Foundations of R Software
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Lecture - 31
Operations on List

Hello friend, welcome to the course Foundations of R Software. And, you can recall that in the last lecture we initiated a discussion on the topic of list. And, we had understood that how list can be created and what are the different properties and characteristics of this list. The list essentially can contain different types of objects and we had learned that how we can access a particular element at a particular location inside the list.

So, now today we are going to extend this discussion and we will try to learn various types of other Operations in the List. And, these operations are, suppose you want to add something at some place or you want to remove something from some place and like this. So, these operations are exactly on the same lines the example what we took on the last lecture that your mom has asked to bring couple of thing from the market. And, you ask her to please write them in the form of a list and you take the list and then you bring the things. And, now suppose you are in the market and your moms calls you and says ok, at please add some milk into the list. So, up to now you were, there were three objects in the list; vegetable, medicine, cloth and now she is asking that ok, add the milk in the list. So, you will add there.

So, what you have to do? You have to write the fourth value at some location. So, how to get it done? Numbers two, there is another option that she asks you ok, whatever I have written at the point number 2, do not bring it. So that means, whatever is written at the second place in the list that has not to be brought. So, that is another option and there is another possibility that you are in the market and she suddenly calls you and says ok, there are couple of things which you have to bring, ok. I am sending you another list with your brother or your sister. Now, you are in the market, your brother or sister comes there and you combine both the list together and then complete the shopping. So, similarly in the list also we have different types of options that how we can add, remove or append or merge different elements and different lists.

How to get it done in the R software that is exactly what we are going to do in the lecture today. So, let us try to understand and try to take some examples to understand how R is going to work and what are the commands. So, let us begin our lecture, right.

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So, in the last class, we had understood that how are you going to create a list. So, to create a list, we simply have to write down here the command l i s t and then inside the parentheses you try to give the values. So, I try to create here two lists, say list1 consist of 3 numbers which are numeric 1, 2, 3 and list2 contains here three characters like as say drinks - water, juice, and lemonade.

I try to write down here list and inside the parentheses I just try to write down all the 3 elements separated by this comma. So, now if you try to see here, these two lists they will look like this. In the list 1, you have here 1, 2 and 3 and then the list number 2, you have here water, juice and lemonade. Now, I want to merge these two lists. So, now, how to do this merging of the list, that is first I would like to explain you.

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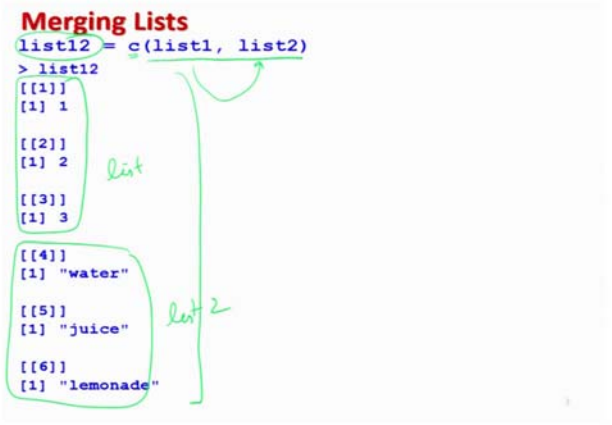

So, in order to merge the list, it is very simple. Just treat the list as a data vector and simply use the command here c and then inside the parentheses try to write down here list1 comma list2. And, the both the lists are going to be joined in the order you are trying to write them inside the parentheses.

So, suppose I try to combine both this list, I try to merge both list and their outcome is stored in a list12, right. So, this outcome will look like this, now you can see here. This first part this is your here list1 and this second part here this is your here list2. So, both the lists are merged together without any problem.

