CS65: Introduction to Computer Science

While Loop (accumulator)
Content Quiz#1

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Announcement

Lab #3 has been released and it will be due on October 4th for all sections

Today (09/28) will be our first Content Quiz on

variable,
expression,
boolean expression
selection statements.

Text Reading

https://python.swaroopch.com/control_flow.html

"The While Statement" in Control Flow section

Review: while loop

- Invalid Inputs with While Loops
  - Hands-on Exercise
- Counting Loops
  - Hands-on Exercise
- Infinite Loops
  - Hands-on Exercise
- Accumulator with With Loops
  - Hands-on Exercise

Review: Input Validation

input validation: making sure the user's input makes sense for the program

We can use the same pattern as the guess-the-number loop to make an input-validation loop.

```
1  print("Soccer team registration form")
2  num_players = 0
3  while num_players <= 11:
4
5      num_players = int(input("How many players on your team (minimum 11): "))
6
7  print("Registerting team with ", num_players, "players")
```

Review: Exercise #2

Prompt the user for a number between 10 and 100

Keep on prompting the user until they enter a valid number

```
give a number between 10 and 100: 112
nope. Try again
give a number between 10 and 100: 2
nope. Try again
give a number between 10 and 100: 56
Thank you!
```

Review: Count-controlled loops

When you use a variable to control the number of times the loop executes, it's called a count-controlled loop

```
val = 0
while val < 10:
    print(val)
    val += 1
print("all done")
```

```
val = 0
while val < 10:
    val += 1
    print(val)
print("all done")
```

Review: Exercise #3

Write a loop that will print out every integer between 1 and 20

Write a loop that will print out every even integer between 12 and 40

Write a loop that will count down from 10 to 1.

Today's Topics

- Invalid Inputs with While Loops
  - Hands-on Exercise
- Counting Loops
  - Hands-on Exercise
- Infinite Loops
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- Accumulator with With Loops
  - Hands-on Exercise

Infinite Loops

In all but rare cases, loops must contain within themselves a way to terminate

Something that makes the test condition false

If your loop does not have a way of stopping, it is called an *infinite loop*

Infinite Loops

In all but rare cases, loops must contain within themselves a way to terminate

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```
counter = 0
while counter < 10:
    print("counter:",counter)
counter += 1
```

Tips for writing loops

- Think about what needs to happen before the loop, during each loop iteration, and after the loop
- Think about what condition should make the loop end
- Make sure there is *something that changes inside the loop* that will eventually allow the loop's condition to be False
- Set up variables with initial values before the loop

Challenge #1

Write a loop that will print out:

```
1
2
3
4
5
6
7
8
9
10
```

Challenge #2

Write a loop that will print out:

```
10
9
8
7
6
5
4
3
2
1
```

Challenge #3

Prompt the user for an integer

Keep on dividing the number by 2 while the number is still greater than or equal to 1:

```
please enter a number: 64
64.0
32.0
16.0
8.0
4.0
2.0
1.0
```

```
please enter a number: 13
13.0
6.5
3.25
1.625
```

Today's Topics

- Invalid Inputs with While Loops
  - Hands-on Exercise
- Counting Loops
  - Hands-on Exercise
- Infinite Loops
  - Hands-on Exercise
- Accumulator with With Loops
  - Hands-on Exercise

Accumulator

An **accumulator** variable is a variable that keeps a running total of something.

What does this code do?

```
1  # Alimoor Reza
2  # accumulator keeps adding something to a variable
3
4  total = 0
5  day = 1
6
7  while day <= 5:
8      amount = float(input("How much did you make today? "))
9      total = total + amount
10     day   = day + 1
11
12 print("you made a total of ", total)
```

What does this code do (part 2)

```
1  # Alimoor Reza
2  # accumulator keeps adding something to a variable
3
4  total = 0
5  counter = 1
6
7  while counter <= 5:
8      grade    = float(input("Please enter a grade: "))
9      total     = total + grade
10     counter   = counter + 1
11
12 print(total/counter) # what do you expect to be output?
```

Challenge #4

- Write a loop that will execute 5 times
- Within the loop, get a float value from the user (the amount of rain that fell in a day)
- Use an accumulator to add up all of the rain that fell over the five days
- Outside of the loop, print out the sum of all of the rainfall

```
What is the rainfall? 2
What is the rainfall? 0
What is the rainfall? 1
What is the rainfall? 1.1
What is the rainfall? 3
There was a total of 7.1 inches of rain
```

Challenge #5

- 1+2+3+4+5 is 15
- 1+2+3+4+5+6 is 21
- Prompt the user for an integer. Output the sum of all of the integers up to and including the input number

```
Please enter an integer: 5
the sum of integers 1 through 5 is 15
```

```
Please enter an integer: 6
the sum of integers 1 through 6 is 21
```

```
Please enter an integer: 200
the sum of integers 1 through 200 is 20100
```

```
Please enter an integer: 1937521
the sum of integers 1 through 1937521 is 1876994781481
```

Challenge #6

Write a program that uses a loop and an accumulator variable to sum up all of the integers from 1 through 2025.

In other words, calculate 1+2+3+....2024+2025

If statements within loops

Let's *trace* this code

"trace" – go through it line by line to determine how it works

Question: What is happening?

mystery_code.py

```
1  # T. Urness
2  # if statement in loops
3
4  a = 0
5  x = 0
6  while a < 5:
7      a += 1
8      b = int(input("Please enter an integer between 0 and 100: "))
9      if b > x:
10         x = b
11 print("The mysterious answer is", x)
12
```