APS106

UNIVERSITY OF TORONTO

while loops.

Week 4 | Lecture 1 (4.1)

if nothing else, write #cleancode

This Week's Content

- **Lecture 4.1**
  - **while loops**
  - **Reading: Chapter 9**
- **Lecture 4.2**
  - More while loops, survey, midterm review
  - Reading: Chapter 9
- **Lecture 4.3**
  - Midterm review

Looping (Iterating)

- Looping means repeating something over and over until a particular condition is satisfied.
- Looping (aka iteration) is the second key control structure in programming (if-statements/branching was the first).

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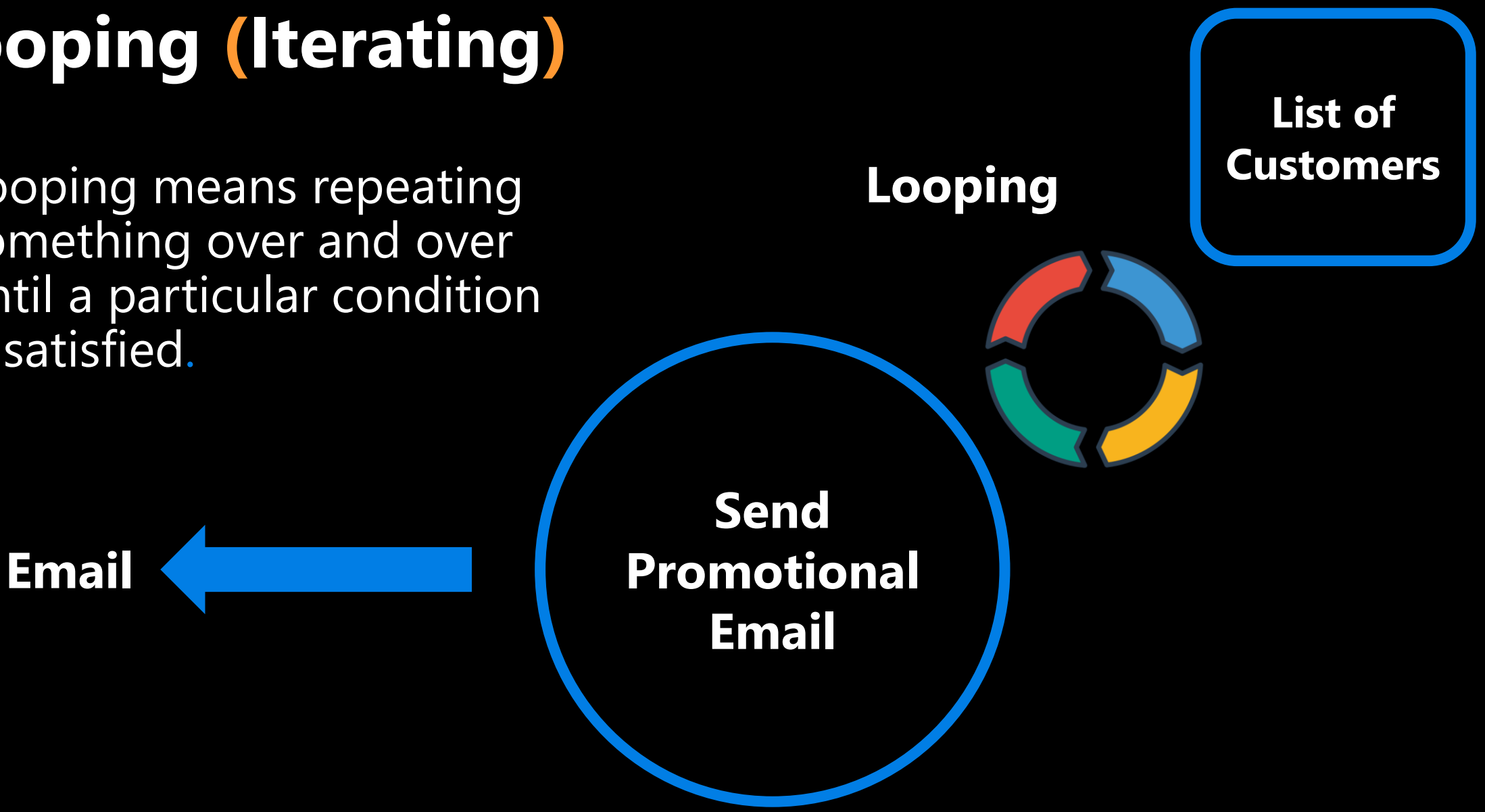

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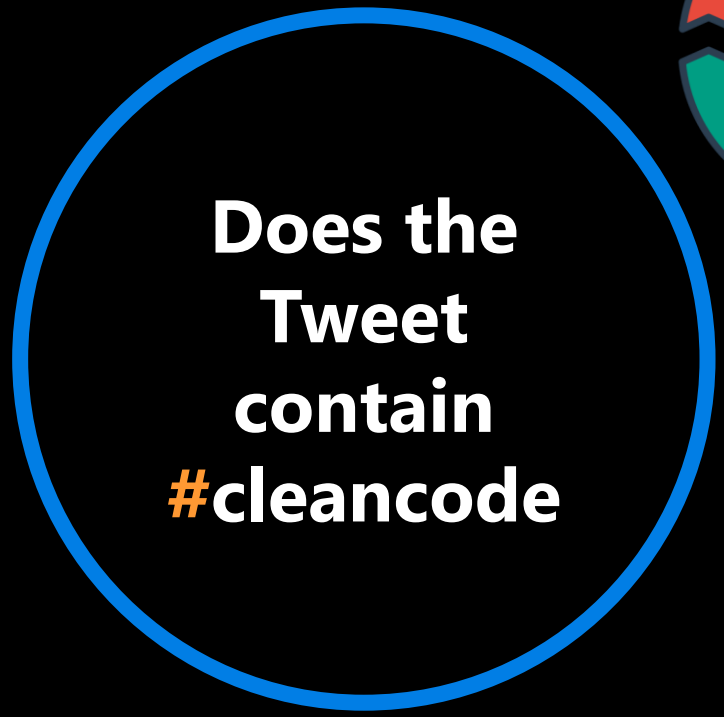

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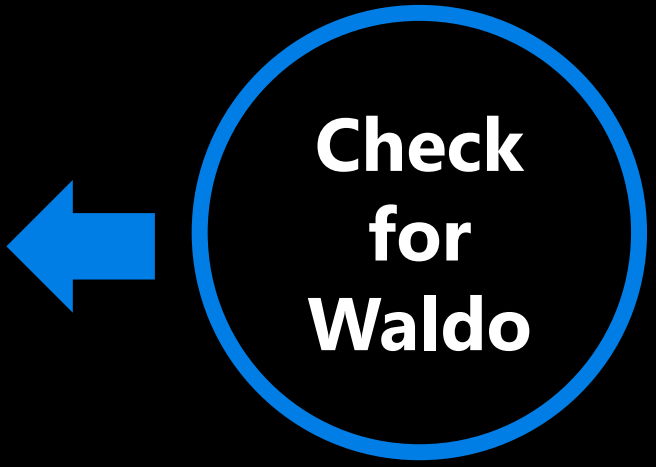