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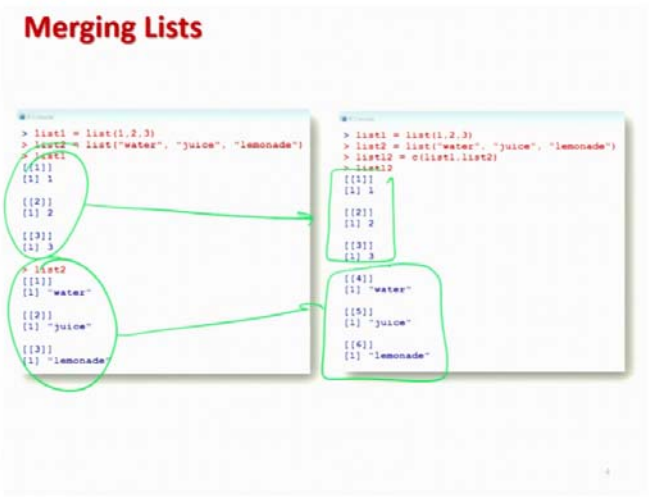

So, you can see here this is not a very difficult operation and if you try to see it on the R console also, this is my list number 1, this is my list number 2. And, now this is appearing in the merge list at here and this is appearing in the merge list at here, right.

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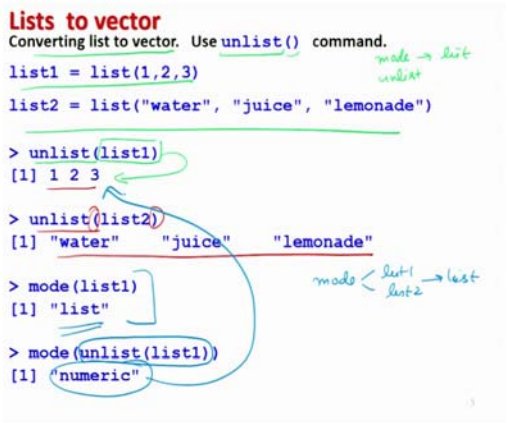

So, I will try to show you this operation on the R console also, but before we try to understand one more aspect of this list. So, now, what you have done here that you have converted a vector to a list, now I want to do the opposite thing. I want to convert the list to a vector. So, for this operation you have to use the command here unlist, u n l i s t and inside the parentheses you try to a give the name of the list which you want to unlist.

And, what will happen? This is actually going to change the mode, right. For example, if you try to recall the mode of a list is actually list. So, when you try to list it or you try to use the command unlist over the list, then what will happen? Let us try to see through this example, right. So, let me try to consider the same list1 and list2 here.

So, now, if you try to see, I simply try to write down here unlist list1. Now, this is converted into a vector. How to identify? If you try to see here in this earlier one, when you were trying to look at this list number 1, it was looking like this that it has here and this is like inside the double square bracket. But, now this is only here 1 2 3 and similarly if you try to here unlist here this list2.

So, simply write unlist u n l i s t inside this parentheses and write down the name of the list, list2. You can see here this is coming out to be simply here as a vector. And, if you

try to verify it here, you can see here that in the earlier one, your this list2 was looking like this. It has the addresses in the format of double square. So, that was the particular structure of the list.

Now, but suppose you want to verify what is really happening with this unlist command, so obviously, if you try to find out the mode of see here list1 and list2, they are both of them are going to be here list, right. You can see here, mode of list1 is list. But, when you try to unlist it so, the mode of this unlist of list1 becomes here numeric. So, now this is here a number, that is what I wanted to show you.

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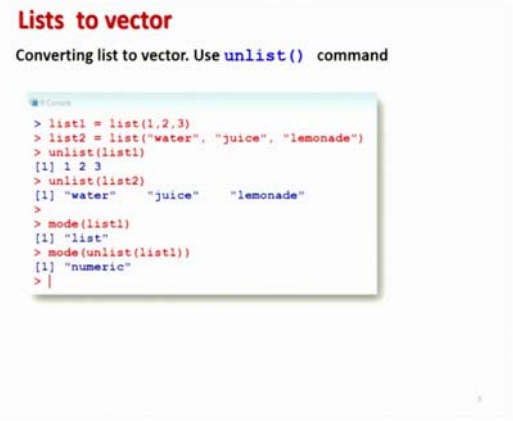

And this is here the screen shot of the same operation.

