COMP1021
Introduction to Computer Science

More on Loops

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Outcomes

- After completing this presentation, you are expected to be able to:
  1. Use the continue command and the break command to stop a loop
  2. Explain the difference between using the continue command and the break command

Stopping a Loop

- There are two commands you can use to stop a loop
- The continue command:
  - It stops the ***current*** execution of the loop
  - After stopping the current loop, the loop will continue to run by going back to the start of the loop
- The break command:
  - It stops the ***whole*** execution of the loop
  - After running the break command, the program moves on to the rest of the code after the loop

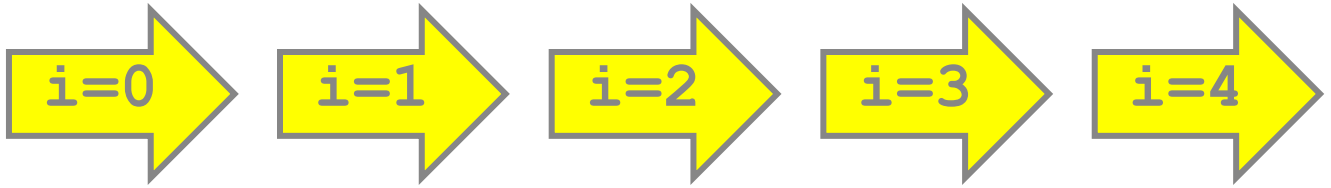
Stopping For Loops and While Loops

- You can use the continue and break commands on both for loops and while loops
- After using the continue command:
  - A for loop will start the loop content using the next item in the item list
  - A while loop will check the loop condition before beginning the next loop
- In this presentation, we will show examples of how to use these commands using for loops

Example of Using Continue

- Let's say we have a for loop that repeats the loop content 5 times, as illustrated below:

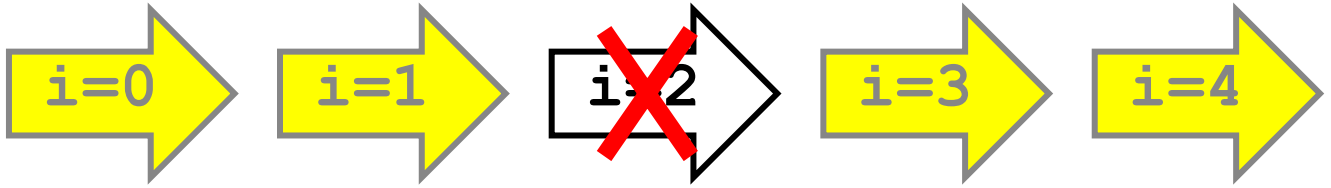
```
for i in range(5):
    print(i, end="")
```




```
01234
>>>
```

- If we run `continue` the third time the loop is executed i.e. i = 2, the execution will look like this:

```
for i in range(5):
    if i == 2:
        continue
    print(i, end="")
```

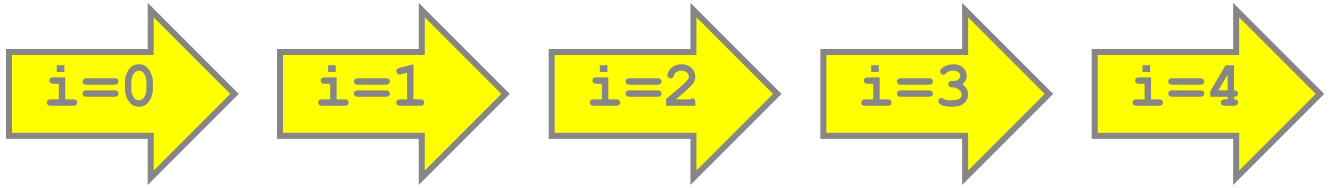



```
0134
>>>
```

Example of Using Break

- Again, we have a for loop that repeats the loop content 5 times, as illustrated below:

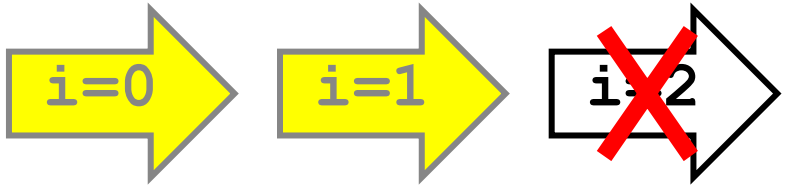
```
for i in range(5):
    print(i, end="")
```




```
01234
>>>
```

- If we run `break` the third time that the loop is executed i.e. i = 2, the execution will look like this:

```
for i in range(5):
    if i == 2:
        break
    print(i, end="")
```




```
01
>>>
```

Continue vs Break

- Let's compare the use of the continue command and the break command using another set of examples

Using continue

```
for i in range(10):
    if i % 2:
        continue
    print(i)
print("done!")
```

Output:

```
0
2
4
6
8
done!
>>>
```

Using break

```
for i in range(10):
    if i % 2:
        break
    print(i)
print("done!")
```

Output:

```
0
done!
>>>
```

Illustration of What Happens in the Program Using 'continue' 1/3

- Remember `range(10)` returns 0, 1, 2, 3, … 9
- In the example using `continue`:
  - when `i` = 0, `i%2` is false so `print(i)` is executed and the loop continues with the next number
  - when `i` = 1, `i%2` is true so `continue` is executed and the loop immediately continues with the next number (`print` is not executed)

```
if 0 % 2:  (false)
    continue ✗
print(0) ✓
```

```
0
```

```
if 1 % 2:  (true)
    continue ✓
print(1) ✗
```

```
0
```

Illustration of What Happens in the Program Using 'continue' 2/3

- when `i` = 2, `i%2` is false so `print(i)` is executed and the loop continues with the next number
- when `i` = 3, `i%2` is true so `continue` is executed and the loop immediately continues with the next number (`print` is not executed)
- when `i` = 4, `i%2` is false so `print(i)` is executed and the loop continues with the next number

```
if 2 % 2: (false)
    continue ✗
print(2) ✓
```

```
0
2
```

```
if 3 % 2: (true)
    continue ✓
print(3) ✗
```

```
0
2
```

```
if 4 % 2: (false)
    continue ✗
print(4) ✓
```

```
0
2
4
```

Illustration of What Happens in the Program Using 'continue' 3/3

- when `i` = 9, `i%2` is true so `continue` is executed and the loop stops immediately because there is no number left (`print` is not executed)
- Finally, the `print` statement after the for loop is executed

```
if 9 % 2: (true)
    continue ✓
print(9) ✗
```

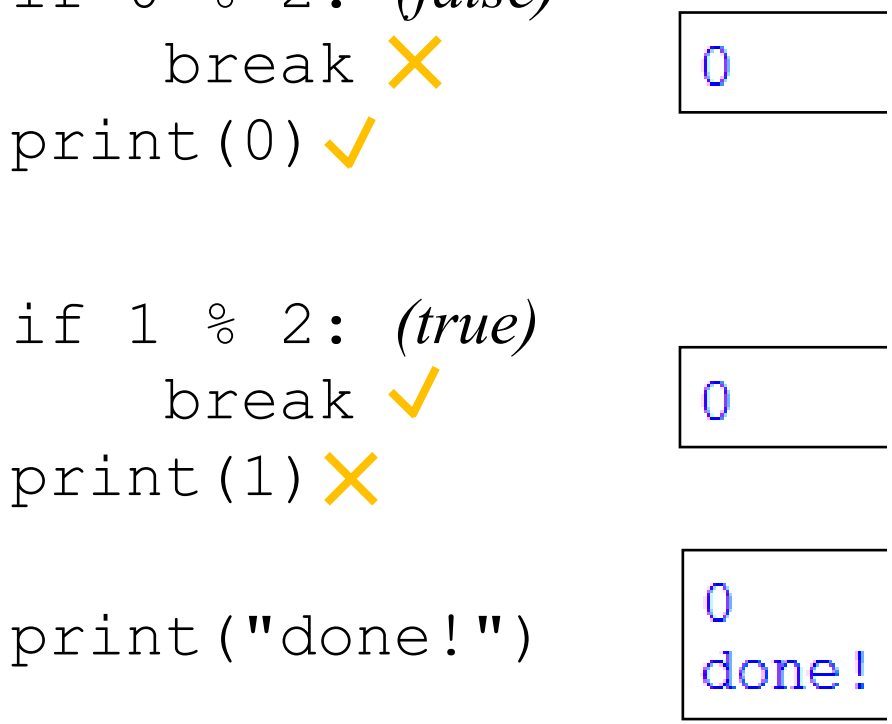
```
0
2
4
6
8
```

```
print("done!")
```

```
0
2
4
6
8
done!
```

