INDIAN INSTITUTE OF TECHNOLOGY MADRAS

सिद्धिर्भवति कर्मजा

IIT Madras

ONLINE DEGREE

Programming in Python
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Introduction to For Loop

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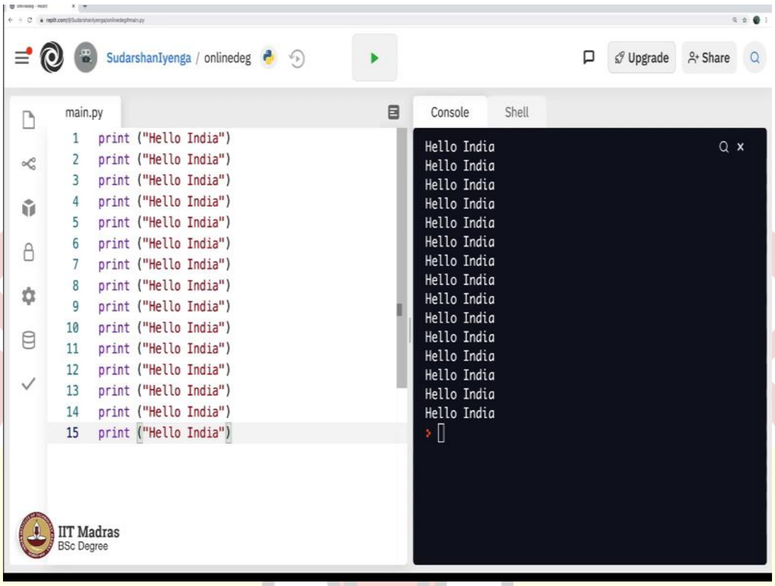

```
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
print ("Hello India")
```

```
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
>
```

Let us take a look at this straightforward command, print Hello India. As we have been seeing this command, also popularly called the Hello World command, it is a one liner command, which does what it is supposed to do, simply display whatever is inside the quotes. So, it says Hello India.

Now, I will copy this, paste it. Now we have two print statements with hello India inside it. As I execute it, I get two Hello India's. What if I try to copy paste it five times and then execute it? I get five Hello India. This is only expected, correct? My question is, if I were to type this 100 times, let us say 15 times, it will of course display 15 times this side.

As we have been discussing, programming is used to get things done really fast, number one. Number two, it is used to automate things. Now this very Ctrl C, Ctrl V that I am doing here copy paste, in itself is automation. My question is, can we reduce this task of simply copy pasting, and but yet get the Hello India output. What do I mean by that? Whatever I am going to do next will be self-explanatory, although I will explain things in detail.

