

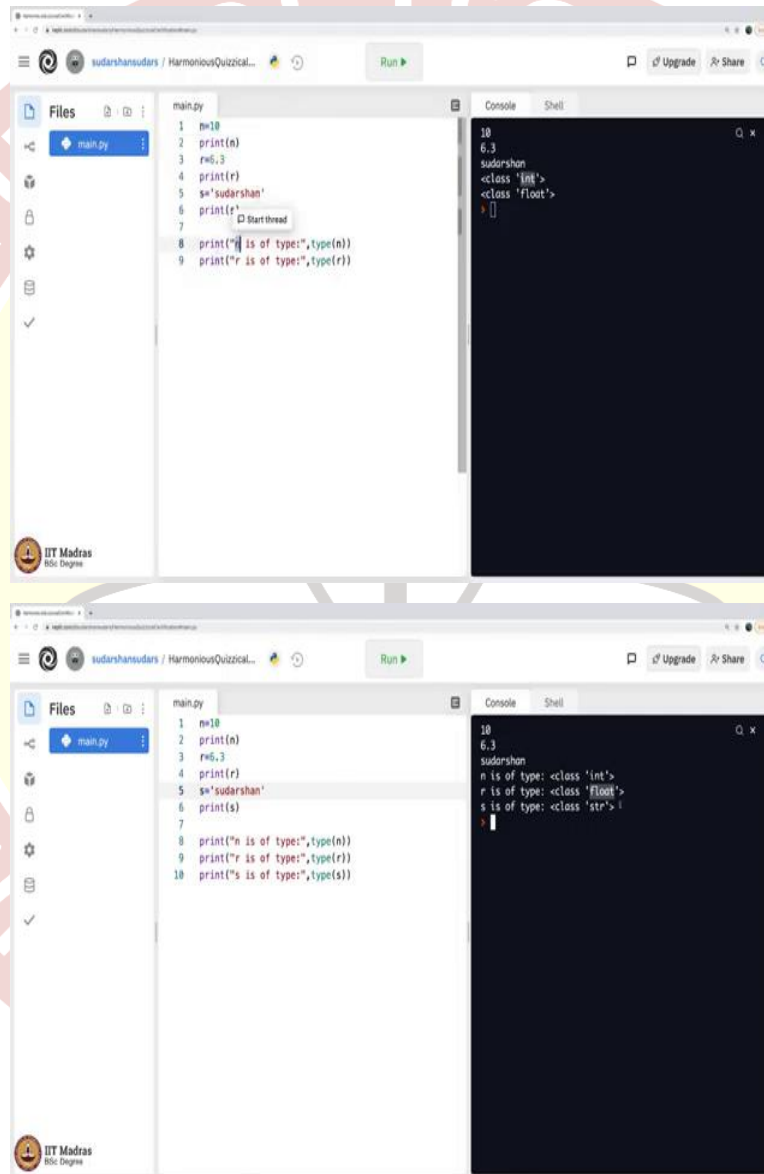


IIT Madras

ONLINE DEGREE

Programming in Python
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Data Types 1

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The image displays two screenshots of a Python IDE interface, likely JupyterLab, showing the execution of a Python script. The top screenshot shows the code being executed, and the bottom screenshot shows the output of the execution.

Top Screenshot (Code):

```
main.py
1 n=10
2 print(n)
3 r=6.3
4 print(r)
5 s='sudarshan'
6 print(s)
7
8 print("n is of type:",type(n))
9 print("r is of type:",type(r))
```

Bottom Screenshot (Output):

```
10
6.3
sudarshan
n is of type: <class 'int'>
r is of type: <class 'float'>
s is of type: <class 'str'>
```

Let us say we declare n equals 10 a variable n and then print the value of n. The output will be as expected as you see the number 10. Assuming I take another number, let us say r equals 6.3 and then print r, obviously it will print first 10 and then will print r. Now, the point is what if I said s equals, please note sudarshan, and then I will print s as well. So, you see what is happening here?

