



Lesson 4.9: While Loops

<https://codehs.com/course/8066/lesson/4.9>

Description	In this lesson, students will explore while loops and Python variables. This combines the ideas of creating variables, updating variables throughout a loop, and determining the correct ending condition.
Objective	Students will be able to: <ul style="list-style-type: none">• Explain the purpose of a while loop• Create while loops to repeat code while a condition is true• Utilize while loops to solve new types of problems
Activities	4.9.1 Video: While Loops 4.9.2 Quiz: While Loops Quiz 4.9.3 Example: While Loop Countdown 4.9.4 Exercise: Inventory 4.9.5 Exercise: Fibonacci 4.9.6 Quiz: AP Practice: Iteration
Prior Knowledge	<ul style="list-style-type: none">• Initializing a variable• Scope of a variable declared inside or outside a loop• Using functions to get input from the user
Planning Notes	<ul style="list-style-type: none">• There are several handouts that accompany this lesson that give practice with writing and debugging while loops. They can be used as in-class activities or as homework assignments. Determine how and if these handouts will be used and make the appropriate number of printouts prior to the class period.• Decide if students will take notes in a notebook, on paper handouts, or through the “Take Notes” function on CodeHS.• This lesson contains several challenging exercises. Make sure to review them beforehand so as to figure out what areas may be confusing for students, and consider allowing students time in another class period to work on them.
Standards Addressed	
Teaching and Learning Strategies	Lesson Opener:

- Consider using the beginning of class discussion questions (listed below) to aid in this conversation. Have students brainstorm and write down answers to the discussion questions. Students can work individually or in groups/pairs. Have them share their responses. [5-7 mins]
 - For the final question, some students will remember how to use while loops, while others may have forgotten. Let students struggle to come up with the answer, and ask a couple of students to share their solution with the class to see how students have brainstormed to solve this problem.

Activities:

- Watch *While Loops* and complete the corresponding quiz. [5-8 mins]
- Explore the *While Loop Countdown* example. [4 mins]
 - Have students convert this to a for loop as a class to show how for and while loops can be interchanged in the correct circumstance.
- Complete *Inventory* and *Fibonacci* exercises. [15 mins]
 - *Inventory* may be difficult for students because the autograder is asking for very specific output from the program. Make sure students read the directions carefully for how they should be responding to each branch in their control structure.
 - If students are unfamiliar with *Fibonacci*, consider bringing the class whole group to discuss what the Fibonacci sequence is, and to strategize how to complete the exercise.
 - It may be good to provide students with the *Control Structures Examples* handout so students can figure out which type of control structure they should be using.

Lesson Closer:

- Have students reflect and discuss their responses to the end of class discussion questions. [5-7 mins]
- Have students complete the *AP Practice: Iteration* as an exit quiz [3 mins]
- If there is time, consider giving one of the other handouts out to the class as an exit ticket or assign it for homework. [5-10 mins]

Discussion Questions

Beginning of Class:

- What are the benefits of using a for loop in our programs?
 - *It allows us to repeat code in an efficient manner.*
- Can you think of a potential limitation of a for loop?
 - *It occurs for a specific number of iterations - what if we need to repeat an action for an indefinite amount of time?*
- Suppose we wanted to create a program that asked a user to enter a four character number into the console, and kept asking until they did it correctly, how would we do that currently?
 - *Answers will vary. Some students may remember using while loops, while others may use a for loop with a very high value.*

End of Class:

- How is a while loop different than a for loop?
 - *The essential difference is that while loops should be used when an action should repeat for an indefinite amount of time, whereas a for loop should run a predetermined number of times.*
- Describe a situation where you would need to use a while loop instead of a for loop.
 - *While loop should be used if a user has to enter a correct password in order to view their information. A for loop would not be used if users are allowed an infinite amount of tries to enter the correct information.*
- How could you rewrite this for loop as a while loop?

```
for i in range(10):  
    print("Hello")
```

```
i = 0  
while i < 10:  
    print("Hello")  
    i += 1
```

Resources/Handouts

[Control Structures Flowchart \(student\)](#).

[Control Structures Flowchart \(teacher\)](#).

[Infinite Loops \(student\)](#).

[Infinite Loops \(teacher\)](#).

[Debugging: Working with Loops \(student\)](#).

[Debugging: Working with Loops \(teacher\)](#).

Vocabulary

Term	Definition	
Modification: Advanced	Modification: Special Education	Modification: English Language Learners
<ul style="list-style-type: none">• For the example and/or exercises, challenge student to recreate their while loop using a for loop.	<ul style="list-style-type: none">• Provide students with the <i>Infinite Loop</i> handout to give students practice with while loops in an offline setting.• Pair programming with another student	<ul style="list-style-type: none">• Provide students with the <i>Infinite Loop</i> handout to give students practice with while loops in an offline setting.• Pair programming with another student