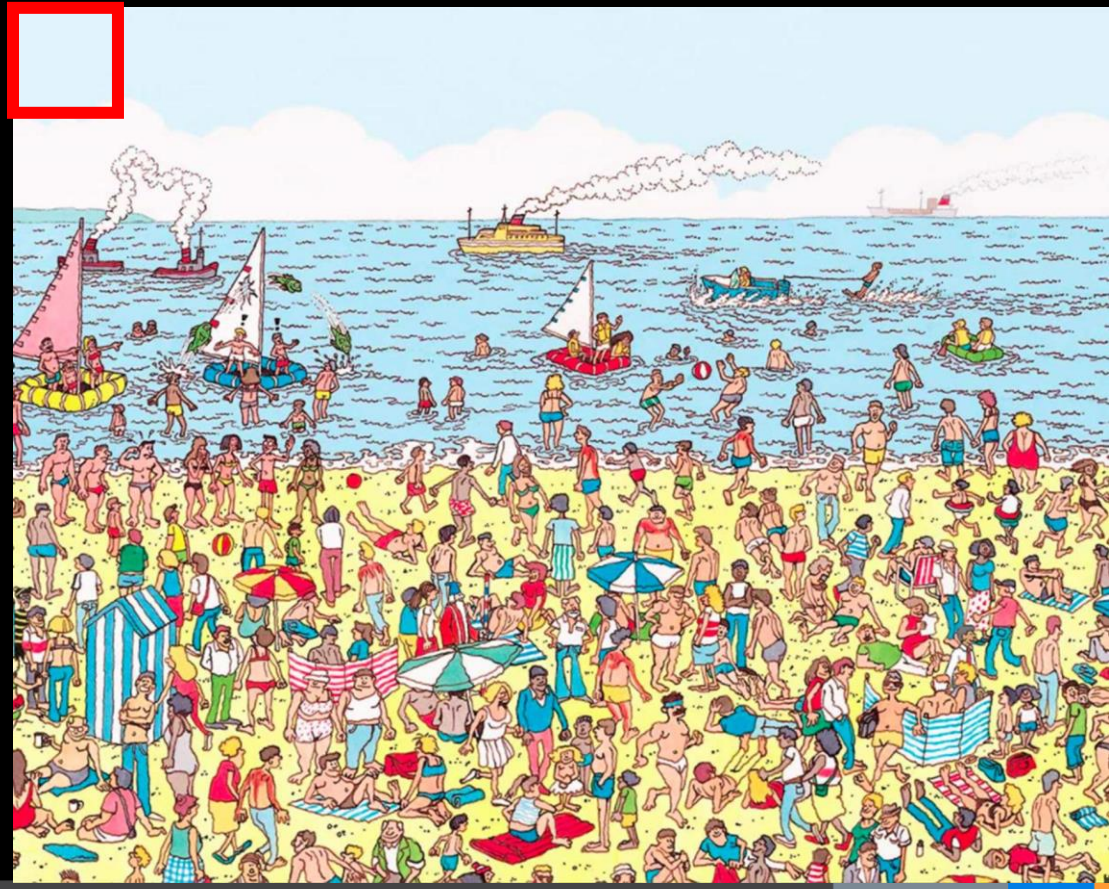

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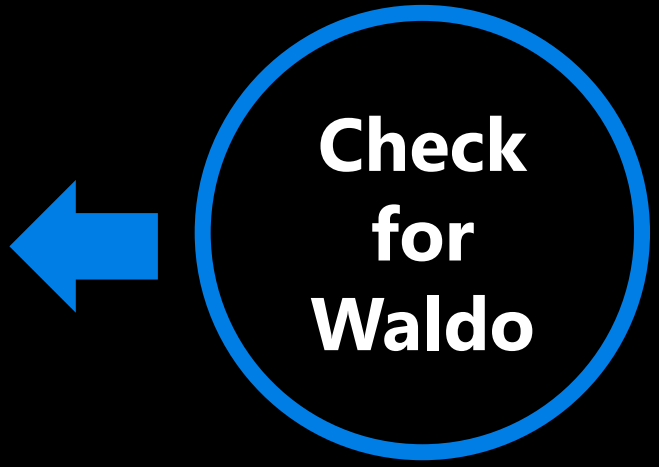

