Cheatography

Python Essentials Cheat Sheet

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Datatypes

Text	`str`
Numeric	`int` , `float`
Sequence	`list` , `tuple` , `range`
Mapping	`dict`
Set	`set`
Other	`bool` , `Nonetype` , `bytes`

Casting

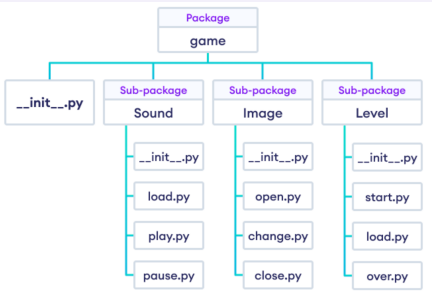
`int()`	converts into an integer	`int(2.8) = 2` `int("3") = 3`
`float()`	converts into float	`float(1) = 1.0` `float( " 3") = 3.0`
`str()`	converts into string	`str(3) = " 3"` `str(1.0) = " 1.0 "`

Casting is converting a datatype to another

Input & Output (I/O)

Output	we use the `print()` function	it has 3 main arguments which the `string` , the `seperator` and the `end` statement	`print( "Are you okay",e nd= " ?")` `print( " Hi", " How are you" ,"I missed you" ,se p="! !")`
Input	we use the `input()` function	the input function is used to take input from user and takes a `text` that is optional as argument	`num = input( 'Enter your age: ')`

Packages



A directory must contain a file named `init.py` in order for Python to consider it as a package. This file can be left empty but we generally place the initialisation code for that package in this file.

Operators

Logical (`and` , `or` , `not`)	used to check whether an expression is *True* or *False*	`a = 5`
		`b = 6`
		`print((a > 2) and (b >= 6))` > `True`

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Operators (cont)

Identity (`is`, `is not`)	used to check if two values are located on the same part of the memory	`x1 = 5`
		`y1 = 5`
		`print(x1 is not y1)`
		`> False`

Membership (`in`, `not in`)	used to test whether a value or variable is found in a sequence `(string, list, tuple, set, dictionary)`	`x = 'Hello world'`
		`print( 'hello' not in x)`
		`> True`

for membership operators , in dictionaries it only checks the keys and not values

Module

- **Module** is a file that contains code to perform a specific task.
- A **module** may contain variables, functions, classes ...
- A collection of **modules** , can make what we call a **package**

As our program grows bigger, it may contain many lines of code. Instead of putting everything in a single file, we can use modules to separate codes in separate files as per their functionality. This makes our code organised and easier to maintain.

```
---------- example.py ----------
def add(a, b):
 result = a + b
return result
---------- main.py ----------
import example
addition.add(4,5) # returns 9
```

List's Basic Operations

Accessing Lists	`list[index]`	`languages = ["Python", "Swift"]`
		`# access item at index 0`
		`print(languages[0])`

Slicing Lists	`list[from:to]`	`# List slicing in Python`
		`my_list = ['p',' r', 'o' ,'g ','r']`
		`# items from index 2 to index 4`
		`print(my_list[2:5])`

Adding one item at the end of list	`list.appe nd( item)`	`numbers = [21, 34, 54, 12]` `numbers.append(32)`

Adding All items of an iterable	`list1.ext end (list2)`	`numbers = [1, 3, 5]`
		`even_numbers = [4, 6, 8]`
		`numbers.extend(even_numbers)`

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List's Basic Operations (cont)

Adding one item at specific index	`list.i nse rt( ind ex, item)`	`numbers = [10, 30, 40]` `numbers.insert(1, 20)`

Changing item values	`list[i tem _index] = new_value`	`languages = ['Python', 'Swift', 'C++']`
		`# changing the third item to 'C'`
		`languages[2] = 'C'`

Removing one item of a list	`list.r emo ve( item)`	`languages = ['Python', 'Swift']`
		`# remove 'Python' from the list`
		`languages.remove('Python')`

Removing one or more items of a list	`del list[f rom:to]`	`del langua ges[1]` `del langua ge[0:2]`

Check if an item exists in a list	`item in list`	`languages = ['Python', 'Swift', 'C++']`
		`print('C' in languages)`
		`> False`

