APS106

UNIVERSITY OF TORONTO

for loops.

Week 6 | Lecture 1 (6.1)

Upcoming

- Term Test 1, Thursday at 7:00 pm.
- Online Term Test Review, Tuesday at 7:30 pm.
- Lab 4 released 6:00 pm Thursday.
- Reflection 6 Released Friday 6:00 pm.
- Tutorial (Online), Practical, Office Hour sessions running all week.

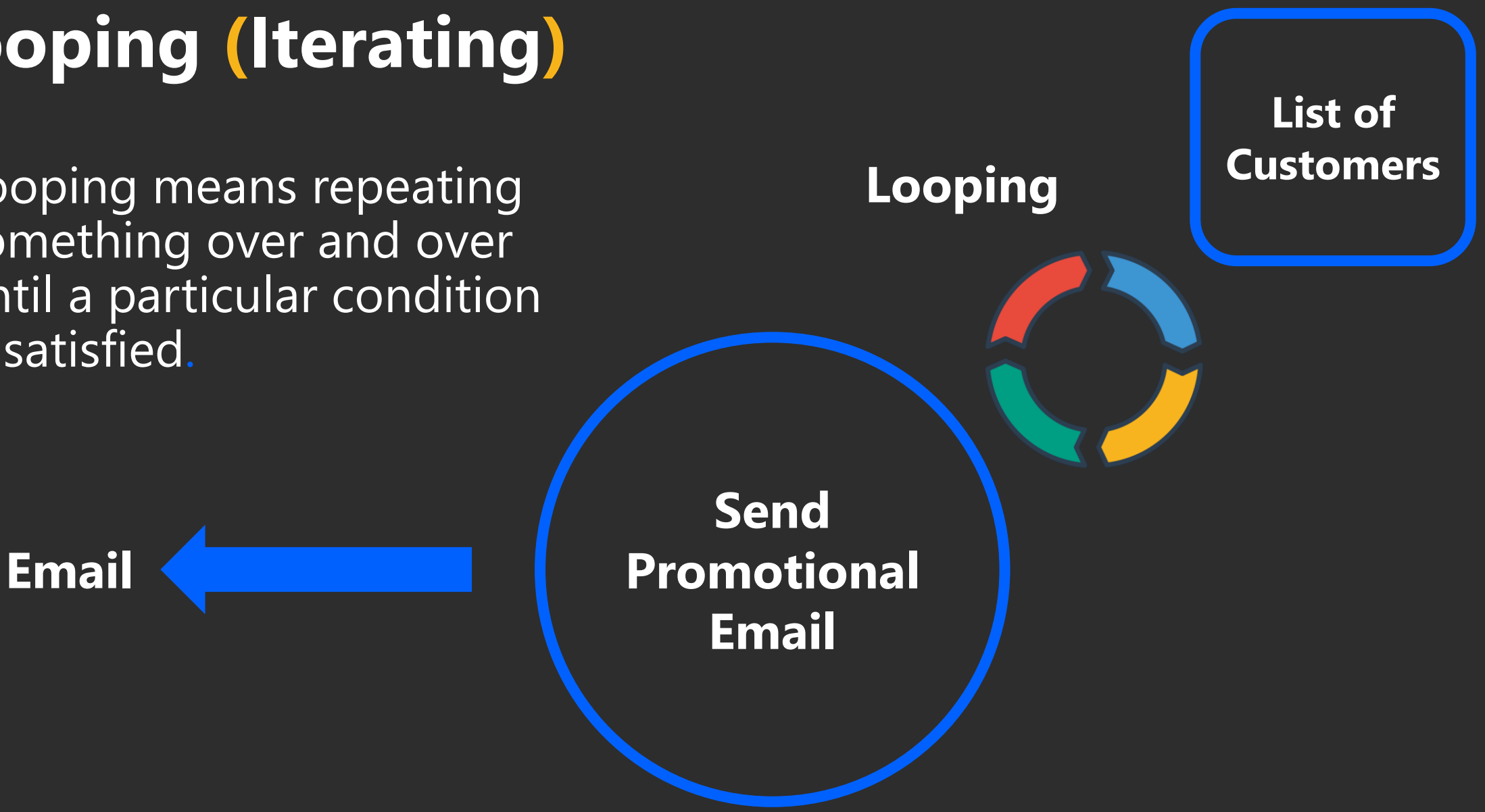
if nothing else, write **#cleancode**.

This Week's Content

- **Lecture 6.1**
  - **for loops**
- **Lecture 6.2**
  - for loops on indices, nested loops
- **Lecture 6.3**
  - Design Problem: Cryptography

Looping (Iterating)

- Looping means repeating something over and over until a particular condition is satisfied.



