# CSIT881
# Programming and Data Structures

**While-Loop Statements**

UNIVERSITY
OF WOLLONGONG
AUSTRALIA

*Dr. Joseph Tonien*

# Objectives

- While loop

# The first while-loop example

```
for i in range(0,10):
  print(i)
```

| | |
|---|---|
| i = 0, print(i) | 0 |
| i = 1, print(i) | 1 |
| i = 2, print(i) | 2 |
| i = 3, print(i) | 3 |
| i = 4, print(i) | 4 |
| i = 5, print(i) | 5 |
| i = 6, print(i) | 6 |
| i = 7, print(i) | 7 |
| i = 8, print(i) | 8 |
| i = 9, print(i) | 9 |

initialization statement

conditional statement

post-loop statement

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

# Going backwards

initialization statement →

```
i = 9
while (i >= 0):    ← conditional statement
   print(i)
   i = i - 1
```

post-loop statement →

```
i = 9, print(i) ————————————→ 9
i = 8, print(i) ————————————→ 8
i = 7, print(i) ————————————→ 7
i = 6, print(i) ————————————→ 6
i = 5, print(i) ————————————→ 5
i = 4, print(i) ————————————→ 4
i = 3, print(i) ————————————→ 3
i = 2, print(i) ————————————→ 2
i = 1, print(i) ————————————→ 1
i = 0, print(i) ————————————→ 0
```

4

# Times table example

```
for i in range(1,10):
  print("{0} x {1} = {2}".format(i, 5, 5*i))
```

```
i = 1, print("{0} x {1} = {2}".format(i, 5, 5*i))      1 x 5 = 5
i = 2, print("{0} x {1} = {2}".format(i, 5, 5*i))      2 x 5 = 10
i = 3, print("{0} x {1} = {2}".format(i, 5, 5*i))      3 x 5 = 15
i = 4, print("{0} x {1} = {2}".format(i, 5, 5*i))      4 x 5 = 20
i = 5, print("{0} x {1} = {2}".format(i, 5, 5*i))      5 x 5 = 25
i = 6, print("{0} x {1} = {2}".format(i, 5, 5*i))      6 x 5 = 30
i = 7, print("{0} x {1} = {2}".format(i, 5, 5*i))      7 x 5 = 35
i = 8, print("{0} x {1} = {2}".format(i, 5, 5*i))      8 x 5 = 40
i = 9, print("{0} x {1} = {2}".format(i, 5, 5*i))      9 x 5 = 45
```

```
i = 0
while (i < 10):
  print("{0} x {1} = {2}".format(i, 5, 5*i))
  i = i + 1
```

# Friend of 10 table

```
for i in range(0,11):
  print("{0:>2} + {1:>2} = {2:>2}".format(i, 10 - i, 10))
```

| | | |
|---|---|---|
| i = 0 | → | 0 + 10 = 10 |
| i = 1 | → | 1 + 9 = 10 |
| i = 2 | → | 2 + 8 = 10 |
| i = 3 | → | 3 + 7 = 10 |
| i = 4 | → | 4 + 6 = 10 |
| i = 5 | → | 5 + 5 = 10 |
| i = 6 | → | 6 + 4 = 10 |
| i = 7 | → | 7 + 3 = 10 |
| i = 8 | → | 8 + 2 = 10 |
| i = 9 | → | 9 + 1 = 10 |
| i = 10 | → | 10 + 0 = 10 |

```
i = 0
while (i <= 10):
  print("{0:>2} + {1:>2} = {2:>2}".format(i, 10 - i, 10))
  i = i + 1
```

# Questions

What is the output of the following codes?

A
```
i = 0
while (i < 10):
  print(i)
  i = i + 2
```

B
```
i = 0
while (i < 10):
  i = i + 2
  print(i)
```

# Questions

What is the output of the following codes?

C
```
i = 10
while (i < 10):
  print(i)
  i = i + 1
```

D
```
i = 5
while (i < 10):
  print(i)
  i = i + 1
```

E
```
i = 5
while (i < 10):
  i = i + 1
  print(i)
```

# Questions

What is the output of the following codes?

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

G
```
i = 0
while (i < 10):
  print(i)
```

H
```
while (cat < 10):
  print(cat)
  cat = cat + 1
```

9

# Even numbers

```
0, 2, 4, 6, 8, 10.
```

i = 0          i = 2          i = 10

```python
i = 0
while (i <= 10):
    trailing = "cat"

    # display the number
    print(i, end="")

    # display the trailing
    print(trailing, end="")

    # update the even number
    i = i + 2
```

```
0cat2cat4cat6cat8cat10cat
```

