IIT Madras

ONLINE DEGREE

Programming in Python
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Nested for loop

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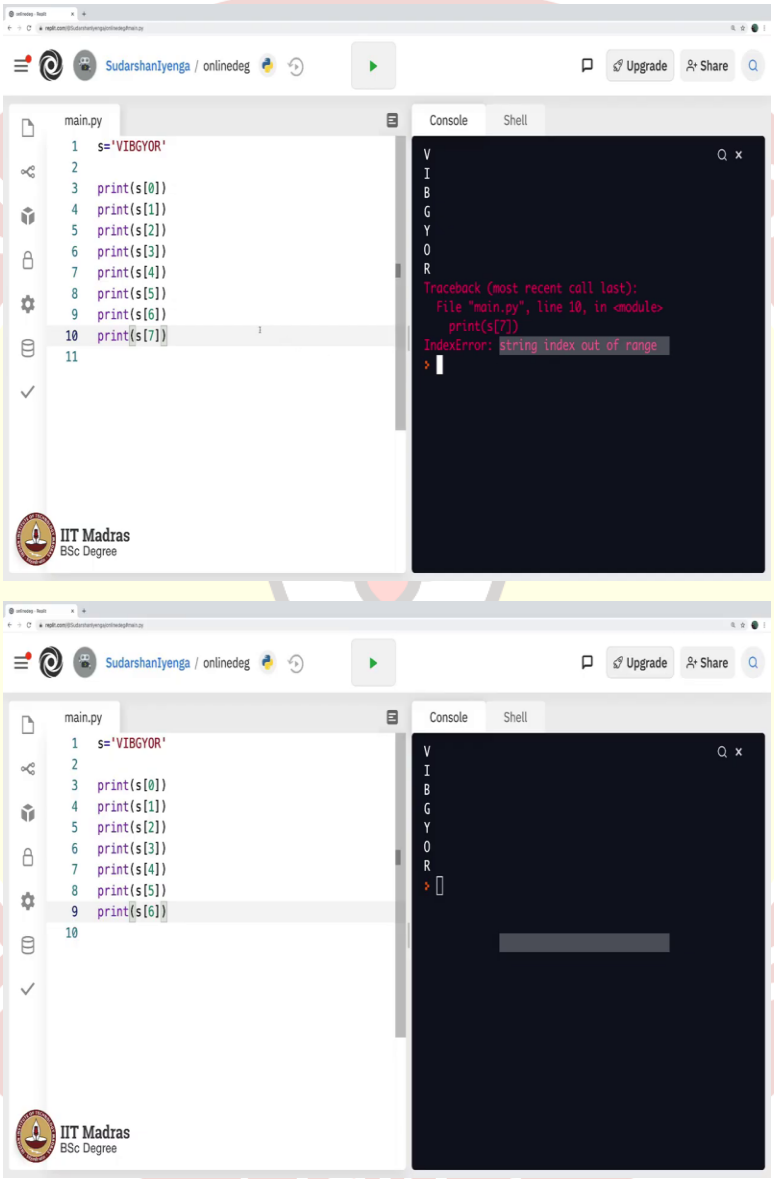

Let us now take a small example, a small coding snippet, most of the things in programming one can learn by seeing small codes, I mean, I will now write it three line code and I will leave it to you all to guess what this could possibly be doing. So, what I will do is, I will declare a string s equals ‘VIBGYOR’ we all know what this is, this stands for violet indigo blue green yellow orange red, you will see in a minute what I am trying to do.

Now, all I am doing is I say print s of 0, then execute this it will give me V, what is it doing? If I say print of s of 1 it gives me V and I, if I say print of s of let us say 2 it gives me V I and let me execute this V I and B, V I and B as you can see. If I go on like this s of 3, it will give me V I B G, let me go ahead s of 4, yes, if you remember the chapter from strings we did discuss some of the string operations in detail there, but I am helping you recollect it once again whenever you mention the strings string variable and then big bracket and then a number here it will indeed show you the fifth letter in the string.

And the last one of course is s of 6 because there are 7 letters in 'VIBGYOR' and you get all these things printed if you try printing s of 7 it will definitely throw an error simply because the seventh entry is not there, you are indexing the string which is going out of range that may sound a little complicated to you in the beginning but you will get used to these error messages. So, let me remove this then retain it, it displays my 6 letters in the string 'VIBGYOR'.