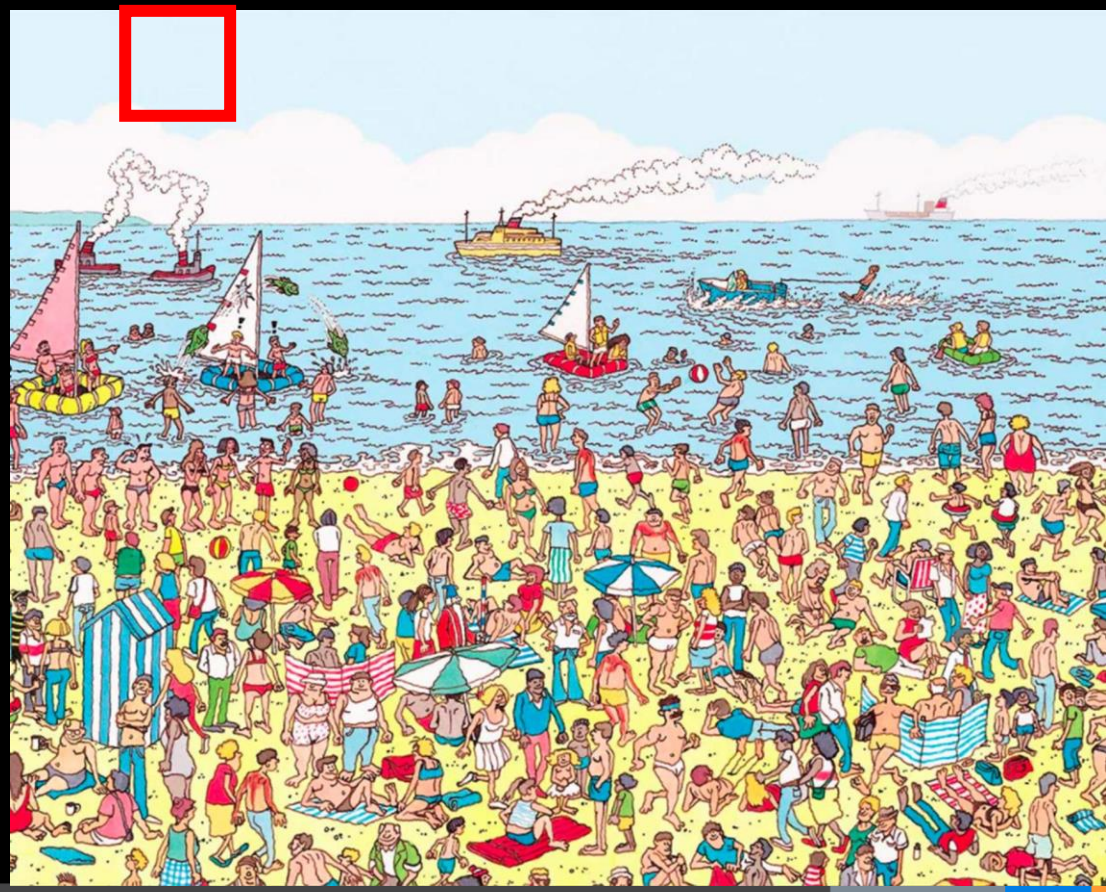

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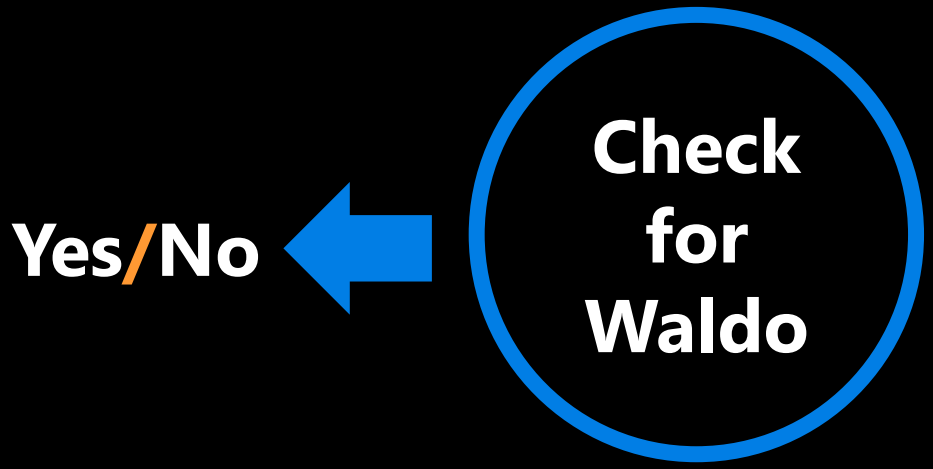

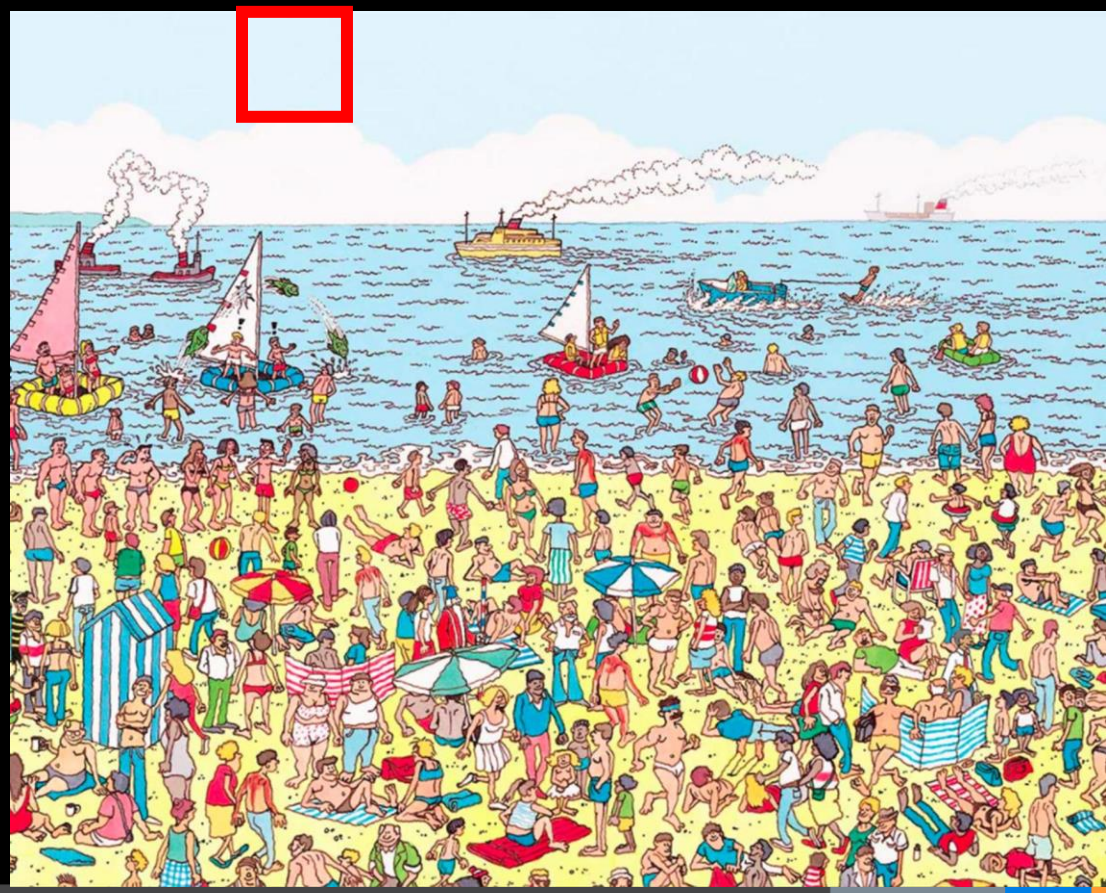

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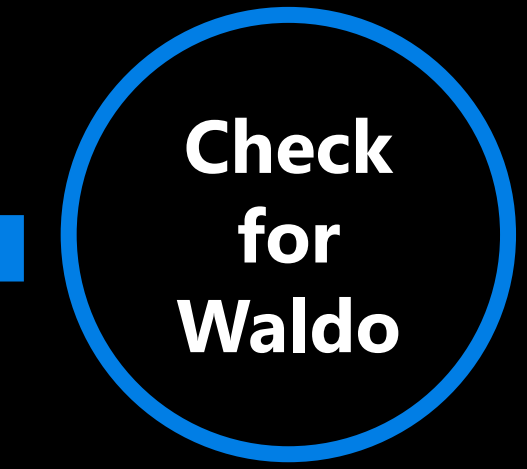