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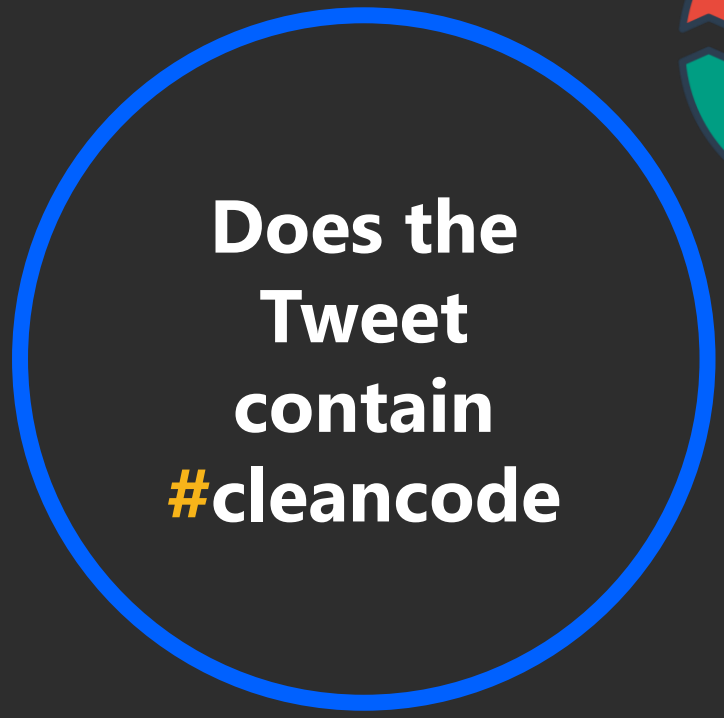

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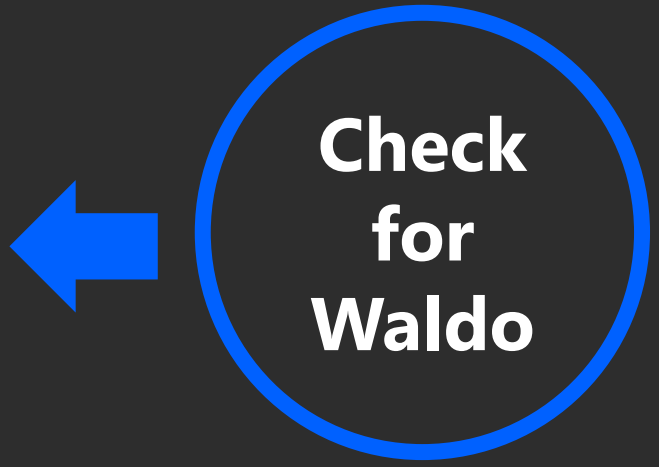
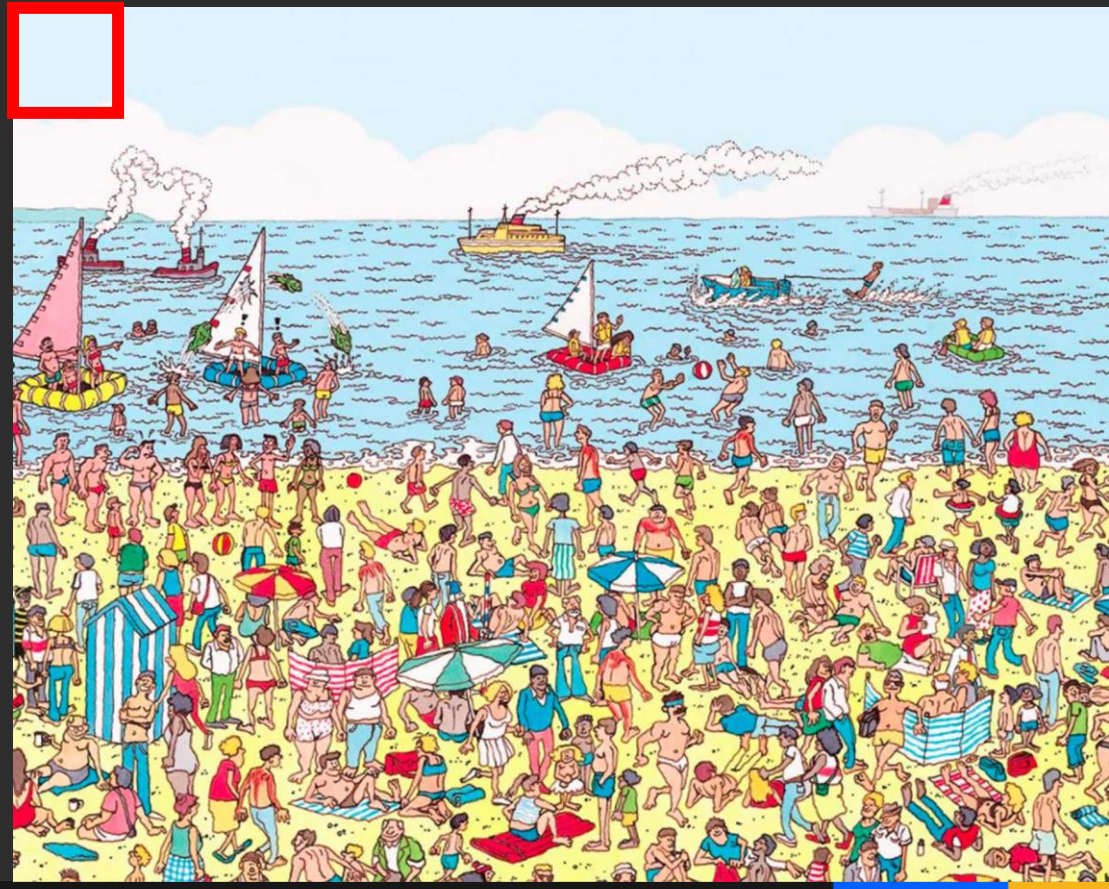
Looping





