Introduction to R Software
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Lecture – 13
Loops

Welcome to the next lecture on introduction to the R software. You have seen that in the last lecture, we started the topics on loops and we had discussed one loop that is for loop and there are 3 possible loops which we are going to discuss one is for loop while loop and repeat loop.

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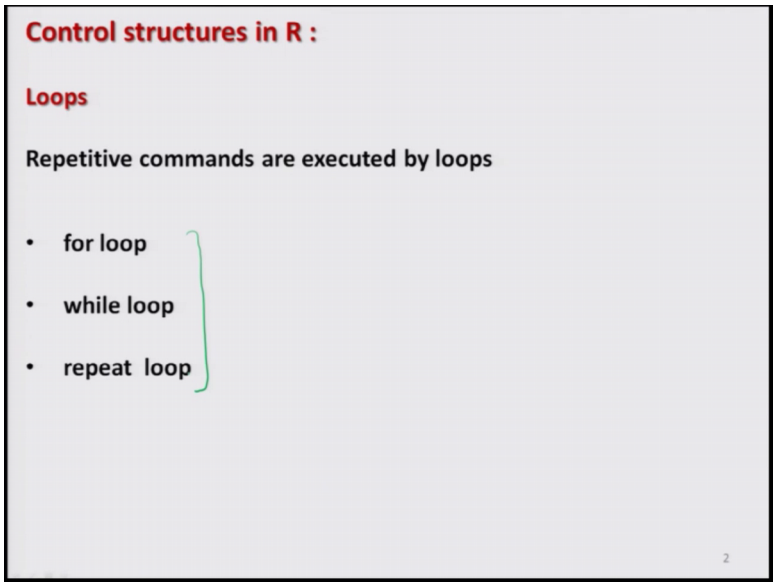

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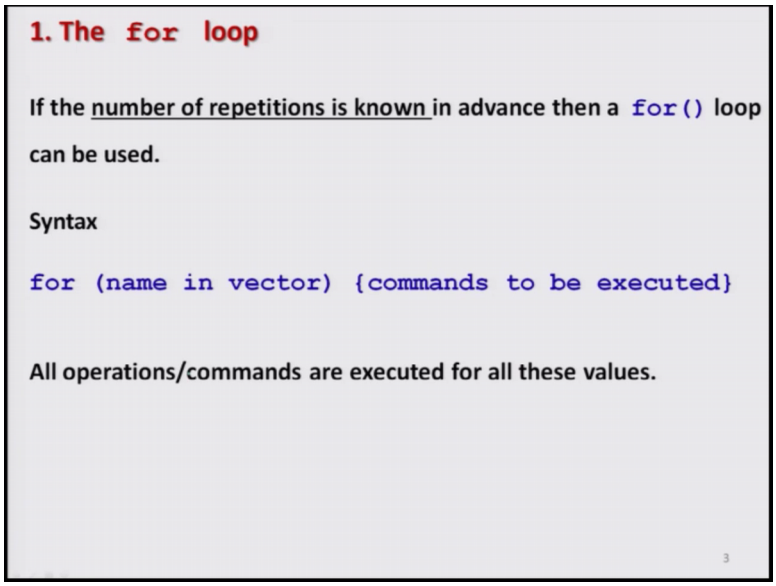

So, for loop we already have done and the syntax for loop was like this and we had taken some examples also.

Now, continuing on the same lines let us try to take here another loop here while loop.

