

Types

str	'abcd'
int	1,2,3,4
float	1.23
bool	True/False
None	None
type('abc')	shows the type of the object
type conversion	int('123') --> 123
bool(x)	False for x values that are null or empty x. True for otherwise
Naming conventions	lowercase and underscore (<code>_HAPPYday</code> , <code>happyday</code>)

Order of growth

def factorial(n): if n < 2: return 1 return n * factorial(n - 1)	O(n)
def fib(n): if n < 2: return 1 return fib(n - 1) + fib(n - 2)	O(2^n) (each branch produces another 2 branches)
def foo(n): while n > 1: print(n) n = n // 2	O(log n)
def bar(n): while n > 1: x = n while x > 1: print(n, x) x -= 1 n -= 1	O(n^2) (loop in a loop)

Order of growth (cont)

def baz(n): while n > 1: x = n while x > 1: print(n, x) x = x // 2 n -= 1	O(n log n) (log n in a loop)
String and tuple slicing	Slicing is an O(n) operation as you need to create another string/tuple when you slice.
def count_me(n): if n < 10: return n else: return count_me(n + 1)	O(infinity)
String and tuple concatenation	O(n)

Time complexity--> looking at the branches of the tree
 Space complexity--> looking at the depth of the tree (depends on the pending operations the function incurred)

And also for analysing OOG questions:
 for <loop>:
 <do work>
 Time
 = work(1) + work(2)+...+work(n)
 If work is fixed (let's say work = k) regardless of n, Time = n * k
 Otherwise,
 Time = sum of work
 Remember to state what the n means

Recursive and Iteration

Recursion

```
def recursive_fn(n):
    if <base case>:
        return <base case value>
    else:
```

Recursive and Iteration (cont)

```
> return <manipulate recursive_fn(n-1)
such that it becomes nth case>
Iteration (for or while loop)
def iterative_fn(n):
    temp = <some basic value>
    for i in <range>:
        <update temp>
    return temp
def factorial(n):
    product, counter = 1, 1
    while counter <= n:
        product *= counter
        counter += 1
    return product
```

Tuples comparison

Tuples are compared **position by position**: the **first item of the first tuple is compared to the first item of the second tuple** (same as string); if they are not equal (i.e. the first is greater or smaller than the second) then that's the result of the comparison, else the second item is considered, then the third and so on.

Truth Tables

OR	True	False	AND	True	False
True	True	True	True	True	False
False	True	False	False	False	False

NOT	
True	False
False	True

Truth values revisited

Truth and False will be represented by 1 and 0 respectively.

not 'abc' --> False

1 or 0 --> 1

' ' is same as False is same as 0 is same as []

while True: infinite looping

while False: will not loop at all

UnboundLocalError

```

UnboundLocalError
son = "Abraham"
def darth_vader():
    print(f"I am your father, {son}")
    son = "Lucas" # assignment
    darth_vader() # UnboundLocalError
  
```

String and tuple slicing

s[start:stop(noninclusive):step]

eg) s = " 123 45", d = '6789'

concatenate -> s + d --> '12345 6789'

s[0] = " 1", s[1:] = " 234 5",

s[:2] = " 12", s[1:5:2] = " 13"

s[-1] = " 5", s[-1:-3] = " ",

s[-3:-1] = '34', s[-5:-1:2] = '13', s[-5:-1:-2] = ' ', s[-1:-5:-2] = '53'

Variable (Global and Local)

```

Local scope
son = "Abraham"
def darth_vader(son): # assignment
    print(f"I am your father, {son}")
    son = "Lucas"
    darth_vader("Luke") # Luke
    print(son) # Abraham
  
```

Variable is local if assigned to in function

Namespaces match function and variable names to their definitions and assignments

Random module

random.ra randint(a, b) Return a random integer N such that a <= N <= b.

random.ra ndrang-e(start, stop[, step]) Return a randomly selected element from range(start, stop, step). This is equivalent to choice(range(start, stop, step)), but doesn't actually build a range object

random.ra ndom() Return the next random floating point number in the range [0.0, 1.0).

random.ra int(random.random() * 9999) -> 3658

can be scaled

break

```

for val in "string":
    if val == "i":
        break
    print(val)
print("The end")
  
```

Output:

```

s
t
r
The end
  
```

The break statement terminates the loop containing it. Control of the program flows to the statement immediately after the body of the loop.

If break statement is inside a nested loop (loop inside another loop), break will terminate the innermost loop.

Hiding 'something'

Input an empty (lambda : "Prof is really cool")

In that way what is printed or sliced / accessed will be the function itself.

To recover the secret message, can input () at the back.

Functions

```

def <name>(formal parameters):
    body
    return (something if not it is going to return to zero)
  
```

Anonymous function -> lambda

```

lambda x: x + 1
  
```

A function need not use every parameter passed into it. (def foo(a, b): return a + a)

A function without any parameters or return value is still valid. (def foo(): return)

Functions do not necessarily need a return value. (def foo(a, b, c): a + b + c)

Conditionals

```

if <statement>:
    do something
elif <statement>:
    do something
else <statement>:
    do something
while <statement>:
    do something
  
```

Equality/ in function

is This means the same object. (3 is 3) --> True

== This mean the same content. (3.00 == 3) --> True

Equality/ in function (cont)

in check the elements inside the other group. Eg) $x = (1,2,3)$. $1 \text{ in } x \rightarrow \text{True}$

OOG Time and Speed



Different Types of Error

NameError Raised when a variable is not found in local or global scope.

IndexError Raised when index of a sequence is out of range.

RuntimeError Raised when an error does not fall under any other category.

SyntaxError Raised by parser when syntax error is encountered

ZeroDivisionError Raised when second operand of division or modulo operation is zero.

UnboundLocalError Raised when a reference is made to a local variable in a function or method, but no value has been bound to that variable

RecursionError Infinite looping

Tuple and string functions

len() Return the length (the number of items) in the tuple.

max() Return the largest item in the tuple.

min() Return the smallest item in the tuple

sum() Return the sum of all elements in the tuple.

tuple() Convert an iterable (list, string, set, dictionary) to a tuple.

count() count the occurrences of an element in a tuple

index() Searches the string for a specified value and returns the position of where it was found

continue

```
for val in "string":
    if val == "i":
        continue
    print(val)
print("The end")
```

Output:

```
s
t
r
n
g
The end
```

The continue statement is used to skip the rest of the code inside a loop for the current iteration only. Loop does not terminate but continues on with the next iteration.