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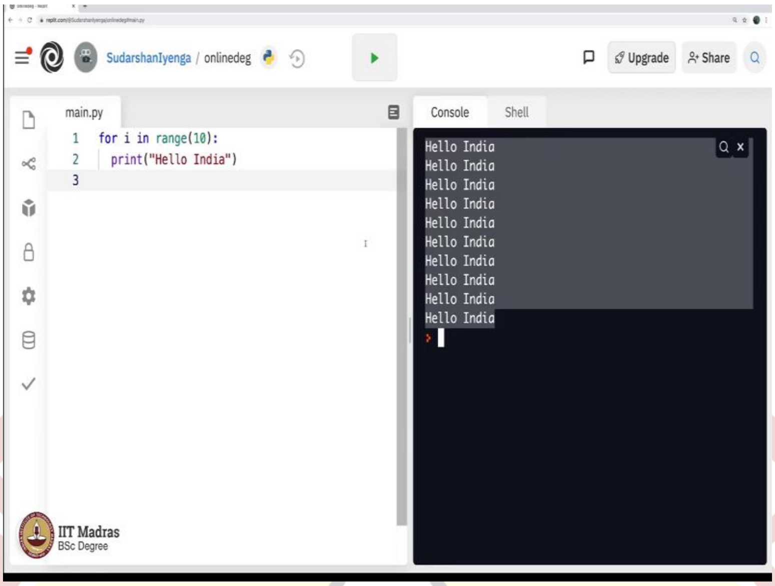
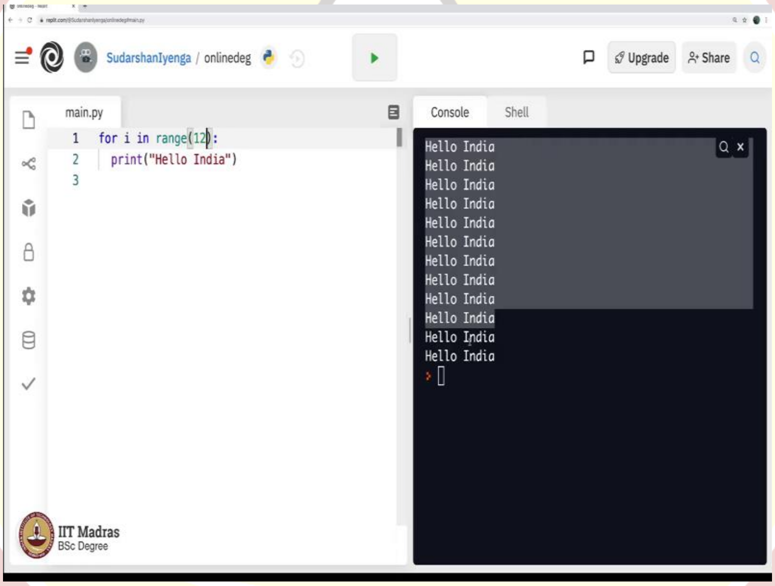


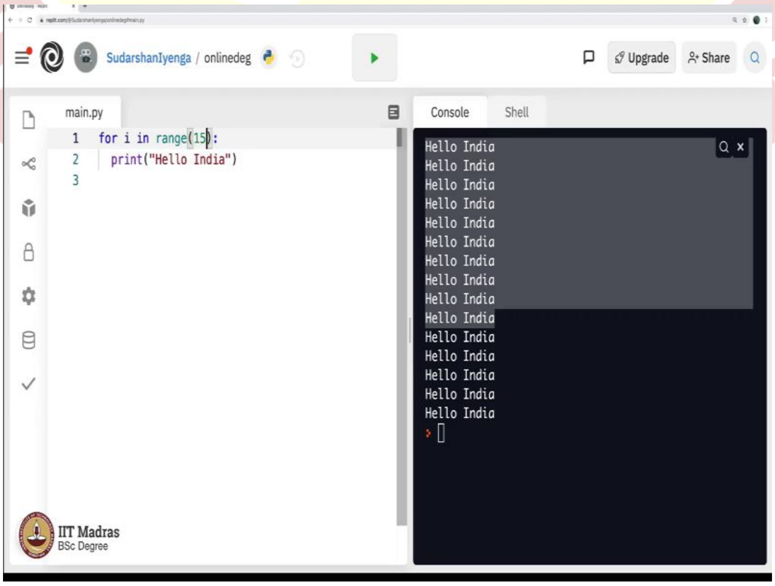
```
for i in range(10):
    print("Hello India")
```

```
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
>
```



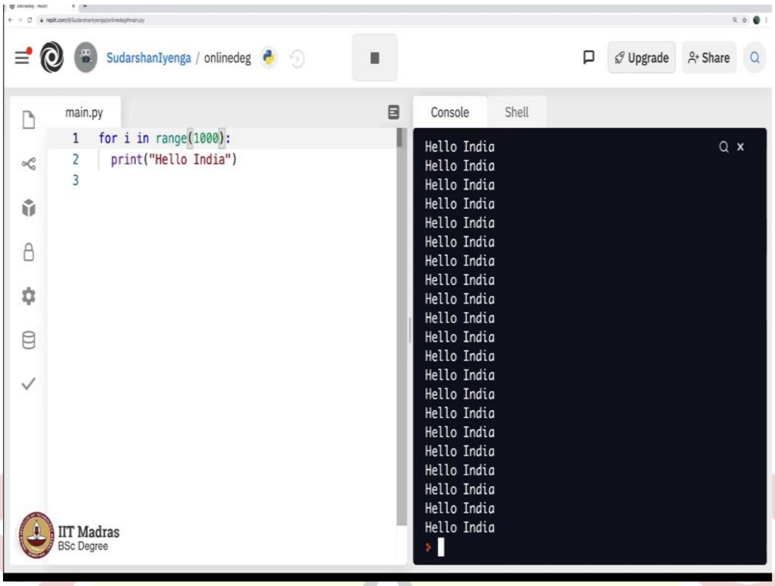
```
for i in range(12):
    print("Hello India")
```

```
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
>
```



