

Iteration, basic programming constructs and loops

Teacher's Notes

Lesson Plan

Length	60 mins	Specification Link	2.1.7/i	Control flow in imperative languages
Learning objective	Students should be able to (a) understand and use iteration in an algorithm (FOR, WHILE and REPEAT loops)			
Time (min)	Activity	Further Notes		
10	Use the Starter Activity . Using a projector, show the video (http://www.cambridgegcsecomputing.org/weblink21) and then click on the Explanation button (once) to display some statements about the video and iteration. Stress that iteration leads to efficiency – the same code can be used many times – no need to rewrite it. Show students the link to the specification. Explain the purpose and objectives of the lesson.			
15	Watch the set of videos.			
5	Ask some questions about the videos to assess learning. e.g. <ul style="list-style-type: none"> What is meant by iteration? What is a loop? Name two types of iteration loops that can be used in an algorithm. 	Repeating a process with the aim of approaching a desired goal. A sequence of instructions that repeats either a specified number of times or until a particular condition is met.		
25	Worksheet 1 Students to complete the task set on Worksheet 1 and then the whole class can go through the interactive activity. The students are instructed to write a program to solve a given problem. Ask individual students for their answers and discuss with the class so that all students have the correct answers entered on their worksheets. The interactive activity can then be used as a class activity to look at the statements and the logic behind the given solution. Show students the Python tutor activity . Explain that this visualizes what is happening in the computer's memory.	Answers provided		
	Extension Challenge/Homework <ul style="list-style-type: none"> The students should complete and submit Worksheet 2 			
5	Plenary Using the projector, display the Plenary Activity and ask the students to predict the outputs from the two programs.			



WORKSHEET 1 ANSWERS

1 Using any programming language, write a program for a guessing game with the following specification:

- (a) The computer generates a random number between 1 and 100.
- (b) The user has 10 attempts to guess the random number.
- (c) The user is asked to enter a number.
- (d) If the guess is too high, then they are told that it is.
- (e) If the guess is too low, then they are told.
- (f) If the guess is correct, then they are told that they are right.
- (g) After 10 incorrect guesses, they are told the correct number.

You can implement the program on the computer and then write or paste the code here.

The following is an example of a solution using Python:

```
import random

mystery_number = random.randint(1, 100)
correct_guess = False
for go in range(10):
    guess = int(raw_input("Guess the number I'm thinking of between 1 and 100: "))
    if guess == mystery_number:
        correct_guess = True
        break
    elif guess > mystery_number:
        print 'Too high'
    else:
        print 'Too low'
if correct_guess:
    print "You got it right!"
else:
    print "The number was", mystery_number
```

WORKSHEET 2 ANSWERS

- 1 A programmer is creating a computer game in which the user has to roll a dice three times. They have written the following code.

The routine for rolling the dice is written as a sequence below:

```
BEGIN RollTheDice
DiceResult(1) = Random Number between 1 and 6
DiceResult(2) = Random Number between 1 and 6
DiceResult(3) = Random Number between 1 and 6
END
```

Rewrite this routine so that it uses iteration. You may use a diagram. (4)

Example:

```
BEGIN RollTheDice
i = 1
WHILE i <= 3
DiceRoll(i) = Random No
END WHILE
END
```

Award marks for:

Using a loop

i (or equivalent) initialised correctly

correct end condition for loop/loops the required number of times

Correct use of i (or equivalent) in DiceRoll(i)

A programmer has created an algorithm to reset the contents of an array with ten items back to zero. The algorithm below contains a logic error.

```
I = 1
REPEAT
Array(i) = 0
I = i + 1
UNTIL i = 10
```

(a) State what is meant by a logic error. (1)

The program is written to do something other than what the programmer intended.

(b) State why the algorithm above contains a logic error. (2)

It will only reset the first 9 elements / will not reset the 10th element.

After setting Array(9) = 0, i will become 10...

... and the loop will stop.

It should be UNTIL i > 10 / or other working correction.