THE UNIVERSITY OF TENNESSEE CHATTANOOGA

Basic Programming Concepts

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GenCyber Workshop

Agenda

- Fundamental Elements of Programming
- An Introduction to Variables
- If...Else Statements
- Print Statements
- For Loops

Learning Objectives

- Explain how basic programming components are combined to create complex programs
- Describe variables and how they are used within a program
- Demonstrate the function of conditional programming statements, including if statements, else statements, and while loops
- Explain the structure and purpose of a for loop within a program

Fundamental Elements of Programming

- For this lesson, we will be focusing on some fundamental concepts of programming
- You can think of these concepts as the building blocks of programming
  - by combining these programming components in different ways, you can build an almost endless variety of executable programs

An Introduction to Variables

- Typically, the same value will need to be referenced multiple times within a program
  - it can be tedious to type out the value each time that it is referenced
- One way to reference a value without having to retype it is by storing the value in a **variable**
  - variable: memory location paired with a given name used to store a value

An Introduction to Variables

- variables can be many different types depending on the programming language

Strings
“Hello, world!” “E.T. phone home.” “UTC”

Chars
‘h’ ‘m’ ‘s’ ‘t’

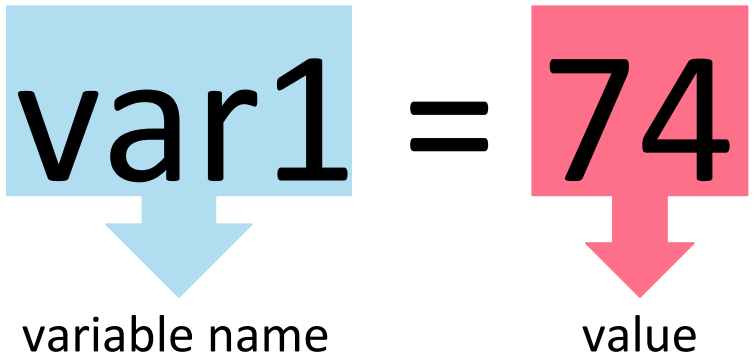
Ints
24 390 7456

Doubles
3.14159 4.3 275.6

Booleans
true false

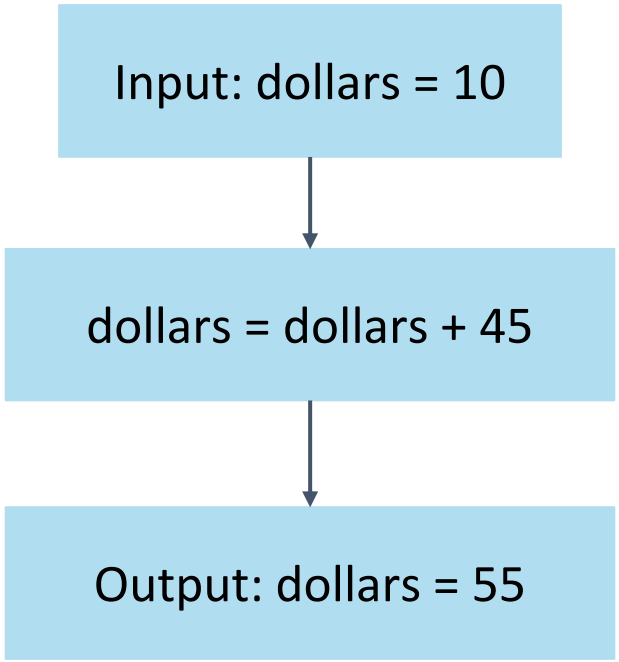
An Introduction to Variables

- in the example below, we **declare** a variable with the name var1 and **initialize** var1 with the value 74
- when naming a variable, do not use spaces or special characters (*,$, etc.)
- try to name your variables with relevant names so it can be easily understood throughout the code, example below is vague



