Course: Utah Introduction to Python 1 | Module: Moving Tracy

Lesson 2.3: For Loops

https://codehs.com/course/20455/lesson/2.3

Description	In this lesson, students are introduced to for loops. They learn how for loops simplify the process of making small changes to a program and help avoid repeating code. For loops are written like this:
	
	`for i in range (4):`
	`    // Code to be repeated 4 times`

Objective	Students will be able to: • Create for loops to repeat code a fixed number of times • Explain when a for loop would be a useful tool • Utilize for loops to write programs that would be difficult/impossible without loops • Use the `bgcolor` command to change the color of Tracy's canvas
Activities	2.3.1 Video: For Loops 2.3.2 Check for Understanding: For Loops 2.3.3 Video: For Loops: Examples Walkthrough 2.3.4 Example: Square Using Loops 2.3.5 Example: Dotted Line 2.3.6 Free Response: For Loops and Trace Tables 2.3.7 Exercise: Row of Circles 2.3.8 Exercise: Color Changing Staircase 2.3.9 Exercise: 4 Columns 2.0 2.3.10 Badge: Looping Badge

Prior Knowledge	• Pattern- something that repeats
	• Radius vs. diameter- Radius of a circle is distance from the center, diameter is the entire width of the circle
	• Indentation- special attention must be paid to indentation when using functions (one indent = 4 spaces)
	• Colon- student must be able to locate and use this symbol on a keyboard
	• Commands:
	  ◦ `circle(radius)`
	  ◦ `forward(distance)`
	  ◦ `backward(distance)`
	  ◦ `penup()`/ `pendown()`
	  ◦ `goto(x, y)`
	  ◦ `setposition(x, y)`

	◦ `setx(x)`/ `sety(y)` ◦ `left()`/`right()` ◦ `seth()`/`setheading()`
Planning Notes	• Remind students of the system they should be using to record and revisit new vocabulary. Are they writing it in a notebook? Do they highlight or underline? Do they use flash cards? • For students completely new to coding, this will be the first video where they will encounter entirely new vocabulary– make sure there are systems in place for students to record and revisit new vocabulary. Remind students to pause the video and replay portions that are confusing to them or use the slides to slow concepts down. • Continue to encourage students to take notes in the format you've chosen (a notebook, on paper handouts, or through the "Take Notes" function on CodeHS.) • There are 3 handouts that accompany this lesson. Determine if and how these handouts will be used and make the appropriate number of printouts prior to the class period: ◦ *For Loops Examples Exploration:* This handout accompanies the example included in the lesson and can be used in conjunction with the example to give students space to explore and put their findings into words. This can be completed individually or in pairs. ◦ *Daily For Loops:* This handout can be used as an in-class extension activity or as a homework assignment. It is suggested that this handout be used after all other lesson activities have been completed. ◦ *For Loops and Trace Tables:* This handout accompanies the Trace Tables exercise included in the lesson and can be used in conjunction with or in place of the online activity to give students the option to complete the exercise by hand.
Standards Addressed	
Teaching and Learning Strategies	**Lesson Opener:** • Have students brainstorm and write down answers to the discussion questions listed below. Students can work individually or in groups/pairs. Have them share their responses. [5 mins] **Activities:** • Allow students to watch the introductory video individually, watch together as a class, or go through the slide deck live with your students. It is recommended that students take notes for later reference. Inform students that there will be a quiz after the video and give them time to complete it. [5-7 mins] ◦ Check for comprehension by asking the purpose of for loops, ensuring that students identify that for loops are used to execute a command a fixed number of times.

- Walk through the *Square Using Loops* example from this lesson as a class. [3-7 mins]
  - Students may need a more thorough explanation of for loop syntax. Be sure to focus on the need for a colon in their statement as well as how important indentation is.
  - You can let students know that the same way they usually use the letter 'x' as the unknown variable in their math classes even though any letter would work fine, when we write for loops, we usually use 'i' as the variable.
- Have students examine the *Dotted Line* example in pairs. [3-7 mins]
  - Encourage students to experiment with the examples by changing the value of i.
  - There are changes noted in the example description that students can make to the program and explore their effect. The *For Loops Examples Exploration* handout can be used with this example as noted in the *Planning Notes* section above.
- Have students complete the *For Loops and Trace Tables* exercise. [5-10 mins]
  - The *For Loops and Trace Tables* handout can be used instead of this activity as noted in the *Planning Notes* section above.
- Students work in pairs to plan out commands to successfully complete the *Row of Circles* exercise. [3-5 mins]
  - For pairs that seem to have one person dominating the thought-process, ask the other student if they agree with the logic and to add their own thinking to the solution.
- Students write the code for the *Row of Circles* exercise individually and test out on their own computers. [2-5 mins]
- Students complete the *Color Changing Staircase* exercise individually. [5-10 mins]
- Students complete the *4 Columns 2.0* exercise individually. [7-15 mins]
- Students can complete the *Daily For Loops* handout activity in pairs or individually if time permits, or for homework. [7-10 mins]

Lesson Closer:

- Have students reflect and discuss their responses to the end of class discussion questions. [5 mins]

Discussion Questions

Beginning of class:

- Write a program that will enable Tracy to draw one circle with a diameter of 50.
  - `circle(50)`
- What would you do if Tracy needed to draw 100 circles?
  - *You would have to write the `circle` command 100 times.*
- What kind of problems could arise when you write the same command many times?
  - *The more lines of code, the more likely to have a bug.*

	End of class:
	• How do for loops make your code more efficient?
	  ◦ *Less code written so less code to make errors in; if one value needs to change, only change it in one place rather than many… (Answers may vary)*
	• Give an example of where you see loops being used in your daily life.
	  ◦ *(Answers may vary)*
	  ◦ It is best to ask this prior to using the 'Daily For Loops' handout. Some ideas can be found on the handout.

Resources/Handouts	Daily For Loops (student) Daily For Loops (teacher) For Loops Examples Exploration (student) For Loops Examples Exploration (teacher) For Loops and Trace Tables (teacher) For Loops and Trace Tables (student)

Vocabulary

Term	Definition
Loop	A loop is a way to repeat code in your program.
For Loop	A for loop lets us repeat code a **fixed number of times.**

Modification: Advanced	Modification: Special Education	Modification: English Language Learners