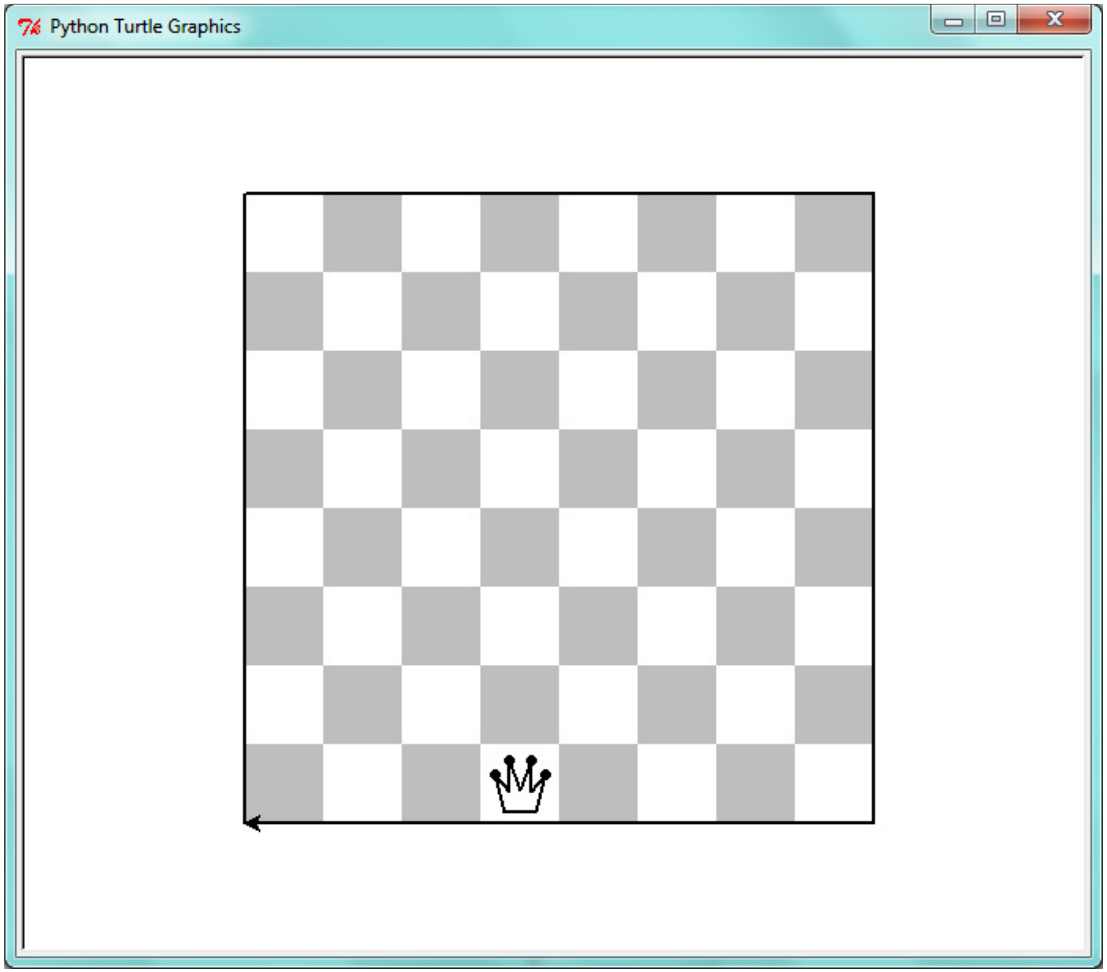
Illustration of What Happens in the Program Using 'break'

