



PROGRESS OUTCOME 5

Programming in Swift Playgrounds

Annotation

Dion is able to discuss the difference between a “for loop” and a “while loop” and can explain when different types of iteration control structures are best applied to solve a problem. He shows insight into the operation of a while loop and demonstrates an understanding of the use of functions in a program and how they make programming easier to read and more efficient.

Dion is able to independently develop, test, and debug a computer program in the Swift programming language. He can apply algorithmic thinking and can decompose problems to determine which programming structures are best for solving a problem that has several possible solutions.

His programming code demonstrates:

- an understanding of variables
- the use of appropriate naming conventions
- selection with conditional logic, including compound logical operators (&&)
- the use of functions
- iteration using a while loop.

Background

Dion and his fellow students are learning to program in Swift using Swift Playgrounds (a free iOS-based environment for learning programming). They have been writing algorithms to solve open-ended, puzzle-based problems and applying the algorithms when writing, testing, and debugging their programs.

Task

The students are asked to take on a challenge that is part of Swift Playgrounds. The challenge requires them to understand and apply:

- programming knowledge of variables and naming conventions
- differences between types of iteration control structures
- the appropriate use of these control structures
- selection through the use of logical comparison operators.

The task provides an opportunity to use the discipline-specific language and skills of a computer scientist.

Challenge: Collect exactly three gems and toggle open four switches

To collect the right number of gems and toggle open the right number of switches in this challenge, you'll need two separate variables. As your character handles the gems and switches, you'll increment the right variable so you stop at the right time.

Start by declaring one variable for the number of gems, and another for the number of switches. Use the guide below to name your variables.

Naming a variable

Use camelCase: Start with a lowercase letter on the first word, and capitalize each new word.

Use a descriptive name: Give the variable a name that tells you what it stores, like `numberOfGems`.

Increment each variable by 1 when you collect a gem or toggle a switch.

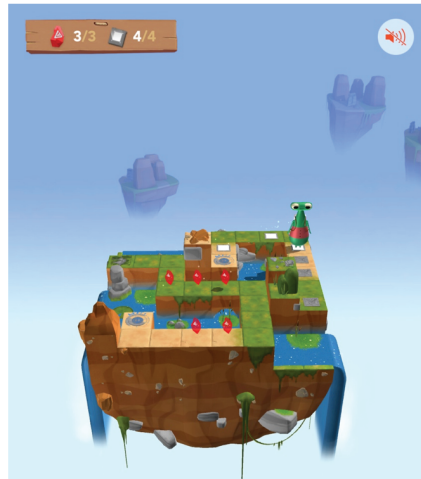
Use one of the comparison operators below to create a condition to tell your character when to stop. Determine what type of control structure would be best to use (for or while loop) to solve this problem.

Comparison operators:

Less than operator: `(a < b)` returns true if a is less than b.

Greater than operator: `(a > b)` returns true if a is greater than b.

Equal to operator: `(a == b)` returns true if a equals b.



Student response

The following response is from Dion's post to the Google™ Classroom.

Mrs Patel: *Sometimes a for loop is better for solving a programming problem, and sometimes a while loop is better suited to the task. Describe the difference and when you would use one over the other.*

Dion: *A for loop means you repeat a pattern a certain amount of times. A while loop means you repeat a pattern while something is true. You use a while loop when you have a condition you have to reach, and you use a for loop when you know the amount of times you want to repeat your pattern, and it is unchanging. When using a while loop, your condition must be able to become false, otherwise your loop will be infinite.*

Mrs Patel: *What is the purpose of functions when writing a program?*

Dion: *Functions let you group a sequence of actions you may need to repeat multiple times, which makes your final code much shorter, tidier, and easy to read. It also means it's quicker to write code, by just writing the function rather than the whole sequence when you need to use it in your code.*

The following is a sample of Dion's code after he has tested, debugged and commented it. The code demonstrates the use of variables, iteration through while loops, predefined functions, selection through conditional logic and use of compound logical operators.

```
//create the variables to store the number of gems and switches
collected

var switchesToggled = 0
var switchesToggled = 0

//the character will move forward while it hasn't collected all the
gems and switches

while switchesToggled < 4 || gemsCollected<3 {

    moveForward()

    //the character will turn right if both the conditions are true
    if isBlocked && isBlockedLeft{
        turnRight()    }

    //the character will turn left if both conditions are true
    if isBlocked && isBlockedRight{
        turnLeft()    }

    //increase the gemsCollected count if both conditions are true
    if isOnGem && gemsCollected<3{
        collectGem()
        gemsCollected = gemsCollected+1    }

    //increase the switchesCollected count if both conditions are true
    if isOnClosedSwitch && switchesToggled<4{
        toggleSwitch()
        switchesToggled = switchesToggled+1
    }
}
```

Downloaded from <http://technology.tki.org.nz>

Swift Playgrounds and Swift are trademarks of Apple Inc., registered in the U.S and other countries.

Google is a registered trademark of Google Inc, used with permission.

Copyright © Ministry of Education 2017, except for student work copyright © student, and Swift Playgrounds image

The program used in this exemplar is not officially endorsed by the Ministry of Education.

ISBN: 978-1-77669-207-1