Practice Worksheet 4 Solution: Iteration

CS 101 Algorithmic Problem Solving

Fall 2023

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1. Corrupted Texts

A group of villagers have brought you a book that they found in the woods and believe to be corrupted by the evil spirit Wendigo. They believe that the letters found in the name Wendigo have the ability of corrupting any texts they are a part of. The villagers have decided that if more than half of the letters in the book are corrupted, they will burn the book; otherwise, they will send it to their philologists for further investigation.

Given a lowercase string S, determine if the string is corrupted or not.

Constraints

- S consists of only alphabets

Interaction

The first line of the input contains a lowercase string S.

The output must be "CORRUPTED" if the string is corrupted, and "SAFE" otherwise.

Sample

Input	Output
"butterfly"	"SAFE"
"oil"	"CORRUPTED"

In the first case, the string S = "butterfly" contains 1 letters from the name Wendigo, which is approximately 11.11% of the total string length; hence, the string is safe.

In the second case, the string S = "oil" contains 2 letters from the name Wendigo, which is approximately 66.66% of the total string length; hence, the string is corrupted.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
"onomatopoeia"	"CORRUPTED"
"ogidnew"	"CORRUPTED"
"woeful"	"SAFE"

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: We had to iterate over the string and determine if more than half of it's letters appeared in the string "Wendigo"

Input: S
Output: Check and count all letters of "Wendigo" in S
"CORRUPTED" if count > len(S)/2; otherwise, "SAFE"

Pseudocode

```
count = 0
for i in S:
  if i in "wendigo":
      count += 1
if count > len(S)/2:
    print("CORRUPTED")
else:
    print("SAFE")
```

Dry Run
Using any two of the inputs provided in the Exercise section above, dry run your pseudocode in the space below.

Input: $S = $ "*onomatopoeia*"

i		count
-	Program starts	count = 0
'o'	Check if 'o' is in "wendigo"? Yes, so execute statements in "if" block	0 + 1 = 1
'n'	Check if 'n' is in "wendigo"? Yes, so execute statements in "if" block	1 + 1 = 2
'o'	Check if 'o' is in "wendigo"? Yes, so execute statements in "if" block	2 + 1 = 3
'm'	Check if 'm' is in "wendigo"? No, so skip statements in "if" block	3
'a'	Check if 'a' is in "wendigo"? No, so skip statements in "if" block	3
't'	Check if 't' is in "wendigo"? No, so skip statements in "if" block	3
'o'	Check if 'o' is in "wendigo"? Yes, so execute statements in "if" block	3 + 1 = 4
'p'	Check if 'p' is in "wendigo"? No, so skip statements in "if" block	4
'o'	Check if 'o' is in "wendigo"? Yes, so execute statements in "if" block	4 + 1 = 5
'e'	Check if 'e' is in "wendigo"? Yes, so execute statements in "if" block	5 + 1 = 6
'i'	Check if 'i' is in "wendigo"? Yes, so execute statements in "if" block	6 + 1 = 7
'a'	Check if 'a' is in "wendigo"? No, so skip statements in "if" block	7

For loop ends. Now check if count > len(S)/2?
len(S)/2 = 7/2 = 3.5
Is count > len(S)/2? 7 > 3.5? Yes, output is "CORRUPTED", which is expected output!

Input: $S =$ "$woeful$"

i		count
-	Program starts	count = 0
'w'	Check if 'w' is in "wendigo"? Yes, so execute statements in "if" block	$0 + 1 = 1$
'o'	Check if 'o' is in "wendigo"? Yes, so execute statements in "if" block	$1 + 1 = 2$
'e'	Check if 'e' is in "wendigo"? Yes, so execute statements in "if" block	$2 + 1 = 3$
'f'	Check if 'f' is in "wendigo"? No, so skip statements in "if" block	3
'u'	Check if 'u' is in "wendigo"? No, so skip statements in "if" block	3
'l'	Check if 'l' is in "wendigo"? No, so skip statements in "if" block	3

For loop ends. Now check if count > len(S)/2?
len(S)/2 = 6/2 = 3
Is count > len(S)/2? 3 > 3? No, so output is "SAFE", which is the expected output!

This means the applied logic is correct

2. Facht Auriel's Riddle

You've bought an entrance ticket to Facht Auriel's Castle and your ticket number is N. The castle houses an ancient blade of immense power that can only be obtained by those wise enough to crack the riddles created by Facht Auriel himself. An entrance ticket gives you one shot at the riddles. However, nobody has been able to solve any of the riddles yet.