A list is a data structure that holds :
1) multiple data at once
2) of different data types (`str`,`int`,`float`)
3) can store duplicates

> we can create lists using brackets **[ ]** or the **list()** constructor

Other Lists Methods

Remove all items from a list	`list.c lear()`	`langua ges.cl ear()`

Return index of item	`list.i nde x(item)`	`animals = ['cat', 'dog', 'rabbit', 'horse']`
		`# get the index of 'dog'`
		`index = animal s.i nde x(' dog')`

Return length of a list	`len(list)`	`length (la ngu ages)` `> 3`

Return count of a specific item in a list	`list.c oun t(item)`	`numbers = [2, 3, 5, 2, 11, 2, 7]`
		`# check the count of 2`
		`count = number s.c ount(2)`

Sort a list (by default ascending)	`list.s ort (re ver se= fa lse)`	`vowels = ['e', 'a', 'u', 'o', 'i']`
		`vowels.sort(reverse=True)`
		`>['u', 'o', 'i', 'e', 'a']`

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Other Lists Methods (cont)

Reverse items of list	`list.r eve rse()`	`prime_ numbers = [2, 3, 5, 7]`
		`# reverse the order of list elements`
		`prime_numbers.reverse()`

Copy a list	`list.c opy()`	`prime_ numbers = [2, 3, 5]`
		`# copying a list`
		`numbers = prime_ num ber s.c opy()`

List Comprehensions

Like there is a short way to write functions , there is a short one to also write lists and it's called **list comprehension**

Syntax : `[expre ssion for item in list]`

List comprehension is generally more compact and faster than normal functions and loops for creating list

Examples :

```
h_letters = [ letter for letter in 'human' ]
print(h_letters)
> ['h', 'u', 'm', 'a', 'n']
```

- We can add conditional to list comprehensions :

```
------ ----- example 01 -------------
number_list = [ x for x in range(20) if x % 2 == 0]
print(number_list)
 >[0, 2, 4, 6, 8, 10, 12, 14, 16, 18]
------ ----- example 02 -------------
num_list = [y for y in range(100) if y % 2 == 0 if y % 5 == 0]
print(num_list)
>[0, 10, 20, 30, 40, 50, 60, 70, 80, 90]
```

Python Tuples

Accessing tuples	`tuple[ index]`	`letters = 'a','b ','c'` `letters[0]`
Slicing tuples	`tuple[ fro m:to]`	`letters = ('a',' b', 'c' ,'d ','e')` `letters[1:3]`
Return index of item	`tuple.i nd ex( item)`	`letters = ('a',' b', 'c' ,'d ','e')` `letters.index('a')`
Return count of a specific item	`tuple.c ou nt( item)`	`letters = ('a',' b', 'a' ,'d ','e')` `letters.count('a')`

Iterating over a tuple	`for item in tuple :`	`languages = ('Python', 'Swift', 'C++')`
		`# iterating through the tuple`
		`for language in languages:`
		`print( lan guage)`

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Python Tuples (cont)

Check if a tuple element exists	`item in tuple`	`'C' in languages`

A **tuple** is a data structure that :
- holds multiple data at once
- of different types (`str`,`int`,`float`)
- can store duplicates
- is `immutable` so we cannot modify its items (this makes it faster to iterate over compared to lists) , meaning no delete or assignement operations

we can create lists using brackets `()` or just comma seperated value (meaning the `()` are optional) like follows :

```
first_ tuple = (1,2,3)
second _tuple = 1,2,3
```

Dictionaries

Accessing Items	`dictio nar y[key]`
	`dictio nar y.g et(key)`
		`countr y_c apitals = {`
		`"United States ": " Was hington D.C.",`
		`"Italy": " Rom e",`
		`"England": " Lon don " }`
		`print(country_capitals["United States"])`
		`> Washington D.C`

Removing Items	`del dictio nar y[key]` `dictio nar y.p op(key)`	`sales = { 'apple': 2, 'orange': 3, 'grapes': 4 }` `popped_element = sales.p op ('a pple')`

