Name: ……………………………………………….. ( ) Class: ……… Date: ………………….

|  |  |  |
| --- | --- | --- |
| **4.1** | **Program Development** | **Loops** |

**Loops**

There are two types of loops that you need to learn: while and for loops.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **while loop** |  | **for loop** |  | **for loop** |
| **while** condition(s):  <statement(s)> |  | **for** i **in** range(n):  <statement(s)> |  | **for** record **in** records:  <statement(s)> |

**For loops**

1. Predict the output of the following code. Write down the expected output. Run to check the actual output against the expected output.

|  |  |  |
| --- | --- | --- |
|  | **Code** | **Expected Output** |
| (a) | **for x in range(10):**  **print(x)** |  |
| (b) | **for x in range(6,10):**  **print(x)** |  |
| (c) | **for x in range(1,5):**  **print(x,"pizza slice(s)")** |  |
| (d) | **for x in range(2,9,2):**  **print(x)** |  |
| (e) | **fruits = ['apples', 'oranges',**  **'bananas', 'grapes']**  **for fruit in fruits:**  **print("Fruit: {}".format(fruit))** |  |

**While loops**

A while loop will repeat a section of the code until a given condition is no longer true.

1. Predict the output of the following code. Write down the expected output. Run to check the actual output against the expected output.

|  |  |  |
| --- | --- | --- |
|  | **Code** | **Expected Output** |
| (a) | **a = 0**  **while a < 10:**  **a = a + 1**  **print(a)** |  |
| (b) | **x = 10**  **while x != 0:**  **print(x)**  **x = x - 1**  **print("Counting down ...")** |  |
| (c) | **x = input("Enter a countdown number \ between 1 to 20. ")**  **x = int(x)**  **while x != 0:**  **print(x)**  **x = x - 1**  **print("Countdown completed!")** |  |

1. Your teacher has asked you to write a program to generate three random register numbers between 1 and the number of students in your class (inclusive). Enter the following program and run it to see how it works.

|  |  |
| --- | --- |
| 1  2  3  4  5  6  7  8  9  10 | **# Program that generates 3 random register numbers**  **import random**  **counter = 0**  **total = int(input("Enter number of students in your class: "))**  **while counter < 3:**  **register\_num = random.randint(1, total)**  **print("Register number", counter + 1, "is:", register\_num)** |

*(Line numbers are provided for reference only and should not be entered.)*

What happened? ………………………………………………………………………………………………………………………

State a possible reason why this happened. ……………………………………………………………………………..

Add an extra line of code to make it work, stating the line number it should be inserted at.

Line number …………………

Code ………………………………………………………………………………………………………………………………………….

1. This program accepts four integers and returns the sum.

|  |  |
| --- | --- |
| **1**  **2**  **3**  **4**  **5**  **6** | **print("This program accepts four integers and returns the sum.")**  **total = 0**  **for i in range(3):**  **x = input("Enter a number: ")**  **total = total + i**  **print("The total is:", x)** |

There are **four** errors in the above code.

Locate these errors and suggest a correction.

Error 1 is on line ………………………………….

Correction …………………………………………………………………………………………………………………………………

Error 2 is on line ………………………………….

Correction …………………………………………………………………………………………………………………………………

Error 3 is on line ………………………………….

Correction …………………………………………………………………………………………………………………………………

Error 4 is on line ………………………………….

Correction …………………………………………………………………………………………………………………………………

1. Study the following nested loop.

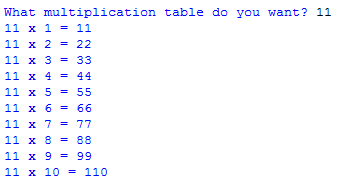
|  |
| --- |
| **for x in range(1, 4):**  **for y in range(1, 4):**  **print(x, "x", y, "=", x \* y)** |

Predict the output.

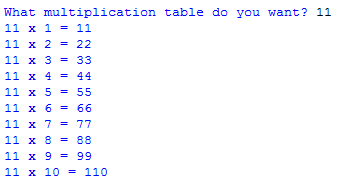
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|  |

1. Write a program that will use a while loop to print the integers from 20 down to and including 0, one integer per line, then print the words "End of while loop".
2. Write a program that will ask the user for a positive integer x, then use a for loop to print your name x times, line by line, before printing the word "Completed" at the end.
3. Write a program that will use a for loop to print a multiplication table. It will ask the user for a positive integer, then print the multiplication table for that integer with the multiplier increasing from 1 to 10 (see following sample).

Sample Input:



Sample Output:



**Extension**

1. Write a program that will prompt for a positive integer and then calculate the factorial of that number. A factorial, represented by an exclamation mark (!), is the product of a positive integer and all the positive integers that precede it. For example, 5! = 5 × 4 × 3 × 2 × 1
2. The last digit of the 10-digit International Standard Book Number (ISBN) is a check digit that is related to the previous 9 digits by the following algorithm:
3. Multiply the first digit by 10, the second digit by 9, the third digit by 8, and so on until the ninth digit, which is multiplied by 2, then sum up the results.
4. Divide the result by 11 and keep the remainder.
5. If the remainder is 0, the check digit should be 0. Otherwise, subtract the remainder from 11. The check digit should be the resulting answer. If the check digit is 10, use the letter “X” as the check digit instead.

Write a program that outputs a check digit that follows the ISBN format when the user inputs a 9-digit number. (Hint: to make the process of extracting digits from the ISBN easier, you may wish to store the ISBN number as a str instead of an int.)

Assume that the input data will always be valid.