Applications Programming

Repetition (Loop) Statement - 3
Nested Loop Statement

Nested Loop Concept

- A loop statement (any loop type) is called nested loop if at least one of the statements in its loop body is a loop statement.

- The inner loop must be enclosed completely inside the outer loop.

- Loops can be nested as many levels as needed.

- Too many levels of nested loop will make reading/understanding the semantics of the statement too difficult, thus make debugging and maintaining the program difficult.

- Write a nested loop only if the program logic demands that a nested loop is necessary.
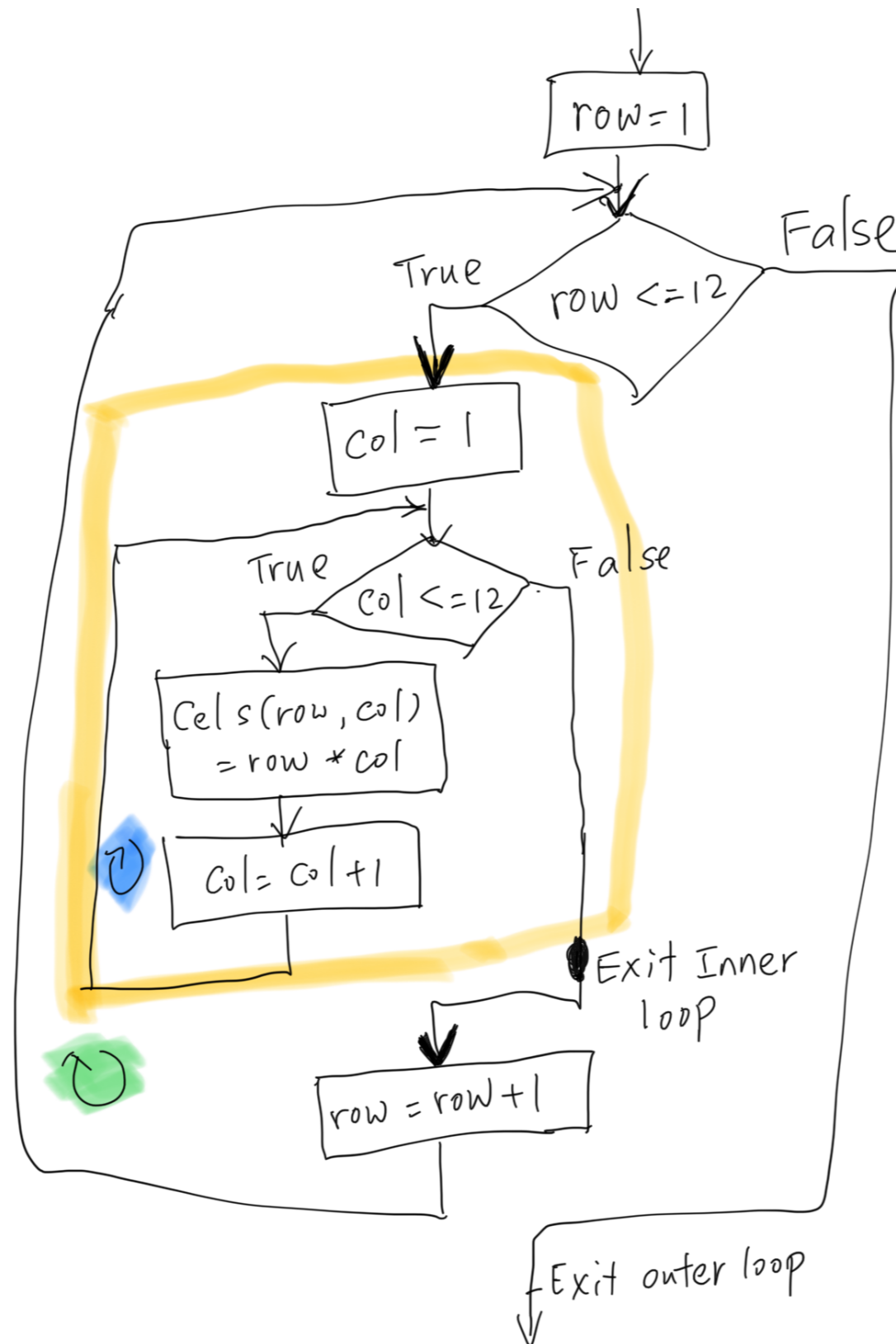
An example

- Display a multiplication table of 12x12

- its variations

  - left-bottom half

  - upper right half

code of the example

```
Sub MultiplciationTable
    Dim row As Integer
    Dim col As Integer
    row = 1
    Do While row <= 12
        col = 1
        Do While col <= 12
            Cells(row, col) = row * col
            col = col + 1
        Loop
        row = row + 1
    Loop
End Sub
```

```
Sub MultiplciationTable

    Dim row As Integer

    Dim col As Integer

    For row = 1 To 12

        For col = 1 To 12

            Cells(row, col) = row * col

        Next col

    Next row

End Sub
```

Control Flow Graph

More Example

- Simulate a RESP account month by month for N years

  - Each year, there is a contribution limit ($5000)

  - Government will give a 20% grant to match the first $2500 contribution

  - Contribution age limit is 17

  - Parameters: monthly contribution, monthly interest rate

Points

- Focus on the semantics more than on the syntax

- Write loop control structure first, then focus on the tasks that need to be repeated

Pitfalls

- Clearly identify the inner and outer loop control variable, especially for the nested For-loop statements

- Off by one error

- Consistency, consistency, consistency!