

Loops

CAC 180

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What is a loop?

Loops

- Gives us the opportunity to repeat a task.
- Let's write a program to average grades given by the user...

Questions about Exercise

- Does it make sense to always only allow 3 grades?
- Is it convenient for the user to have to re-run the program to average grades for another student?

How do we fix this?

How do we fix this?
Loops!!!!

While Loop

- Does a task *while* a specified condition is true.

while condition:
 Do something

Notice we use
indentation like we
did with if statements

- Let's rewrite our example using loops

Sentinel Value

- This is a flag or dummy value that is used to indicate the termination of a loop.
- It should be a value that would never appear in the dataset.
- Examples...

Scenario	Sentinel
Grades	-1
Temperature	200

Infinite Loop

- Good or bad?

Infinite Loop

- Good or bad?
- Bad! The program will never stop running!
- To avoid this, make sure that whatever condition you have in your while statement can be reached.
- For example, if you have the condition:
 - `while x > 0:`
- Make sure that x is altered within your loop.

Counter

- Sometimes it's necessary to execute a loop a specific number of times
- For example, I need to enter 10 numbers
- Let the variable n be my counter

```
n = 1
```

```
while n <= 10:
```

```
    num = int(input('enter a number'))
```

```
    ...
```

```
    n += 1
```

Counter

- Sometimes it's necessary to execute a loop a specific number of times
- For example, I need to enter 10 numbers
- Let the variable `n` be my counter

```
n = 1
```

```
while n <= 10:
```

```
    num = int(input('enter a number'))
```

```
    ...
```

```
    n += 1
```

using `n` ensures
that my loop
executes only
10 times

Counter

- We can also increment by any value we want
- Let's say I want to print out even numbers from 0 to 100...how would I do that?
- You try

Even Numbers

```
n = 0
```

```
while n <= 100:  
    print(n)  
    n += 2
```

Necessary Components of Counting Loops

1. Must include a counter set to the starting value before the loop
2. Must include the appropriate condition (set the limit) in the while condition
3. Must increment (or decrement) the counter

Something Easier?

- There's more than one answer to the problem
- Is there an easier way to count within a loop?

For Loops!

- For loops do things FOR you!
- The header of the for loop creates the counter variable, sets the condition, and increments (or decrements) the counter when we combine it with the range() function

```
for i in range(100):  
    print(i)
```

prints 0 to 99

Range Function

Range	Generated sequence	Explanation
<code>range(5)</code>	<code>0 1 2 3 4</code>	Every integer from 0 to 4.
<code>range(0, 5)</code>	<code>0 1 2 3 4</code>	Every integer from 0 to 4.
<code>range(3, 7)</code>	<code>3 4 5 6</code>	Every integer from 3 to 6.
<code>range(10, 13)</code>	<code>10 11 12</code>	Every integer from 10 to 12.
<code>range(0, 5, 1)</code>	<code>0 1 2 3 4</code>	Every 1 integers from 0 to 4.
<code>range(0, 5, 2)</code>	<code>0 2 4</code>	Every 2 integers from 0 to 4.
<code>range(5, 0, -1)</code>	<code>5 4 3 2 1</code>	Every 1 integers from 5 down to 1
<code>range(5, 0, -2)</code>	<code>5 3 1</code>	Every 2 integers from 5 down to 1

Practice

- Rewrite the following using a for loop

```
n = 1
```

```
while n <= 10:
```

```
    num = int(input('enter a number'))
```

```
    ...
```

```
    n += 1
```

Solution

```
for n in range(10):  
    num = int(input('enter a number'))  
    ...
```

Practice

- Print every even number from 100 to 0...

Solution

```
for n in range(100, -1, -2):  
    print(n)
```

Other For Loops

- Remember the operator 'in'? Here's where it's super helpful

```
fruits = ['apples', 'lemons', 'grapes', 'strawberries',  
'blueberries', 'bananas']
```

```
for fruit in fruits:  
    print('My favorite fruit is:',fruit)
```

Automatically looks
at each element
within the list

Practice

- Given the list:

```
numbers = [1,3,5,6,7,4,2,9,10]
```

- create a new list holding the sum of each number in the list and 5 (store 1+5, 3+5, etc.)
- My new list should look like:

```
numbersPlus5 = [6, 8, 10, 11, 12, 9, 7, 14, 15]
```

Hint: how do you add items to a list?

Solution

```
numbers = [1,3,5,6,7,4,2,9,10]  
numbersPlusFive = []
```

```
for num in numbers:  
    numbersPlusFive.append(num+5)
```

For Next Time...

- Keep working your way through Zybooks!
- Friday lab