Finally, your turn to enter the castle arrives. You enter a large room in the center of which is a statue of Facht Auriel, with his two hands extended out. On one of his hands, there's a pen, a paper, and a riddle that says:

"You are the product of those that came before you and failed. Scribble who you are on this parchment and await Facht Auriel's judgement.".

Confused by the riddle at first, you sit down to think. After some time, you realize the answer must be the product of the ticket numbers of all those who came before you.

Given your ticket number N, determine the answer to the riddle. Note that the ticket numbers start from 1.

HINT: USE "in" operator

Constraints

- $N \in \mathbb{N}$
- $2 \leq N \leq 10^5$

Interaction

The input comprises of a single integer denoting the value of N.

The output must be a single integer denoting the answer to the riddle.

Sample

Input	Output
4	6
3	2

In the first case, $N = 4$, so the answer to the riddle is $1 * 2 * 3 = 6$.

In the second case, $N = 3$, so the answer to the riddle is $1 * 2 = 2$.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
12	39916800
9	40320
6	120

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: Find factorial of N-1

Input: N
Output: $(N - 1)!$

Pseudocode

```
ans = 1
for i in range(2,N):
    ans = ans*i
print(ans)
```

Dry Run

Using any two of the inputs provided in the Exercise section above, dry run your pseudocode in the space below.

Input: $N = 12$

i		ans
-	Program starts	1
2	Is i < N? 2 < 12? Yes, so enter loop	1 * 2 = 2
3	Is i < N? 3 < 12? Yes, so enter loop	2 * 3 = 6
4	Is i < N? 4 < 12? Yes, so enter loop	6 * 4 = 24
5	Is i < N? 5 < 12? Yes, so enter loop	24 * 5 = 120
6	Is i < N? 6 < 12? Yes, so enter loop	120 * 6 = 720
7	Is i < N? 7 < 12? Yes, so enter loop	720 * 7 = 5040
8	Is i < N? 8 < 12? Yes, so enter loop	5040 * 8 = 40320
9	Is i < N? 9 < 12? Yes, so enter loop	40320 * 9 = 362880
10	Is i < N? 10 < 12? Yes, so enter loop	362880 * 10 = 3628800
11	Is i < N? 11 < 12? Yes, so enter loop	3628800 * 11 = 39916800
12	Is i < N? 12 < 12? No, so exit loop	

For loop ends, and prints ans. The output is 39916800, which is the expected output!

Input: $N = 6$

i		ans
-	Program starts	1
2	Is i < N? 2 < 6? Yes, so enter loop	1 * 2 = 2
3	Is i < N? 3 < 6? Yes, so enter loop	2 * 3 = 6
4	Is i < N? 4 < 6? Yes, so enter loop	6 * 4 = 24
5	Is i < N? 5 < 6? Yes, so enter loop	24 * 5 = 120
6	Is i < N? 6 < 6? No, so exit loop	

For loop ends, and prints ans. The output is 120, which is the expected output!

This means the applied logic is correct

3. Another Riddle

Having succeeded with Facht Auriel's riddle, you stand around waiting for someone to bring you your shiny new sword. However, to your surprise, a paper drops at your feet. You pick it up to find yet another riddle that reads:

"You walk an uncharted path, oh young traveler. Knock at the door of greatness as many times as the tally of your great name and the blade will be yours to wield."

You take a moment to process that you've gotten further than anyone else before sitting down once again to think on the riddle. You look around and as you look at the door from whence you came, the solution strikes you. The riddle wants you to knock at the door as many times as the sum of the digits in your answer to the last riddle.

Given A, the answer to the last riddle, determine how many times you must knock.

Constraints

- $A \in \mathbb{N}$
- $1 \leq A \leq 10^5$

Interaction

The input comprises of a single integer denoting the value of A.

The output must be a single integer denoting the answer to the second riddle.

Sample

Input	Output
6	6
24	6

In the first case, $A = 6$, so the answer to the riddle is 6.

In the second case, $A = 24$, so the answer to the riddle is $2 + 4 = 6$.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
39916800	36
40320	9
120	3

Problem Identification
Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: Add all the digits in the given integer, A

Input: A
Output: Sum of all digits of A

Pseudocode

```
ans = 0
while N != 0:
    ans += N%10
    N = N//10

print(ans)
```

Dry Run
Using any two of the inputs provided in the Exercise section above, dry run your pseudocode in the space below.

