

(<http://csmatters.org>) 2 - 9

0b10 - 0b1001

Nested and Chained Conditional Statements



Unit 2. Developing Programming Tools

Revision Date: Jul 22, 2019

Duration: 1 50-minute session

Lesson Summary

Pre-lesson preparation

Students must have an understanding of using conditional statements, and have completed all the assignments from Lesson 2-8.

Summary

Students will learn how programs can solve problems using nested and chained conditional statements in Python programs.

Outcomes

- Students will understand how nested and chained conditional logic controls program flow.
- Students will be able to solve problems that require nested and chained conditional logic.
- Students will work collaboratively, resolve conflicts and facilitate group work to create a small program.
- Students will use their journals to record answers and check for understanding and reflection.

Overview

1. Getting Started (5 min)
2. Introduction of Content (30 min)
 1. Conditional Statements [10 min]
 2. Nested Conditional Statements [15 min]
 3. Chained Conditional Statements [5 min]
3. Activity (10 min)
4. Wrap-up (5 min)

Learning Objectives

CSP Objectives

- *EU CRD-1 - Incorporating multiple perspectives through collaboration improves computing innovations as they are developed.*
 - LO CRD-1.C - Demonstrate effective interpersonal skills during collaboration.
- *EU AAP-2 - The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and selection constructs to represent repetition and make decisions to handle varied input values.*
 - LO AAP-2.A - Express an algorithm that uses sequencing without using a programming language.
 - LO AAP-2.E - For relationships between two variables, expressions, or values: a. Write expressions using relational operators. b. Evaluate expressions that use relational operators.
 - LO AAP-2.G - Express an algorithm that uses selection without using a programming language.
 - LO AAP-2.H - For selection: a. Write conditional statements. b. Determine the result of conditional statements.
 - LO AAP-2.I - For nested selection: a. Write nested conditional statements. b. Determine the result of nested conditional statements.

Math Common Core Practice:

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.

Common Core ELA:

- WHST 12.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes
- WHST 12.9 - Draw evidence from informational texts to support analysis, reflection, and research

NGSS Practices:

- 1. Asking questions (for science) and defining problems (for engineering)
- 3. Planning and carrying out investigations
- 4. Analyzing and interpreting data
- 5. Using mathematics and computational thinking
- 8. Obtaining, evaluation, and communicating information

Key Concepts

Students must know that conditional statements can be used inside of other conditional statements using nested and chained conditional statements.

Vocabulary:

- nested conditional statements
- chained conditional statements

Essential Questions

- How are programs developed to help people, organizations or society solve problems?
- How do computer programs implement algorithms?
- How do people develop and test computer programs?
- Which mathematical and logical concepts are fundamental to computer programming?

Teacher Resources

Student computer usage for this lesson is: **required**

In the Lesson Resources Folder:

- Nested If Statement Setup

Reference Text:

- How to Think Like a Computer Scientist
(<http://www.openbookproject.net/thinkcs/python/english2e/>) (Ch. 7 Selection
(<http://interactivepython.org/runestone/static/thinkcspy/Selection/toctree.html>))
- Python for Everybody (http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf)

Project Ideas:

- CS1 Python Programming Projects Archive
<http://www.cse.msu.edu/~cse231/PracticeOfComputingUsingPython/>
(<http://www.cse.msu.edu/~cse231/PracticeOfComputingUsingPython/>)

Lesson Plan

Getting Started (5 min)

In your journal, write what will be displayed by the following code segment. How do you know your answer is correct?

```
x=2500
if x < 1000:
    print("small number")
else:
    print("big number")
```

Introduction of Content (30 min)

Brief introduction to conditional statements (10 min)

Suggested Activity: What's in the box? (Part 2)

Show physical representation using real life example by revisiting the box example from previous lesson:

Materials: Four small opaque containers, four small items, two opaque containers big enough to fit two small opaque containers, Six post it notes to label each container with a color

Set Up Directions: Set up the activity before the class arrives following the directions below:

1. Place one small item in each small container
2. With the post-it notes, label the four small containers with different color names (red, orange, yellow, green)
3. Place two labeled containers in each of the larger containers
4. With the remaining post it notes, label one box blue and the other indigo.
5. On the board, write the color names on the board to record the student tally.
6. On the board, write the following pseudocode:

```
if numofBlue > numofIndigo
  if numofRed > NumofOrange
    open red box
  else
    open orange box
else
  if numofYellow > NumofGreen
    open yellow box
  else
    open green box
```

The Activity Directions

1. Ask: "If you could choose one of these colors, which one would it be. Please only vote once. Raise your hand if you would choose Blue. Record the number of students who voted for Blue on the board.
2. Ask: "Raise your hand if you would choose Indigo." Record the number of students who voted for Indigo on the board.
3. Show the students the pseudocode on the board and work through the if/else statement using the the data collected from the class.
4. Open the the box and display the contents of the box the class voted for.
5. Have students repeat the voting procedure to choose which smaller box to choose and show the object they chose

Brief discussion on nested conditional statements (15 min)

Demonstrate the coding process of the example below.

