

Lesson 8-1: Nested Loops

Computer Science 46A: Introduction to Programming
San José State University

Announcements

- Homework 8 will be posted. Check Google drive
- Lab #8 is this Friday (3/21)
- Sample test questions posted to Canvas
- When is the Midterm?

Learning Objectives

By the end of this lesson, you should be able to:

1. Use Scanner object checks as conditions in while loops
2. Write a nested while, for, or do loop

Recall: Loops

- A loop is a code block that is repeated many times
- It's one of the most powerful components of programming
- There are a few implementations of loops in different languages
- In Java, there are three different implementations of loops:
 - While loop – if a condition is met, keep doing something
 - For loop – do something a certain amount of times
 - Do loop – do something, and then keep doing it if a condition is met

Loops and Scanner Methods

Recall: User inputs with a Scanner Object

- With a Scanner object we have:
 - Received one or two inputs from the user
 - Terminated programs if the input was not correct
 - Used sentinel values to stop the loop
- What if we wanted to continue receiving inputs until one is valid?
- Or if we wanted to continue receiving inputs until a terminal value is provided
- Loops give us the power to continue the program for these desired behaviors

Poll Everywhere: Receiving User Input

What kind of loop would be best to continue receiving inputs from the user until a valid input is provided?

A) for loop,

B) while loop

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while loops with Scanner methods: Getting the right type of input

- We can leverage Scanner methods in while loops to continue asking for input of a given type until we receive a value of that type
- Example:

```
Scanner myObj = new Scanner(System.in);  
while (!myObj.hasNextInt())  
{  
    // print a message that the value  
    // is not correct; try again  
}
```


Example: EnterAnInt

Goal: Get an integer from the user – if the user provides an input that is not an integer, ask again

```
Please enter an integer:  
ten  
Invalid: ten is not an integer.  
Please enter an integer:  
10.2  
Invalid: 10.2 is not an integer.  
Please enter an integer:  
10  
Nice, 10 is an integer.
```

Output of EnterAnInt

while loops with Scanner methods:

Getting input until an escape character is passed

- We can leverage Scanner methods in while loops to continue asking for input of a given type until we receive a value to quit
- Example:

```
Scanner myObj = new Scanner(System.in);  
while (myObj.hasNextInt())  
{  
    // enter code here  
}
```

Example: EnterSomeInts

Goal: Get integers from the user until the user signals to quit

Note: While similar, this is different than a sentinel values because the sentinel value is of the same type

```
Enter an integer or Q to quit: 17
Sweet! 17 is a great integer.
Enter an integer or Q to quit: 31
Sweet! 31 is a great integer.
Enter an integer or Q to quit: 47
Sweet! 47 is a great integer.
Enter an integer or Q to quit: 61
Sweet! 61 is a great integer.
Enter an integer or Q to quit: Q
```

