(COMP-1400) Lab Exercises #2

Objective:
The main objective of this exercise is to help students to break down a problem into smaller units and write a step-by-step solution for a given problem using a **pseudocode** or **flowchart** diagram.

Part A: a sample pseudocode and flowchart. Try to recreate this flowchart in Raptor (see raptor flowchart at the end of the document).

Problem: Get a positive integer value from the input and calculate and print the number of digits.

Sample Input	Sample Output
10	2
150	3
266002	6

Solution:

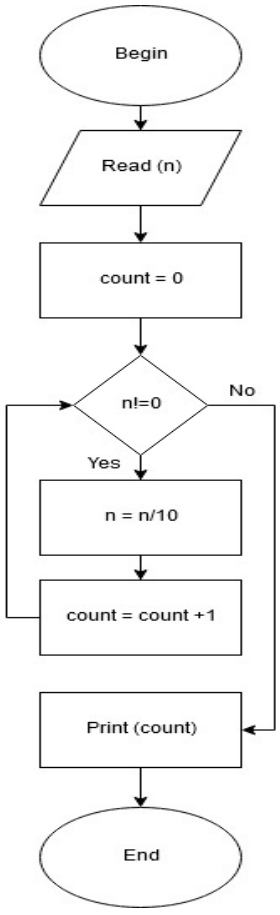
```
1: Begin
2: Read (n)
3: count ← 0
4: While (n!=0) Do
5:         n ← n/10
6:         count ← count+1
7: End While
8: Print (count)
9: End
```

Description:
Assume the given number is n, use a loop statement, and continuously divide the n by 10 until n becomes 0. Count the number of iterations and print it. In fact, the number of iterations represents the number of digits.

Note 1: If you want to know (extract) the last digit of a number, you can always obtain it by (n % 10) which is a reminder of dividing n by 10. We name operation % as "mod".
e.g., if n is 1234, (1234%10) is 4.

Note 2: By dividing a number, with n digits, by 10, you can get the n-1 most significant digits from the number, e.g., (1234/10) is 123. We name this division as "Integer Division".

(Raptor flowchart on the last page)



Part B: Write a pseudocode or draw a flowchart for the following problems. To design/draw the flowchart, you have the options to do it in different ways, using a flowchart software like Raptor, or a graphical software like "https://www.draw.io", or simply on a piece of paper.
Note: Two Software tools, Raptor and Flowgorithm, are available on CS servers using NoMachine.

Problem 1: Reverse the digits of a number

Get an integer number from the user and print the number in the reversed order on the screen. Use math arithmetics to solve this problem (see Note 1/2 on sample problem).

Sample Input	Sample Output
15	51
126	621
266002	200662

Problem 2: Find the frequency of a digit in a number

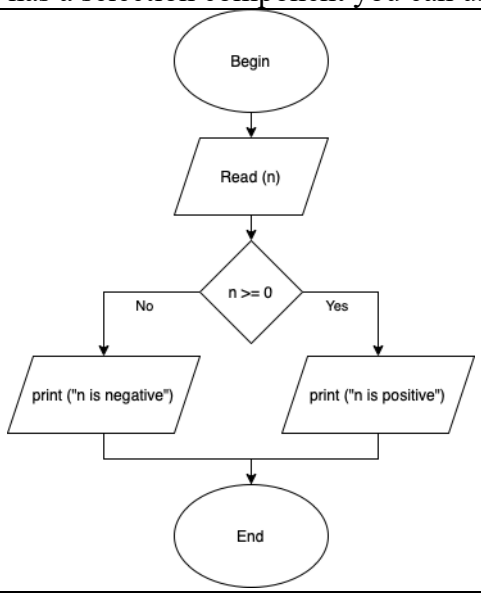
Get an integer number, and a digit from the user and calculate and print out the frequency of the given digit in the number. Use math arithmetics to solve this problem (see Note 1/2 on sample problem).

Sample Input	Sample Output
123333 3	4
222545 4	1
555 2	0
922325 2	3

Hint: How the selection statement works (note Raptor has a selection component you can use).

```
1: Begin
2: Read (n)
3: IF (n >= 0) Then
4:     print("n is positive")
5: ELSE
6:     print("n is negative")
7: End IF
8: End
```

Description:
The program reads an integer from the user and determines if the number is positive using 'n >= 0' (n bigger than or equal to 0) and prints the result, otherwise this means n must be negative so we print n is negative.
Note: The "ELSE …" (line 5/6) is optional if it's not needed (doesn't contain code).



EVALUATION: You need to show your GA/TA the complete pseudocode and/or flowcharts during the lab (consider saving them as a screenshot or PDF). **Total 10 marks**.

A sample Raptor flowchart for Part A