Guided Activity 1 - Coding Example: Write a program that evaluates a variable "age" and displays a group age category (you are not an adult, you are a senior citizen or you are an adult.)**Suggested Instructional Strategy** - Think Aloud - model your thought process for solving this problem. Include comments in your code.

```

age = 18
if age < 18:
    print("you are not an adult")
else:
    if age is > 65:
        print("you are a senior citizen")
    else:
        print("you are an adult")

```

Brief discussion on chained conditional statements (elif) (5 min)

Guided Activity 2 - Coding Example:

Write a program that prompts the user for their age and displays their age category (you are not an adult, you are a senior citizen or you are an adult.) If they are older than 200 display a message that reads "humanly impossible".

```

age = int(input("How old are you"))
if age < 18:
    print("you are not an adult")
elif age > 200:
    print("humanly impossible")
elif age >= 65:
    print("you are a senior citizen")
else:
    print("you are an adult")

```

Check for understanding

Assign students random numbers from 0 - 250. Have students decide what group they belong to (child, adult, senior citizen, not human) and explain why they made their choice. *** You could have students physically move into the groups, hold up a sign with their answer or answer quietly in their journal.

Activity (10 min)

Collaborative Coding (10 minutes)

1. Review group work requirements: all members contribute, resolve conflicts internally before asking the teacher for help, facilitate the contribution of all team members. Work together to decide how to divide up the work so that all group members contribute significantly to the process. Suggested roles: driver/navigator, timer, tester, journalist (recorder).
2. In your group, develop the pseudocode for the following problem:

A year is a **leap year** if it is divisible by 4 unless it is a century that is not divisible by 400. Write a function that takes a year as a parameter and returns True if the year is a leap year, False otherwise.
3. In your group, write the program for the problem.

***Note

It is recommended that:

All partners should be actively involved in the program development. For example, you may choose to employ Pair Programming, in which one partner “drives” (types and uses the mouse) while the other “navigates” (reviews and helps to guide what the driver is doing), with the partners changing roles every 20 minutes. Another method of collaboration is for each partner to develop pieces of the program, combine those pieces, and provide frequent feedback to each other during the development process.

-The College Board Computer Science Principles, Performance Assessment ©2014

Wrap Up (5 min)

Journal

Thinking about Nested and Chained Conditional Statements, answer the following questions:

1. What difficulties, if any did you encounter during development of your program?
2. What difficulties, if any, did you encounter with your partner.
3. If any difficulties did arise, what do you think are some strategies to eliminate the difficulties
4. What concepts in this lesson do you need clarified?

Options for Differentiated Instruction

Extensions

- Have students finish the collaborative coding activity started in class using online collaboration tools such as the ones provided by Google (Google docs, Google Hangout...)
- Have students watch the videos in the How to Think Like a Computer Scientist text book in Chapter 7 Selection
(<http://interactivepython.org/runestone/static/thinkcspy/Selection/toctree.html>)
- Have students work through the practice problems in the How to Think Like a Computer Scientist <http://interactivepython.org/runestone/static/thinkcspy/Selection/toctree.html>
(<http://interactivepython.org/runestone/static/thinkcspy/Selection/toctree.html>)
- Assign a practice project from CS1 Python Programming Projects Archive
<http://www.cse.msu.edu/~cse231/PracticeOfComputingUsingPython/>
(<http://www.cse.msu.edu/~cse231/PracticeOfComputingUsingPython/>)

Homework

- Extension can be assigned as Homework

Alternate Instructional Strategy:

- For guided practice, have a list of list of instructions for how to write the example presented
- Think Aloud - Model your thought process while solving the guided practice problems

Alternate Instructional Strategy: Interactive Journaling

- Comment on the journal entry by asking check for understanding questions or clarifying any misconceptions students write about.

Evidence of Learning

Formative Assessment

- A variety of checking for understanding techniques
 - Temperature checks
 - Teacher review student's code
 - Thumbs up/ thumbs down
 - Questioning throughout the lesson (whole group / small group / individual)
- Quick quizzes
- Peer review
- Interactive journaling

Summative Assessment

Students will create a collaborative program demonstrating concepts introduced in this two part lesson. Students will be assessed using a rubric and will reflect on their learning in their journal



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