# Even numbers

```
0, 2, 4, 6, 8, 10.
```

i = 0          i = 2          i = 10
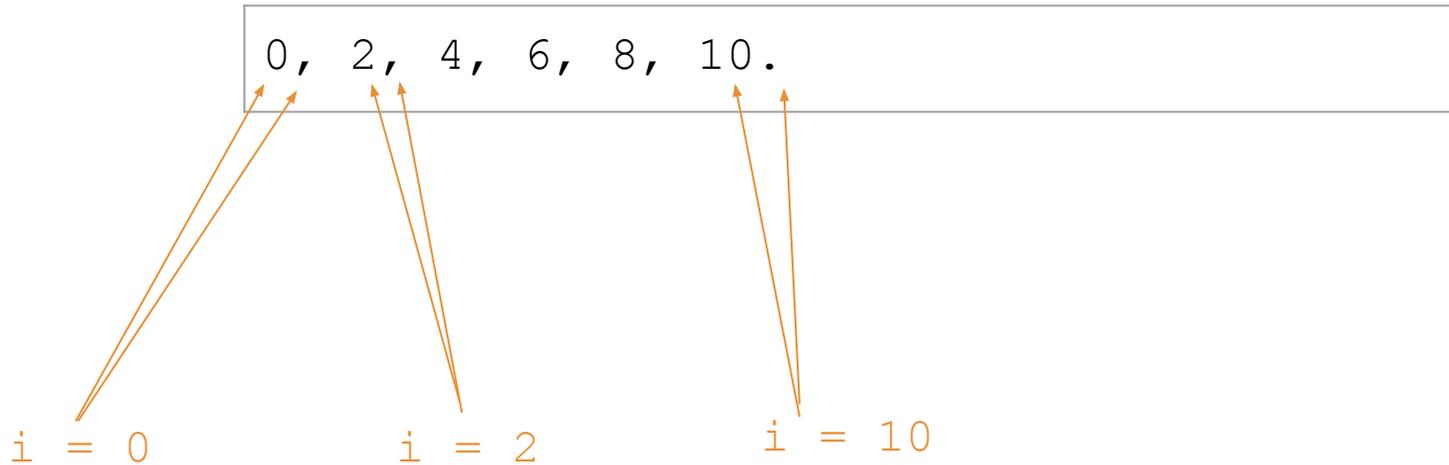
```
i = 0
while (i <= 10):
    # determine the trailing
    if (i < 10):
        trailing = ", "
    else:
        trailing = "."

    print(i, end="")
    print(trailing, end="")

    i = i + 2
```

# Display equations

```
Enter start number: 4
Enter end number: 7

Equations:
4 + 4 = 8
5 + 5 = 10
6 + 6 = 12
7 + 7 = 14
```

```python
# ask user for start number

# ask user for end number

# display equations between the two input numbers
```

# Display equations

```python
# ask user for start number and end number
user_input = input("Enter start number: ")
number_start = int(user_input)

user_input = input("Enter end number: ")
number_end = int(user_input)

# display equations between the two input numbers
print("Equations:")

# initialise number to the start number
number = number_start

# repeat as long as number is <= number_end
while(number <= number_end):

    print("{0} + {1} = {2}".format(number, number, number*2))

    # increase the number by 1
    number = number + 1
```

```
4 + 4 = 8
5 + 5 = 10
6 + 6 = 12
7 + 7 = 14
```

# while loop that runs forever

```
while True:
  user_input = input("Enter something: ")
  print("You have entered: " + user_input)
```

This program will run forever!

```
Enter something: Clocks on fox tick
You have entered: Clocks on fox tick
Enter something: Clocks on Knox tock
You have entered: Clocks on Knox tock
Enter something: Six sick bricks tick
You have entered: Six sick bricks tick
Enter something: Six sick chicks tock
You have entered: Six sick chicks tock
…………
```

# this while loop will stop if user enters q

```python
while True:
  user_input = input("Enter something (or q to quit): ")

  if (user_input == "q"):
    print("Goodbye!")
    break

  print("You have entered: " + user_input)
  print()
```

use **break** to stop the loop

```
Enter something (or q to quit): Clocks on fox tick
You have entered: Clocks on fox tick

Enter something (or q to quit): Clocks on Knox tock
You have entered: Clocks on Knox tock

Enter something (or q to quit): Six sick bricks tick
You have entered: Six sick bricks tick

Enter something (or q to quit): q
Goodbye!
```

15

# Keep asking until user enters a positive number

```
Enter a positive integer: -2

Enter a positive integer: 0

Enter a positive integer: -5

Enter a positive integer: 20
You have entered: 20
```

```
Enter a positive integer: 6
You have entered: 6
```

# Keep asking until user enters a positive number

```python
while True:
  user_input = input("Enter a positive integer: ")
  number = int(user_input)

  if (number > 0):
    break

  print()

print("You have entered: {0}".format(number))
```

User has entered a positive number. Hurray!!!

*use* **break** *to stop the loop*

```
Enter a positive integer: -2

Enter a positive integer: 0

Enter a positive integer: -5

Enter a positive integer: 20
You have entered: 20
```

# Counting even and odd numbers

```
Enter an integer (or q to quit): 5
Enter an integer (or q to quit): 7
Enter an integer (or q to quit): 0
Enter an integer (or q to quit): 13
Enter an integer (or q to quit): 8
Enter an integer (or q to quit): 15
Enter an integer (or q to quit): q
You have entered 2 even numbers
You have entered 4 odd numbers
```

# Counting even and odd numbers

```python
even_count = 0
odd_count = 0

while True:
  user_input = input("Enter an integer (or q to quit): ")

  if (user_input == "q"):
    break

  number = int(user_input)

  if (number%2 == 0):
    even_count += 1
  else:
    odd_count += 1

print("You have entered {0} even numbers".format(even_count))
print("You have entered {0} odd numbers".format(odd_count))
```

# Green egg and ham?

```
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Oh well, you don't know what you're missing!
```

```
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): N
Would you like green eggs and ham? (Y/N): Y
That's a smart choice!
```

# Green egg and ham?

```python
# how many time we ask the question
ask_count = 0

# keep asking green egg question
while True:
  answer = input("Would you like green eggs and ham? (Y/N): ")
  ask_count = ask_count + 1

  if (answer == "Y"):
    print("That's a smart choice!")
    break                              use break to stop the loop

  if (ask_count == 10):
    # after 10 times, user still says NO, ok enough!
    print("Oh well, you don't know what you're missing!")
    break                              use break to stop the loop
```