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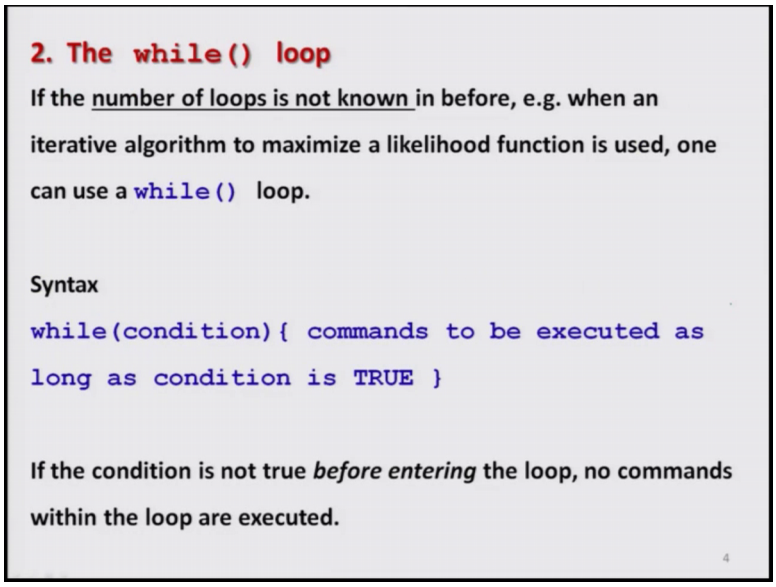

Now when you are trying to take the help on this while loop, you simply have to type here say help and then within the double quotes, simply type while on the R console and you will get the same outcome that we had got earlier for example, you can see here I can show you here.

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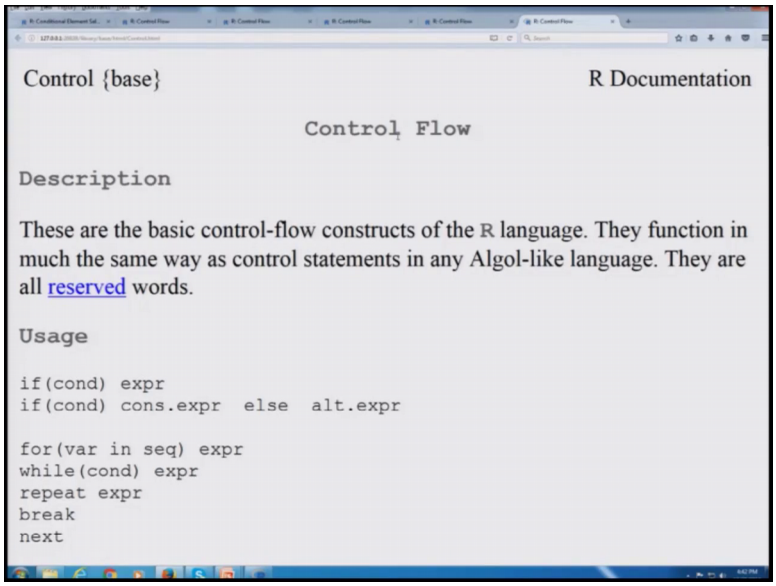

And you can see here that will bring you to the website of R project where all the help is given. So, again all the things are given over here you can simply read it and try to gain more information in depth, right.

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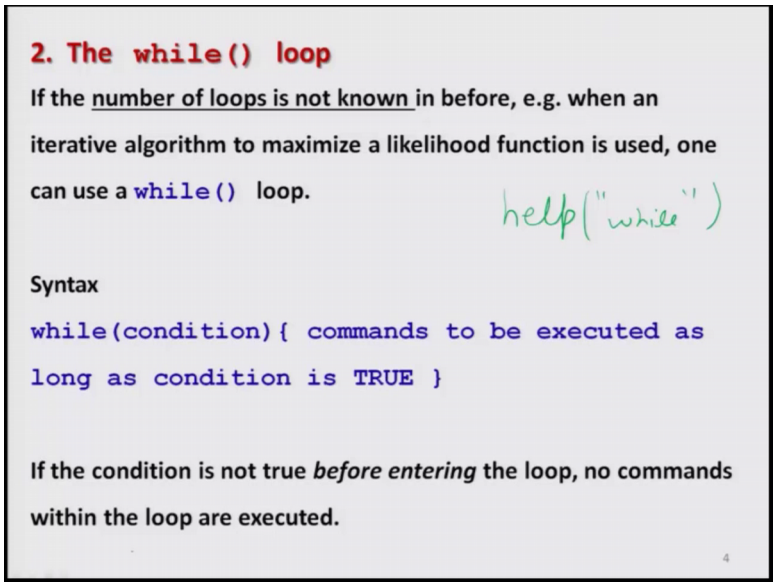

Similar to for loop, this while is also another type of loop, but this is more useful when the numbers of repetitions are not known to us. Whereas, in the for loop the number of repetitions are known to us in advance. So, in this case, we have to keep in mind that whenever there is a situation where the number of loops is a known to us; just use a

while loop and this is also a sort of iterative algorithm. For example, if you are little bit familiar with the statistics, when we try to maximize the function for example, a likelihood function, then it is a sort of iterative process that the process will continue till the maximum is obtained.