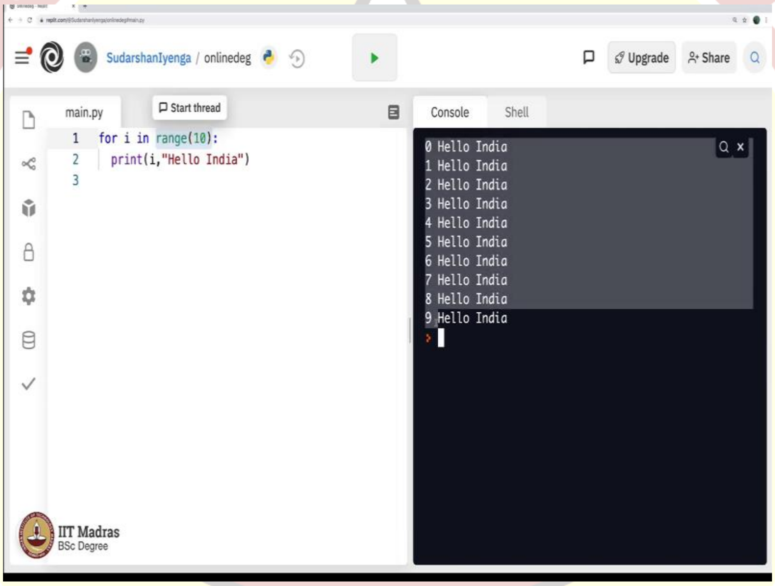
```
for i in range(15):
    print("Hello India")
```

```
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
>
```



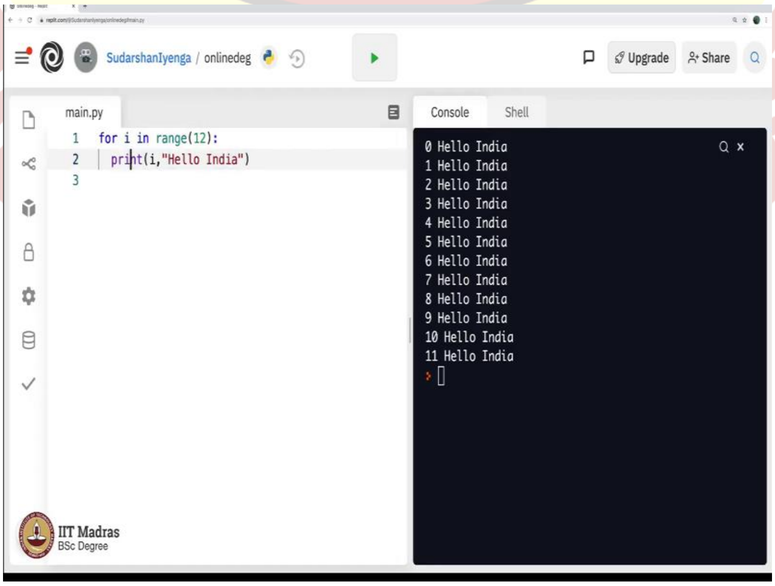
```python
for i in range(1000):
  print("Hello India")
```

```
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
Hello India
>
```



```python
for i in range(10):
  print(i,"Hello India")
```

```
0 Hello India
1 Hello India
2 Hello India
3 Hello India
4 Hello India
5 Hello India
6 Hello India
7 Hello India
8 Hello India
9 Hello India
>
```



```python
for i in range(12):
  print(i,"Hello India")
```

```
0 Hello India
1 Hello India
2 Hello India
3 Hello India
4 Hello India
5 Hello India
6 Hello India
7 Hello India
8 Hello India
9 Hello India
10 Hello India
11 Hello India
>
```

