

Repetition Structures cont'd: Nested Loops and Input Validation

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Nested Loops

A loop that is inside another loop is called a nested loop.

For each iteration of the outside loop, the inside loop runs *all* of its iterations.

e.g.

```
for minutes in range(60):  
    for seconds in range(60):  
        print(minutes, ':', seconds)
```

#for each minute
#-> all of the 60 secs are printed
i.e. all of the 60 iterations are
#carried out of the inner loop

Nested Loops

Here is another example showing where the outside loops start and end:

```
for outside in ['outside1', 'outside2', 'outside3']:
    print ('start of ', outside, 'loop')
    for inside in ['inside1', 'inside2', 'inside3']:
        print (inside)
    print ('end of ', outside, 'loop')
```

Nested Loops

To create 10 rows x 5 columns with *

```
for row in range(10):  
    for column in range(5):  
        print('*', end=' ')  
    print()
```

Nested Loops

To get a triangular pattern:

```
for row in range(10):  
    for column in range (row+1): #This is the only difference  
        print('*', end=' ')  
    print()
```

Can you create a triangular pattern so that the top row has 10 *s and bottom row of 1 *

Input Validation Loops

Input validation is the process of inspecting data that has been input to a program to make sure it is valid before it is used in a computation.

It is introduced in the context of loops because it is often done in a context of a loop.

The loop keeps iterating as long as the inputted data is not valid.

Input Validation Loops

```
#Get a test score (must be between 0-100)
score = int(input('Enter a test score: '))
while score<0 or score>100:
    print('ERROR: The score cannot be negative')
    print('or greater than 100.')
    score= (input('Enter the correct score: '))
```

Sentinel

A sentinel is a special value of your choosing that marks the end of a sequence of values.

It is useful when asking for input in a loop as a way to end the loop.

E.g. if you are asking for input of test scores in a while loop and the user can enter the sentinel -1 to end the while loop.

```
while score != -1:  
    score = int(input('Enter the next test score: '))
```