4.2: While loops

Students,
Section 4.3 is a part of 2 assignments: CSC108 CH04.1-4.6 C4A
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Due: 03/11/2021, 11:59 PM EDT

4.3 More while examples

Example: GCD

The following is an example of using a loop to compute a mathematical quantity. The program computes the greatest common divisor (GCD) among two user-entered integers num1 and num2, using Euclid's algorithm. If num1 = num2, assign num1 with num2 - num1, else assign num2 with num2 - num1. These steps are repeated until num1 equals num2, at which point num1 and num2 each equal the GCD.

Figure 4.3.1: While loop example: GCD (greatest common divisor) program.

```
#include iostream
using namespace std;

// Output GCD of user-input num1 and num2

int main:
  int num1;  // User input
  int num2;  // User input

  cout << "Enter first positive integer: ";
  cin >> num1;

  cout << "Enter second positive integer: ";
  cin >> num2;

  while (num1 != num2)  // Euclid's algorithm
     if (num1 > num2)
        num1 = num1 - num2;
     else
        num2 = num2 - num1;

  cout << "GCD is: " << num1 << endl;

  return 0;
```

```
Enter first positive integer: 8
Enter second positive integer: 5
GCD is: 1

Enter first positive integer: 15
Enter second positive integer: 10
GCD is: 5

Enter first positive integer: 99
Enter second positive integer: 33
GCD is: 33

Enter first positive integer: 505
Enter second positive integer: 505
GCD is: 505
```

Feedback?

PARTICIPATION ACTIVITY 4.3.1: GCD program.

Refer to the GCD code above. Assume user input of num1 = 15 and num2 = 10.

1) For the GCD program, what is the value of num1 before the first loop iteration?

Check Show answer

2) What is the value of num1 after the first iteration of the while loop?

Check Show answer

3) What is num1 after the second iteration of the while loop?

Check Show answer

4) How many loop iterations will the algorithm execute?

Check Show answer

Feedback?

Example: Conversation

Below is a program that has a 'conversation' with the user, asking the user to type something and then (randomly) printing one of four possible responses until the user enters "Goodbye".

The program uses getline() to read a string from the user into userText. The loop checks whether userText is "Goodbye". If not, the loop body executes. The loop body generates a "random" number between 0 and 3, by using .size() to get the length of the user's string, which can vary, and modulo the length by 4. The loop body then prints one of four messages, using an if-else statement.

Figure 4.3.2: While loop example: Conversation program.

```
#include iostream
#include cstdlib
using namespace std;

/* Program that has a conversation with the user.
   Uses random number generator to choose number input of:
   to end up the program's response. */

int main():
  int randomnum_0;  // Random number 0 to 3
  string userText;  // User input

  cout << "Tell me something about yourself:" << endl;
  cout << "You can type "Goodbye" at anytime to quit."
       << endl;

  getline(cin, userText);

  while (userText != "Goodbye"):
     randomnum_0 = (rand() % 4);  // % "Modulo" num. 4 returns 0-3

     if (randomnum_0 == 0):
        cout << endl << "Wasssup mayhair Fortina?"
             << endl << endl << "?";

     else if (randomnum_0 == 1):
        cout << endl << "Why do you ask\?\*" << userText << \*\?"
             << endl << endl << "?";

     else if (randomnum_0 == 2):
        cout << endl << "I don't think that's right."
             << endl << endl << "?";

     else if (randomnum_0 == 3):
        cout << endl << "Were sure you aware?"
             << endl << endl << "?";

     else:
        cout << endl << "Hrrrm, something went wrong. Try again."
             << endl << endl;

     getline(cin, userText);

  cout << endl << "It was nice talking with you. Goodbye." << endl;

  return 0;
```

```
Tell me something about yourself:
You can type "Goodbye" at anytime to quit.

I I'M 18 years old.

Why do you ask\?\*I'M 18 years old.\?*

I Well, I was born 20 years ago.

I don't know what's right.

I I am sure it is correct.

Please replace Fortina.

Goodbye

It was nice talking with you. Goodbye.
```

Feedback?

PARTICIPATION ACTIVITY 4.3.2: Conversation program.

1) What will be printed if the user types "Ouch"?

Check Show answer

2) What will be printed if the user types "Bye"?

Check Show answer

3) Which if-else branch will execute if the user types "Goodbye"?
Valid answers are branch 0, 1, 2, 3, or none.

Check Show answer

4) How many loop iterations will execute if the user plans to type 'I'm hungry', 'You are weird', 'Goodbye', and 'I like you'.

Check Show answer

Feedback?

Example: Getting input until a sentinel is seen

Loops are commonly used to process an input list of values. A **sentinel value** is a special value indicating the end of a list, such as a list of positive integers ending with 0, as in 10 5 0 0. The example below computes the average of an input list of positive integers, ending with 0. The 0 is not included in the average.

Figure 4.3.3: Computing average of a list with a sentinel.

```
#include iostream
using namespace std;

// Program computes average list of positive integers
// list ends with 0 (sentinel)
// Ex: 10 5 0 0 0
```