The maximum is going to be obtained in the fifth round or in the seventh round or in the hundredth round that we do not know in those situation, this while loop is more useful the syntax of while loop is as follows. Just simply try to write down here while; w h i l e in small letters, then inside the bracket sign, try to write down the condition which has to be checked and then try to write down inside this curly bracket all the commands which are to be executed as long as this condition is true.

So, in very simple words, I am asking my while loop to repeat the program unless and until the conditions remains true; that means, as soon as the condition become false the program will automatically stop that is the advantage of while loop.

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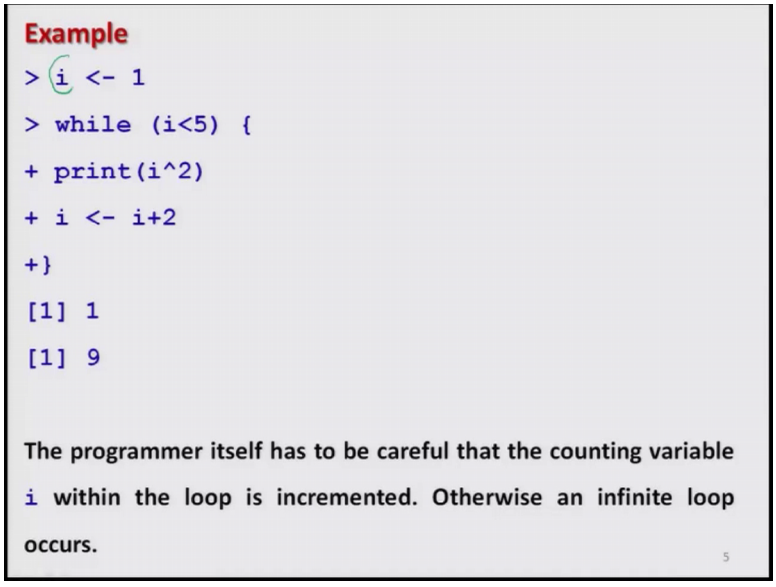

So, let us try to take here some examples and try to understand suppose I take a variable here i and I assign it a value equal to one and I am saying here as long as or in your R language while i is smaller than 5, please execute the following program and I am trying to write down this program inside these 2 curly brackets, you please do not get confused with this plus signs because they will occur when you are trying to write the program in

the R console, I will try to show you that how do they come and then you will understand it very clearly, right.

So, now you can see here what is happening first we try to do it in the R software. So, now, I have; I am typing this program over here and you can see here that how this plus comes as soon as I write a statement and I enter a plus come plus means the program is yet not complete and as soon as I give here curly bracket sign, the program becomes complete and then I get the outcome here 1 and 9.

Now, the next question comes; how this 1 and 9 is coming. So, let us try to understand it inside this program. So, what I am trying to say here that as long as I is less than 5, my program should continue. So, now, the first value is I equal to 1 which is given over here because that was the sign I equal to 1 means I am trying to say here print i square print 1 is square; answer comes out to be 1 and then in the next stage, I am trying to replace it, but before that since the answer has come out to be one this is appearing here and now in the next stage I am saying that do not use I equal to 2, 3, 4 or 5, but try to replace i by i plus 2. So, up to now, this I was taking the value 1. So, i becomes here 1 plus 2 is equal to a 3 and as soon as i become 3, the program comes back to this statement print i square and then again print i square which is equal to here print 3 square is executed, we get an answer here 9 and this answer you can see here that is appearing here and this answer here one that was appearing here.

