







# CS1117 – Introduction to Programming

Dr. Jason Quinlan, School of Computer Science and Information Technology

#### A TRADITION OF INDEPENDENT THINKING



# Extra coding class

Going forward I plan on adding an extra class On Monday mornings, 10-11am

It will be in G20, where any CS1117 student can come and ask me questions

I'll go over anything and everything covered so far

Attendance is not mandatory, no sign in will be taken, it's just for you to ask me anything that you are unsure of.



# Extra coding class

As part of this class, I have uploaded a Google form to Canvas under Modules - Feedback

You can select concepts we have covered and give some feedback on what you would like me to cover

At the end of each coding class, I shall reset the form, so each week you get to give me new feedback



#### **Continuous Assessment 1**

Wednesday – 23<sup>rd</sup> October 3-4pm in room 107

**Multiple Choice Questions** 



#### **Continuous Assessment 2**

Canvas access from 12<sup>th</sup> November 9am

Submission deadline 23<sup>rd</sup> November 1am

Covering Lectures from week 1 to week 9



# List Recap

In List we can use all the functions we have seen for Tuple, plus we can use:

Functions - list.append(), list.sort(), list.remove(value), del list[index], list.reverse(), min/max(list), insert(index,value)

Operators - \*, +, +=

Negative indexing — list[-2]

Slicing – list[start:end], list[start:end:step]

Slicing works for string, list, tuple but not float or int (cast...)



Lists are a cool way to hold data we can modify



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But it is time consuming to fill a list based on what we know so far



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Say, I want a user to input their favourite things from the Harry Potter movies:



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Say, I want a user to input their favourite things from the Harry Potter movies:

So, harry, hermonie, ron, owls, wands, golden snitch, he who must not be named, etc.



Lists are a cool way to hold data we can modify

But it is time consuming to fill a list based on what we know so far

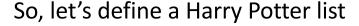
Say, I want a user to input their favourite things from the Harry Potter movies:

So, harry, hermonie, ron, owls, wands, golden snitch, he who must not be named, etc.

Let's look at some code for this:



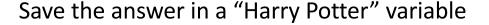
```
HP list = []
 # ask a question
HP item = input("Tell me something you liked from the Harry Potter movies: ")
HP_list.append(HP_item)
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 # append to the HP list
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HP item = input("Tell me something you liked from the Harry Potter movies: "),
```

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  append to the HP list
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HP list = []
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```

Let's add this item to the HP list using append()



```
HP list = []
HP item = input("Tell me something vou liked from the Harry Potter movies: ")
  append to the HP li
HP_list.append(HP_item)
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```
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HP_list.append(HP_item)
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```

No, the index does not exist and will throw an exception



```
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HP_list.append(HP_item)
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So let's add a little bit of extra text to our question

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
# if nothing has been passed in, then stop
if HP_item == "":
    exit()
# append to the HP list
HP_list.append(HP_item)
print(HP_list)
```



So let's add a little bit of extra text to our question

(press enter to stop)

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# empty Harry Potter list
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(press enter to stop)

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# if nothing has been passed in, then stop
if HP_item == "":
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# append to the HP list
HP_list.append(HP_item)
print(HP_list)
```

Which returns an empty string ""



Now let's check if the returned string is empty

```
# empty Harry Potter list
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Now let's check if the returned string is empty

And if it is empty, then call the exit() function

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    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
# if nothing has been passed in, then stop
if HP_item == "":
    exit()
# append to the HP list
HP_list.append(HP_item)
print(HP_list)
```

Which stops the program



Now let's check if the returned string is empty

if it is not empty, then add the item to the HP list

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
# if nothing has been passed in, then stop
if HP_item == "":
    exit()
# append to the HP list
HP_list.append(HP_item)
print(HP_list)
```



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# if nothing has been passed in, then stop
if HP_item == "":
    exit()
# append to the HP list
HP_list.append(HP_item)
print(HP_list)
```

And print the list, so I can see what is being added to list



Now let's check if the returned string is empty

if it is not empty, then add the item to the HP list

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
# if nothing has been passed in, then stop
if HP_item == "":
    exit()
# append to the HP list
HP_list.append(HP_item)
print(HP_list)
```

And print the list, so I can see what is being added to list

Now, let's add all of this extra code to each question...



#### This is even worse...