Here is a number without any decimal value, here is a number with a decimal part. So, it is not just an integer, it is a decimal, it is a fraction, 6.3, and then here this is neither an integer nor is it a decimal number like this. This is a string, a name. I say print s and sudarshan gets printed. Now the point is what we may want to note here is let me explain that with an illustration.

When I say print type of n, you will see what this type does, you see it says class int, do not worry about the, I would say it is a very ugly looking output, so with less than symbol, greater than symbol, the word class and things like that, but all that it says is it is an integer type number in n. What if we said print type r, executed, it says class float and then, so let me just write this for clarity.

I will say the type, n is of type, let us say n is of type, then I say type r, make sense, r is of type r. So, mind you the letter n here is not a variability, it is just, I am asking the computer to print the whatever is inside the code, this n is not the value 10 here, this is simply the letter n, which for reference let me just run this and show you, it will say n is of type class and r is of type class float.

And then I say print s is of type, type s and I will execute this, you see what happens, s is of type str, we have seen this somewhere before. So, str is string. What exactly does it mean? What is int here, what is float here, what is str here? You never specified that anywhere here, you went ahead and said n equals 10, r equals 6.3, s equals string sudarshan.

But the computer automatically called this as int type, integer, called this float, the word float simply means something that is more than an integer, 10.171, now that is a floating point, it is called a floating point number. So, in a first course in computing you will study all these things, I am sure you did if not you can always look up, it is a very easy thing to understand.

Floating point representation of a number is the way a computer stores a number that is not an integer, it stores in a very, it is a little too technical to get in right now, but just assume from my side that this is not an integer and if it is not an integer, if it is beyond an integer it is called a float for a computer, it is automatically calling it a float and this is called a string. A computer automatically recognizes the type of data that is being stored.

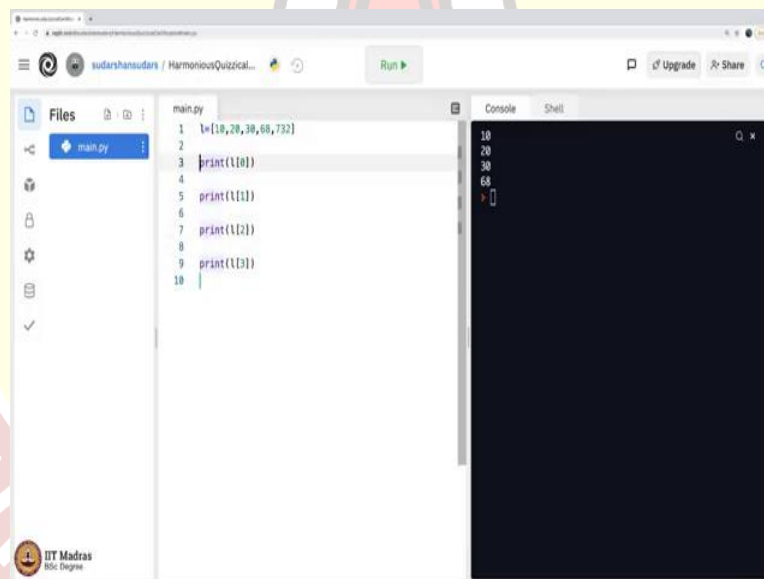
Why would anyone want something like this? The answer is very simple if you were to create a vessel where you will put your, let us say rice, look at the shape of the vessel that you use, a

jar rather, what kind of a jar do you use for rice, what kind of a jar do you use for, let us say to store some liquid, they appear differently. It is not just for the showy, aesthetics reasons.

It is it is simply because the container that holds rice may have to ensure that it is free from moisture whereas a container that that stores water you need not to worry about moisture. So, in a very-very similar way the kind of data that you store, your computer does some work internally in allocating some memory location for it to be stored.

Now it cannot simply keep the same location for all types of data that you may want to store, be it string or be it floating point or be it integer. It is not the same mantra for everything. The computer recognizes what kind of data you are storing and it declares the data type, this is called data type and it stores the values there and says this is the type integer, I will store it in this way only, details aside with time you will understand it, but given that you are new to programming all that you need to know is Python has different data types.