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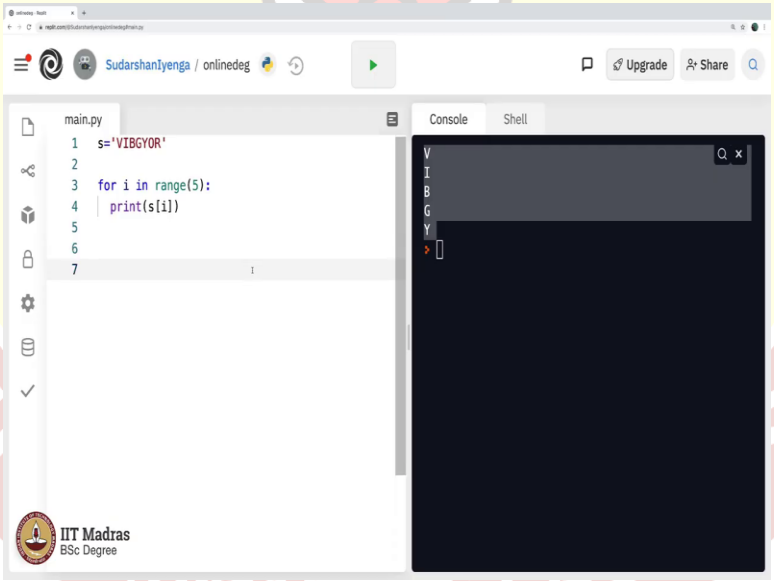

So, now let me remove all these things and do this in one line for i in range 7 print s of i. So, what will happen? s of 0, s of 1, s of 2 you will see all of it printed here in fact the same thing will get printed you will not see any changes, if in case you were to say range up to 5, you will only go up to 1, 2, 3, 4, 5, 5 letters in the string VIBGYOR, good.

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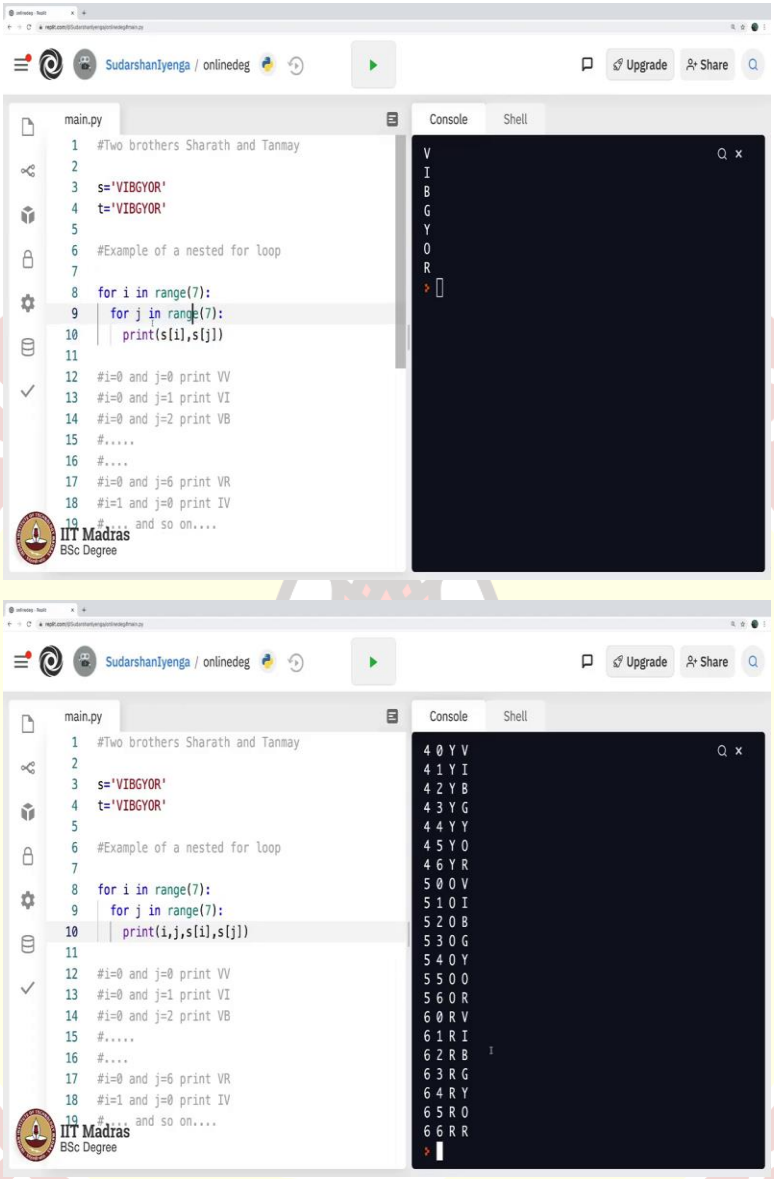

Now, I am going to ask you people a question, there are two brothers s and t, two brothers s and t, let us say s for, two brothers s for Sharath and t for Tanmay, two brothers s and t and they wear one of these colors every day, violet or indigo or blue or green or yellow or orange or red, whenever Sharath wears one of these colors, it does not mean Tanmay also wears the same color, he can wear any color for that matter.