Now, in the next stage, I am saying that i becomes here i plus 2. So, this i becomes here 3 plus 2 which is equal to here 5. So, now, just the condition that while i is less than 5 remains true, no, this becomes 5 less than 5 which is false and as soon as the condition becomes false the program is terminated.

This is how the while loop works and in this case we have to be little bit careful that the counting variable i within the loop has to be specified very carefully otherwise some time the program is tracked in an infinite loop so, but with some experience you will come to know that how to write this loop such that you are never trapped into an infinite looping and here on this slide, I have simply tried to give the screenshot of R console when I was running the program.

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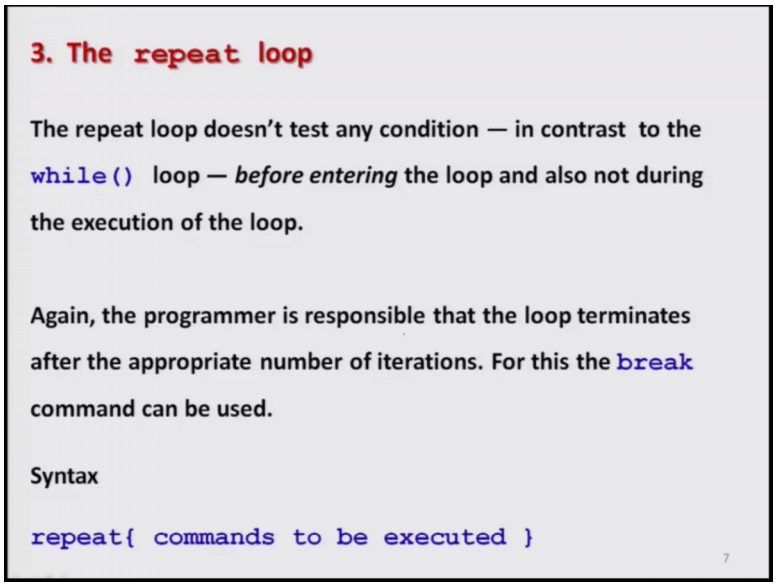

So, after this I try to take the next loop which is here repeat loop. Now the first question is what is the difference between repeat loop with respect to the earlier loops for and while you may recall that in for and while we are always checking a condition and when the condition is true, only then the statements are executed depending on whether the statements are true or false whereas, in repeat loop such conditions are not needed, but the entire program will continue to any specified number of times whatever you are mentioning.

So, in this case, the responsibility lies on the programmer that he has to write the number of time the program has to be repeated inside the program right in this case first let us try to see the syntax the syntax is very simple. In fact, if it is much simpler than for or while loop it is just try to write down repeat; r e p e a t in small letters, then just write down this curly brackets and inside this curly bracket try to write down all the commands whatever are to be executed that is all.

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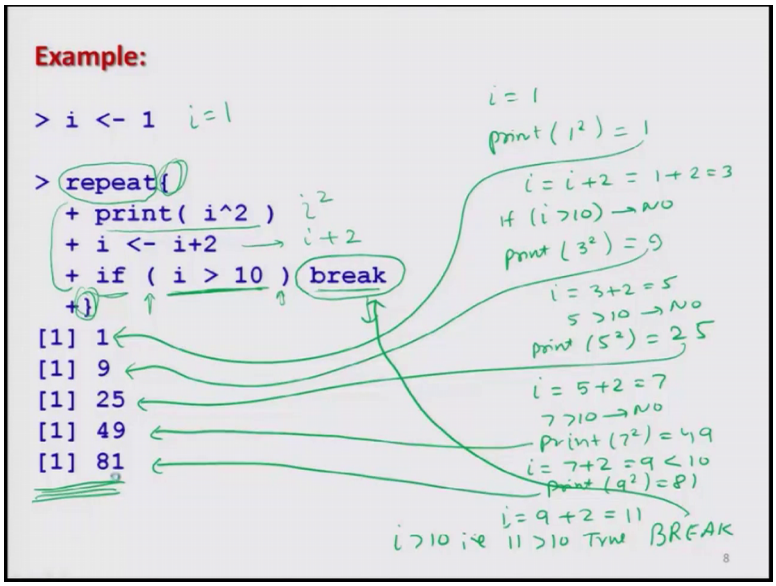

Let us try to take an example and try to see how these things are done, right. In this example, I try to take an increment variable say i equal to 1 that is my initial value given to the variable i.