Membership Test (keys only)	`key in dictionary`	`my_list = {1: " Hel lo", " Hi": 25, " How dy": 100}`
		`print(1 in my_list) -> True`
		`print("Howdy" not in my_list) -> False`
		`print("Hello" in my_list) -> False`

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Dictionaries (cont)

Iterating Items	`for key,value in dictio nar y.i tem s()`	`my_dict = {'apple': 1, 'banana': 2, 'orange': 3, 'grape': 4}`
		`for key, value in my_dic t.i tems():`
		`print(f"Key: {key}, Value: {value }")`

A **dictionary** is a data structure and a collection that :
- allows us to store data in key-value pairs.
- **dictionary** keys must be immutable, such as tuples, strings, integers, etc meaning we cannot use mutable (changeable) objects such as lists as keys.
- **dictionary** values must be mutable of course

We create dictionaries by placing **key:value** pairs inside curly brackets **{}**, separated by commas

Other Dictionary Methods

Update Items	`dictio nar y.u pda te({key : new_va lue})`
	`dictio nar y.u pda te( {ne w_key : new_va lue})`
		`d = {1: " one ", 2: " thr ee"}`
		`d1 = {2: " two "}`
		`# updates the value of key 2`
		`d.update(d1)`

Remove All Items	`dictio nar y.c lear()`	`d.clear()`

Return All Keys	`dictio nar y.k eys()`	`numbers = {1: 'one', 2: 'two', 3: 'three'}`
		`# extracts the keys of the dictionary`
		`dictionaryKeys = number s.k eys()`

Return All Values	`dictio nar y.v alues()`	`marks = {'Phys ics ':67, 'Maths ':87}` `print(marks.values())`

Return Items	`dictio nar y.i tems()`	`marks = {'Phys ics ':67, 'Maths ':87}`
		`print(marks.items())`
		`> dict_i tem s([ ('P hys ics', 67), ('Maths', 87)])`

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Other Dictionary Methods (cont)

Copy Dictionary	`dictio nar y.c opy()`	`origin al_ marks = {'Phys ics ':67, 'Maths ':87}` `copied_marks = origin al_ mar ks.c opy()`

Create Dictionary From Keys & Values	`dict.f rom key s(k eys ,va lues)`	`keys = {'a', 'e', 'i', 'o', 'u' }`
		`value = [1]`
		`vowels = dict.f rom key s(keys, value)`

Sets

Adding Items	`set.ad d(item)`	`numbers = {21, 34, 54, 12}` `numbers.add(32)`

Update Items	`set.up dat e(i ter a ble)`	`companies = {'Laco ste', 'Ralph Lauren'}`
		`tech_companies = ['apple', 'google', 'apple']`
		`companies.update(tech_companies)`
		`print(companies)`
		`> {'google', 'apple', 'Lacoste', 'Ralph Lauren'}`

Remove Items	`set.di sca rd( item)`	`remove dValue = langua ges.di sca rd( 'Java')`

Checking if All Set Items Are True (or empty)	`all(set)` (stands for U or *)	`L = [1, 3, 4, 5]`
		`print(all(L))`
		`> True`

Checking if Any Set Items Are True	`any(set)` (stands for ∩ or +)	`L = [1, 3, 4, 0]`
		`print(any(L))`
		`> True`

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Sets (cont)

Returning Enumerate Object

```
enumur ate (it erable)
```

```
grocery = ['bread', 'milk', 'butter']
for count, item in enumer ate (gr ocery):
 print( count, item)
> 0 bread
 1 milk
 2 butter
```

Returning Length Of Set

```
len(set)
```

```
len(gr ocery)
```

Largest & Smallest item

```
max(set)
min(set)
```

```
numbers = [9, 34, 11, -4, 27]
# find the maximum number
max_number = max(nu mbers)
```

Sorting Set

```
sorted (set)
```

```
py_set = {'e', 'a', 'u', 'o', 'i'}
print(sorted(py_set)
> ['a', 'e', 'i', 'o', 'u']
```

Summing Set Items

```
sum(set)
```

```
marks = {65, 71, 68, 74, 61}
# find sum of all marks
total_marks = sum(marks)
> 339
```