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The screenshot shows a Python IDE with a file named 'main.py'. The code in the file is as follows:

```
1 l=[10,20,30,60,732]
2
3 print(l[0])
4
5 print(l[1])
6
7 print(l[2])
8
9 print(l[3])
10
```

The console output on the right shows the following values being printed:

```
10
20
30
60
>
```

So, with this I will end with a small data type which will be discussed in detail later though, but right now I will give you a quick glimpse of what this data type is all about. Let me refresh the screen. So, what if I said what if I said, remove this, I is equal to let us say 10 comma 20 comma 30.

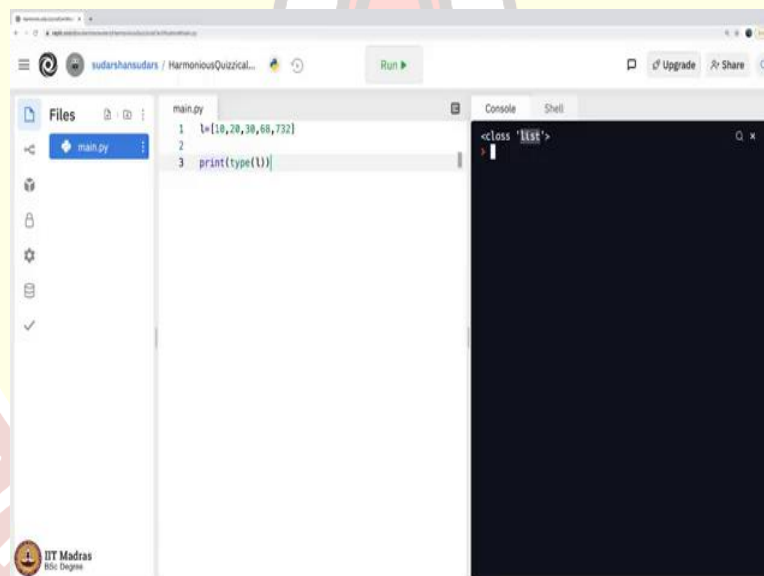
Please note the format here, I give a variable name here and say is equal to start a big bracket and put some numbers separated by comma and close the bracket that is it and I say print l. You can guess the obvious, you will see this same values being printed here. And the best

part is when you say 1 of 0 it displays 10, if you say print 1 of 1, 0 and 1, it displays the 0th value which is 10, the first value that is 20. And let us say print of 1 of 2 will be 30.

Now, what are we trying to say here? A computer always starts naming, assume you go to a classroom and you start counting people, you start with here, this fellow is the first person, he is the second person, third person, fourth person, we humans start with 1, 2, 3, but a computer generally starts with 0, 1, 2.

The reason is a little technical we will get there sometime, but then as of now you please assume that a computer always starts with 0, does not start with 1. The first element here is called the zeroth element, then the first element, and then the second element and so on. So, if I were to have more numbers here, let us say 68, 720, 732, you can put whatever you want, and then you say print of 1 of 3, you will get 10, 20, 30. And then the 1 of 3, which is the fourth element here, which is 68 and so on, this is called a list.

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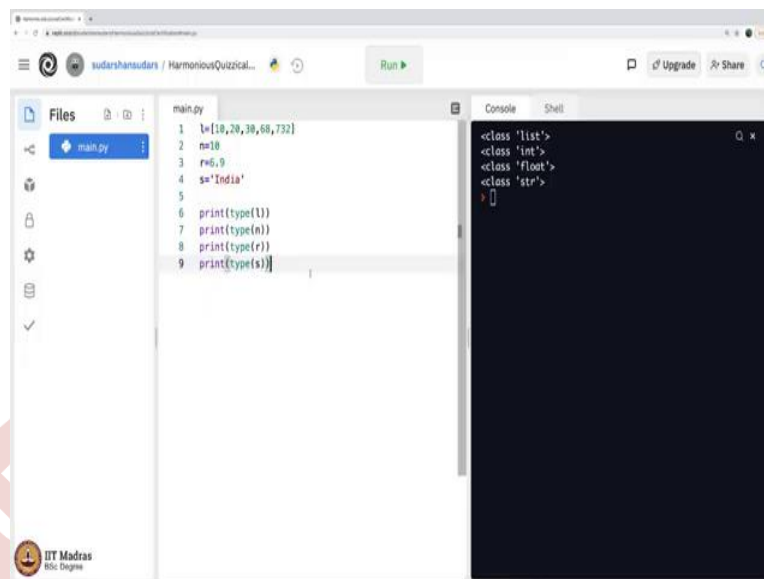
A screenshot of a Python IDE interface. The 'Files' pane on the left shows a file named 'main.py'. The main editor area displays the following code:

```
1 l=[10,20,30,68,732]
2
3 print(type(l))
```