Input: $A = 39916800$

	N	ans
Program starts	N = 39916800	ans = 0
Is N != 0? 39916800 != 0? Yes, so enter loop!	$39916800//10 = 3991680$	$0 + (39916800 \% 10) = 0 + 0 = 0$
Is N != 0? 3991680 != 0? Yes, so enter loop!	$3991680//10 = 399168$	$0 + (3991680 \% 10) = 0 + 0 = 0$
Is N != 0? 399168 != 0? Yes, so enter loop!	$399168//10 = 39916$	$0 + (399168 \% 10) = 0 + 8 = 8$
Is N != 0? 39916 != 0? Yes, so enter loop!	$39916//10 = 3991$	$8 + (39916 \% 10) = 8 + 6 = 14$
Is N != 0? 3991 != 0? Yes, so enter loop!	$3991//10 = 399$	$14 + (3991 \% 10) = 14 + 1 = 15$
Is N != 0? 399 != 0? Yes, so enter loop!	$399//10 = 39$	$15 + (399 \% 10) = 15 + 9 = 24$
Is N != 0? 39 != 0? Yes, so enter loop!	$39//10 = 3$	$24 + (39 \% 10) = 24 + 9 = 33$
Is N != 0? 3 != 0? Yes, so enter loop!	$3//10 = 0$	$33 + (3 \% 10) = 33 + 3 = 36$
Is N != 0? 0 != 0? No, so exit loop!	0	36

While loop ends, and prints ans. The output is 36, which is the expected output!

Input: $A = 120$

	N	ans
Program starts	N = 120	ans = 0
Is N != 0? 120 != 0? Yes, so enter loop!	$120//10 = 12$	$0 + (120 \% 10) = 0 + 0 = 0$
Is N != 0? 12 != 0? Yes, so enter loop!	$12//10 = 1$	$0 + (12 \% 10) = 0 + 2 = 2$
Is N != 0? 1 != 0? Yes, so enter loop!	$1//10 = 0$	$2 + (1 \% 10) = 2 + 1 = 3$
Is N != 0? 0 != 0? No, so exit loop!	0	3

While loop ends, and prints ans. The output is 3, which is the expected output!

This means the applied logic is correct

4. Password

You've made a website that hosts information about upcoming events taking place at your university. You're working on the backend of the login system and have decided that the user passwords must be very difficult to crack so that nobody can impersonate others and misuse your website. You've come up with a set of parameters that a password must satisfy in order to be accepted. These are:

- The password must contain a lowercase character.
- The password must contain an uppercase character.
- The password must contain a number.
- The password must not contain any symbols or spaces.

Given a string S, determine if it is an acceptable password or not.

Constraints

- $1 \leq len(S) \leq 20$

Interaction

The input comprises of a single line containing a string S denoting the password.

The output must be "YES" if the string is an acceptable password, and "NO" otherwise.

Sample

Input	Output
"seVenteen17"	"YES"
"H@B1Buni"	"NO"

In the first case, S = "seVenteen17" which satisfies all the given parameters and is an acceptable password.

In the second case, S = "H@B1Buni" which contains a special character and is not an acceptable password.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
"pass_Word23"	"NO"
"29thFeb2004"	"YES"
"14th Aug"	"NO"

Problem Identification
Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: Iterate over the string and check if it contains lowercase, uppercase, numeric, and special characters/spaces

> Input: S
> Output: If any letter of S is not a number, nor a lowercase letter, neither an uppercase letter, then output = "YES"; Otherwise "NO"

Pseudocode

```
lowercase = False
uppercase = False
num = False
for i in S:
    if i in "abcdefghijklmnopqrstuvwxyz":
        lowercase = True
    elif i in "ABCDEFGHIJKLMNOPQRSTUVWXYZ":
        uppercase = True
    elif i in "1234567890":
        num = True
    else:
        print("NO")
        break

if lowercase and uppercase and num:
    print("YES")
```

Dry Run
Using any two of the inputs provided in the Exercise section above, dry run your pseudocode in the space below.