Now, I am writing here the program here repeat and then I am trying to write down here the curly bracket and then I am trying to write down here the print; that means, whatever the value of i is taken here print its square that is i square, then in the next step, try to replace i by i plus 2 and try to repeat the program, but how long. So, for that I have to give here another statement say here when I want to break the program when I want to stop the program otherwise the program will be trapped into an infinite loop.

So, now I am trying to say here and giving the condition that if i is greater than 10; that means, as soon as i becomes more than 10, please break the program this is the syntax. So, such a condition is written with this bracket sign simple bracket sign and after that we write here break; b r e a k in small letters and all this commands which are to be executed, they are written inside these curly brackets.

So, now let us try to execute this program over the R console and see the outcome. So, now, I am trying to type the program over here inside the R program.

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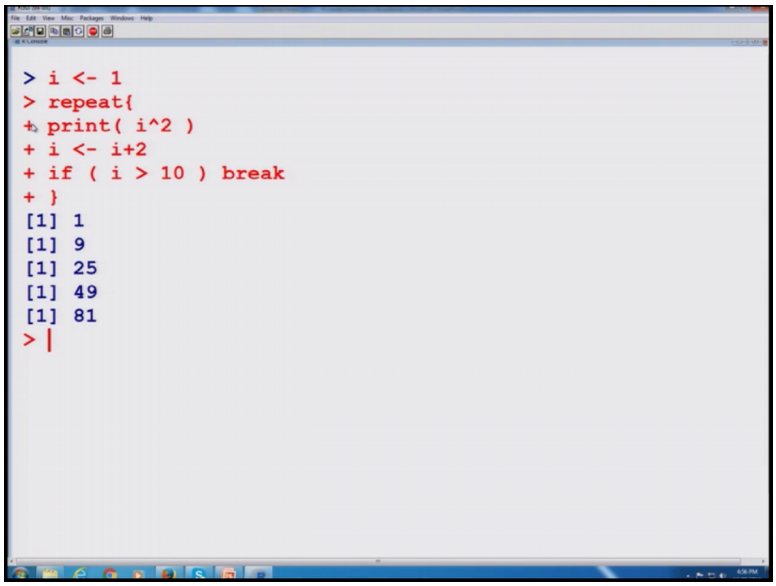

And you can see here again you are getting a plus sign; that means, the program is not complete, but now I complete all my steps and I try to write down here the curly sign and as soon as I press enter; the program is complete and you can see here this is the outcome that I have got.

So, now you have to understand 2 things first of all, since I am working directly into the R console that is why all these plus signs are coming, but in case you are working with R studio, then you can type these commands over here and this plus commands will not appear. So, do not get confused when you are working with R or say or say R studio, right.

So, let us try to first understand that how this outcome is generated what is the logic and what is really happening. So, you can see here; I have a given initial value of i to be here one now the program is starts with this value and it takes i equal to 1 and now I am asking it to print i square. So, it is printing me here one is square and this one is square is equal to here 1 and this is printed over here.

Now, I am asking it in the next step that i is to be replaced by I plus 2. So, now, since i is equal to 1. So, this becomes 1 plus 2. This is equal to here 3 and then the control comes over and it checks if I is greater than 10 the answer is no. So, the control comes back to print i square and now i is taken has here 3. So, this is printing here this is printing here 9 and this 9 is printed over here and so on; this process continues that in the next stage, i

will become here 3 plus 2 this is equal to here 5 and means again 5 is greater than 10 no; this is false. So, this gives me an output here print 5 square which is here 25 and this value here is printed here

Now, in the next step, i becomes 5 plus 2 which is equal to here 7 and then that condition says that is 7 greater than 10 answer comes out to be no and then I get here the answer print say 7 square which is here 49 and this value is printed over here, then in the next stage, I get here I equal to 7 plus 2 which is again here 9 and 9 is a smaller than 10. So, I get here the answer print say 9 square which is here eighty one and this is appearing here and now you have to see what is happening.