So, we have what is called the for loop, for i in range 10 as I say this and then say print Hello India and then execute this, you will get Hello India, 10 times 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10. So, you get Hello India 10 times, if you put 12 here and then execut it, you will get two more times 10 plus 2 as you can see is 12 and if you put 15 here, you will get 15 of it, so on and so forth. If you put 100 here, you will get 100 of it.

So, try putting 1000 you will get 1000 of it, of course you are unable to see it. There is a nice way to see it. Let me explain how, you simply go ahead and put i comma here and you will get the numbers towards the left of hello India. Now what just happened? What is this for i in range 10 here? As we have been discussing computers understand commands when it is specified in a particular form and format.

So, what I am telling the computer here is my command to the computer is that through this language called Python is that for i, the variable i, will take the values in the range of 10, starting from 0, going up to 9. So, 0 to 9 is 10. That is what we mean by range 10. If you say range 12 it means the variable i take the value 0, 1, 2, 3, 4, 5, 6, 7, 8 I am executing it 9, 10 and 11 from 0 to 11 it takes the values, as simple as that.

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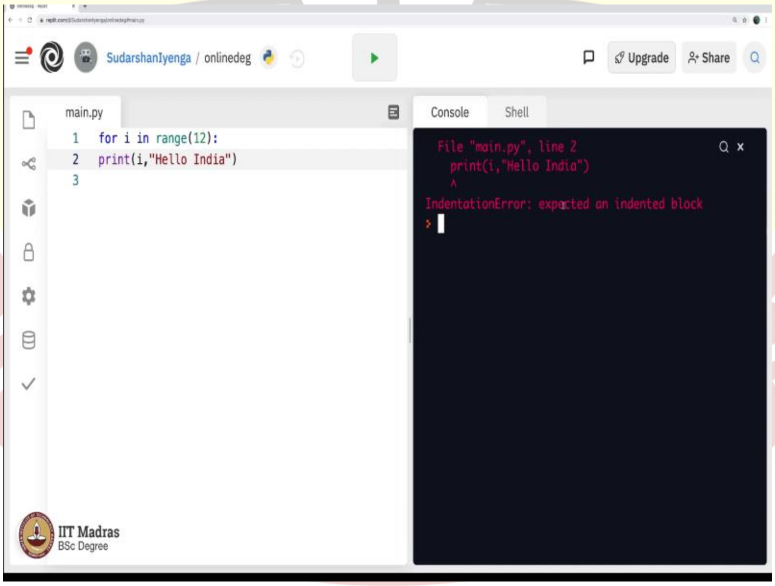
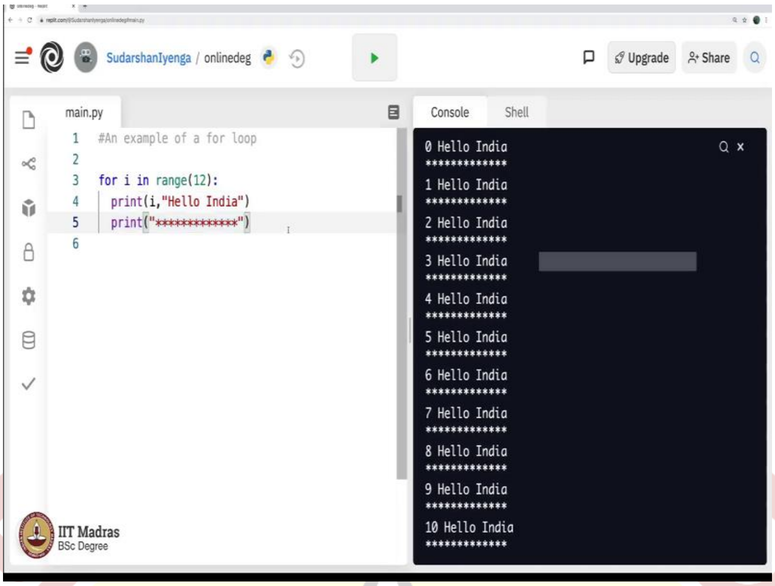


```
for i in range(12):
print(i,"Hello India")
```