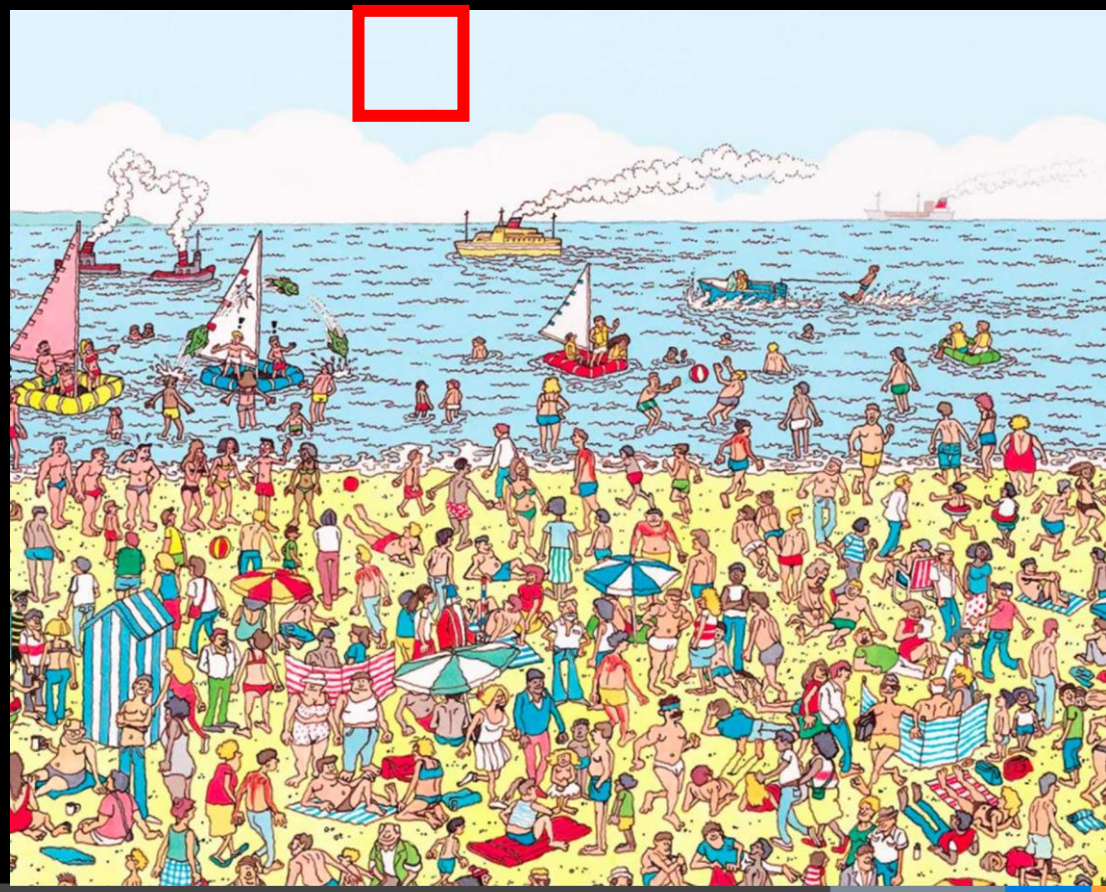

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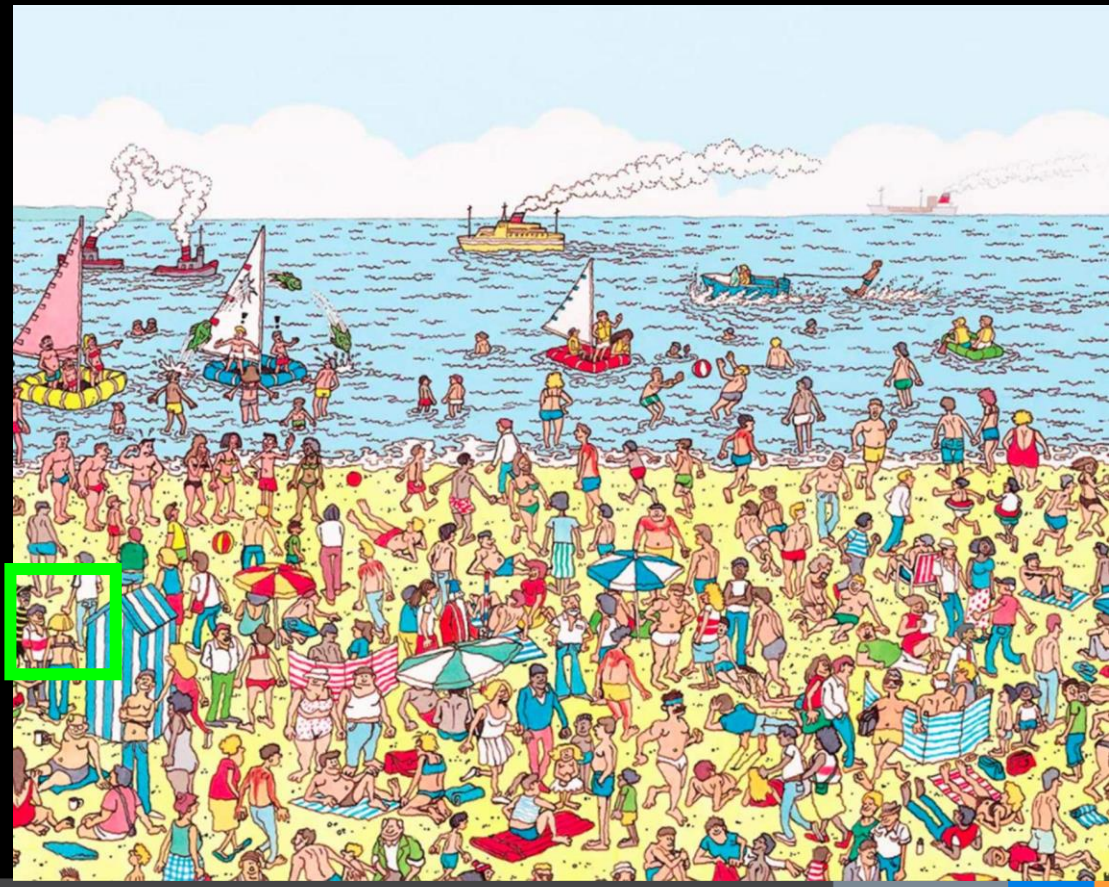
Looping



Check for Waldo

Yes/No

While Loops

- Sometimes we need to keep looping as long as some condition is **True**, and stop when it becomes **False**.
- Let's say you want to ask the user a question.
  - "Do you think the Toronto Maple Leafs will win the Stanley Cup in your lifetime?"
- If the user answers 'y', print out "You are going to live for a very long time." If the user answers 'n', print out "Well, sometimes miracles happen."

Open your notebook

Click Link:

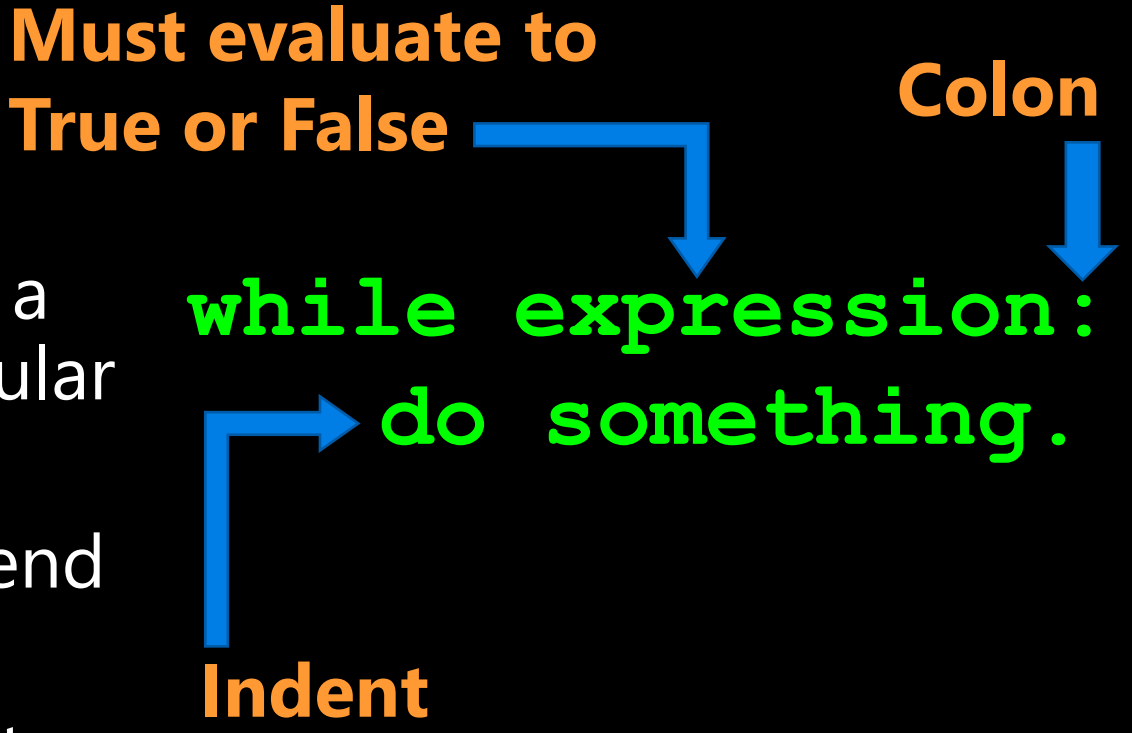
1. Asking the User a Question

While Loops

- Oh code kinda worked but if the user makes a typo, they can't participate in the questionnaire.
- The general solution is to loop: to execute the same lines of code more than once. This is also called iteration.
- We're going to talk about one loop construct today: the while-loop where you loop while some boolean expression is True.

