVariableExample {
    int x; // instance variable
    int y; // instance variable

    public void setValues(int a, int b) {
        x = a; // accessing instance variable
        y = b; // accessing instance variable
    }

    public void printValues() {
        System.out.println("x: " + x); // accessing instance variable
        System.out.println("y: " + y); // accessing instance variable
    }

    public static void main(String[] args) {
        InstanceVariableExample example1 = new InstanceVariableExample();
        example1.setValues(5, 10);
        example1.printValues();

        InstanceVariableExample example2 = new InstanceVariableExample();
        example2.setValues(15, 20);
        example2.printValues();
    }
}
```

In the above example, the variables x and y are instance variables of the class InstanceVariableExample. Each instance of the class (e.g., example1 and example2) has its own separate copies of these instance variables. They can be accessed and modified using the object reference.

When example1 and example2 are created, they have their own distinct values for x and y. Modifying the instance variables of one object does not affect the values of the instance variables in another object.

In summary, local variables are declared within a method and have a limited scope, while instance variables are declared within a class and are associated with objects of the class, having separate copies for each object.