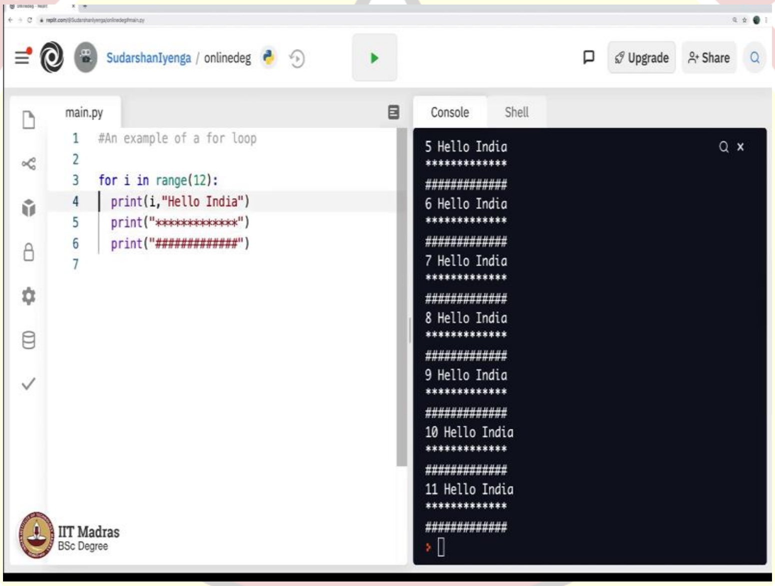
```
  File "main.py", line 2
    print(i,"Hello India")
    ^
IndentationError: expected an indented block
> 
```



```
#An example of a for loop

for i in range(12):
  print(i,"Hello India")
  print("*************")
```

```
0 Hello India
*************
1 Hello India
*************
2 Hello India
*************
3 Hello India
*************
4 Hello India
*************
5 Hello India
*************
6 Hello India
*************
7 Hello India
*************
8 Hello India
*************
9 Hello India
*************
10 Hello India
*************
```



```
#An example of a for loop

for i in range(12):
  print(i,"Hello India")
  print("*************")
  print("#############")
```

```
5 Hello India
*************
#############
6 Hello India
*************
#############
7 Hello India
*************
#############
8 Hello India
*************
#############
9 Hello India
*************
#############
10 Hello India
*************
#############
11 Hello India
*************
#############
> 
```

As and always please note, there should be an indent here, try removing the indent, it will throw an error. As expected here it says indentation error, expected an indented block. So, let us go back and reverse our mistake that we did. So, the best part about these interfaces also called the integrated development environments, you will be using, we are using the online repl.it portal, but then with time as you gain more expertise you will be using integrated development environments also called the IDEs where you will observe that this indenting automatically happens there.

But then keep in mind that you may have to put a tab here after for loop just the way you did with the if statement, if you remember, fine then. So, this is called a for loop. An example of a for loop. Why do we say loop here? The word loop here means that it is circuitry, it is sort of cyclic. You loop over this again and again. How many times? The number of times you specify here and whatever is here gets looped, you can say, print then simply put some design like these stars and then say and then let us execute it.

Let us see what happens. As you can see, whatever is inside, this gets executed 12 times, starting from 0. It gets executed 12 times. So, what if I do more of this? Let us say, I will put some other design like this, these three things get executed 12 times. Let us see if this is indeed what is happening here, that is right.

So, as you can see, it starts from here, it says, firstly, Hello India, when i is 0 and then the next line is all stars, the next line is all hash and then i becomes, i is in the range of 12, first i becomes 0 and these three things get executed, i becomes 1, these three things get executed, so on and so forth, up to 11.