The 'Console' pane on the right shows the output of the code: `<class 'list'>`. The IDE has a dark theme and includes a 'Run' button at the top right.

So, let us see print type of l. What kind of data is this? Is this the jar that contains rice or is this a jar that contains a juice or a jar that contains sugar? The computer stores this as what? Class list. It calls it a list. It has a very different mechanism, very different way in which it stores, but that is not important for you right now. All you need to know is Python has different data types. By data types we mean it has a knack to store what kind of data in what form.

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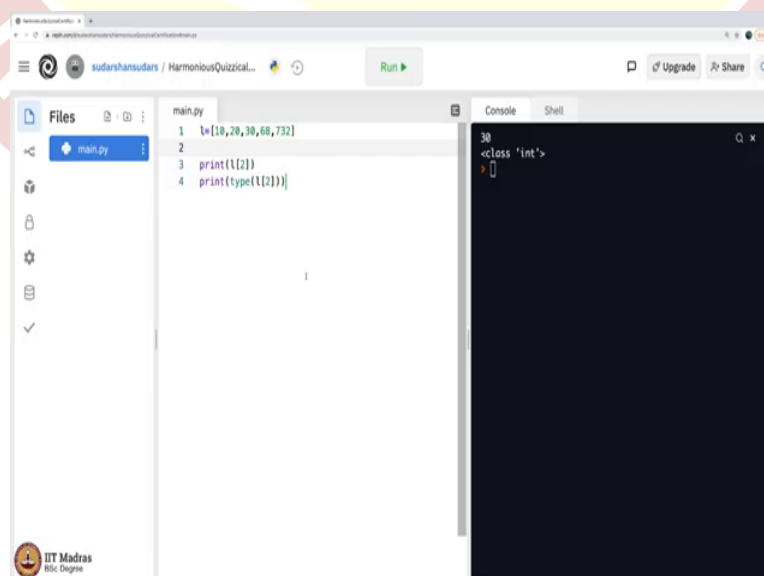
```
main.py
1 l=[10,20,30,60,732]
2 n=10
3 r=6.9
4 s='India'
5
6 print(type(l))
7 print(type(n))
8 print(type(r))
9 print(type(s))
```

```
<class 'list'>
<class 'int'>
<class 'float'>
<class 'str'>
```

Let us revise whatever we discussed so far, if you say n equals 10 this becomes an integer, if you say r equals some 6.9, it becomes float, as I said, let us try printing these things, print n, print r and then we discussed another thing, the last thing was a string, s equals let us say India and when we say print s, this prints the values, the first one was type, but what we wanted was type, so I will change this to type here, type, and then let us say type.

And you know the obvious will happen. It is throwing an error simply because I did not close the brackets. Let us try closing the brackets, now it says the first one is a list, second is an int, third is a float, fourth is a string. So, let me try showing you something and leave it as an exercise for you all to figure out what is happening.

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```
main.py
1 l=[10,20,30,60,732]
2
3 print(l[2])
4 print(type(l[2]))
```

```
30
<class 'int'>
```

What will happen if I were to type, type of 1 of 2? So, let us say print 1 of 2 and there is a print type 1 of 2, and I delete the rest, I remove this also. Guess what will happen if I execute this. I will execute and show you and I leave it to you to realize what is happening here. So, with this we end this topic of data types. I hope it is very clear. Do not break your head much. All that you need to know is computer has a different way to handle different types of data that you may want to use in your programming show. Thank you!

