**Sequence Diagram:**

**Sequence Diagram Description:**

This diagram will illustrate the interactions between different parts of the Form1 class during the compilation process, emphasizing semantic analysis and related functions.

1. **Objects/Lifelines:**

**User:** Represents the user of the form, interacting through buttons.

**Form1:** Represents the main form class.

**LexicalAnalyzer:** An imaginary object that represents the lexical analysis done within Form1.

**SemanticAnalyzer:** An imaginary object that represents the semantic analysis functions within Form1.

**MemoryHandler:** An imaginary object that represents actions on memoryList, calcList, and finalMemoryList.

**OutputHandler:** An imaginary object that represents actions to display compilation output and errors.

1. **Messages (Interactions):**

* Solid arrows represent synchronous calls (the sender waits for a response).
* Dashed arrows represent return values.

1. **Sequence of Events (Ordered Chronologically):**

• **User -> Form1:** button1\_Click(): The user clicks the "Lexical Analyze" button.

• **Form1 -> LexicalAnalyzer:** Analyze Lexically(): performs lexical analysis by classifying tokens.

• **LexicalAnalyzer -> Form1:** returns token stream.

• **Form1 -> User:** Displays token information in flowLayoutPanel1.

• **User -> Form1:** button3\_Click(): The user clicks the "Compile" button.

• **Form1 -> SemanticAnalyzer:** mainAnalyze(3): Initiates the main analysis and semantic validation of the code.

• **SemanticAnalyzer -> SemanticAnalyzer:** (Calls analyze1a, analyze1b, analyze2a, analyze2b, analyze3a, analyze3b, analyze3Loop based on code) performs semantic checks on declarations, assignments, and if statements.

• **SemanticAnalyzer -> MemoryHandler:** Modifies memoryList, calcList.

• **SemanticAnalyzer -> Form1:** Returns boolean, if any error occurred.

• **Form1 -> OutputHandler:** printErrors(error, isCompiled): Prints compilation success or error.

• **User -> Form1: button4\_Click():** The user clicks the "Run" button.

• **Form1 -> SemanticAnalyzer: mainAnalyze(4):** Initiates the main analysis and semantic validation of the code.

• **SemanticAnalyzer -> SemanticAnalyzer:** (Calls analyze1a, analyze1b, analyze2a, analyze2b, analyze3a, analyze3b, analyze3Loop based on code) performs semantic checks on declarations, assignments, and if statements.

• **SemanticAnalyzer -> MemoryHandler:** Modifies memoryList, calcList.

• **Form1 -> MemoryHandler:** Clear the lists, get values from memoryList, and creates finalMemoryList.

• **Form1 -> MemoryHandler: updateValues():** Updates the value of variables in calcList.

• **MemoryHandler -> MemoryHandler:** Performs calculations based on the calcList statements and saves to memory.

• **MemoryHandler -> Form1:** Returns result of calculations and memory.

• **Form1 -> OutputHandler:** createMemoryLabels(): Updates UI with the output.

• **Form1 -> MemoryHandler:** Prints calculation information

• **Form1 -> OutputHandler:** prints errors if any from calculations.

1. **Diagram:**

