Nested Loops

Programming and Algorithms

```python
n = 3
for i in range(1,n+1):
    print("Hello World!")
```

Hello World!
Hello World!
Hello World!

Lecture by

Dr Daniil Osudin

STEM Digital Academy

School of Science & Technology

www.city.ac.uk

What will we Cover?

- Nested Loops

- Using FOR and WHILE loops

- Using the Boolean data type

Nested Loops

Body of a FOR or WHILE loop contains another FOR or WHILE statement

A nested loop can contain another loop and so on

Examples

Nina walks to the train station every morning

- Walking is an action of moving forward by repetitively
    - Taking a step with one leg
    - Taking a step with the other leg
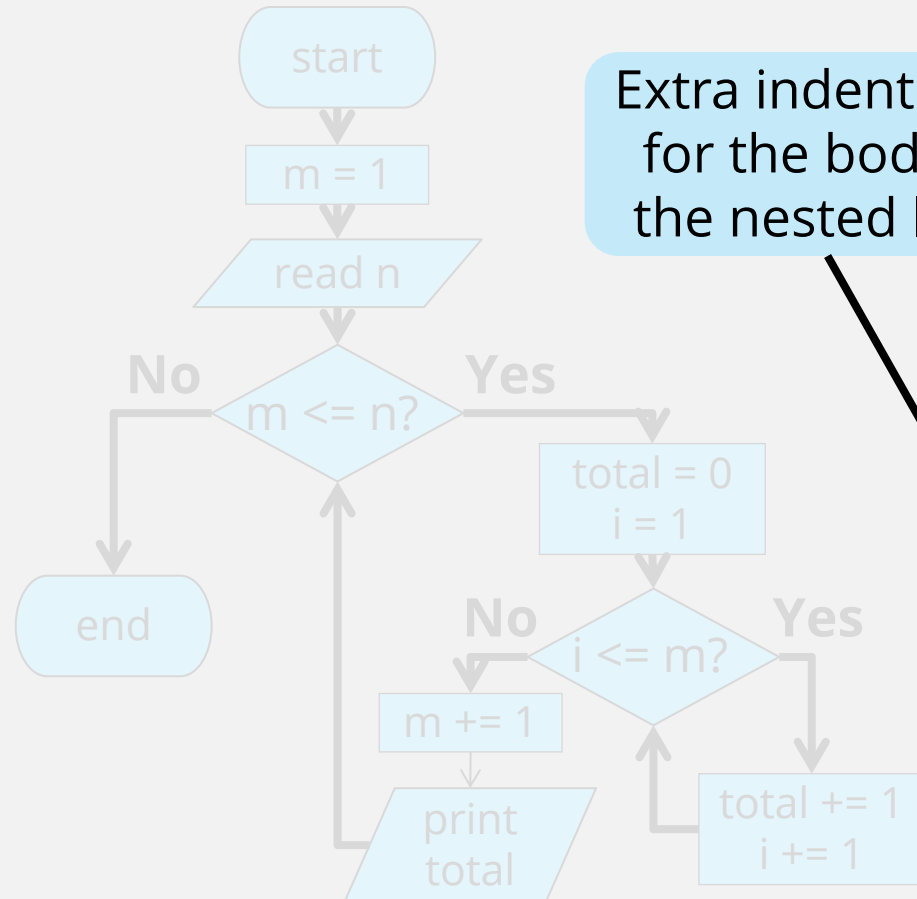
Nested Loops in Python

The nested loop is executed multiple times

```
while <condition>:
 body(while <condition>:
  body)
```

Extra indentation for the body of the nested IF statement

One or multiple statements in each body.