Iterate Over Set

```
for item in set :
```

```
fruits = {"Ap ple ", " Pea ch", " Man go"}
# loop to access each fruits
for fruit in fruits:
 print( fruit)
```

A **Set** is data structure that :
- Stores different data types
- Cannot have duplicates
- has **immutable** elements unlike lists and dictionaries

In Python, we create sets by placing all the elements inside curly braces **{ }** , separated by comma or using the **set()** constructor.

```
student_id = {112, 114, 116, 118, 115}
```

Set Operations

Union

```
set1.u nio n(set2)
set1 | set2
```

```
A = {1, 3, 5}
B = {0, 2, 4}
print(A|B)
> {0, 1, 2, 3, 4, 5}
```


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Set Operations (cont)

Intersection	`set1.i nte rse cti on( set2)`
	`set1 & set2`
		`A = {1, 3, 5}`
		`B = {1, 2, 3}`
		`print(A & B)`
		`> {1, 3}`

Difference	`set1.d iff ere nce (set2)`
	`set1 - set2`
		`A = {2, 3, 5}`
		`B = {1, 2, 6}`
		`print(A - B)`
		`> {3, 5}`

Symmetric Difference	`set1.s ymm etr ic_ dif fer enc e(set2)`
	`set1 ^ set2`
		`A = {2, 3, 5}`
		`B = {1, 2, 6}`
		`print(A ^ B)`
		`> {1, 3, 5, 6}`

Python Strings

Accessing Strings	`string [index]`	`greet = 'hello'` `print(greet[1])`
Slicing Strings	`string [fr om:to]`	`greet = 'hello'` `print(greet[0:2])`

Comparing Two Strings	`string1 == string2`	`str1 = " Hello, world! "`
		`str2 = "I love Python."`
		`print(str1 == str2)`

Joining Strings	`string1 + string2`	`str1 = " Hello, world! "`
		`str2 = "I love Python."`
		`print(str1 + str2)`

String Length	`len(st ring)`	`greet = 'hello'` `print(len(greet))`
Formatting Strings (f-strings)	`f"{s tri ng} "`	`print( f'{ name} is from {count ry}')`
Uppercase & Lowercase Strings	`string.up per()` `string.lo wer()`	`message = 'python is fun'` `print(message.upper())`

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Python Strings (cont)

Partitioning String Into Three Part Tuples	`string.partition(separator)`	`string = " Python is fun, isn't it"`
		`print(string.partition('is'))`
		`>('Python ', 'is', " fun, isn't it"`

Replacing Sub-String	`string.replace(old_substring,new_substring,occurences`^{optional}`)`	`song = 'Let it be, let it be, let`
		`# replacing only two occurr ences`
		`print(song.replace('let', " don't`

Return Index of Substring	`string.find(substring)`	`quote = 'Let it be, let it be, let`
		`# first occurance of 'let it'(case`
		`result = quote.find('let it')`

Remove Trailing Characters (By default removes whitespace)	`string.strip(substring`^{optional}`)`	`website = 'www.program iz.com/'` `print(website.rstrip('m/.'))`

Splitting Strings	`string.split(separator,maxsplit)`	`grocery = " Milk, Chicken, Bread,`
		`print(grocery.split(', ', 1))`
		`>["Milk","Chicken, Bread, Butter "`

Checking String Start	`string.startswith(substring)`	`text = " Python is easy to learn."`
		`result = text.startswith('is ea`
		`> False`

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Python Strings (cont)

Advanced String Indexing

`string.index(substring , from, to optional)

```
sentence = 'Python progra mming is fun.'
# Substring is searched in 'gramming is '
print(sentence.index('g is', 10, -4))
```

Python strings are immutable meaning we cannot change them , but we can assign its variable to another string which can do the job :

```
message = 'Hola Amigos'
message = 'Hello Friends'
```

Python Files

A **file** is a container in computer storage devices used for storing data.
When we want to read from or write to a file, we need to :
1- Open the file
2- Read or write in the file
3- Close the file