Output of EnterSomeInt

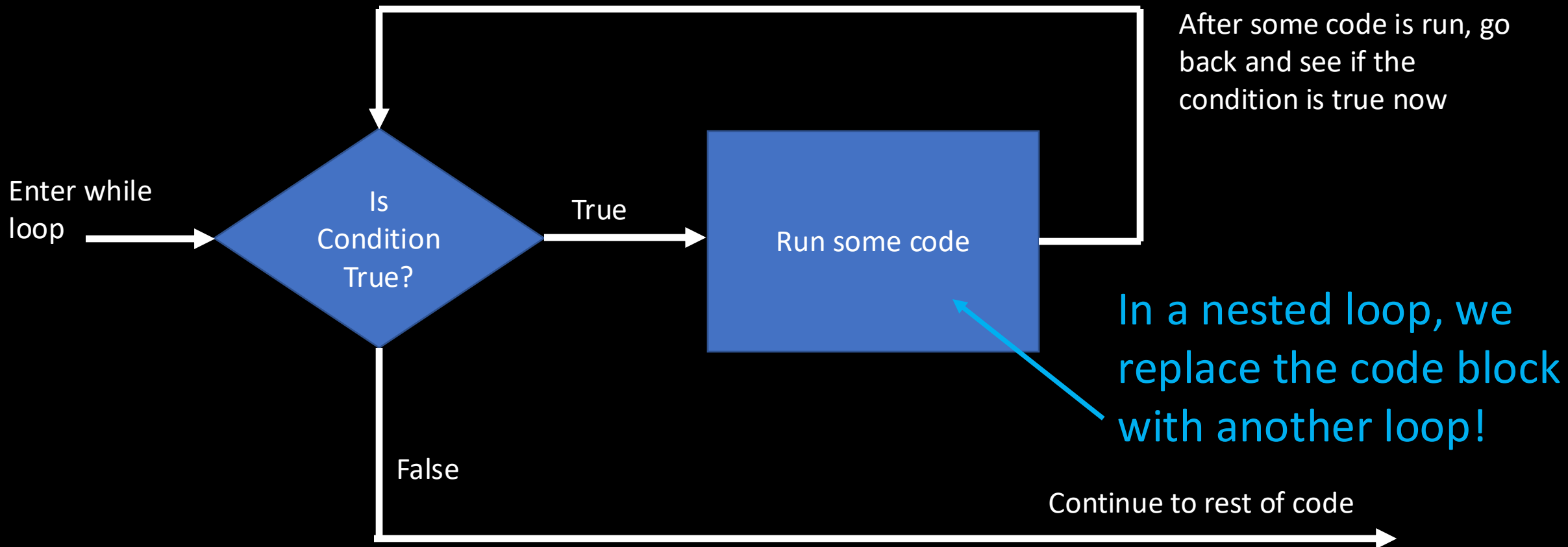
Nested Loops

Nested Loops Defined

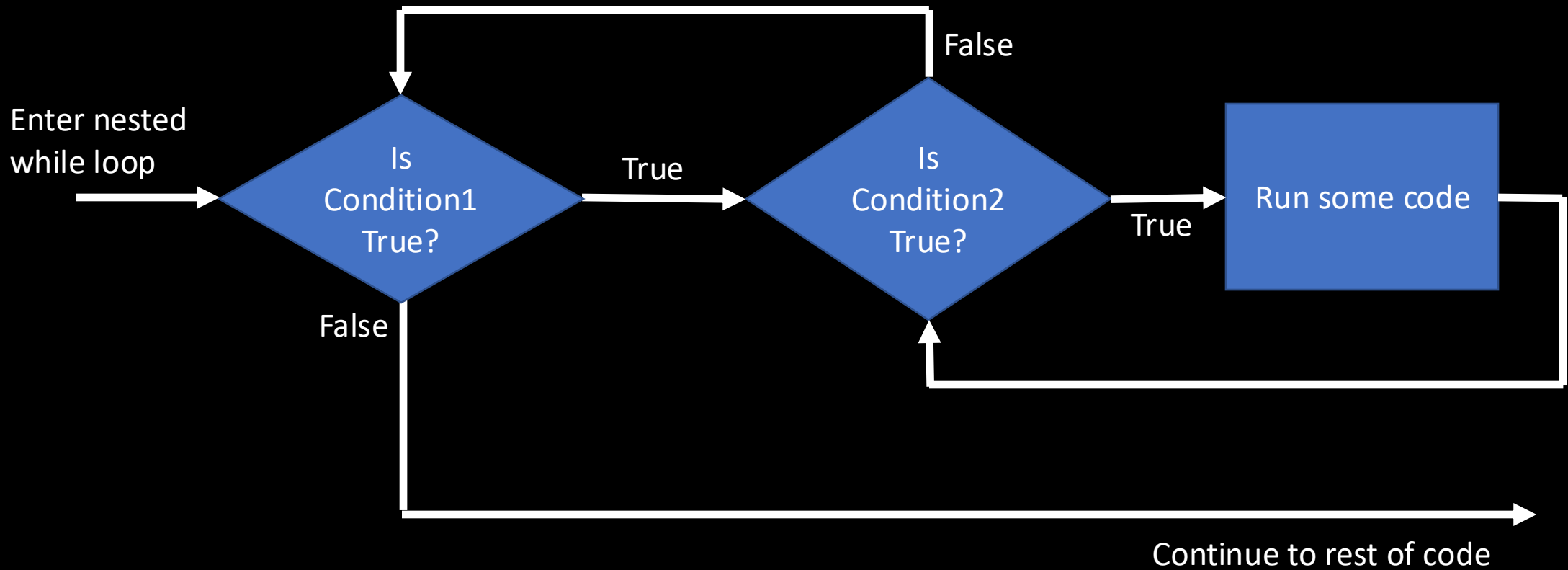
- A “nested” loop is a loop which is *inside* another loop
- Example syntax for nested while loops:

```
while (condition1)
{
    while (condition2)
    {
        // do this command
    }
}
```

The `while` loop flow chart



The nested `while` loop flow chart



Example: **SeatsOnAPlane**

Consider a small plane that has:

5 rows of seats numbers 1-5

4 seats per row lettered A-D

List all of the seats on the plane

```
Row 1 has the seats 1-A, 1-B, 1-C, 1-D,  
Row 2 has the seats 2-A, 2-B, 2-C, 2-D,  
Row 3 has the seats 3-A, 3-B, 3-C, 3-D,  
Row 4 has the seats 4-A, 4-B, 4-C, 4-D,  
Row 5 has the seats 5-A, 5-B, 5-C, 5-D,
```

Row 1:	1-A	1-B		1-C	1-D
Row 2:	2-A	2-B		2-C	2-D
Row 3:	3-A	3-B		3-C	3-D
Row 4:	4-A	4-B		4-C	4-D
Row 5:	5-A	5-B		5-C	5-D

Airplane seat diagram

Example: AlphabetSoup

- See example code in the Lecture08-1.zip file

Poll Everywhere:

Question 2

The last line of the
AlphabetSoup script is:

- A) The first 5 letter(s) of the alphabet is/are A, B, C, D, E,
- B) The first 4 letter(s) of the alphabet is/are A, B, C, D,
- C) E,
- D) D,

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Participation Exercise 8-1a:

TotalAndOutOfRangeCounts

Goal: Use Scanner methods in a while loop to collect values until the letter Q is provided.

As inputs are collected, count the numbers which are less than 20 or more than 40

```
Enter an integer or Q to quit: 11
Enter an integer or Q to quit: 21
Enter an integer or Q to quit: 31
Enter an integer or Q to quit: 41
Enter an integer or Q to quit: 51
Enter an integer or Q to quit: Q
    The total count: 5.
    The out of range count: 3.
```

Codecheck Link: [HERE](#) and on Canvas

Participation Exercise 8-1b:

DrawingATriangle

Goal: Use nested loops to draw a triangle with asterisk

The triangle height and base should be equal to the integer provided

```
Enter a positive integer: -2
Not a positive integer: -2
Enter a positive integer: 10
*
**
***
****
*****
*****
*****
*****
*****
*****
```

Output of DrawingATriangle

Codecheck Link: [HERE](#) and on Canvas