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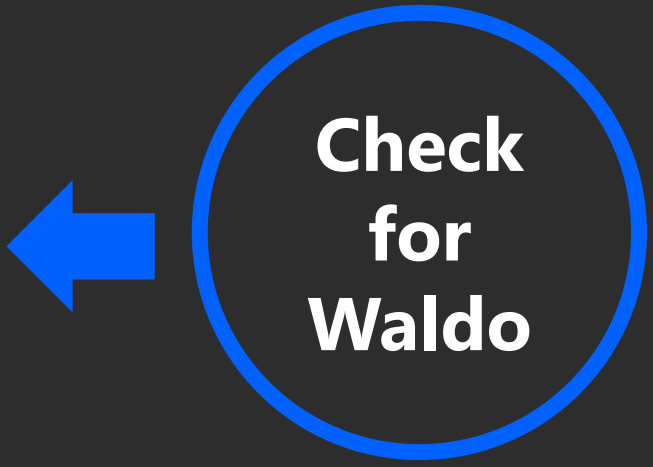

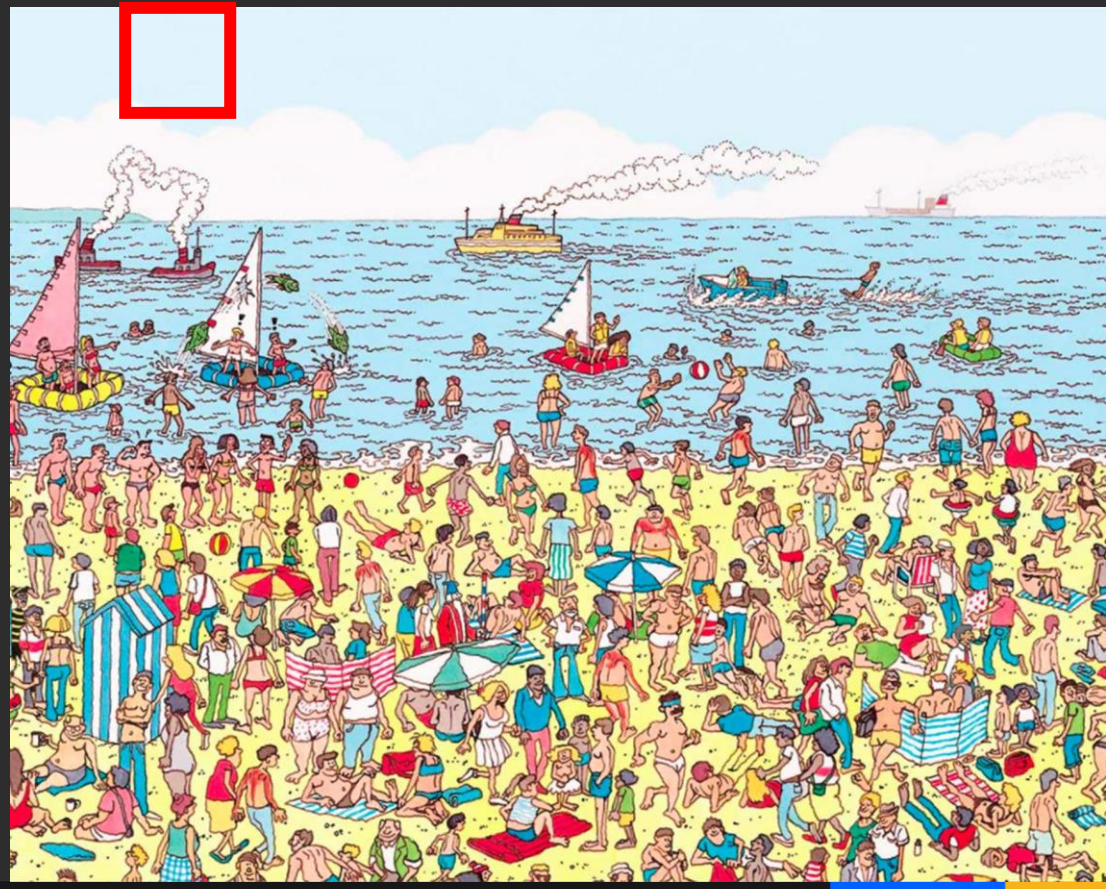

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