File Operations

Opening Files For Reading	`open(s our ce,'r')`	`file1= open("t est.tx t",'r')`
Reading Files	`file.r ead()`	`read_c ontent = file1.r ead()` `print(read_content)`
Closing Files	`file.c lose()`	`file1.c lose()`
Opening Files For Writing	`open(s our ce,'w')`	`file2 = open("t est.tx t",'w')`
Writing in Files	`file.w rit e(text)`	`file2.w ri te( 'Pr ogr amming is Fun.')`

Automatically Closing Files	`with open(s our ce, mode) as filname :`
	`#instructions`
		`with open("t est.tx t", " r") as file1:`
		`read_content = file1.read()`
		`print(read_content)`

Directory Management

Get Current Working Directory

`os.get cwd()`

```
import os
print(os.getcwd()
> /Users /ta yss irb ouk rou ba/Data Science Cheat Sheet
```


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Directory Management (cont)

Changing Directory	`os.chd ir( new _di rec tory)`	`import os`
		`os.chdir('/Users/tayssirboukrouba/')`
		`print(os.getcwd())`

List Directories	`os.lis tdir()`	`import os`
		`os.chdir('/Users/tayssirboukrouba/')`
		`os.listdir()`

Making New Directory	`os.mkd ir( 'di r_n ame')`	`os.mkdir('test')` `os.listdir()`

Renaming Directory or File	`os.ren ame ('o ld_ dir ',' new _dir ')`	`import os`
		`os.listdir()`
		`os.rename('test','new_one')`
		`os.listdir()`

Removing Directories	`os.rem ove ('d ire ctory')`	`import os`
		`# delete " tes t.t xt" file`
		`os.remove("test.txt")`

A **Directory** is a collection of files and subdirectories.
A directory inside a directory is known as a **sub-directory** .

Python has the **os** module that provides us with many useful methods to work with directories (and files as well).

Conditionals

if	used to execute an instruction if a condition was true	`number = 0`
		`if number > 0:`
		`print( " Pos itive number " )`

elif	used to execute an instruction if the previous condition was not true and stands for *else if*	`elif number == 0:` `print( 'Zero')`
else	used to execute an instruction if all conditions were not true	`else print( "not positi ve")`

Loops

for	used mostly to loop through a sequence	`languages = ['Swift', 'Python', 'Go', 'JavaS cript']`
		`for language in languages:`
		`print( lan guage)`

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Loops (cont)

while	used to loop through a statement while the condition is not met	`counter = 0`
		`while counter < 3:`
		`print( 'Inside loop')`
		`counter = counter + 1`
		`else  print( 'Inside else' )`

break	used to terminate the loop immediately when it is encountered	`for i in range(5):`
		`  if i == 3:`
		`  break`
		`print(i)`

continue	used to skip the current iteration of the loop and the control flow of the program goes to the next iteration	`for i in range(5):`
		`  if i == 3:`
		`  continue`
		`print(i)`

pass	null statement which can be used as a placeholder for future code	`n = 10`
		`if n > 10:`
		`  pass`
		`print( 'He llo')`

Functions & Arguments

Syntax	`def functi on_ nam e(a rgu ments):`
	`  # function body`
	`return`

Arguments with default values	`def add_nu mbers(a = 7,  b = 8):`

Arguments with keywords	`def displa y_i nfo (fi rst _name, last_n ame):`
	`  print( 'First Name:', first_ name)`
	`  print( 'Last Name:', last_name)`
	`display_info(last_name = 'Cartman', first_name = 'Eric')`

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Functions & Arguments (cont)

Arbitrary Arguments

```
def my_fun cti on( *kids):
print("The youngest child is " + kids[2])
my_function("Emil", " Tob ias ", " Lin us")
```

If you do not know how many arguments that will be passed into your function, add a `*` before the parameter name in the function definition which will make the param an *arbitrary argument*

Variables Scopes

Local variable a variables that is declared inside a function (cannot be accessed outside it)

```
def greet():
# local variable
 message = 'Hello'
 print( 'Lo cal', message)
greet()
```

Global variable a variables that is declared outside a function (can be accessed outside or inside it)

```
# declare global variable
message = 'Hello'
def greet():
 # declare local variable
 print( 'Lo cal', message)
greet()
print('Global', message)
```

we can use the `global` keyword when we are inside a function , and we want to read and write a global variable inside a function.

