

Objectives

- Boolean operators
- Indefinite Loops

Problem

- We are grading a science fair.
- There is different criteria for winning first place, depending on what grade you are.
- Given the variables `scienceScore` and `grade`
 - Write a condition that will evaluate to `True` if (and only if) the student's score is above the first place threshold of 60 points and the student's grade is 8.
 - Otherwise, the condition should evaluate to `False`

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- Given the variables `scienceScore` and `grade`
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 - Otherwise, the condition should evaluate to `False`

```
scienceScore > 60 and grade == 8
```

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Short-circuit Evaluation

- Don't necessarily need to evaluate all expressions in a compound expression
- A **and** B
 - If A is `False`, compound expression is `False`
- A **or** B
 - If A is `True`, compound expression is `True`
- No need to evaluate B
 - Put more important/limiting expression first

➤ Example:

```
if count != 0 and sum/count > 10:  
    do something
```

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INDEFINITE LOOPS

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Indefinite Loops

- **for** loops are *definite* loops
 - Execute a *fixed* number of times
- *Indefinite* loops: keep iterating until certain conditions are met
 - Depending on condition, no guarantee in advance of how many times the loop body will be executed

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While Loop Syntax

while condition :
statement1
statement2
...
statementn

keyword

body of while loop

loop stops when condition is False

- Like a looped **if** statement
 - Execute statements **only** when condition is true

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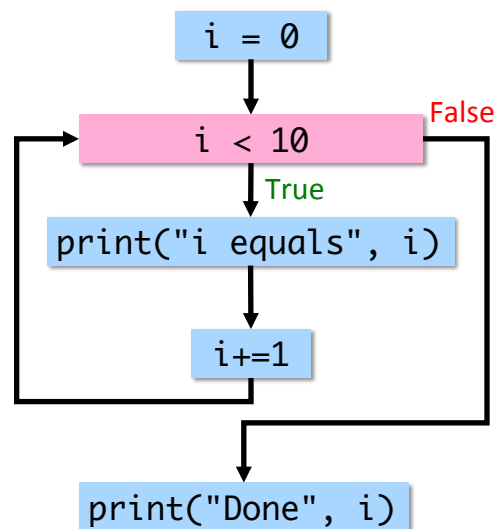
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While Loop

```
i = 0
while i < 10 :
    print("i equals", i)
    i+=1
print("Done", i)
```

Questions:

- How many times will **i** get printed out?
- How many times is the condition evaluated?
- What is the value of **i** after the loop?



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`while.py`

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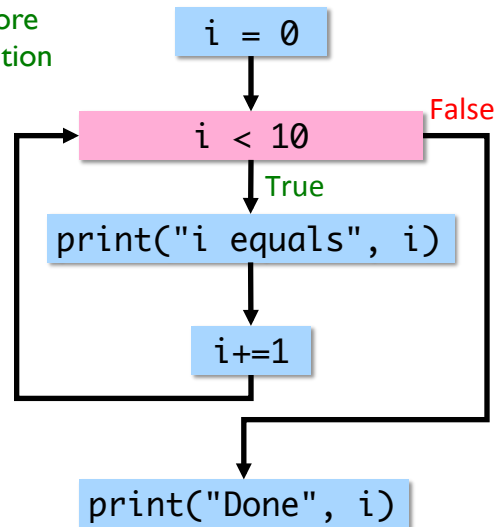
While Loop

```
i = 0  
while i < 10 :  
    print("i equals", i)  
    i+=1  
print("Done", i)
```

← Initialize i before using in condition

Questions:

- How many times will `i` get printed out?
- How many times is the condition evaluated?
- What is the value of `i` after the loop?



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while.py

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While vs. For Loops

- Any **for** loop can be translated into a **while** loop
- But **NOT** vice versa

➤ **while** loops are more **powerful** than **for** loops

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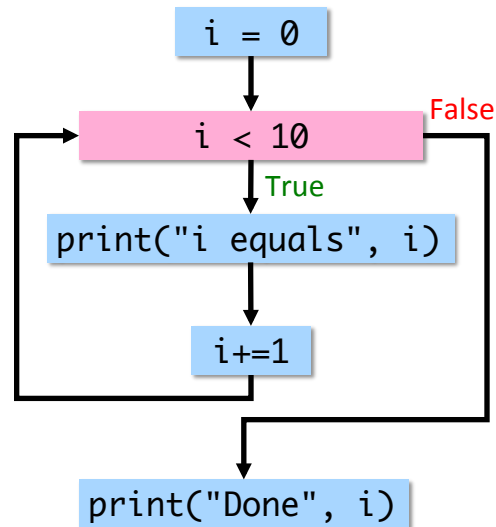
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Convert to a **for** loop

We *can* convert this **while** loop into a **for** loop because it executes a *fixed* number of times.

```
i = 0
while i < 10 :
    print("i equals", i)
    i+=1
print("Done", i)
```



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Comparing **while** and **for**

- What are the main differences between these loops?
- What are the advantages and disadvantages of each?

```
i = 0
while i < 10 :
    print("i equals", i)
    i+=1
print("Done", i)
```

```
for i in range(10):
    print("i equals", i)
print("Done", i+1)
```

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[whilevsfor.py](#)

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What Will This Loop Do?

```
count = 1
while count > 0:
    print(count)
    count += 1
```

Infinite Loop

- Condition will never be False so keeps executing

```
count = 1
while count > 0:
    print(count)
    count += 1
```

- To stop an executing program in Linux use
➤ Control-C

Infinite Loop Discussion

- Is there ever a time that an infinite loop is wanted?
 - Yes! For example in web servers, we have something like

```
while True:
    listenForRequest()
    handleRequest()
```
- Can a computer automatically detect infinite loops?
 - No that is an **undecidable** problem
 - Best to **prevent** infinite loops (more later)
 - Benefit of **for** loops: definite loops

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A Very Simple Therapist

- Whenever a user tells the computer/program what they think, the program asks, "How does that make you feel?"
- Ends when user enters nothing ("")
- Partial example output:

```
Tell me what is bothering you.
There is too much going on in my life.
How does that make you feel?
I feel like I am out of control and can't juggle it all.
How does that make you feel?
Really stressed and tired.
How does that make you feel?

Thank you! Come again!
```

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therapist.py

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Design Pattern: Sentinel Loop

- Sentinel: when to stop
 - “guard” to the loop

```
value = get input
while value != sentinel :
    process value
    value = get input
```

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while Loops: comparing use of break

```
# condition says when loop
# will continue
x=eval(input("Enter number:"))
while x % 2 != 0 :
    print("Error!")
    x = eval(input("Enter
number: "))
print(x, "is an even number.")
```

Says when to keep going

```
# have to look inside loop to
# know when it stops
while True :
    x = eval(input("Enter number:"))
    if x % 2 == 0 :
        break    "breaks" out of a loop
    print("Error!")
print(x, "is an even number.")
```

Says when to stop

Using break statements:
Best when loop has to
execute at least once.

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Transform Therapist

- Write using a break instead...

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Summary: While vs. For Loops

- Any **for** loop can be translated into a **while** loop
- But **not** vice versa
- **while** loops are more **powerful** than **for** loops
 - Give an example of a **while** loop that can't be converted to a **for**

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Flipping Coins

- Problem: How many flips does it take to get 3 consecutive heads?
 - How can we simulate flipping a coin?

`game.py`
`consecutiveHeads.py`

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Looking Ahead

- Lab 5 due Friday
- Broader Issue: Self-driving Cars

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