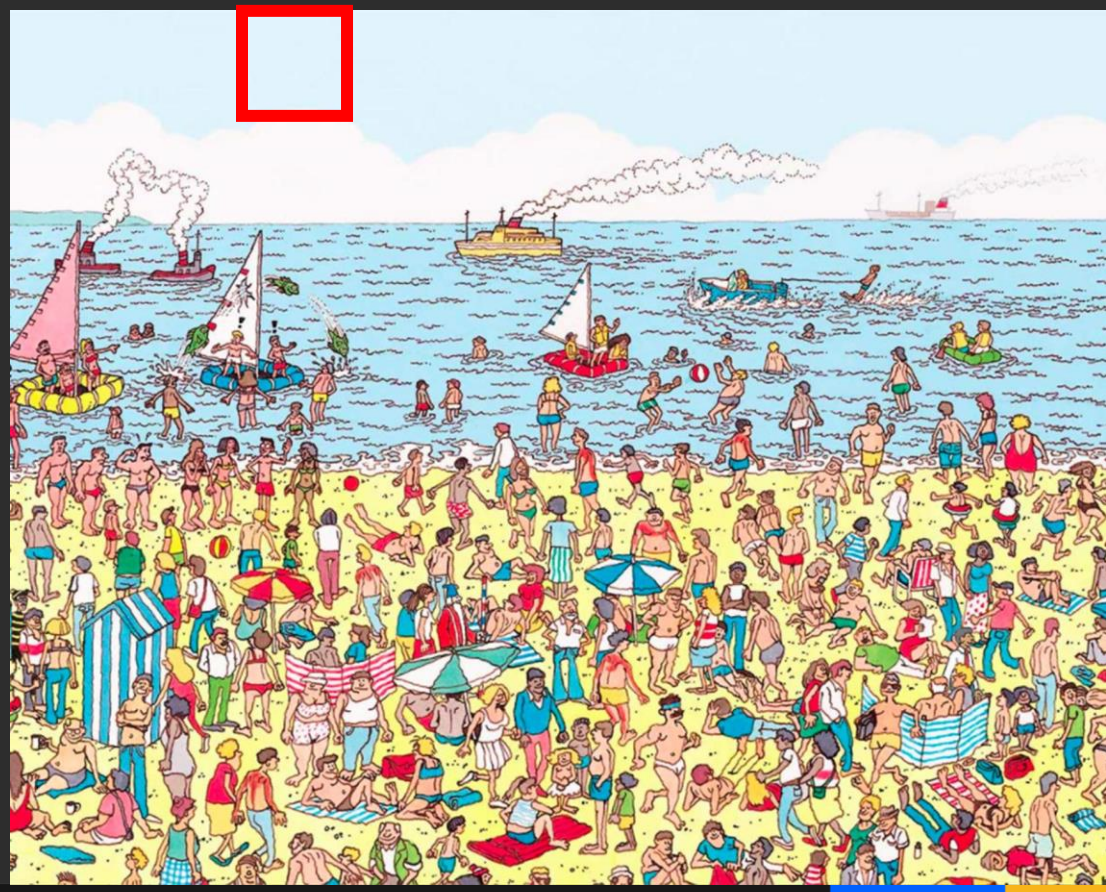
Looping



Looping (Iterating)

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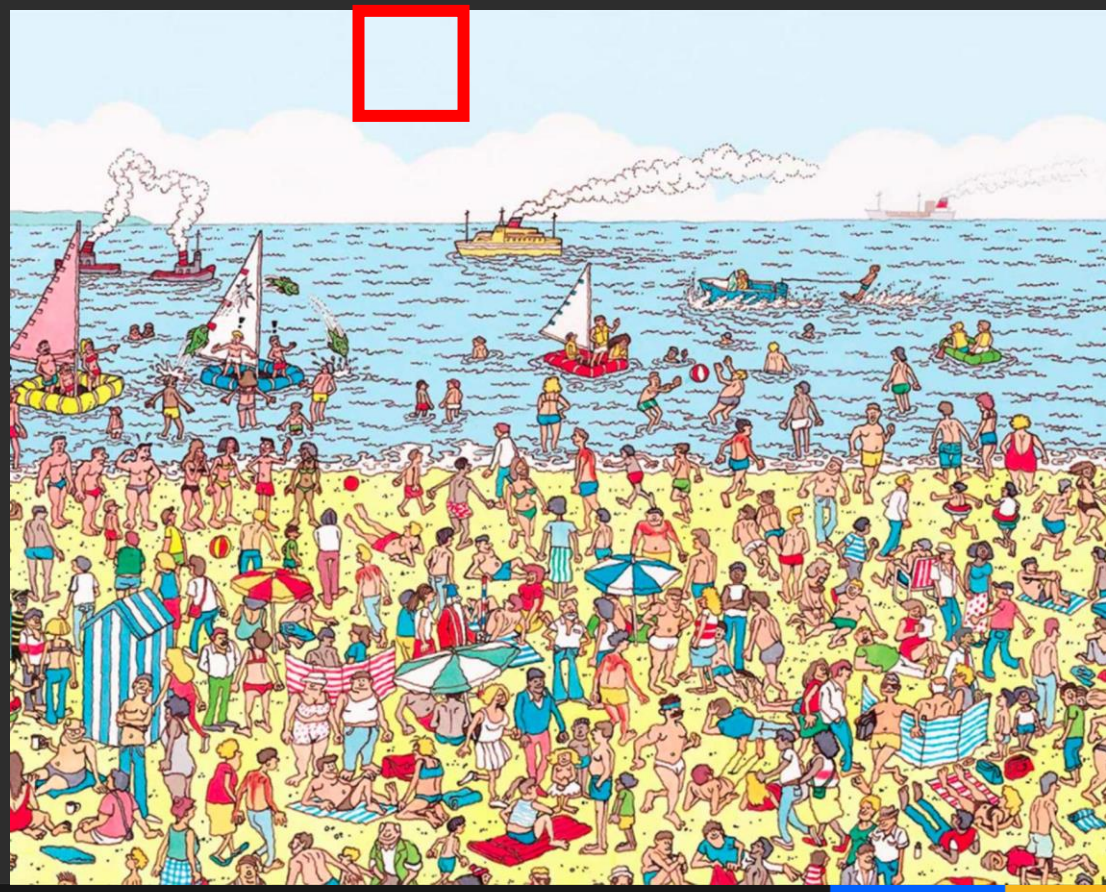
Looping