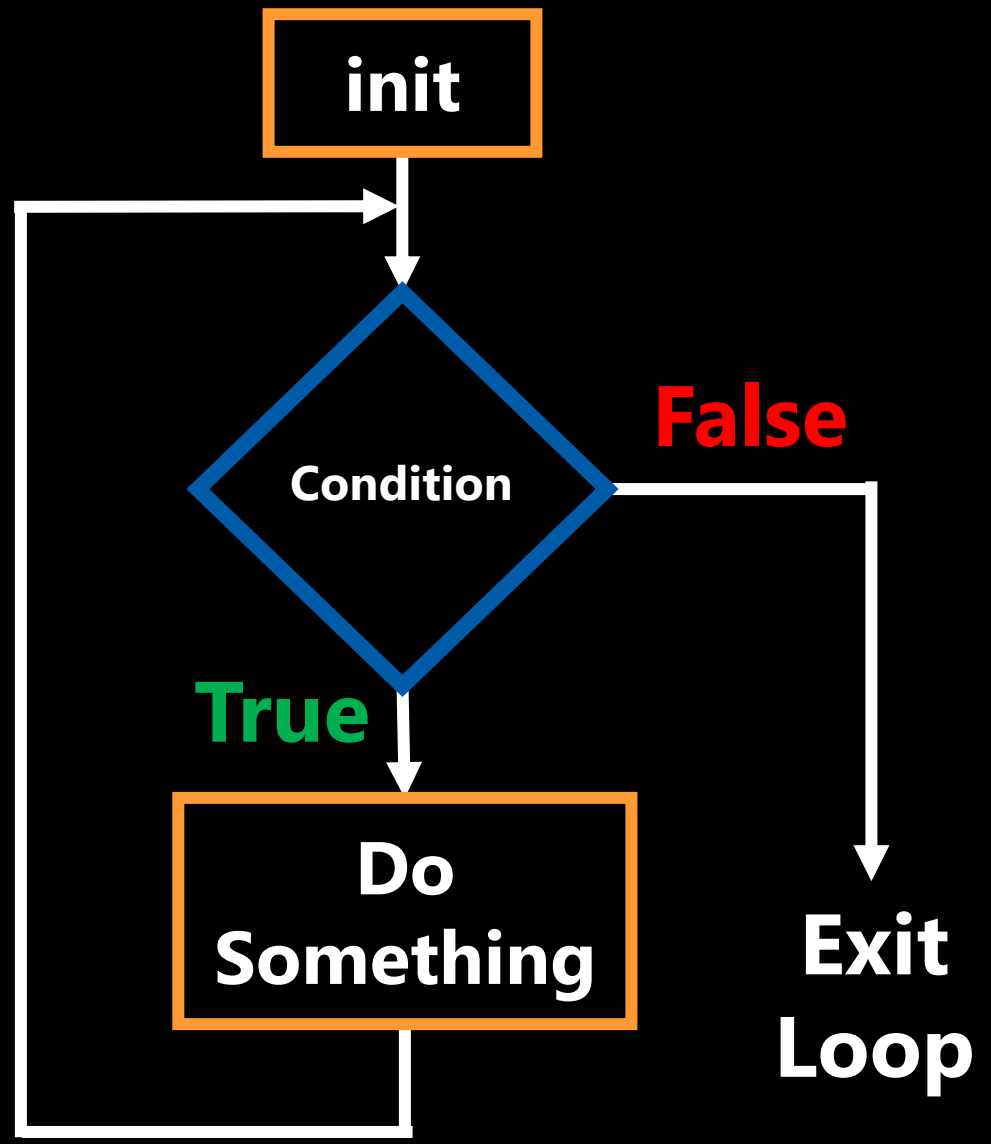
While Loops

- The **while loop** keeps executing a piece of code as long as a particular condition is **True**.
- There must be a colon (:) at the end of the while statement.
- The action to be performed must be indented.



While Loops

- The condition that gets evaluated is just an boolean expression.
- In particular it can include:
  - Something that evaluates to **True** or **False**.
  - logical operators (**and**, **or**, **not**)
  - comparison operators
  - function calls
- … really anything that evaluates to **True** or **False**.



While Loops

Must evaluate to True or False

Colon

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

Indent

Open your notebook

Click Link:
2. While Loops

`while` & `for` Loops

- In Python there are two types of loops `for` and `while`.
- For loops will be introduced in Week 6.
- What is the difference between `for` loops and `while` loops and when would we use one over the other?

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

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

while & for Loops

- for loop
- The number of iterations to be done is already known.

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

```
cats = ['Persian', 'Siamese', 'Ragdoll']

for cat in cats:
    print(cat)

>>> Persian
>>> Siamese
>>> Ragdoll
```

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

while & for Loops

- **while loop**
- The number of iterations to be done is NOT known and iteration continues until a condition is met.

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

```
x = 0
while x*x < 200:
    print(x)
    x += 1
```