An Introduction to Variables

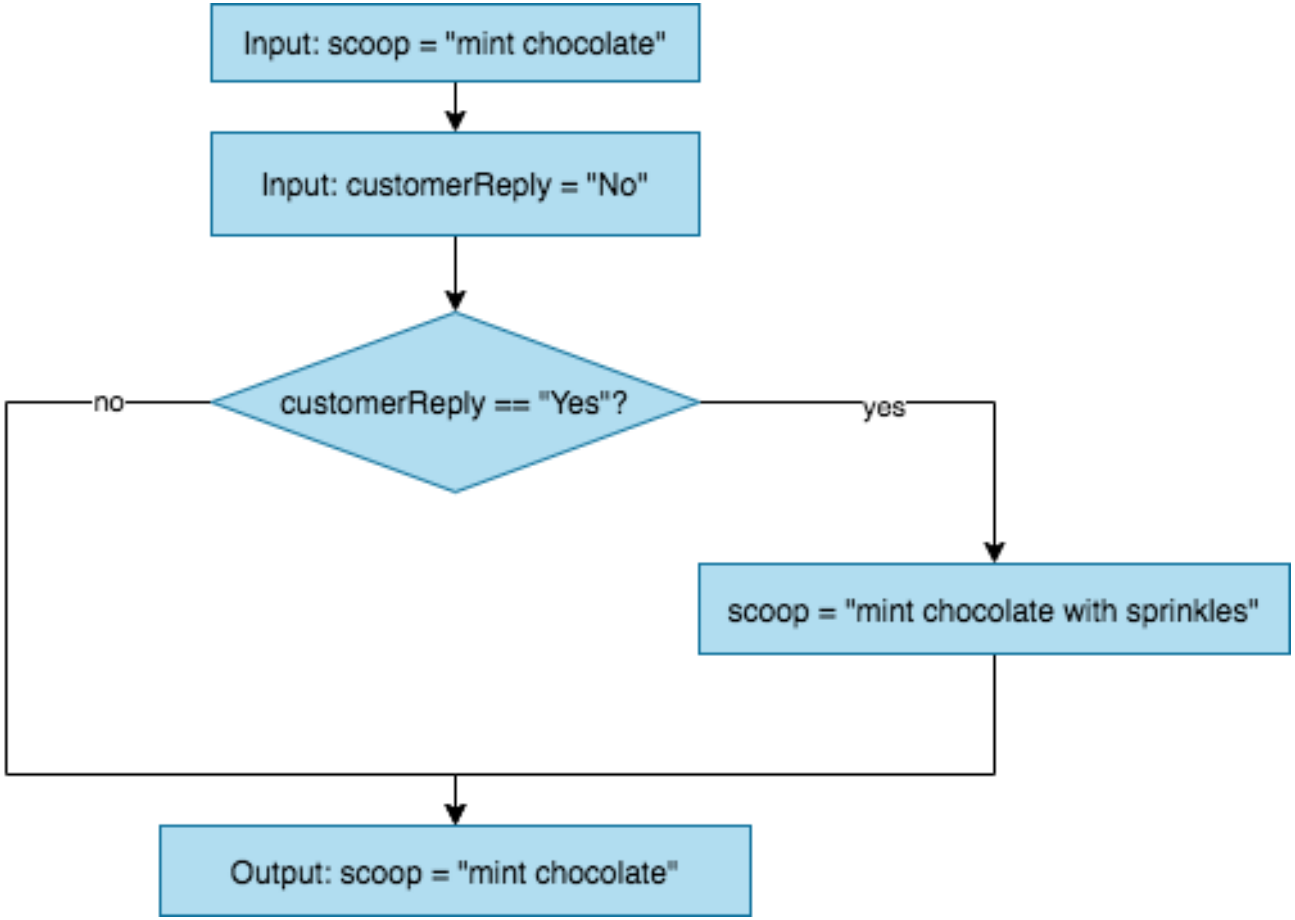
- depending on the programming language, the value of a variable can be changed using a programming statement



If...Else Statements

- Say that you are coding an ice cream stand simulation
  - You only want to put sprinkles on a customer's scoop if the customer asks for it
  - How do you do this in code?
- To do this, you could use an **if statement**
  - if statement: a block of code that is executed only when a condition or set of conditions is true
  - possible conditions:
    - equals (==)
    - does not equal (!=)
    - greater than (>)
    - less than (<)
    - greater than or equal to (>=)
    - less than or equal to (<=)

