CS 133 - Introduction to Computational and Data Science

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Introduction to Python II

- In the previous class, you have learned functions and if statement.

If statement

The code we have seen before is “always” executed. How would we create cases in which only some code is executed?

- **if expression:** # expression is boolean type
  do something when expression is True
  [else:] # this is optional

Practices

1. Get user's score, save it as variable score.
2. print 'A' for score in [90,100], 'B' for [80,90), 'C' for [70,80), 'D' for rest of scores.

Demo to implement it and improvement!

Boolean logic

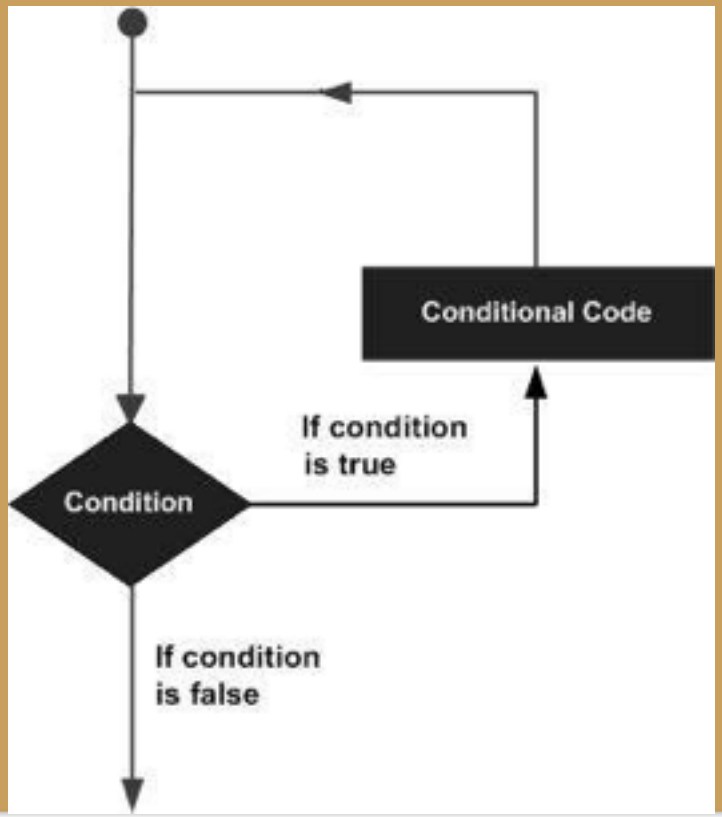
Python expressions can have “and”, “or”:

```
if(a <= 10 and b >= 10 or a == 100 and b!= 5):
    print “Hello”


if( 3 <= a <= 100):
     print “great!”
```

For statement

Python use “for” as keyword to handle loops.



For statement

- **>>> names = [“cao”, “python”]**
- **>>> for name in names:**

  print name

For statement

```
data = [ ("C20H20O3", 308.371),
         ("C22H20O2", 316.393),
         ("C24H40N4O2", 416.6),
         ("C14H25N5O3", 311.38),
         ("C15H20O2", 232.3181)]

for (formula, mw) in data:
         print "The molecular weight of %s is %s" % (formula, mw)
```

```
The molecular weight of C20H20O3 is 308.371
The molecular weight of C22H20O2 is 316.393
The molecular weight of C24H40N4O2 is 416.6
The molecular weight of C14H25N5O3 is 311.38
The molecular weight of C15H20O2 is 232.3181
```

Loop Control Statements

break	Jumps out of the closest enclosing loop
continue	Jumps to the top of the closest enclosing loop
pass	Does nothing, empty statement placeholder

Break and continue in loop

```
>>> for value in [3, 1, 4, 1, 5, 9, 2]:
...     print "Checking", value
...     if value > 8:
...         print "Exiting for loop"
...         break
...     elif value < 3:
...         print "Ignoring"
...         continue
...     print "The square is", value**2
...
```

Range

- “range” creates a list of numbers in a specified range
- range([start,] stop[, step]) -> list of integers
- When step is given, it specifies the increment (or decrement).

```
>>> range(5)
[0, 1, 2, 3, 4]
>>> range(5, 10)
[5, 6, 7, 8, 9]
>>> range(0, 10, 2)
[0, 2, 4, 6, 8]
```

How to get every second element in a list?

```
for i in range(0, len(data), 2):
        print data[i]
```

while

Similar to for, the usage is:

while expression:
    always do when expression is True.

while

```
>while True:
        line = raw_input(' > ')
        if line = = 'done':
                break
        print line
print 'Done!‘
```

How to expand to accept other words?

while

Set a condition for the loop to end

```
>def sequence( n):
        while n != 1:
                print n,
                if n% 2 = = 0: # n is even
                        n = n/ 2
                else: # n is odd
                        n = n* 3 + 1
```

Practice

Fermat's Last Theorem says that there are no integers a, b, and c such that

$$a^n + b^n = c^n$$

for any values of n greater than 2.

1. Write a function named `check_fermat` that takes four parameters — `a`, `b`, `c` and `n` — and that checks to see if Fermat's theorem holds. If n is greater than 2 and it turns out to be true that

$$a^n + b^n = c^n$$

the program should print, "Holy smokes, Fermat was wrong!" Otherwise the program should print, "No, that doesn't work."

Practice

The built-in function `eval` takes a string and evaluates it using the Python interpreter. For example:

```
>>> eval('1 + 2 * 3')
7
>>> import math
>>> eval('math.sqrt(5)')
2.2360679774997898
>>> eval('type(math.pi)')
<type 'float'>
```

Write a function called `eval_loop` that iteratively prompts the user, takes the resulting input and evaluates it using `eval`, and prints the result.

It should continue until the user enters `'done'`, and then return the value of the last expression it evaluated.