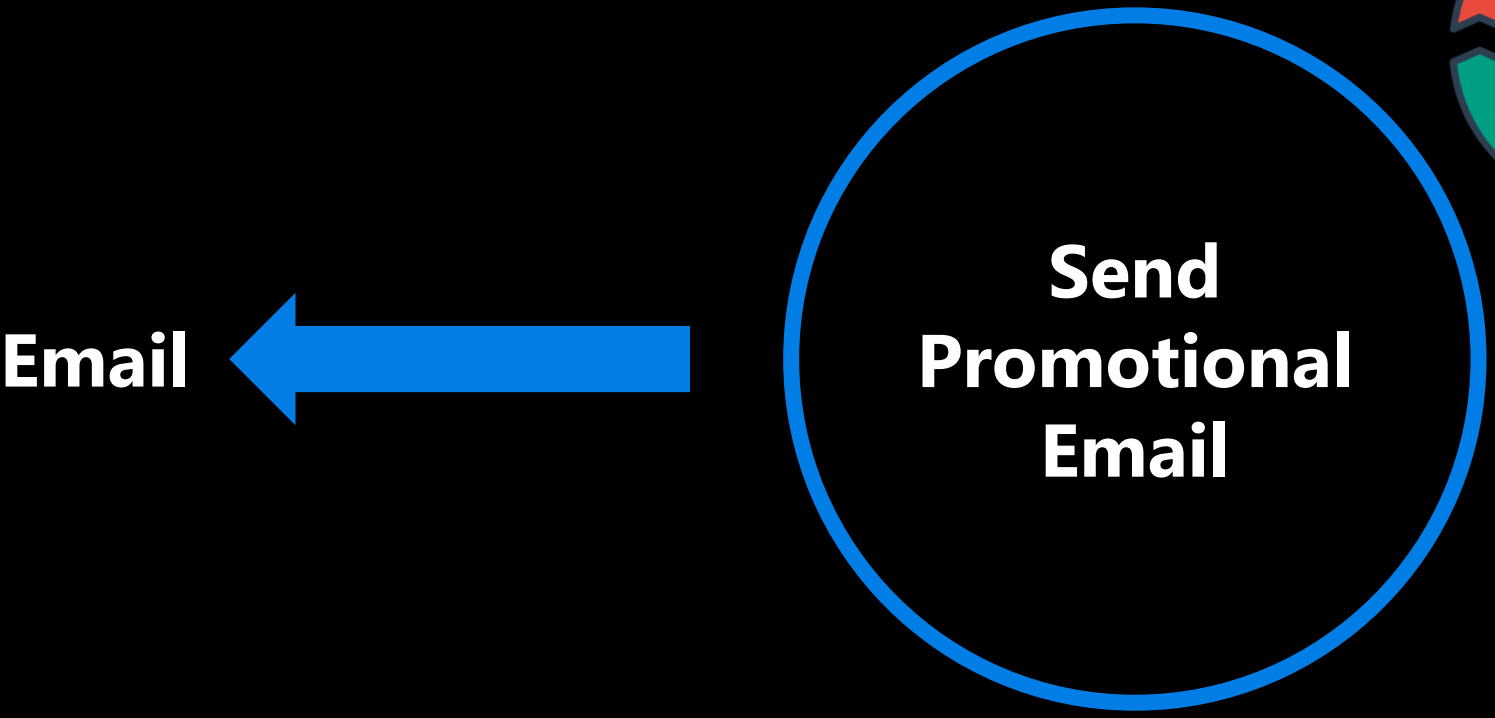
```
>>> 0
>>> …
>>> 14
```

I don't know how many times I should iterate but I know when I should stop.

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

`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

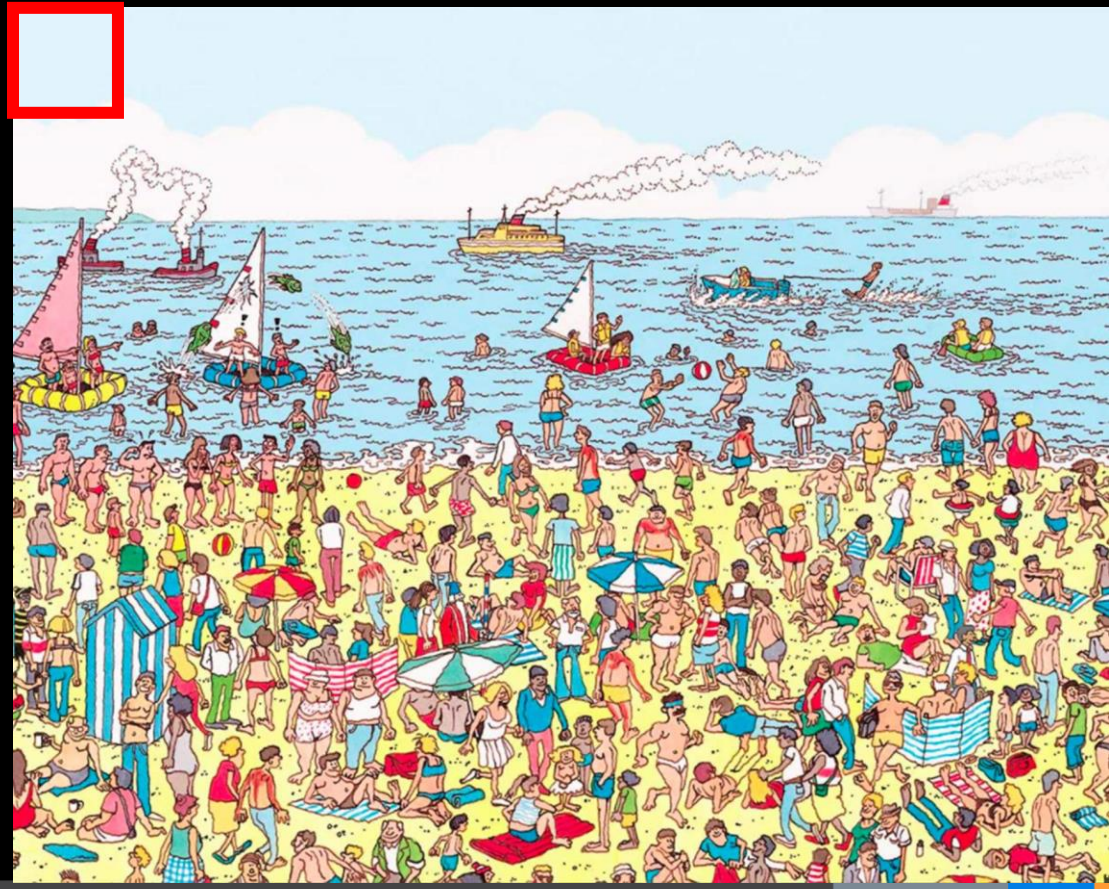
`while` & `for` Loops

- `for` loop or `while` loop?

Looping

Check for Waldo

Yes/No



Infinite Loops

- Remember that a `while` loop ends when the condition is `False`.
- A common error when working with while loops is for the condition to never be satisfied and therefore, the loop to continue forever (till infinity).
- **We need some way inside the loop for the condition to become false.**

```
x = 0
while x < 10:
    print(x)
    x += 1
```

`True`

```
x = 0, 1, 2,
3, 4, 5, 6,
7, 8, 9
```

`False`

```
x = 10
```

Infinite Loops

- Remember that a `while` loop ends when the condition is satisfied (`True`).
- A common error when working with while loops is for the condition to never be satisfied and therefore, the loop to continue forever (till infinity).
- **We need some way inside the loop for the condition to become false.**

Open your notebook

Click Link:
3. Infinite Loops

Variable Scope and Loops

```
def func(x):
    x += 1

x = 0
func(x)
```

x (Local)

x (Global)

```
x = 0
while x < 10:
    x += 1
```

x (Global)

x (Global)

While Loops

- Let's revisit our User Input code and see if the While Loop will solve out problem.

Open your notebook

Click Link:
4. Back to User Input

Breakout Session 1

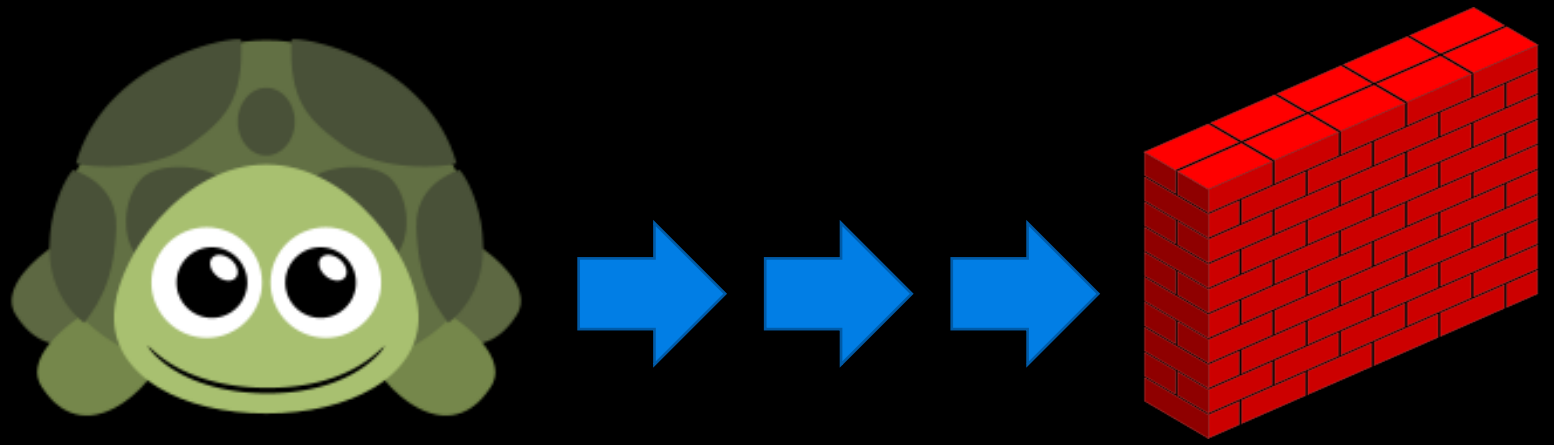
- Write code to print all the numbers from 0 to 20 that aren't evenly divisible by either 3 or 5.
- Zero is divisible by everything and should not appear in the output.

