

Week 5 Exercises : While Loops

Feb 12th 2012

1 Approach

Always read *all* of this document before you start the first exercise. Do this before the Tuesday lab session so that you know what your workload for the week will be. If you are aiming for a high grade then do both the basic exercises and those marked with a star. If you are having difficulty with the pace on the course then skip the starred exercises. The exercises are now roughly divided into three; these match the Tuesday / Wednesday / Thursday lab sessions. Make sure you approach the work in these batches: on a given day ask the questions that you need to understand how to do those exercises — finish them between classes.

2 Exercises

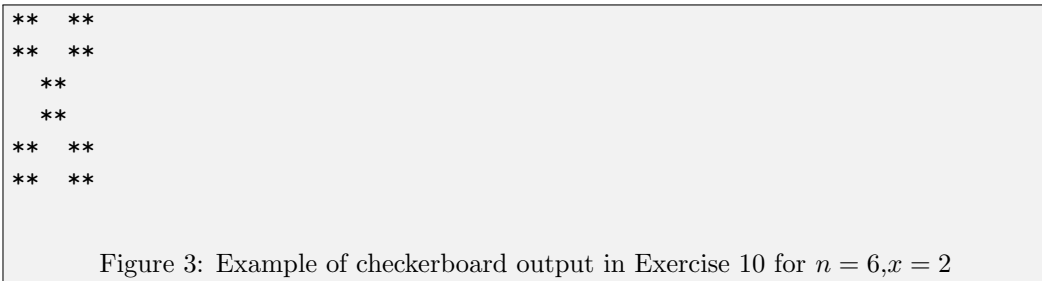
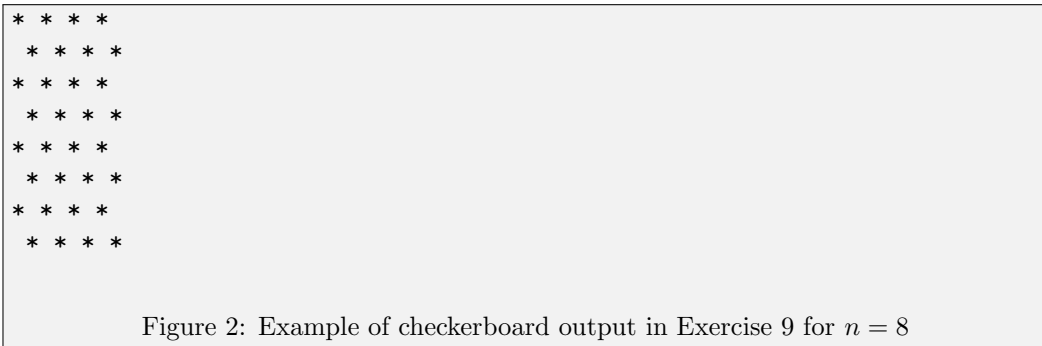
1. Write a program that allows the user to input a sequence of integers. When the integers sum to 100, or more, output the number of integers that were entered.
2. Write a program that inputs an integer n from the user, and outputs n star characters in a row.
3. Modify the previous exercise to output a column of n star characters.
4. Write a program that inputs two integers x and y from the user. Output a rectangle shape on the console using x star characters on each row, and y rows in total.

So far you have seen single loops, and simple nests of loops where the inner condition is *regular*. Now we look at what we can do by making the inner condition *irregular*. That means that it behaves slightly differently for each iteration of the outermost loop.

5. Write a program that inputs an integer n and draws a triangle n rows tall, and n columns wide at the base. An example of the output is shown in Figure 1.
6. Modify your previous program so that the triangle faces the other way (slope changes from right to left).
7. * Modify your previous program so that the user inputs two integers w and h and the triangle is w columns wide and h rows tall. This implies that the slope of the hypotenuse will change.
8. Write a program that takes an input r and draws a circle of that radius. To make your task easier center the circle in a region that is $2r + 1$ columns wide, and $2r + 1$ rows high.

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Figure 1: Example of triangle output in Exercise 5 for $n = 4$



Until now there has been a tight connection between the sequence of iterations of loops and the observable output. Exercise 7* demonstrated an alternative approach for those of you who attempted it. Now we are going to look at *parametric* loop bodies. In each of the following exercises the behaviour of the body of the loop needs to be controlled by a condition that produces the desired effect.

9. Write a program that takes an input n and draws a checkerboard pattern n columns wide and n rows tall. There is an example of the output in Figure 2.
10. Modify your previous program so that an extra parameter x is input, and make each square in the checkerboard pattern x columns across and x rows tall. An example of the output is shown in Figure 3.
11. * Think about how to combine techniques from two of your previous exercises this week. Write a program that draws a checkerboard pattern inside a circular region. Your program should input two parameters, r for the radius of the circle, and n for the size of the checkerboard squares.