- In the example using `break`:
  - when `i` = 0, `i%2` is false so `print(i)` is executed and the loop continues with the next number
  - when `i` = 1, `i%2` is true so `break` is executed and the loop immediately stops (`print` is not executed)
  - Finally, the `print` statement after the for loop is executed



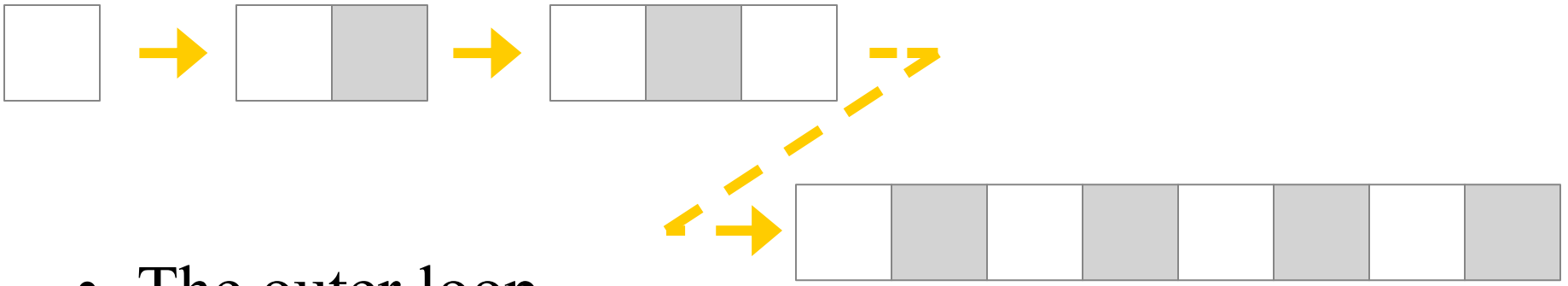
Drawing a Chess Board

- The next example uses a nested loop and the continue command to draw a chess board:

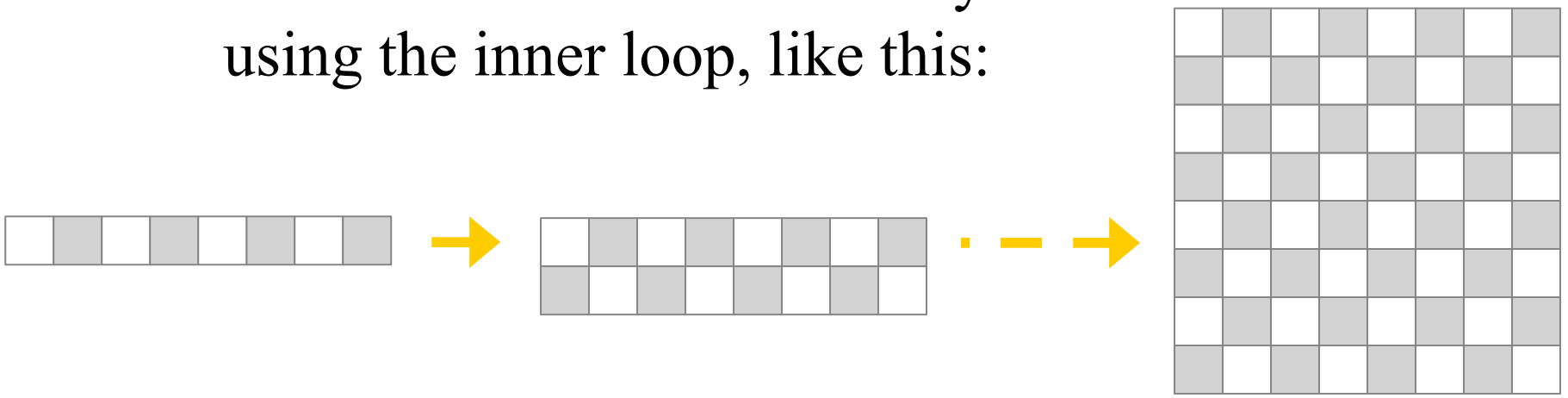


Inner Loop and Outer Loop

- The inner loop
  - draws a single row box by box, like this:

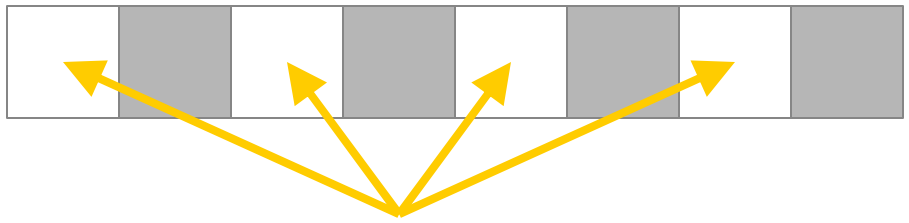


- The outer loop
  - draws the chess board row by row using the inner loop, like this:



The Inner Loop – Drawing a Row

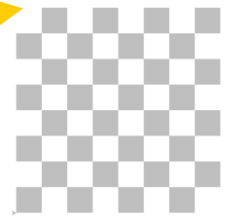
- A white box or a gray box is shown in the chess board depending on the row number and the column number of the box
- No drawing is required for a white box because the background is already white, so we can use `continue` to skip the drawing for a white box

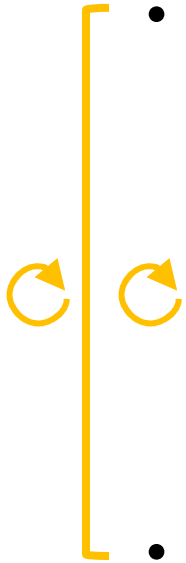


skip

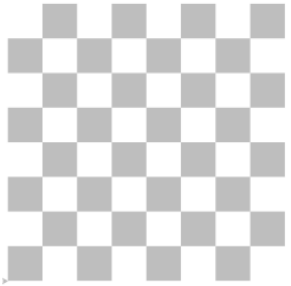
Designing the Code

- Let's draw the chess board using two loops
  - Move to the top-left hand corner of the chess board
  - **Outer loop:** repeat eight times for drawing eight rows
    - **Inner loop:** repeat eight times for the eight boxes
      - If the current box is a white box, move to the next box position (no drawing occurs) and stop the current loop
      - Draw a gray box
      - Move to the next box position
  - Move to the position of the next row
- We will show the code in the following slides





Drawing the Chess Board – The Code 1/2



```
turtle.up()
turtle.goto(-200, 200)
turtle.down()
```

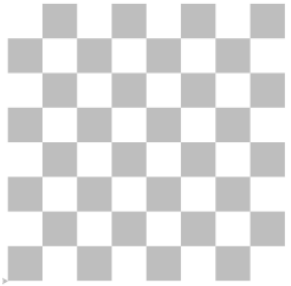
Move to the top-left hand corner of the chess board

```
for row in range(8):
    for col in range(8):
        if col % 2 == row % 2:
            turtle.forward(50)
            continue
```

If both row and column are odd numbers, or both are even numbers, move to the next box (i.e. leave this part white) and stop the current loop

... the inner loop is continued on the next slide ...

Drawing the Chess Board – The Code 2/2



... this is the inner loop continued from the previous slide ...

```
turtle.begin_fill()
for _ in range(4):
    turtle.forward(50)
    turtle.right(90)
turtle.end_fill()
turtle.forward(50)
```

Draw a gray box

Move to the next box position

```
turtle.backward(400)
turtle.right(90)
turtle.forward(50)
turtle.left(90)
```

Move to the position of the next row

Finishing the Chess Board

- We could add a border around the chess board and a queen chess piece to make a nice final image, like this:
- The code to draw the black border and the chess piece is not shown in this presentation