We did not mean to exaggerate on a very simple for loop, many of you would not have seen for loop ever in your life, you probably are seeing it for the first time. While most of you would have encountered this already. In writing your pseudo codes you have used the for loop already in, if you have encountered any other programming language in your life, you would have surely seen for loop already. So, let us not play around this very simple statement. Let us make it a little more complicated.

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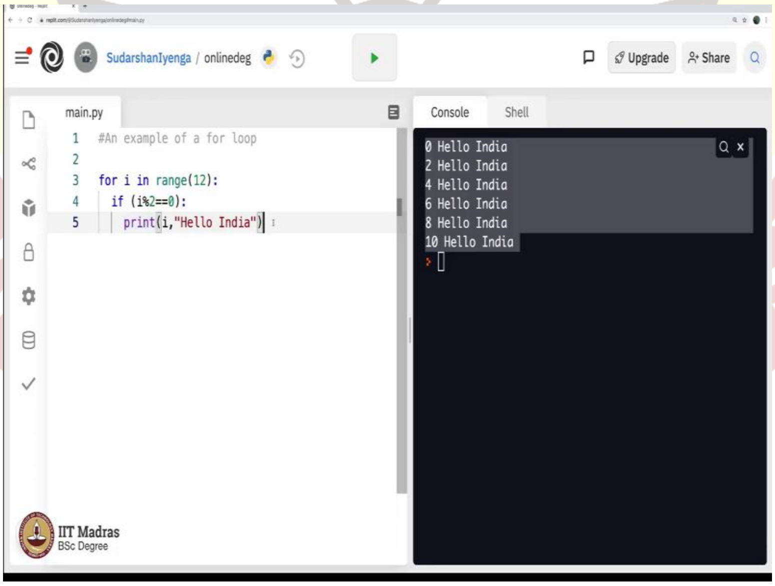
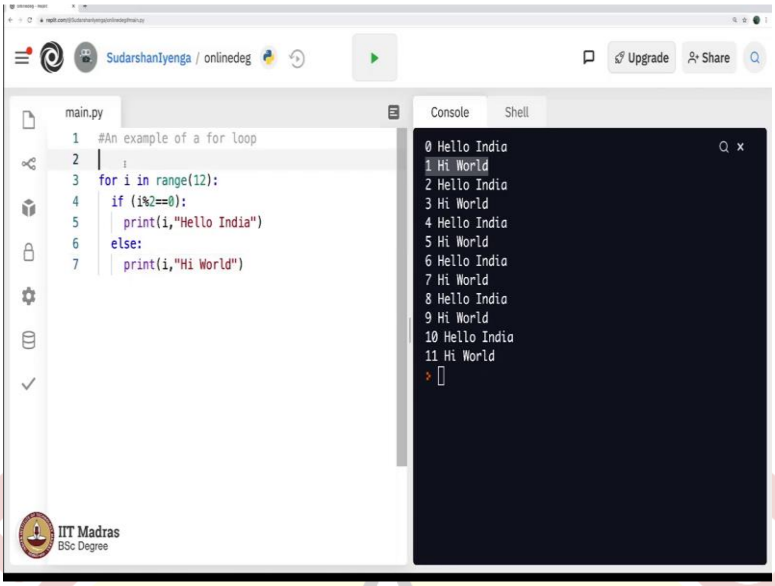


```
#An example of a for loop

for i in range(12):
  if (i%2==0):
    print(i,"Hello India")
```

```
0 Hello India
2 Hello India
4 Hello India
6 Hello India
8 Hello India
10 Hello India
>
```



```
#An example of a for loop

for i in range(12):
  if (i%2==0):
    print(i,"Hello India")
  else:
    print(i,"Hi World")
```

```
0 Hello India
1 Hi World
2 Hello India
3 Hi World
4 Hello India
5 Hi World
6 Hello India
7 Hi World
8 Hello India
9 Hi World
10 Hello India
11 Hi World
```

Let me remove these two things, then execute it back again, we get 12 Hello India. Perfect. So, what I will do is I will put a if here and then say, if i mod 2 is equal to 0, then display, I will put an indent here. Print i Hello India. Now can you guess what this is going to give you? This is not a very complicated program; you would have guessed it already.