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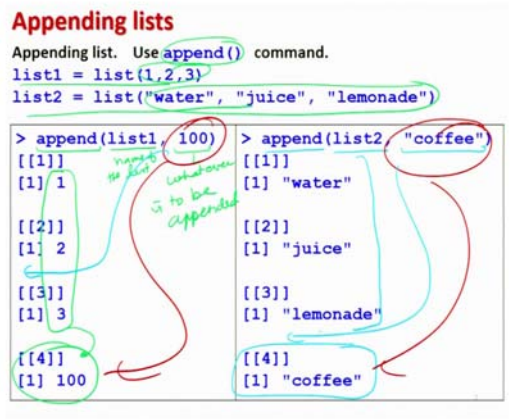

And, similarly I will try to show you that what will happen if you try to unlist the list2. So, you treat try to just think what do you expect what will happen if you try to unlist the list number 2, right. So, first let me try to create here this here two lists say list1 and list2.

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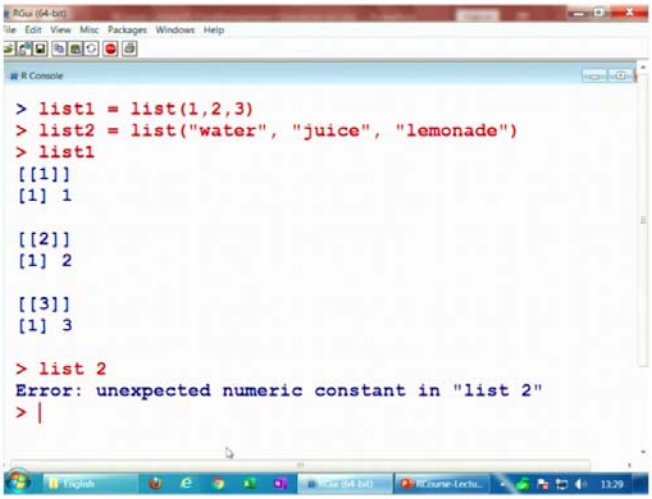

So, you can see here, I try to consider here this list1 is like this and list2 here is like this right. So, you have to just see.

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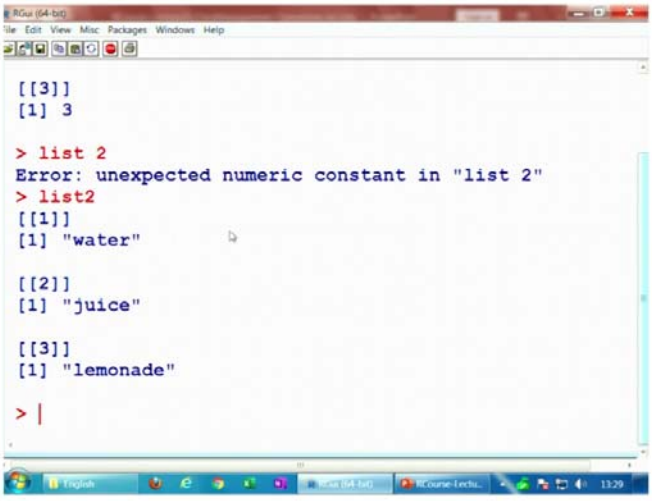

Well, you have to write it like this ok. So, this is here list2.