Open your notebook

Click Link:
5. Breakout Session 1

Turtles and `while` loops

- I'm a little turtle and I want to take steps to the right until I get to the brick wall.
- However, I don't know how far away the brick wall I.



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Click Link:
6. Turtles and while loops

Random Module

- This module implements pseudo-random number generators for various distributions.

```
import random

random.uniform()
random.random()
random.randint()
...
```

Open your notebook

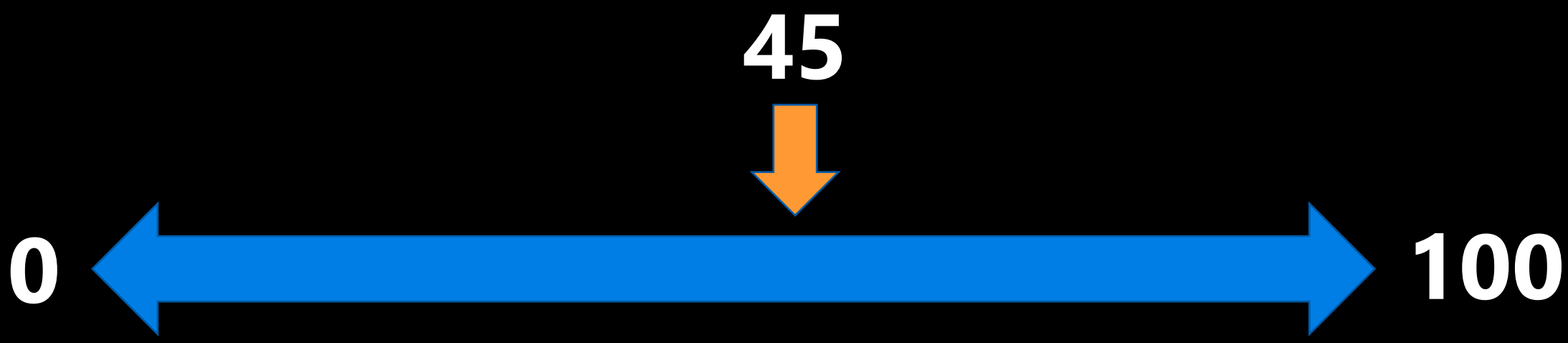
Click Link:
7. Random Module

Guessing Game

- Let's build a simple guessing game.
  - Get the computer to choose a random integer from 0 to 100.
  - Ask the user for a guess and allow the user to input a guess or "q".
  - If the user inputs "q" print a nice message and end the program.
  - If the user enters a guess, tell them if they should guess higher, lower, or if they got it right.
  - If they got it right, print a nice message and quit.

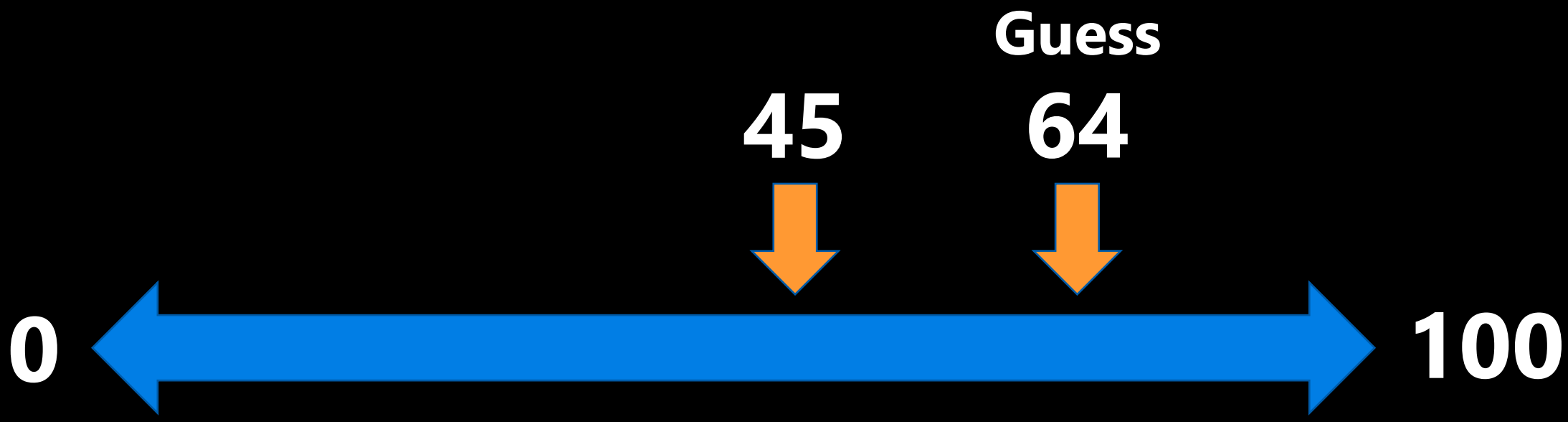
Guessing Game

- Get the computer to choose a random integer from 0 to 100.
  - The computer selects 45.

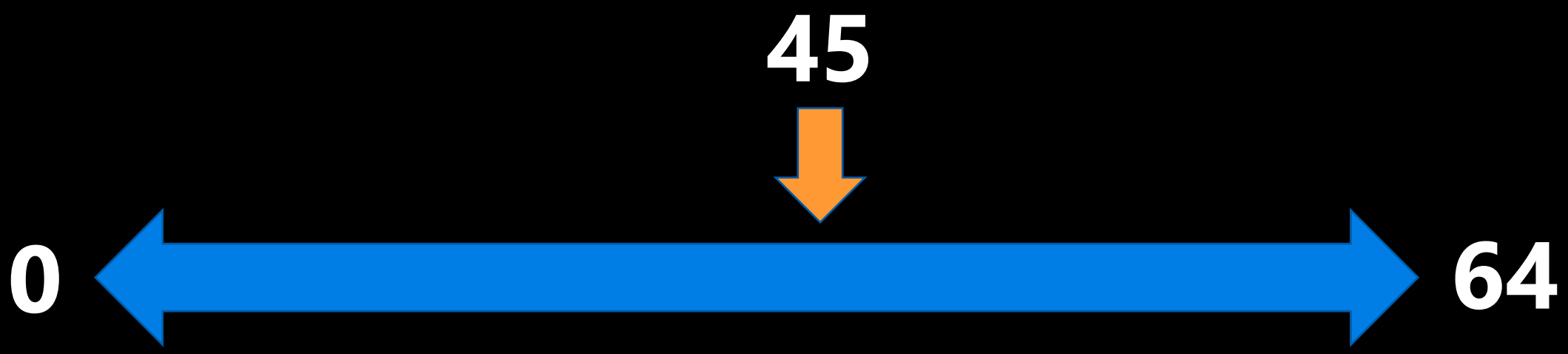


Guessing Game

- The user guesses 64.
  - The computer says **LOWER**.