All I am saying is i will be in the range of 12, but this statement gets executed only, if it passes this if statement. And what does the if statement say here? It says that i modulo 2 should be 0, which means i should be even, only then this gets executed. Otherwise, nothing else gets executed.

So, let us see if it is doing what it is supposed to do. Let me execute this command and see yes, indeed it is doing what is expected to do, it is only showing the even numbers here. The odd numbers, i it does not even print, it does not enter the loop here when i is a odd number.

So, then just in case I said, else here as you know, we have discussed this already. If something is true, then this gets executed, for that value of i. If not, this gets executed. What do we say here? We will say i still and say Hi World. So, what will this do? You would have guessed it right. It says Hello India, if the number is even, and Hi World if the number is odd, perfect.

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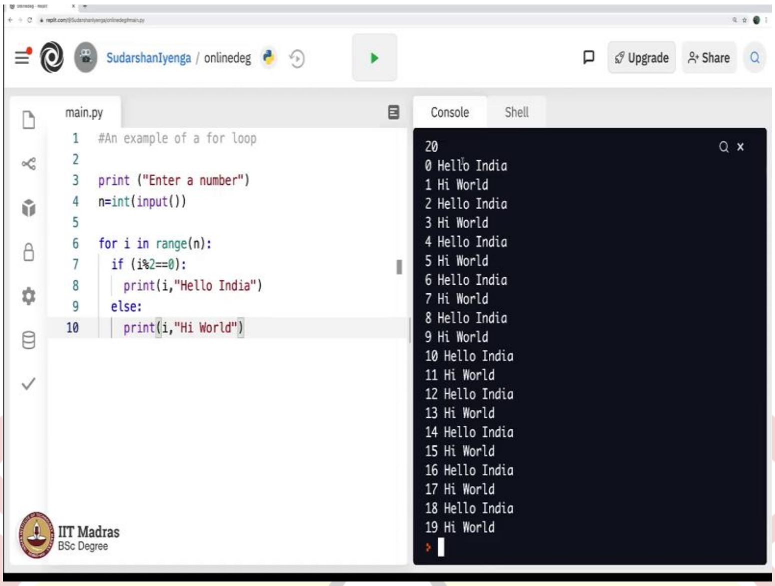
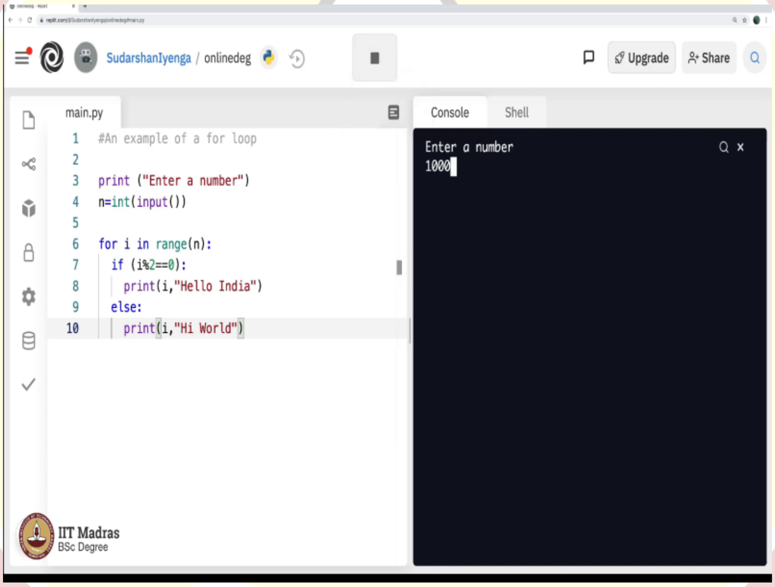


```python
#An example of a for loop

print ("Enter a number")
n=int(input())

for i in range(n):
  if (i%2==0):
    print(i,"Hello India")
  else:
    print(i,"Hi World")
```

```
20
0 Hello India
1 Hi World
2 Hello India
3 Hi World
4 Hello India
5 Hi World
6 Hello India
7 Hi World
8 Hello India
9 Hi World
10 Hello India
11 Hi World
12 Hello India
13 Hi World
14 Hello India
15 Hi World
16 Hello India
17 Hi World
18 Hello India
19 Hi World
>
```