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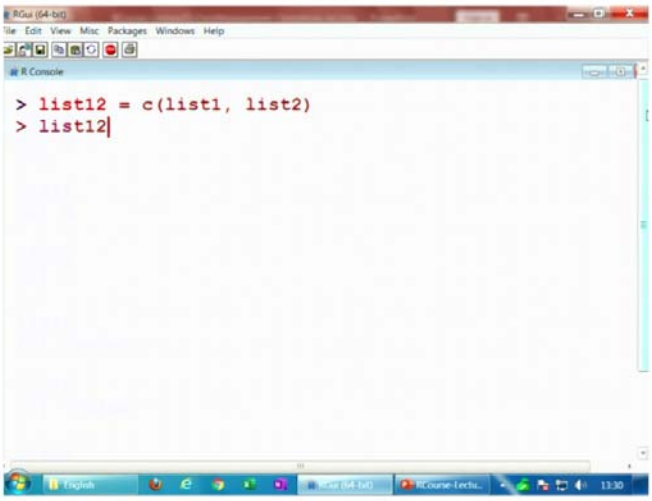

So, you can see here now I can write down here, see here I want to now combine them together. So, I try to write down here list12 is equal to say c, say list1 and comma list2 and you can see here what happens, now this is your here list12 like this.

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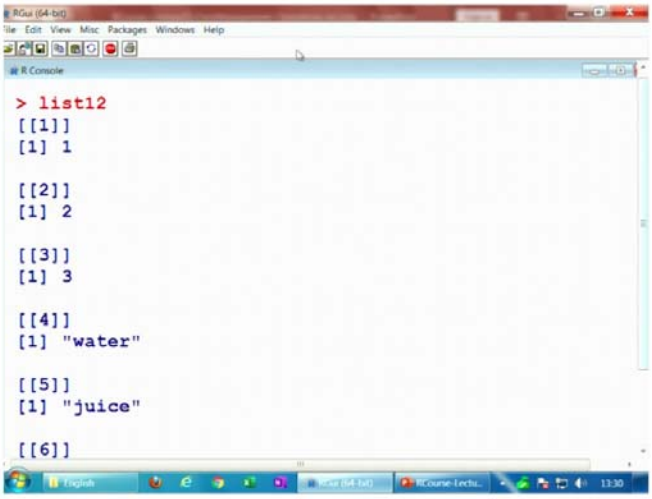

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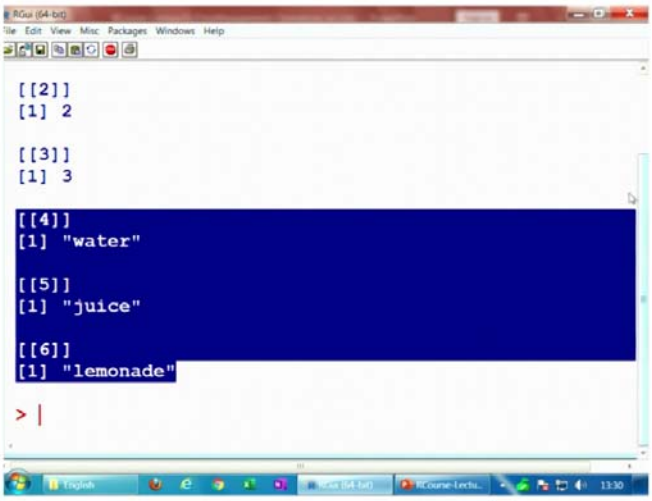

You can see here that first 3 elements, they are going to be from the list1 and the remaining 3 elements water, juice and lemonade they are from the list2, right. So, like this.

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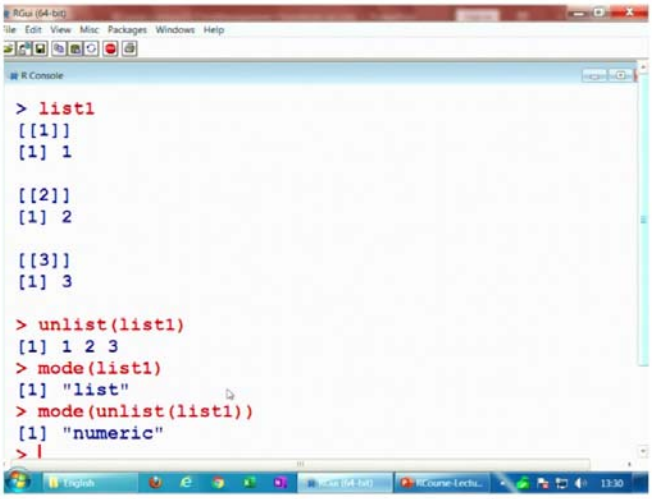