Input: $S =$ "$pass\_Word23$"

i		lowercase	uppercase	num
-	Program starts	False	False	False
'p'	Check if 'p' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	False	False
'a'	Check if 'a' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	False	False
's'	Check if 's' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	False	False
's'	Check if 's' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	False	False
'_'	Check if '_' in the list of lowercase letters? No, so go to elif statement	True	False	False
	Check if '_' in the list of uppercase letters? No, so go to the next elif statement			
	Check if '_' in the list of numbers? No, so go to the else statement			
	In else, it prints "NO", and breaks out of the loop			

For loop ends. Now check if lowercase == True? Yes, then check if uppercase == True? No, so skip the if statement, and output remains the same, i.e. "NO", which is the expected output!

Input: $S =$ "$29thFeb2004$"

i		lowercase	uppercase	num
-	Program starts	False	False	False
'2'	Check if '2' in the list of lowercase letters? No, so go to elif statement			
	Check if '2' in the list of uppercase letters? No, so go to the next elif statement			
	Check if '2' in the list of numbers? Yes, so update num to True, skip the remaining else statement, and continue loop!	False	False	True
'9'	Check if '9' in the list of lowercase letters? No, so go to elif statement			
	Check if '9' in the list of uppercase letters? No, so go to the next elif statement			
	Check if '9' in the list of numbers? Yes, so update num to True, skip the remaining else statement, and continue loop!	False	False	True
't'	Check if 't' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	False	True

i		lowercase	uppercase	num
'h'	Check if 'h' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	False	True
'F'	Check if 'F' in the list of lowercase letters? No, so go to elif statement			
	Check if 'F' in the list of uppercase letters? Yes, so update uppercase to True, skip all the remaining elif/else statements, and continue loop!	True	True	True
'e'	Check if 'e' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	True	True
'b'	Check if 'b' in the list of lowercase letters? Yes, so update lowercase to True, skip all the remaining elif/else statements, and continue loop!	True	True	True
'2'	Check if '2' in the list of lowercase letters? No, so go to elif statement			
	Check if '2' in the list of uppercase letters? No, so go to the next elif statement			
	Check if '2' in the list of numbers? Yes, so update num to True, skip the remaining else statement, and continue loop!	True	True	True
'0'	Check if '0' in the list of lowercase letters? No, so go to elif statement			
	Check if '0' in the list of uppercase letters? No, so go to the next elif statement			
	Check if '0' in the list of numbers? Yes, so update num to True, skip the remaining else statement, and continue loop!	True	True	True
'0'	Check if '0' in the list of lowercase letters? No, so go to elif statement			
	Check if '0' in the list of uppercase letters? No, so go to the next elif statement			
	Check if '0' in the list of numbers? Yes, so update num to True, skip the remaining else statement, and continue loop!	True	True	True
'4'	Check if '4' in the list of lowercase letters? No, so go to elif statement			
	Check if '4' in the list of uppercase letters? No, so go to the next elif statement			
	Check if '4' in the list of numbers? Yes, so update num to True, skip the remaining else statement, and continue loop!	True	True	True

For loop ends. Now check if lowercase == True? Yes, then check if uppercase == True? Yes, then check if num == True? Yes, so print "YES", which is the expected output!

This means the applied logic is correct

5. Party Invites

Your friend is hosting a party at his house. He's prepared X burgers and Y sandwiches for the event. He needs your help in figuring out how many people to invite. Ideally, he wants that everyone gets the same amount of burgers and sandwiches, and no food is leftover.

Given values of X and Y, determine the maximum number of guests your friend can invite.

Constraints

- $X, Y \in \mathbb{N}$
- $1 \leq X, Y \leq 10^5$

Interaction

The input comprises of a single line containing two space-separated integers denoting the values of X and Y respectively.

The output must be a single integer denoting the maximum number of guests your friend can invite.

Sample

Input	Output
12 16	4
9 9	9

In the first case, $(X, Y) = (12, 16)$, the maximum number of guests your friend can invite is 4; each guest can have 3 burgers and 4 sandwiches.

In the second case, $(X, Y) = (9, 9)$, the maximum number of guests your friend can invite is 9; each guest can have 1 burger and 1 sandwich.

Exercise

In the space provided, indicate the outputs for the given inputs.

Input	Output
16 17	1
32 52	4
256 128	128

Problem Identification

Briefly explain the underlying problem you identified in the above question that led you to your solution.