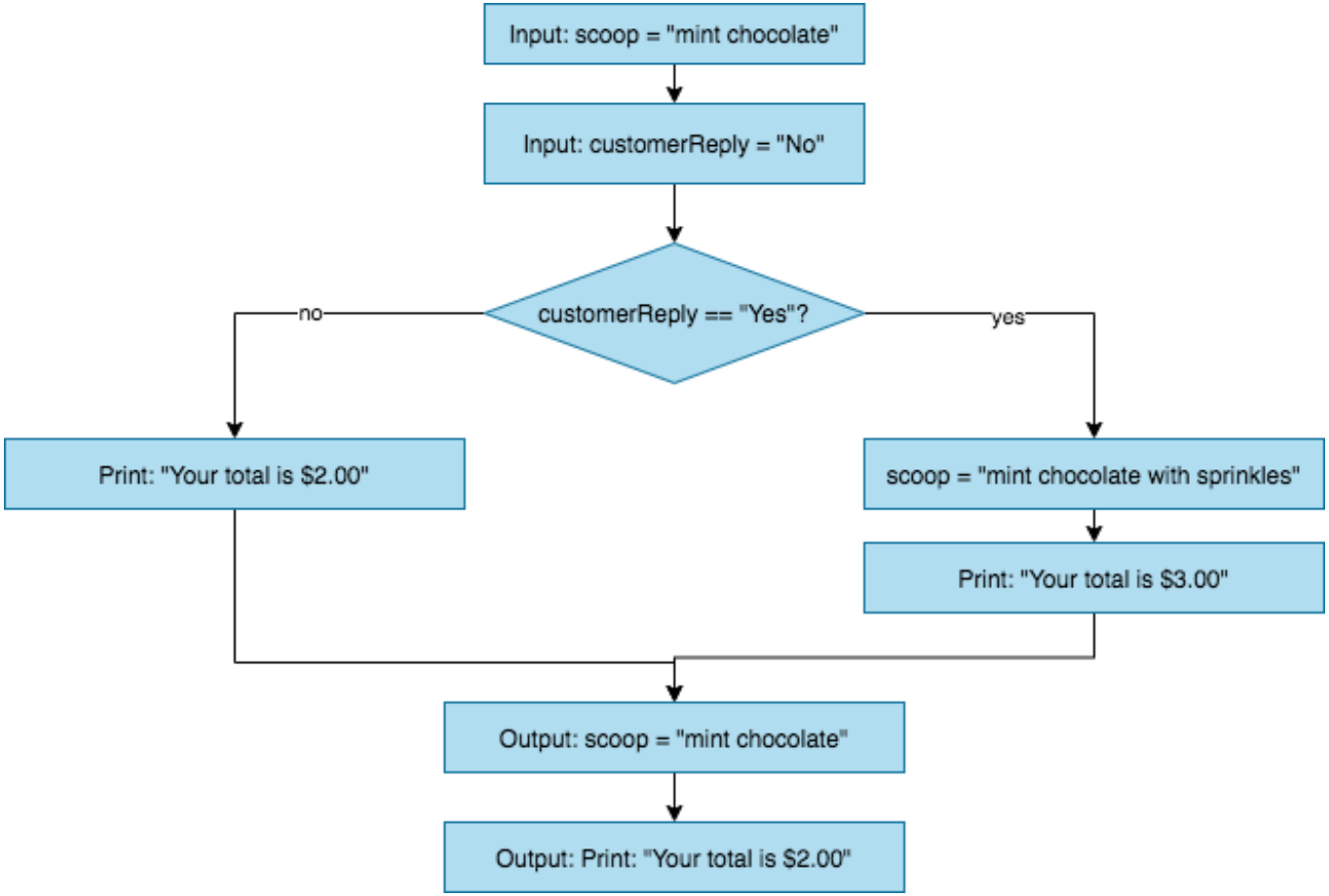
If...Else Statements



If...Else Statements

- if statements can be used by themselves or in combination with **else statements**
  - else statement: section of code that executes when the if statement(s) above it are false