```
HP_list = []
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
if HP_item == "":
    exit()
HP list.append(HP item)
```



#### This is even worse...

```
HP_list = []
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
if HP_item == "":
    exit()
HP list.append(HP item)
```

But we can see repetition of code



#### This is even worse...

```
HP_list = []
HP_item = input(
  "Tell me something you liked from the Harry Potter movies: (press enter to stop)")
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
HP item = input(
   "Tell me something you liked from the Harry Potter movies: (press enter to stop)"
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)"
if HP_item == "":
    exit()
 # append to the HP list
HP list append(HP item)
```

But we can see repetition of code



Can we write a function??

#### This is even worse...

```
HP_list = []
HP_item = input(
   "Tell me something you liked from the Harry Potter movies: (press enter to stop)"
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
HP item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)"
if HP_item == "":
    exit()
HP_list.append(HP_item)
print(HP_list)
# ask a questi<u>on</u>
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop)"
if HP_item == "":
    exit()
 # append to the HP list
HP list append(HP item)
```

But we can see repetition of code



Can we write a function??

HP\_list = []

This is even worse... see repetition of code

Yes, but each call to the function is repeating code

```
HP_item = input(
     "Tell me something you liked from the Harry Potter movies: (press enter to stop)
 if HP_item == "":
     exit()
HP_list.append(HP_item)
 print(HP_list)
HP item = input(
     "Tell me something you liked from the Harry Potter movies: (press enter to stop)"
 if HP_item == "":
     exit()
 HP_list.append(HP_item)
 print(HP_list)
 # ask a questi<u>on</u>
 HP_item = input(
     "Tell me something you liked from the Harry Potter movies: (press enter to stop)"
 if HP_item == "":
     exit()
 HP list append(HP item)
```



But we can

### Let's try something new

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```



#### Here we have the same list definition

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```



### The same question

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```



### The same append



### And the same print list



#### But instead of our if conditional check

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```



#### We have a while conditional check

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```



#### We have a while conditional check

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```

It uses the same Boolean logic as if/else/elif



#### We have a while conditional check

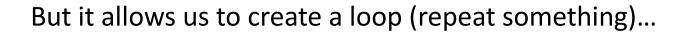
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    HP_item = input(
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print(HP_list)
```

It uses the same Boolean logic as if/else/elif





Let's try and see if we can work out what is happening...

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
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    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```

So create a list and ask an initial question



Let's try and see if we can work out what is happening...

```
# empty Harry Potter list
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# ask a question
HP_item = input(
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while HP_item != "":
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    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```

Then check if the returned answers is not the empty string



Let's try and see if we can work out what is happening...

```
# empty Harry Potter list
HP_list = []

# ask a question
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while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```

If this is True, then execute the code in the statement block



Let's try and see if we can work out what is happening...

```
# empty Harry Potter list
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    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```

Everything fine so far...



Let's try and see if we can work out what is happening...

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print(HP_list)
```

Now the while



#### While loop

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```

With Python code, we start here



#### While loop

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#### While loop





#### While loop

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print(HP_list)
```



### While loop

With Python code, we start here and go line by line

If this is True, we move to the statement block



#### While loop

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With Python code, we start here and go line by line

At the end of the statement block we move to the next line



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    # append to list

→ HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```



#### While loop

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    # ask the question again

>> HP_item = input(
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print(HP_list)
```



### While loop

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    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```

But for While, once we reach the end of the statement block

We check again. We repeat this until the condition is False



#### While loop

```
# empty Harry Potter list
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# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

print(HP_list)
```

So in this example, I ask a question, and if the answer is not the empty string, I add the item to the list and I ask the question again