Answer: Find the GCD/HCF between X and Y

Input: X, Y
Output: $GCD(X, Y)$

Pseudocode

```
ans = 0
for i in range(1, X+1):
    if X%i == 0 and Y%i == 0:
        ans = i
print(ans)
```

Dry Run

Using any two of the inputs provided in the Exercise section above, dry run your pseudocode in the space below.

Input: $(X, Y) = (16, 17)$

i		ans
-	Program starts	0
1	Is i < (X + 1)? 1 < (16 + 1)? 1 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 1 == 0? Yes!	
	Then check if Y % i == 0? 17 % 1 == 0? Yes!	
	As both conditions are True, set ans to i i.e. ans = 1, and continue loop	1
2	Is i < (X + 1)? 2 < (16 + 1)? 2 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 2 == 0? Yes!	
	Then check if Y % i == 0? 17 % 2 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
3	Is i < (X + 1)? 3 < (16 + 1)? 3 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 3 == 0? No!	
	As both conditions are not True,ans remains same, and continue loop	1
4	Is i < (X + 1)? 4 < (16 + 1)? 4 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 4 == 0? Yes!	
	Then check if Y % i == 0? 17 % 4 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
5	Is i < (X + 1)? 5 < (16 + 1)? 5 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 5 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
6	Is i < (X + 1)? 6 < (16 + 1)? 6 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 6 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
7	Is i < (X + 1)? 7 < (16 + 1)? 7 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 7 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
8	Is i < (X + 1)? 8 < (16 + 1)? 8 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 8 == 0? Yes!	
	Then check if Y % i == 0? 17 % 8 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
9	Is i < (X + 1)? 9 < (16 + 1)? 9 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 9 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
10	Is i < (X + 1)? 10 < (16 + 1)? 10 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 10 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
11	Is i < (X + 1)? 11 < (16 + 1)? 11 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 11 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
12	Is i < (X + 1)? 12 < (16 + 1)? 12 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 12 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1

i		ans
13	Is i < (X + 1)? 13 < (16 + 1)? 13 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 13 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
14	Is i < (X + 1)? 14 < (16 + 1)? 14 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 14 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
15	Is i < (X + 1)? 15 < (16 + 1)? 15 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 15 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
16	Is i < (X + 1)? 16 < (16 + 1)? 16 < 17? Yes, so enter loop	
	Check if X % i == 0? 16 % 16 == 0? Yes!	
	Then check if Y % i == 0? 17 % 16 == 0? No!	
	As both conditions are not True, ans remains same, and continue loop	1
17	Is i < (X + 1)? 17 < (16 + 1)? 17 < 17? No, so exit loop	

For loop ends, and prints ans. The output is 1, which is the expected output!

Input: $(X, Y) = (32, 52)$

i		ans
-	Program starts	0
1	Is i < (X + 1)? 1 < (32 + 1)? 1 < 33? Yes, so enter loop	
	Check if X % i == 0? 32 % 1 == 0? Yes!	
	Then check if Y % i == 0? 52 % 1 == 0? Yes!	
	As both conditions are True, set ans to i i.e. ans = 1, and continue loop	1
2	Is i < (X + 1)? 2 < (32 + 1)? 2 < 33? Yes, so enter loop	
	Check if X % i == 0? 32 % 2 == 0? Yes!	
	Then check if Y % i == 0? 52 % 2 == 0? Yes!	
	As both conditions are True, set ans to i i.e. ans = 2, and continue loop	2
3	Is i < (X + 1)? 3 < (32 + 1)? 3 < 33? Yes, so enter loop	
	Check if X % i == 0? 32 % 3 == 0? No!	
	As both conditions are not True,ans remains same, and continue loop	2
4	Is i < (X + 1)? 4 < (32 + 1)? 4 < 33? Yes, so enter loop	
	Check if X % i == 0? 32 % 4 == 0? Yes!	
	Then check if Y % i == 0? 52 % 4 == 0? Yes!	
	As both conditions are True, set ans to i i.e. ans = 4, and continue loop	4
	...	
	...	
	The process continues until i becomes 33	
	...	
	...	
33	Is i < (X + 1)? 33 < (32 + 1)? 33 < 33? No, so exit loop	

For loop ends, and prints ans. The output is 4, which is the expected output!

This means the applied logic is correct

LET'S LEARN TO DEBUG

6. By Three They Come

A big phone service provider has just announced they will be handing out special prizes to some people registered with their service. The lucky winners will be selected on the basis of their phone number. A winning phone number must contain at least 5 integers which are a multiple of 3.