So, now, if you try to unlist them, so, you can see here this is your here list1 and if you try to unlist here list1 what happens? This is here like this. So, you can see the structure very clearly. This is the structure of the list and this is only a vector. And, in case if you try to find out the here the mode of this list1, you can see here this will come out to be a

list whereas, if you try to find out the mode of this unlist of list1, this comes out to be here numeric, right.

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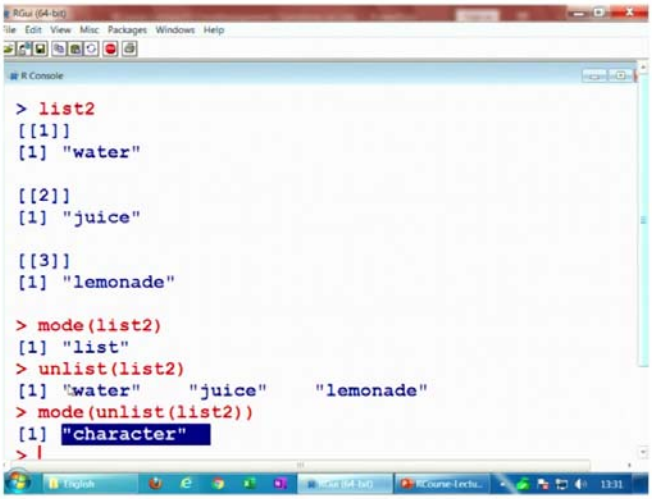

And, similarly if you try to look here for here list2, this is here like this. And, what will be the mode of this list2? This is a list. Now, you try to unlist, unlist here list number 2. We can see here this will become just like a vector. And, if you try to find out the mode of this unlisted list2, it comes out to be here a character; that is what I told you. This is character, right.

So, now let us try to consider some more operations and now I try to show you that how you can append something in the list. Means, append you know that you want to add something, right. Now, you have two option, whether you want to append something at a particular location or at the end.

So, first try to consider the same list, list1 and list2 here and you can see here both of them have 3 elements. The list1 has three elements 1, 2 and 3 and the list2 has three elements water, juice and lemonade. Now, suppose I want to add 100 in the list1. So, for that I simply use the command here append. a p p e n d, all in lower case alphabets.

So, I try to write down here a p p e n d and then inside the parentheses, I write down the name of the list and then I try to write down whatever is to be appended. I write here 100, now you see what will happen. Means, earlier your list was up to here 1 2 3 list1,

but now you have appended and now you have here the 4th element here 100. So, now this is your here new list.

And, similarly if I want to add coffee in the list number 2 here, so, I try to use the command here append a double p e n d and inside the parentheses I try to write down here list2. The list in which I want to append and without giving anything, I simply try to add here the name coffee. So, you can see here once you enter, this is these first 3 elements they are from the list number 1 and now the 4th value is added here.

And, one thing what you have to keep in mind here, it is very important that you have not given any here location. But, whatever you are adding here that is simply coming at the end, right, whether it is numeric or character. But, now suppose you want to add these number at a particular location. Suppose, you want to add this 100 say somewhere here or say coffee somewhere here for example, then how to get it done, right?