Looping (Iterating)

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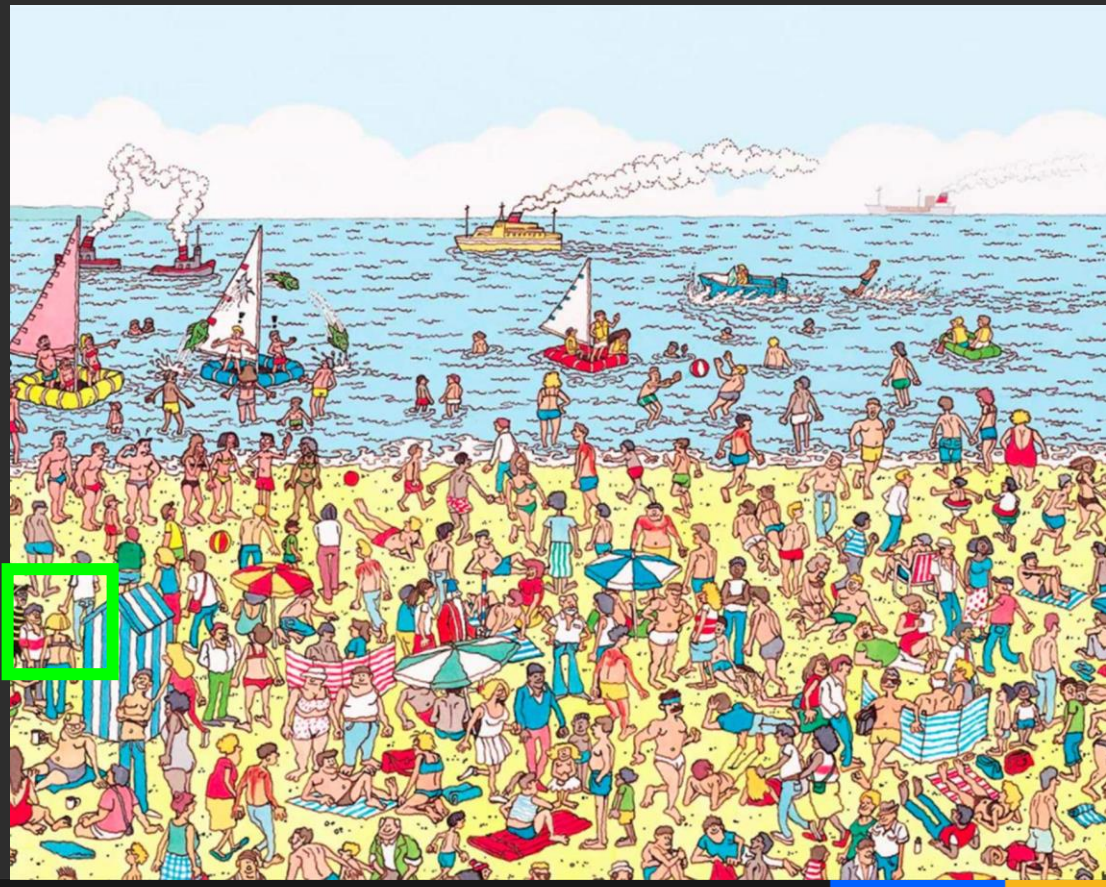
Looping