If...Else Statements



Print Statements

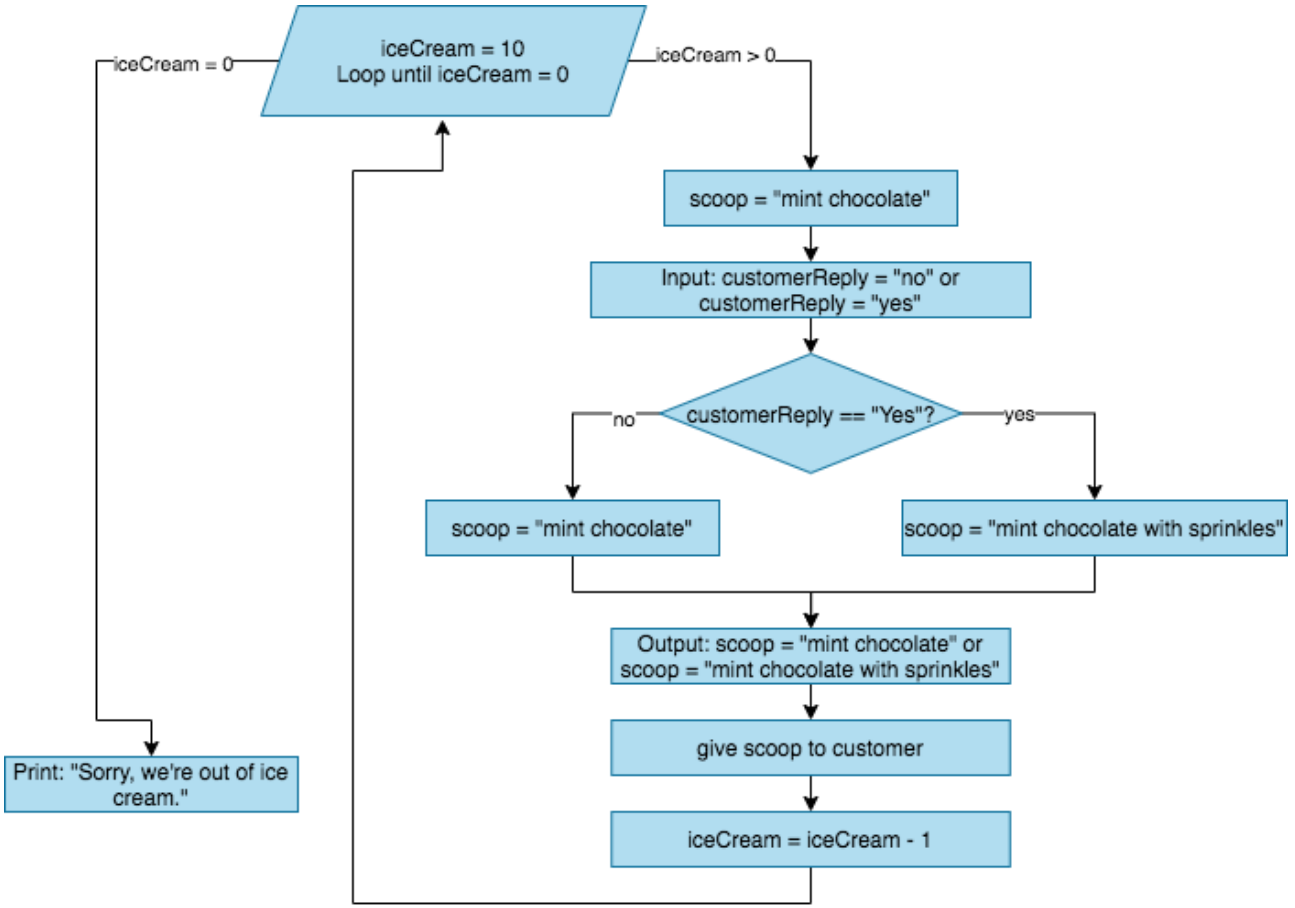
- You may have noticed this statement in the last slide

- This is a **print statement**, a way for programmers to print data to the terminal
  - can be a convenient way to communicate with users

For Loops

- keeping with the ice cream shop example, you will probably need to perform the same actions multiple times
  - scoop ice cream, ask customer for sprinkles, give cone to customer
- one way to perform the same section of code several times is to use a **for loop**
  - for loop: section of code that is repeated a specified number of times

For Loops


iceCream = 10
Loop until iceCream = 0
iceCream = 0
iceCream > 0
scoop = "mint chocolate"
Input: customerReply = "no" or
customerReply = "yes"
customerReply == "Yes"?
no
yes
scoop = "mint chocolate"
scoop = "mint chocolate with sprinkles"
Output: scoop = "mint chocolate" or
scoop = "mint chocolate with sprinkles"
give scoop to customer
iceCream = iceCream - 1
Print: "Sorry, we're out of ice cream."

Conclusion

- Now that you have learned the basic components of programming, it is time for you to try them out for yourself
  - Good luck!

Resources

- https://www.cs.utah.edu/~germain/PPS/Topics/variables.html
- youtube.com/watch?v=m2Ux2PnJe6E
- https://levelup.gitconnected.com/the-difference-between-for-loops-and-while-loops-in-javascript-6029f45faeba#:~:text=This%20is%20the%20key%20difference,look%20at%20the%20image%20below.&text=A%20while%20loop%20is%20a,until%20the%20condition%20becomes%20false.

LAB

- Complete the questions for the Lab - Writing Simple Programs