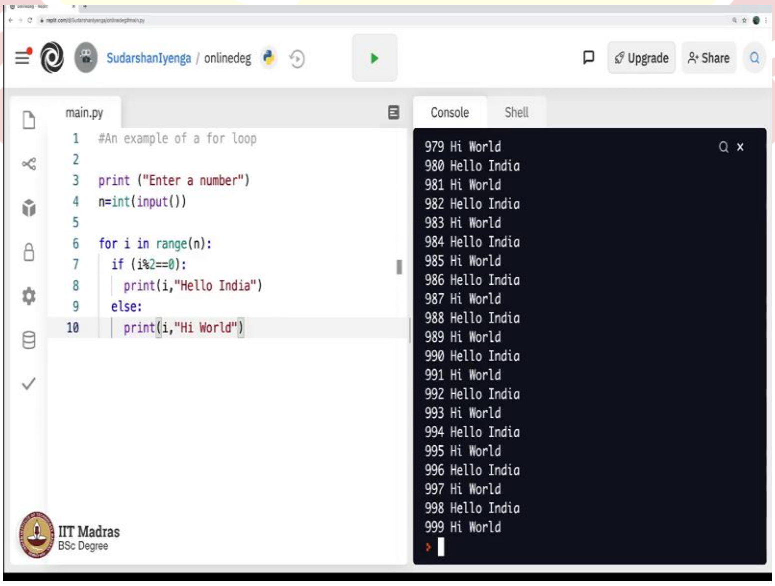


```python
#An example of a for loop

print ("Enter a number")
n=int(input())

for i in range(n):
  if (i%2==0):
    print(i,"Hello India")
  else:
    print(i,"Hi World")
```

```
Enter a number
1000
```



```python
#An example of a for loop

print ("Enter a number")
n=int(input())

for i in range(n):
  if (i%2==0):
    print(i,"Hello India")
  else:
    print(i,"Hi World")
```

```
979 Hi World
980 Hello India
981 Hi World
982 Hello India
983 Hi World
984 Hello India
985 Hi World
986 Hello India
987 Hi World
988 Hello India
989 Hi World
990 Hello India
991 Hi World
992 Hello India
993 Hi World
994 Hello India
995 Hi World
996 Hello India
997 Hi World
998 Hello India
999 Hi World
>
```

Let me just do a small addition here. I will say print, enter a number, enter a number and then I will take n equals int of input we have discussed this already you know what this means, just takes a number and then this 12 will be replaced by my n. So, what exactly is happening here? I am firstly taking, I say enter a number that is what is shown here and then n equals input, int input which means a number gets taken as an input.

If we put 20 and then for i in range, n which means loop through the values of 0, 1, 2, 3 up to n minus 1, as you go ahead like that, you display the number is even, say display the number and then say Hello India if the number is not even, which means if it is odd, then display Hi World. So, what do you see? What do you expect to see here?

Let us execute it and then see it. So, enter number 20 and I say enter you get 0 Hello India, 1 Hi World, 2 Hello India, 3 Hi World, 4 Hello India, so on and so forth up to 19. Which is 0 to 19 which is the value of n that I input which is 20 and this can be 100 or even 1000 for that matter. Let me see what it does? In a fraction of a second as you saw, it displays everything.

So, that is the introduction to, for loop. So, the sky is the limit right now, you can use for loop in situations, where there is a loop, where you may have to execute a bunch of statements multiple times. The word multiple here stands for a number, n times that itself could be a variable or a fixed number, a number of times, like how we repeated this 10 times before.

So as and always, you may want to practice this very code for a couple of times just to understand what exactly we did and then use your imagination and write your own programs using the, for loop. Let us go to more complex usage of the, for loop, in our next lesson.