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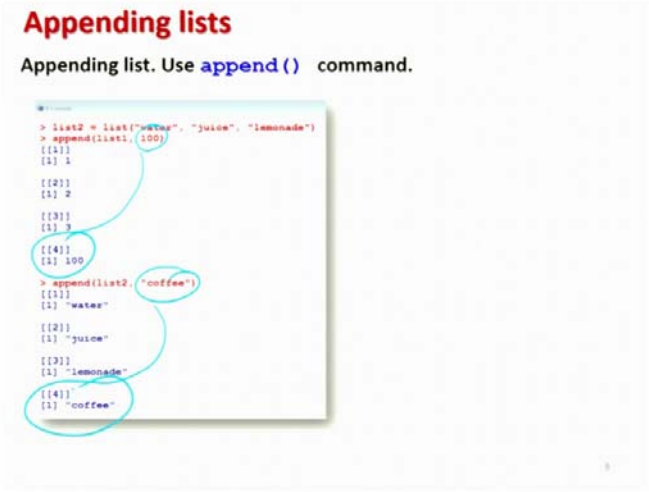

So, this is the screenshot of the same operation. You can see here that once you are trying to add here 100, then after this, what is happening that this is coming here and coffee is coming here, right.

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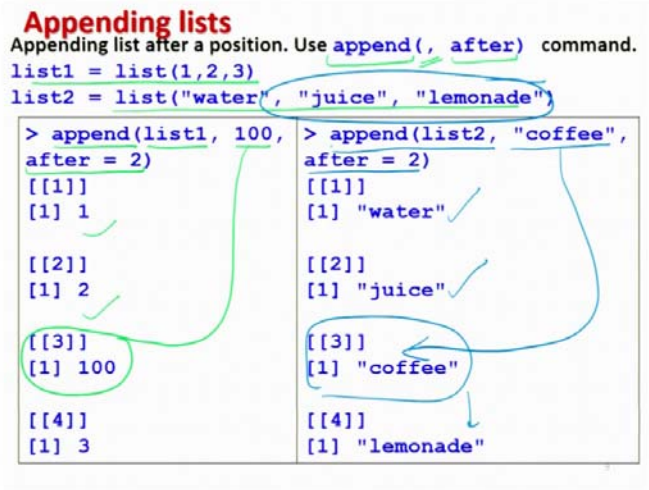

And, now if you want to add something at a given location, suppose, you want to add some number after given location, then what are you going to do? For that, we use the command here, see here append. So, I try to take here the same list command, list 1, 2, 3 and list water, juice, lemonade. So, and I try to suppose I want to add here a number 100 at after the 2nd position.

So, suppose I write down here append then list1 and then whatever I want to 100, whatever I want to add that I write and then I try to write down here after is equal to 2. So, now you will see here this 100 is going to appear where? This is here 3, means this is after 1, this is after 2 and this is here the position. And, similarly if you want to add suppose coffee here after 2, then you have to give the command here like here append.

See, here append list2, then coffee and then after that you write after equal to 2, a f t e r is equal to 2. So, you can see here the 1st element is your water, then 2nd element is your juice and the 3rd element in the list was lemonade, but now this coffee has entered after the 2nd position and this is now here, right. And, the lemonade is now shifted to the 4th position. So, this is how you can actually append the list after a given position.

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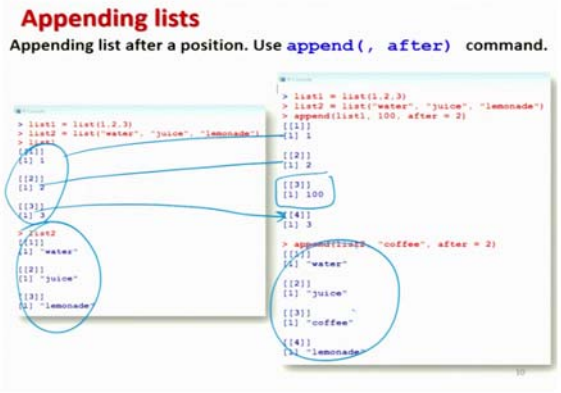

And, these are here the screenshot because it was quite long. So, I have shown you here. This is your here list1, this is your here list2. And, you can see here once you are trying to add here this 1st element of list1, 2nd element of list1 and 3rd element comes here now here in the 4th position. Now, this 100 is entered here and similarly the same thing is happening in the list2, that you have appended here the coffee, right.