Check for Waldo

Yes/No



for loops

- There are several ways to repeat a block of code.
- We've already seen **while** loops and this week, we'll discuss **for** loops.
- Do Something = block of code we want to execute.

```
while expression:
    do something.
```

```
for item in iterable:
    do something.
```

for loops

- A for loop starts with the keyword for.

```
name = 'Sebastian'

for character in name:
    print(character)
```

for loops

- Next, we provide the name of one of more variables.
- We have called the variable `character`, but you can call it whatever you like as long as it follows rules for naming a variable.

```
name = 'Sebastian'

for character in name:
    print(character)
```

```
for item1, item2 in iterable:
    do something.
```

for loops

- Our variable `character` will be bound to each of the items in the sequence in turn.

```
name = 'Sebastian'

for character in name:
    print(character)
```

for loops

- Specify what the values are in.
- What is the iterable?
- An iterable is an object that can be iterated over.
- Strings are iterable (we know these from last week).
- Lists (**next week**) are iterable.

```
name = 'Sebastian'

for character in name:
    print(character)
```

for loops

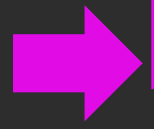
- As with the `while` loop, the `for` loop statement ends with a colon.
- This is how Python knows you are going to create a new block of code.

```
name = 'Sebastian'

for character in name:
    print(character)
```

for loops

- Indenting four spaces tells Python what lines of code are in that block you want to repeated.

```
name = 'Sebastian'

for character in name:
    print(character)
```



Indent

for loops

- What output should we get?

```
name = 'Sebastian'

for character in name:
    print(character)
```

for loops

- What output should we get?

```
name = 'Sebastian'

for character in name:
    print(character)
```

```
Output:
S
e
b
a
s
t
i
a
n
```

for loops

- What output should we get?

```
name = 'Sebastian'

for character in name:
    print(character)

print(character)
```

for loops

- What output should we get?

```
name = 'Sebastian'

for character in name:
    print(character)

print(character)
```

```
Output:
S
e
b
a
s
t
i
a
n
n
```

`character` holds the value of the last item in the iterable.

for loops

- Let's try it ourselves.

Open your notebook

Click Link:
1. Your first for loop

for vs while

- You've learned about `for` loops and `while` loops, but when should you use them?
- Firstly, all `for` loops can be written as `while` loops, and vice-versa.
- You should use a `for` loop when you know how many times the loop should run.
- If you want the loop to break based on a condition (do this until....) you should use a `while` loop.

for vs while

- Problem: You have had your **DNA** sequenced and each of your chromosomes is represented by a string of nucleotides: adenine (A), thymine (T), guanine (G), and cytosine (C).
- **chrome_4 = ATGGGCAA**
- Create a function to count the number of occurrences of a nucleotides.

```
my_func(chrome_4, 'A')
>>> 3
```

Open your notebook

Click Link:
2. while vs for

while

```
i = 0
counter = 0
while i < len(chrome_4):
    if chrome_4[i] == 'A':
        counter += 1
    i += 1
```

for

```
counter = 0
for character in chrome_4:
    if character == 'A':
        counter += 1
```

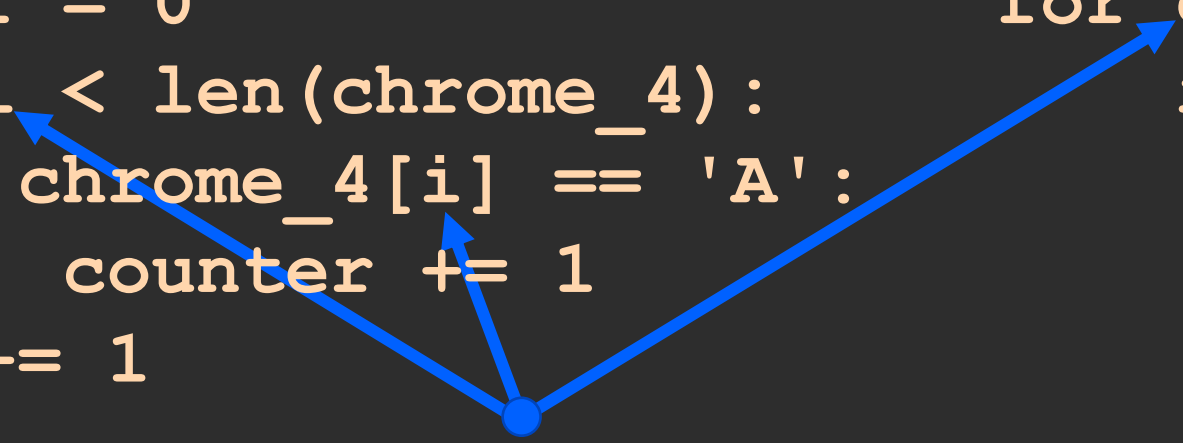
- Differences

while

```
i = 0
counter = 0
while i < len(chrome_4):
    if chrome_4[i] == 'A':
        counter += 1
    i += 1
```

for

```
counter = 0
for character in chrome_4:
    if character == 'A':
        counter += 1
```



