4. Exceptions and data structures

An exception can be defined as an abnormal condition in a program resulting in the disruption in the flow of the program.

Whenever an exception occurs, the program halts the execution, and thus the further code is not executed. Therefore, an exception is the error which python script is unable to tackle with.

Python provides us with the way to handle the Exception so that the other part of the code can be executed without any disruption. However, if we do not handle the exception, the interpreter doesn't execute all the code that exists after the that

Common Exceptions

A list of common exceptions that can be thrown from a normal python program is given below.

1. **ZeroDivisionError:** Occurs when a number is divided by zero.
2. **NameError:** It occurs when a name is not found. It may be local or global.
3. **IndentationError:** If incorrect indentation is given.
4. **IOError:** It occurs when Input Output operation fails.
5. **EOFError:** It occurs when the end of the file is reached, and yet operations are being performed.

Problem without handling exceptions

As we have already discussed, the exception is an abnormal condition that halts the execution of the program. Consider the following example.

Example

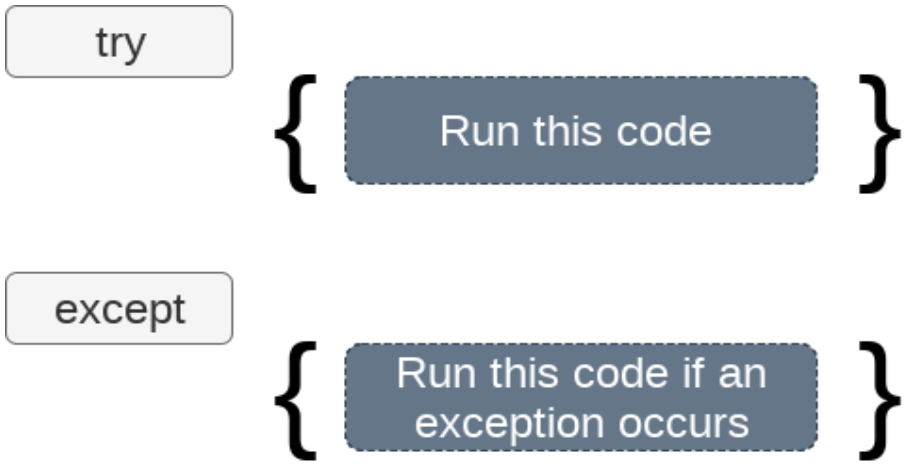
```
a = int(input("Enter a:"))
b = int(input("Enter b:"))
c = a/b;
print("a/b = %d"%c)

#other code:
print("Hi I am other part of the program")
```

Output:

```
Enter a:10
Enter b:0
Traceback (most recent call last):
  File "exception-test.py", line 3, in <module>
    c = a/b;
ZeroDivisionError: division by zero
```

Exception handling in python

If the python program contains suspicious code that may throw the exception, we must place that code in the try block. The try block must be followed with the except statement which contains a block of code that will be executed if there is some exception in the try block.



Syntax:-

```
try:
   #block of code

except Exception1:
   #block of code

except Exception2:
```

```
    #block of code

#other code
```

We can also use the else statement with the try-except statement in which, we can place the code which will be executed in the scenario if no exception occurs in the try block.

The syntax to use the else statement with the try-except statement is given below.

```
try:
    #block of code

except Exception1:
    #block of code

else:
    #this code executes if no except block is executed
```

Example

```
try:
    a = int(input("Enter a:"))
    b = int(input("Enter b:"))
    c = a/b;
    print("a/b = %d"%c)
except Exception:
else:
    print("Hi I am else block")
```

Raising exceptions

An exception can be raised by using the raise clause in python. The syntax to use the raise statement is given below.

Syntax

raise Exception_class,<value>

Points to remember

1. To raise an exception, raise statement is used. The exception class name follows it.
2. An exception can be provided with a value that can be given in the parenthesis.
3. To access the value "as" keyword is used. "e" is used as a reference variable which stores the value of the exception.

Example

```
try:
    age = int(input("Enter the age?"))
    if age<18:
        raise ValueError;
    else:
        print("the age is valid")
except ValueError:
    print("The age is not valid")
```

Output:

```
Enter the age?17
The age is not valid
```

Python Arrays:

An array is defined as a collection of items that are stored at contiguous memory locations. It is a container which can hold a fixed number of items, and these items should be of the same type. An array is popular in most programming languages like C/C++, JavaScript, etc.

Array is an idea of storing multiple items of the same type together and it makes easier to calculate the position of each element by simply adding an offset to the base value. A combination of the arrays could save a lot of time by reducing the overall size of the code. It is used to store multiple values in single variable. If you have a list of items that are stored in their corresponding variables like this:

The array can be handled in Python by a module named **array**. It is useful when we have to manipulate only specific data values. Following are the terms to understand the concept of an array:

Element - Each item stored in an array is called an element.

Index - The location of an element in an array has a numerical index, which is used to identify the position of the element.

Array operations

Some of the basic operations supported by an array are as follows:

- **Traverse** - It prints all the elements one by one.
- **Insertion** - It adds an element at the given index.
- **Deletion** - It deletes an element at the given index.
- **Search** - It searches an element using the given index or by the value.
- **Update** - It updates an element at the given index.

The Array can be created in Python by importing the array module to the python program.

```
from array import *
arrayName = array(typecode, [initializers])
```

Accessing array elements

We can access the array elements using the respective indices of those elements.

```
import array as arr

a = arr.array('i', [2, 4, 6, 8])
print("First element:", a[0])
print("Second element:", a[1])
print("Second last element:", a[-1])
```

Output:

```
First element: 2
Second element: 4
Second last element: 8
```

Explanation: In the above example, we have imported an array, defined a variable named as "a" that holds the elements of an array and print the elements by accessing elements through indices of an array.

How to change or add elements

Arrays are mutable, and their elements can be changed in a similar way like lists.

```
import array as arr
numbers = arr.array('i', [1, 2, 3, 5, 7, 10])

# changing first element
numbers[0] = 0
print(numbers)    # Output: array('i', [0, 2, 3, 5, 7, 10])

# changing 3rd to 5th element
numbers[2:5] = arr.array('i', [4, 6, 8])
print(numbers)    # Output: array('i', [0, 2, 4, 6, 8, 10])
```

Output:

```
array('i', [0, 2, 3, 5, 7, 10])
```

```
array('i' ,[0, 2, 4, 6, 8, 10])
```

Explanation: In the above example, we have imported an array and defined a variable named as "numbers" which holds the value of an array. If we want to change or add the elements in an array, we can do it by defining the particular index of an array where you want to change or add the elements.

How to delete elements from an array?

The elements can be deleted from an array using Python's **del** statement. If we want to delete any value from the array, we can do that by using the indices of a particular element.

```
import array as arr
number = arr.array('i', [1, 2, 3, 3, 4])
del number[2]                    # removing third element
print(number)                    # Output: array('i', [1, 2, 3, 4])
```

Output:

```
array('i', [10, 20, 40, 60])
```

Explanation: In the above example, we have imported an array and defined a variable named as "number" which stores the values of an array. Here, by using del statement, we are removing the third element [3] of the given array.

Array Concatenation

We can easily concatenate any two arrays using the + symbol.

Example

```
a=arr.array('d',[1.1 , 2.1 ,3.1,2.6,7.8])
b=arr.array('d',[3.7,8.6])
c=arr.array('d')
c=a+b
print("Array c = ",c)
```