So, now my question is what are all possible colors that Sharath and Tanmay can wear, what do I mean by this? By this I mean for i in range 7 print s of i will simply print VIBGYOR, but then if you say for every combination of a color that Sharath wears, Tanmay can wear

the 7 colors what do I mean by this just stay patient and see this code snippet, just stare at it for a moment.

What I am doing is inside this the for loop gets executed, this very for loop, so these two lines here get executed for every value of i, when i is 0, these two lines get executed, when i is 1, these two lines get executed, when i is 2, these two lines get executed but what is there in these two lines?

These two lines there is yet another for loop, this is called, this is an example of a nested for loop, looks complicated, it takes time for you all to understand but then with time you will be able to master this, this is not at all complicated just looks a little complex. So, for i in range 7, for j in range 7 means initially i will be 0, j will be 0 and you will print s of i, s of j, what will this do let me write.

i will be 0 and j will be 0 and then you will print s of i and s of j, so you will be printing basically s of i, s of j, V V, when i equals 0 and j will be equal to 1, why is that? i remain 0 here and j runs through all values between 0 and 6. So, j equals 1 the you will be printing violet and blue, so on and so forth i is 0 and j is 2 you will be printing violet, this was violet and indigo, this will be violet and blue because when s of 0 is V s of 2 is B.

And then so on and so forth, so on and so forth you will also see a, and then at the end you have i equal 0 and j equals 6, then you will be printing V and R. Why? Think through it, you will get to know, let me leave it as an exercise. And then finally after j runs from 0 to 6 the for loop here, here the value of i then becomes 1 and j becomes, it starts from 0, then you will print s of i which is I and s of j which is V and so on it is a little complicated to explain but trust me all that is happening here is put your hands here and then let us say whatever is inside here in this line gets executed for every value of i ranging from 0 to 6.

And if it is another for loop there that entire for loop gets executed for each value of i, let us see the output of this it will be very interesting to see the output, yeah hip hip hurry, as you can see you have a VV as expected, VI as expected, VB as expected and so on when i equal 0, j equals 6 it says VR, we are indeed seeing VR here and then IV here, IV when i is 1 and j is 0 and so on.

In fact, to make it a little more interesting we can also display i and j here. Let us execute this, so yeah here is the output, let me go up yeah when i is 0, j 0 it displays V and V, when i is 0, j is 1 it displays V and I, so on and so forth, when i is 6 and j is 6 it displays s of 6 and j of, t of 6 which is R, totally there are so many ways in which these two brothers can wear these 7 colors.

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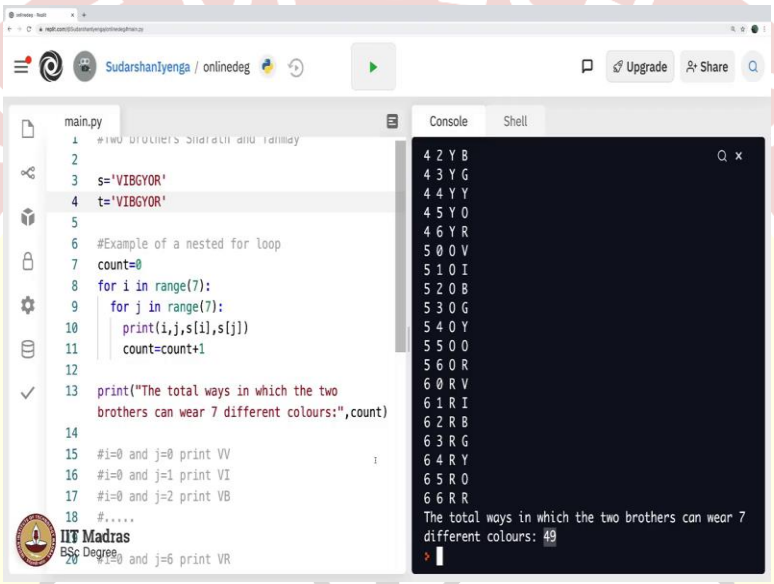

How many ways is that let me just count that out. How do I count that? I will say count equals 0 and then increment the counter here, I hope I am making sense here, then finally declare here, print the total ways in which the two brothers can wear 7 different colors, that sounds a little complicated makes it a little mathematical but yes computer science is not interesting without mathematical thinking, you would have realized that after the Computational Thinking course, there was some good deal of math there.

So, I will say count here this should give me the answer as to how many lines were here, this execution. Let us go ahead, execute this and then see what is the answer. Wow, there are 49 ways, indeed that is true because there are 7 ways in which can wear a shirt of color violet or indigo or blue or green or yellow or orange or red, for every combination than my has 7 ways. So, it is 7 into 7, 49. Why is that? It is a little mathematical do not worry, if you are unable to see why it is the answer is 49, my computer program is saying it is 49, so I trust my code, so the answer is 49.