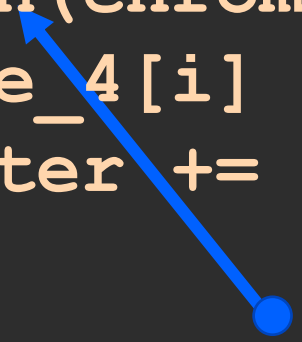
- Differences
- In the `while` loop, the loop variable `(i)` was the index of each character, while in the for loop the loop variable `(character)` is the value of each character.
- No indexing `[i]` required in the for loop.

while

```
i = 0
counter = 0
while i < len(chrome_4):
    if chrome_4[i] == 'A':
        counter += 1
    i += 1
```

for

```
counter = 0
for character in chrome_4:
    if character == 'A':
        counter += 1
```



- Differences
- We do not have to worry about how long the string is (e.g., use `len()`) because the `for` loop will go through every character of the string exactly once.

while

```
i = 0
counter = 0
while i < len(chrome_4):
    if chrome_4[i] == 'A':
        counter += 1
    i += 1
```

for

```
counter = 0
for character in chrome_4:
    if character == 'A':
        counter += 1
```

- Differences
- We do not have to worry about incrementing the loop variable (`i += 1`) as the `for` loop takes care of this.

while

```
i = 0
counter = 0
while i < len(chrome_4):
    if chrome_4[i] == 'A':
        counter += 1
    i += 1
```

6 lines

for

```
counter = 0
for character in chrome_4:
    if character == 'A':
        counter += 1
```

4 lines

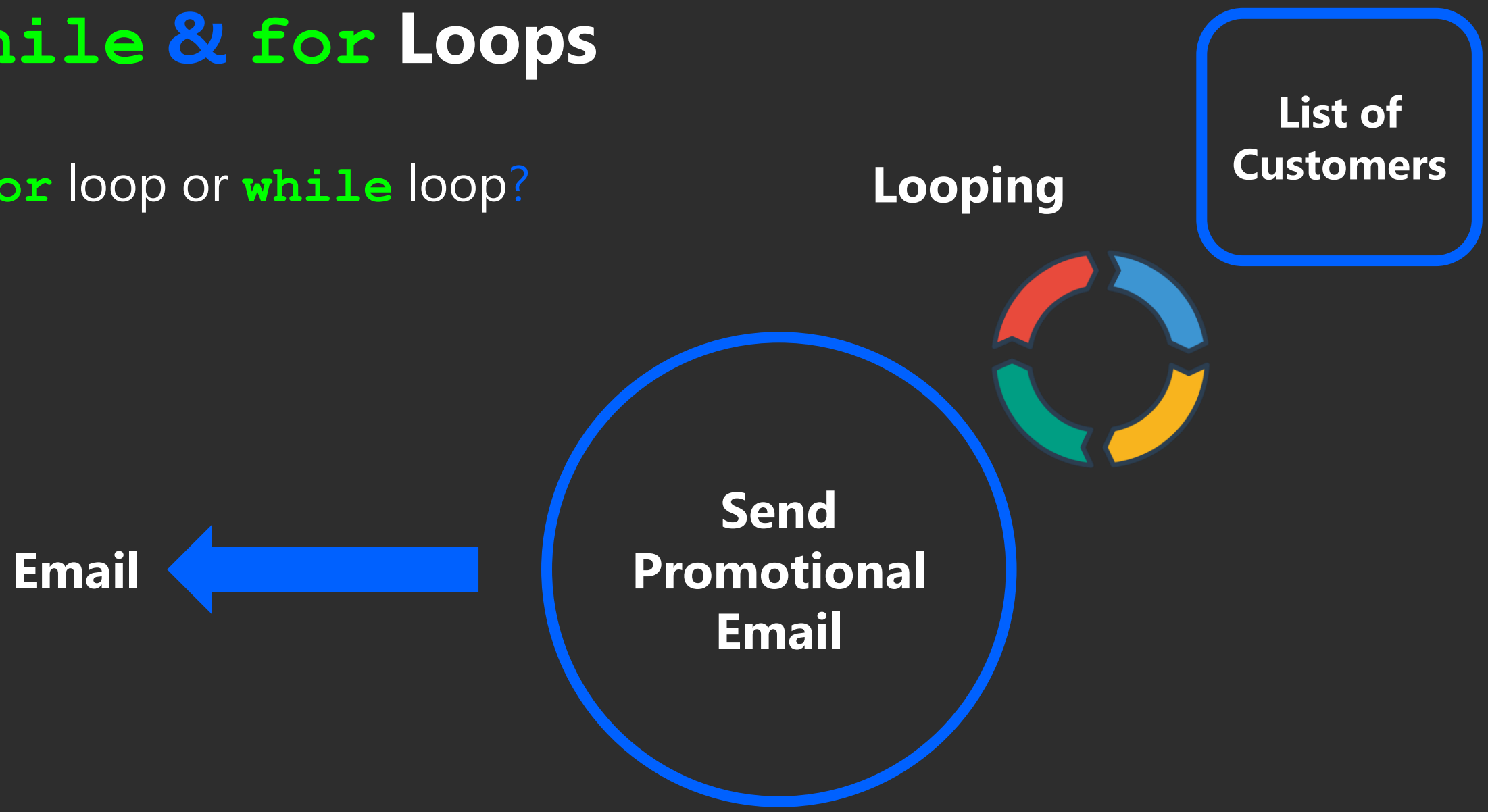
- Differences
- The for loop is **MUCH** easier to read and therefore, desirable when writing code for large collaborative projects.
- #cleancode

for vs while

- You should use a `for` loop when you know how many times the loop should run.
- If you want the loop to break based on a condition (do this until....) you should use a `while` loop.