Nested Loop Flow Chart

start

m = 1

read n

No   Yes
m <= n?

end

total = 0
i = 1

No   Yes
i <= m?

m += 1

print
total

total += 1
i += 1

Extra indentation
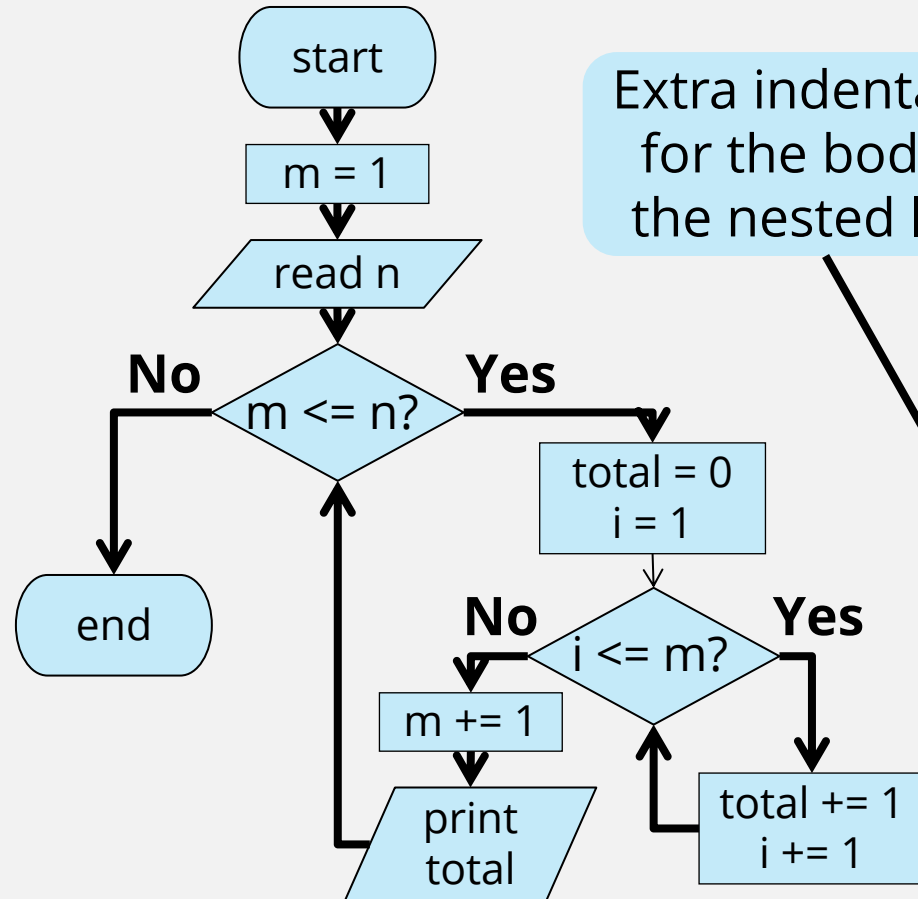for the body of
the nested loop

```
n = int(input("enter n: "))
m = 1
while m <= n:
  total = 0
  i = 1
  while i <= m:
   total += i
    i += 1
  m += 1
print("sum is", total)
```

Condition 1

Set variables for
the nested loop

Condition 2

Nested Loop Flow Chart

start

m = 1

read n

m <= n?   No   Yes

end

total = 0
i = 1

No   i <= m?   Yes

m += 1

print
total

total += 1
i += 1

Extra indentation for the body of the nested loop

```
n = int(input("enter n: "))
m = 1
while m <= n:
  total = 0
  i = 1
  while i <= m:
    total += i
    i += 1
  m += 1
print("sum is", total)
```

Condition 1

Set variables for the nested loop

Condition 2

Examples

```python
n = int(input("enter n: "))
m = 1
while m <= n:
    total = 0
    i = 1
    while i <= m:
        total += i
        i += 1
    print("sum of 1 to", m, "is", total)
    m += 1
```

Condition 1

Condition 2

Body 2

Body 1

```
enter n: 4
sum of 1 to 1 is 1
sum of 1 to 2 is 3
sum of 1 to 3 is 6
sum of 1 to 4 is 10
```

Try It Yourself

Trace the execution of the following nested loop:

```python
n = int(input("enter n: "))
total = 0
while n > 0:
    m = n
    i = 1
    while i <= m:
        total += i
        i += 1
    n -= 1
print("total is", total)
```

```
enter n: 6
total is 56
```