

# 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

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```

```
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.)



# Solution

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

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