Lambda Functions

Syntax

```
lambda arguments : expression
```

Example

```
greet_user = lambda name : print( 'Hey,', name)
greet_ use r(' Del ilah')
> Hey, Delilah
```

Lambda functions are also called anonymous functions because they have no name

Python OOP

Object it's a collection of **data** (variables) and **methods** (functions).

```
class Bike:
#Attributes with default values :
name = ""
gear = 0
```


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Python OOP (cont)

Class	it is a **blueprint** or an example (sample) of that object	`bike1 = Bike()`

Accessing Class Attributes Using Objects	We use the **"."** notation to access the attributes of a class	`# modify the name attribute`
		`bike1.name = " Mou ntain Bike"`
		`# access the gear attribute`
		`bike1.gear`

Class Methods	A Python Function defined inside a class is called a **method**.	`class Room:`
		` length = 0.0`
		` breadth = 0.0`
		`# method to calculate area`
		`  def calcul ate _ar ea( self):`
		`  print( "Area of Room =", self.l ength * self.b read th)`

Constructors	We can initialise class using **__init_ _()** function	`class Bike:`
		`# constr uctor function`
		` def __init __( self, name = ""):`
		`  self.name = name`
		`bike1 = Bike()`
		`bike1 = Bike("M ountain Bike")`

Exception Handeling

try-except Statement

```
try:
 numerator = 10
 denomi nator = 0
 result = numerator/denominator
 print(result)
except:
 print( " Error: Denomi nator cannot be 0.")
# Output: Error: Denomi nator cannot be 0.
```


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Exception Handeling (cont)

Catching Specific Exceptions

```
try:
 even_n umbers = [2,4,6,8]
 print(even_numbers[5])
except ZeroDivisionError:
 print( " Den omi nator cannot be 0.")
except IndexError:
 print( " Index Out of Bound.")
# Output: Index Out of Bound
```

`try-else` Statement

```
# program to print the reciprocal of even numbers
try:
 num = int(in put ("Enter a number: "))
 assert num % 2 == 0
except:
 print( "Not an even number!")
else:
 reciprocal = 1/num
 print( rec ipr ocal)
```

`try-fi nally` Statement

```
try:
 numerator = 10
 denomi nator = 0
 result = numerator/denominator
 print( result)
except:
 print( " Error: Denomi nator cannot be 0.")
finally:
 print( "This is finally block." )
```

Exceptions can terminate the program's execution , that's why it is important to handle them

*when an exception occurs, the rest of the code inside the **try** block is skipped. If none of the statements in the **try** block generates an exception, the **except** block is skipped.*

In Python, the **finally** block is always executed no matter whether there is an exception or not.

Python Exceptions

`Syntax Erro r`	Raised when there is a syntax error in the code, such as incorrect indentation, invalid syntax, or mismatched parentheses.

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Python Exceptions (cont)	
`Indent ati onError`	A specific type of SyntaxError that occurs when there are problems with the indentation of the code.
`NameError`	Raised when a variable or name is used before it is defined.
`TypeError`	Occurs when an operation or function is applied to an object of an inappropriate type.
`ValueError`	Raised when a function receives an argument of the correct data type but an inappropriate value
`ZeroDi vis ion Erro r`	Occurs when attempting to divide by zero
`IndexError`	Raised when trying to access an index that is out of range for a list, tuple, or string.
`KeyError`	Raised when trying to access a non-existent key in a dictionary.
`Attrib ute Error`	Raised when an attribute or method is not found for an object.
`Import Error`	Occurs when a module cannot be imported.
`Assert ion Error`	Raised when an assert statement fails.
`Overfl owError`	Raised when the result of an arithmetic operation is too large to be represented.
`Memory Error`	Occurs when the Python interpreter cannot allocate enough memory for an object.
`Runtim eError`	A generic error that is raised when no specific exception applies.

An **exception** is an unexpected event (error) that occurs during program execution , for example :

```
divide _by _zero = 7 / 0
```

The above code causes an exception as it is not possible to divide a number by 0.

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