#### While loop – sample output

```
# empty Harry Potter list
HP_list = []

# ask a question
HP_item = input(
    "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

while HP_item != "":
    # append to list
    HP_list.append(HP_item)
    # ask the question again
    HP_item = input(
        "Tell me something you liked from the Harry Potter movies: (press enter to stop): ")

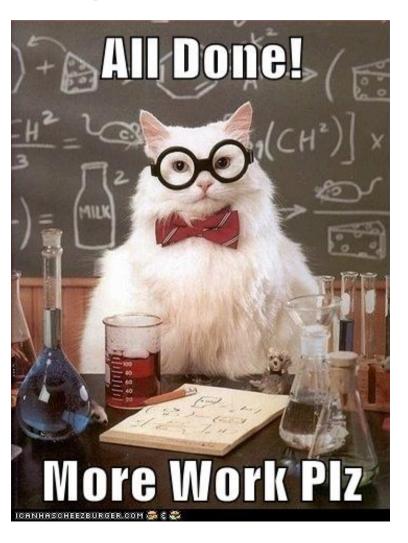
print(HP_list)
```

```
Tell me something you liked from the Harry Potter movies: (press enter to stop): harry Tell me something you liked from the Harry Potter movies: (press enter to stop): hermonie Tell me something you liked from the Harry Potter movies: (press enter to stop): ron Tell me something you liked from the Harry Potter movies: (press enter to stop): ['harry', 'hermonie', 'ron']
```



# Canvas Student App

#### Let's Sign into this lecture now





Live Coding Time...



We now have a mechanism for looping over repeating code



We now have a mechanism for looping over repeating code

We use a While loop when we're not sure how many times to execute a piece of code i.e. **indefinite** loop



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While the condition remains True, execute the statement block



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We use a While loop when we're not sure how many times to execute a piece of code i.e. **indefinite** loop

While the condition remains True, execute the statement block

Remember we need some way to make the condition False



We now have a mechanism for looping over repeating code

We use a While loop when we're not sure how many times to execute a piece of code i.e. **indefinite** loop

While the condition remains True, execute the statement block

Remember we need some way to make the condition False

Otherwise it becomes an infinite loop...



Let's look at a very common example

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



Let's look at a very common example

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

We set a counter (also called a control variable)



Let's look at a very common example

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

We set a counter

The variable name does not matter, but 'i' is normally used



Let's look at a very common example

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

While 'i' is less than 10



Let's look at a very common example

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

While 'I' is less than 10

Execute the statement block



Let's look at a very common example

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

While 'i' is less than 10

Execute the statement block



Let's look at a very common example

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

Print the value of 'i'

And add 1 to 'i'



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```



Let's look at a very common example - output



```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

First time in the while loop, i == 0



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

First time in the while loop, i == 0



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

Then we add 1 to 'i'



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

Then we add 1 to 'i'



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

Now i == 1



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

We continue this until i == 9



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

We continue this until i == 9



#### Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

At which point we add 1 to i i.e., i == 10



#### Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

We now check the statement condition



Let's look at a very common example - output



```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

We now check the statement condition



#### Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

Which is now False i.e., i (10) is not less than 10



#### Let's look at a very common example - output

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

print("Phew. The While has stopped")</pre>
```

# 0

# 2

# 2

# 3

# 5

# 6

# 7

# 8

# 9

# Phew. The While has stopped

The while condition is now False, so we move to the next line of code



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

The while condition is now False, so we move to the next line of code



Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

And we print "Phew..."



#### Let's look at a very common example - output

```
i = 0
while i < 10:
    print(i)
    i += 1
print("Phew. The While has stopped")
```

And we print "Phew ..."



Let's look at a very common mistake

```
i = 0
while i < 10:
    print(i)
# i += 1</pre>
```



Let's look at a very common mistake

```
i = 0
while i < 10:
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# i += 1</pre>
```

If we forget to increment our counter



Let's look at a very common mistake

```
i = 0
while i < 10:
    print(i)
# i += 1</pre>
```

If we forget to increment our count



If we change our code ever so slightly

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

print("\nPhew. The While has stopped")</pre>
```



If we change our code ever so slightly

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

print("\nPhew. The While has stopped")</pre>
```

We can print the output on one line



If we change our code ever so slightly

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

print("\nPhew. The While has stopped")</pre>
```

We can print the output on one line

```
0 1 2 3 4 5 6 7 8 9
Phew. The While has stopped
```



If we change our code ever so slightly

```
i = 0
while i < 10:
    print(i, end=" ")
    i += 2

print("\nPhew. The While has stopped")

# Output
# 0 2 4 6 8
# Phew. The While has stopped</pre>
```

If we change what we add to our counter, we can print only even numbers



If we change our code ever so slightly

```
i = 1
while i < 10:
    print(i, end=" ")
    i += 2

print("\nPhew. The While has stopped")

# Output
# 1 3 5 7 9
# Phew. The While has stopped</pre>
```

And if we change the initial value of our counter we can print only odd numbers