Given a numeric string S, determine if the string is a winning phone number.

Constraints

- S consists of only integers between 0 and 9
- $len(S) = 11$
- 0 is not considered a multiple of 3

Interaction

The first line of the input contains a numeric string S.

The output must be "YES" if the string is a winning phone number, and "NO" otherwise.

Sample

Input	Output
"09820561379"	"NO"
"03768391549"	"YES"

In the first case, the string $S =$ "09820561379" contains 4 multiples of 3; hence, it is not a winning phone number.

In the second case, the string $S =$ "03768391549" contains 6 multiples of 3; hence, it is a winning phone number.

Proposed Solution

```
1   count = 0
2   for i in S:
3     if int(i)%3 == 0: # convert the digit to integer, and check if divisible by 3
4       count += 1
5   if count > 5:
6     print("YES")
7   else:
8     print("NO")
```

Dry Run

Using the inputs provided in the Sample section above, dry run the proposed code solution below.

Input: $S =$ "09820561379"

i		count
-	Program starts	count = 0
'0'	Check if int('0') % 3 == 0? 0 % 3 == 0? Not possible, so do not execute statements in if block	0
'9'	Check if int('9') % 3 == 0? 9 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$0 + 1 = 1$
'8'	Check if int('8') % 3 == 0? 8 % 3 == 0? 2 == 0? No, so do not execute statements in if block	1
'2'	Check if int('2') % 3 == 0? 2 % 3 == 0? 2 == 0? No, so do not execute statements in if block	1
'0'	Check if int('0') % 3 == 0? 0 % 3 == 0? Not possible, so do not execute statements in if block	1
'5'	Check if int('5') % 3 == 0? 5 % 3 == 0? 2 == 0? No, so do not execute statements in if block	1
'6'	Check if int('6') % 3 == 0? 6 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$1 + 1 = 2$
'1'	Check if int('1') % 3 == 0? 1 % 3 == 0? 1 == 0? No, so do not execute statements in if block	2
'3'	Check if int('3') % 3 == 0? 3 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$2 + 1 = 3$
'7'	Check if int('7') % 3 == 0? 7 % 3 == 0? 1 == 0? No, so do not execute statements in if block	3
'9'	Check if int('9') % 3 == 0? 9 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$3 + 1 = 4$

For loop ends. Now check if count > 5? 4 > 5? No, go to else statement and print "NO", which is the expected output!

Input: $S =$ "03768391549"

i		count
-	Program starts	count = 0
'0'	Check if int('0') % 3 == 0? 0 % 3 == 0? Not possible, so do not execute statements in if block	0
'3'	Check if int('3') % 3 == 0? 3 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$0 + 1 = 1$
'7'	Check if int('7') % 3 == 0? 7 % 3 == 0? 1 == 0? No, so do not execute statements in if block	1
'6'	Check if int('6') % 3 == 0? 6 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$1 + 1 = 2$
'8'	Check if int('8') % 3 == 0? 8 % 3 == 0? 2 == 0? No, so do not execute statements in if block	2
'3'	Check if int('3') % 3 == 0? 3 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$2 + 1 = 3$
'9'	Check if int('9') % 3 == 0? 9 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$3 + 1 = 4$
'1'	Check if int('1') % 3 == 0? 1 % 3 == 0? 1 == 0? No, so do not execute statements in if block	4
'5'	Check if int('5') % 3 == 0? 5 % 3 == 0? 2 == 0? No, so do not execute statements in if block	4
'4'	Check if int('4') % 3 == 0? 4 % 3 == 0? 1 == 0? No, so do not execute statements in if block	4
'9'	Check if int('9') % 3 == 0? 9 % 3 == 0? 0 == 0? Yes, so enter if block and increment count	$4 + 1 = 5$

For loop ends. Now check if count > 5? 5 > 5? No, go to else statement and print "NO", which is not the expected output, as the question clearly states that if there are at least 5 integers that are a multiple of 3, then it is a winning number. But according to the given logic, it says it's not!

However, logic cannot work only partially, so need to correct the logic!

Error Identification
Briefly explain the errors you identified in the proposed code solution. Mention the line number and the errors in each line.

Line 5: should enter the if block even if count is equal to 5

Correct Solution
Rewrite the lines of code you mentioned above with their errors corrected.

```
Line 5: if count >= 5:
```

Rough Work