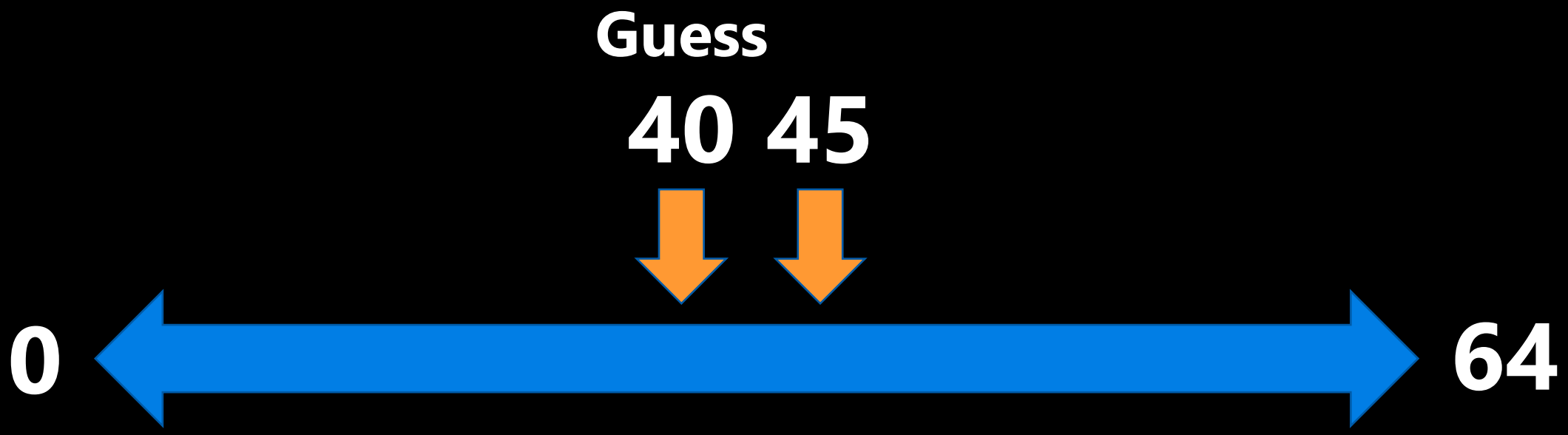


Guessing Game

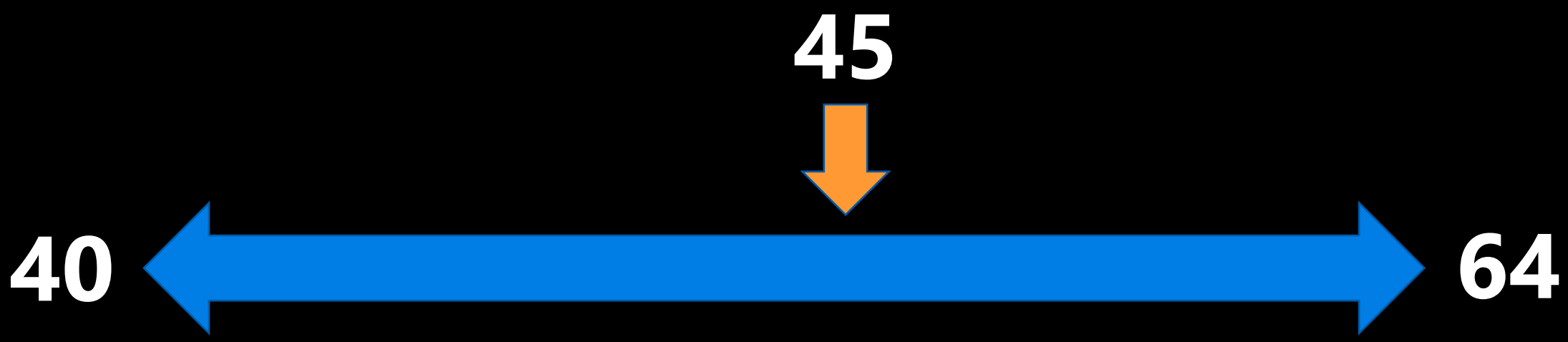


Guessing Game

- The user guesses 40.
  - The computer says **HIGHER**.

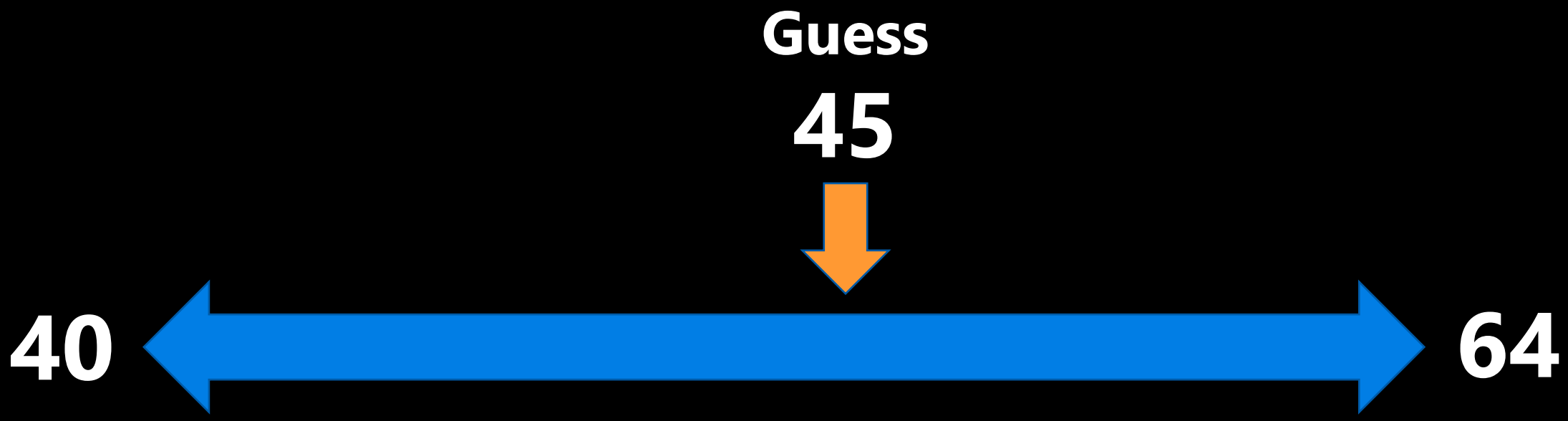


Guessing Game



Guessing Game

- The user guesses 45.
  - The computer says **YOU WIN**.



Guessing Game

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Open your notebook

Click Link:
8. A Simple Guessing Game

Lecture Recap

Practice!

- Looping (aka iteration) is the second key control structure in programming (if-statements/branching was the first).
- The basic idea of loops is to repeated execute the same block code.
- Looping is very powerful idea.
- While loops is one of two loop types in Python.

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functions, input & output, importing modules.

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