`while` & `for` Loops

- `for` loop or `while` loop?



`while` & `for` Loops

- `for` loop or `while` loop?

List of Tweets

Looping

Does the Tweet contain #cleancode

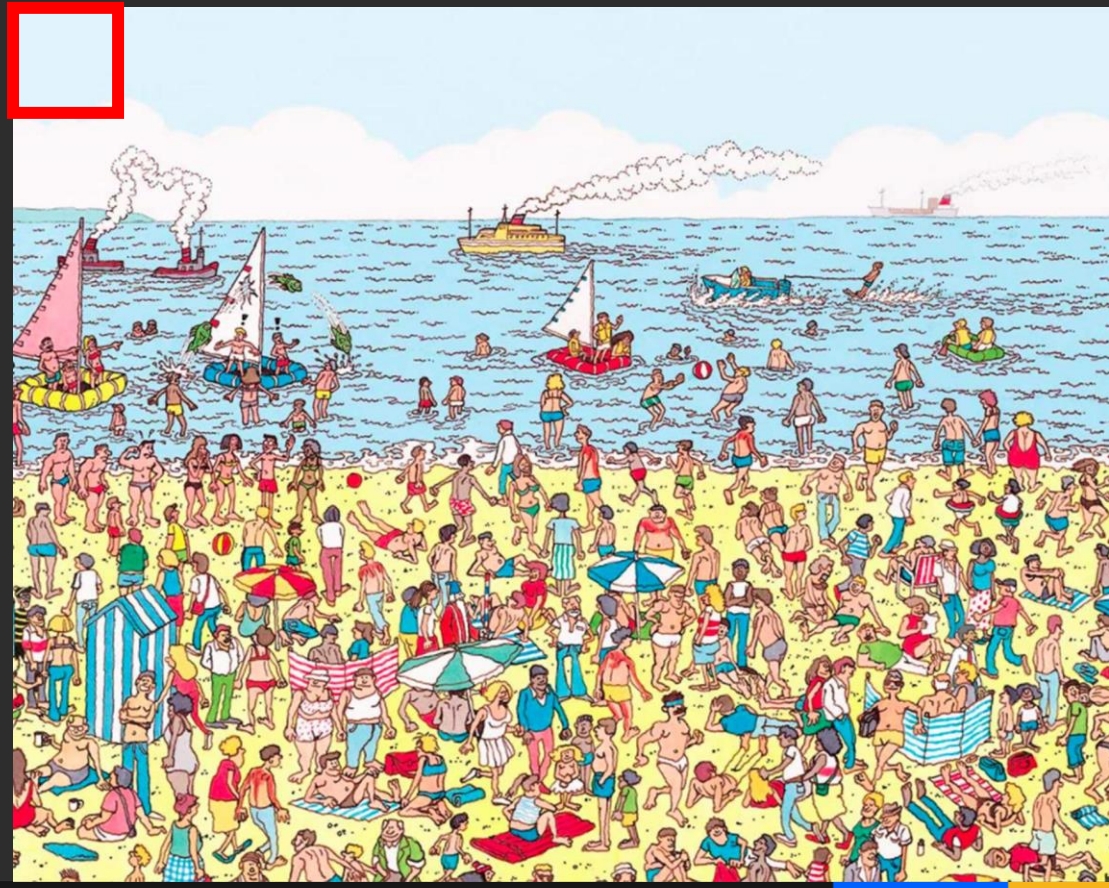
Yes/No

`while` & `for` Loops

- `for` loop or `while` loop?

Looping

Yes/No



Breakout Session 1

Vowels: a, e, i, o, u.

- Write a function that takes in a string and returns the number of vowels in the string. (use `for` loop)
- Test 1
  - `count_vowels('Happy Anniversary!')`
  - `5`
- Test 2
  - `count_vowels('xyz')`
  - `0`

Open your notebook

Click Link:
3. Breakout Session 1

Breakout Session 2

- Write a function to return the unique separators in a string of integer codes. (use `for` loop)
- The string only contains integers and separators.
- Test 1
  - `find_seperators('23,613-23;2:45')`
  - `',-;:'`
- Test 2
  - `find_seperators('613-555-3224')`
  - `'-'`

Open your notebook

Click Link:
4. Breakout Session 2

PRACTICE!

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for loops.

Week 6 | Lecture 1 (6.1)

if nothing else, write **#cleancode**.