Now, in the next says i becomes 9 plus 2; i plus 2. So, I equal to 9 will be replaced by i equal to 9 plus 2 that is 11 and as soon as i becomes 11, the condition that i greater than 10 that is eleven is greater than 10, the condition becomes yes; this is true and as soon as this becomes true the program says break the program which is written here and the program terminates after this. So, that is why there is no value after 81, right.

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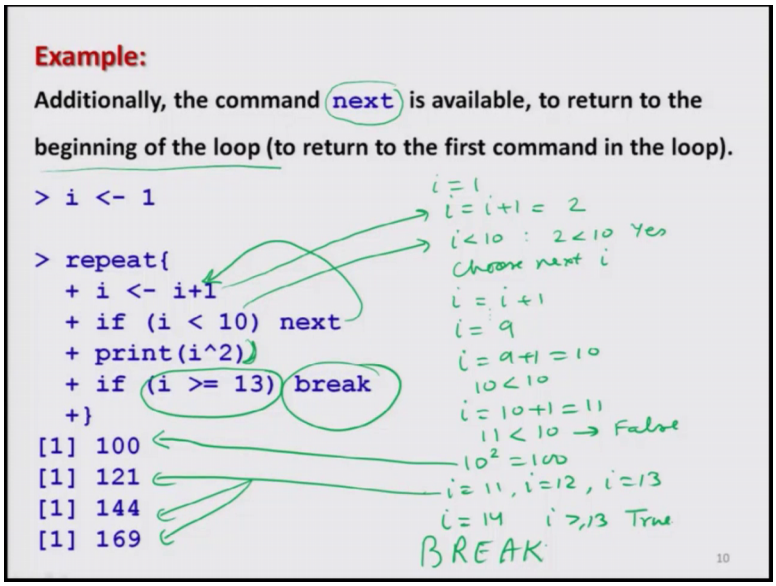

In the next slide, I have given the screenshot of the same program which you can repeat yourself; now I try to take another example in which I am trying to use here another function here inside the same loop which is here; next right and this command next is helpful in returning the control to the beginning of the loop and this brings back the control to the first command which is given inside the curly bracket.

Let us try to first see is outcome and then we will try to explain how the things are happening. So, now, I had typed the same program here and as soon as I put here a curly bracket; this programs finishes and you can see here the outcome and the same outcome is mentioned over here in this slide that you can see.

So, now we have to understand how this outcome is coming. So, you can see here; I have given here i equal to 1. So, this program comes over here and it gives me here trying to replace i by i plus 1 which becomes here 2 and now in the next step, it is trying to check whether this i is smaller than 10 or not. Now I can see here that 2 is a smaller than 10; answer is yes, this is true and when it is true then it is trying to take; next I choose next i and this process goes on, then in the next stage the control from here next comes back to here i equal to i plus 1 which is the first command in the list and this process is continued that that this print i squared will be established will be executed only when this condition is false.

So, now you can see here that as soon as i equal to; here say here 9; the i is replaced by 9 plus 1 which is happening here 10 is in between; you have to do all these calculations yourself; right and then i becomes 10, 10 is a smaller than 10; no, then in the next stage I becomes 10 plus 1 which is here eleven and then in this case the condition that i less than 10; that is 11 less than 10 becomes here false and as soon as the false condition come; this is executed and I get here print 10 square which is here 100.

Now, it goes with i equal to say this 11, i equal to 12, i equal to 13 and now as soon as I say here these values are given here and as soon as I take the value here; i equal to 14. This condition here that i greater than or equal to 13 that is satisfied and this becomes here true and in this case; this command here break comes into picture and the program stops here.

So, now in this repeat loop; you have an option that you can use the next and break commands logically to make your program much better. So, now, we have completed some details on the loop and now it is your turn to do some more practice take some question from the assignment take question from say books or from your area and try to practice them; loops are very important in any sort of bigger programming language or any sort of program; I am doubtful if any program can be really accomplished without the using of loops. So, we will see you in the next lecture, till then good bye.