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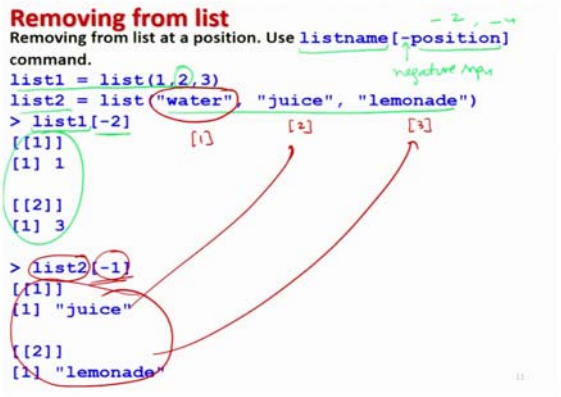

So, similarly I try to give you here one more operation, that if you want to remove something from the list. And, suppose you want to remove something then definitely you have to give that what you want to remove and its location. So, if you want to remove something at a given position, then you have to use the command here like this. You have to write down here the name of the list, right.

And then you have to write down here the negative sign here and then you have to write down the number of location or position. So, suppose I want to remove suppose the 2nd element; that means, the element which is at the 2nd position. So, I will have to write down here -2 and similarly if I want to remove something which is at the 4th position, then I have to write down here -4 like this.

So, we try to consider the same example and let us try to remove some elements from those lists. So, let us consider the same list, list1 is equal to like as here consisting of 1, 2, 3; list2 is consisting of water, juice and lemonade. Now, suppose I want to remove the 2nd element from list1. So, what is the 2nd element in your list1 which is here 2. So, you simply write down here the name of the list which is list1 and inside the square bracket simply write try to write down the -2.

So, you can see here now this 2 is removed and then you have only here 2 values 1 and 3 and yeah you can save it in a new list also and you can operate it. Similarly, if I want to remove water from the list2. So, you can see here, this is the position number 1, position number 2 for juice and position number 3 for lemonade. So, I have to simply write down here list2 which is the name of the list, inside the square bracket I have to write down here -1.

So, you can see here this water is removed and you have only here juice and lemonade right which are corresponding to the 2nd and 3rd element in the list2. So, this is how you can remove any element from a list which is given at some given position.

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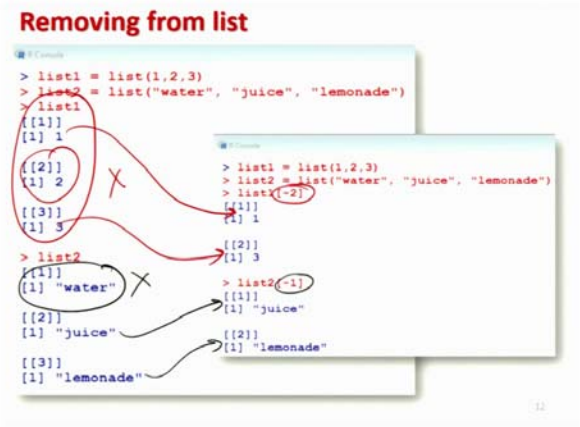

So, you can see here this is the screenshot. You have here list1 and from there you are trying to remove the 2nd element. So, this 1st element comes here and the 3rd element now become the 2nd element because and this 2nd element is now removed. And, similarly in the here this list number 2, if you try to see here you wanted to remove the 1st element. So, this 1st element here water is removed and the 2nd element which is here juice comes at the 1st place and lemonade comes at the 2nd place.

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So, you can see here that these are not very difficult operations. But, let me try to first show you these operations on the console so that you are more confident about them right. So, first we try to create here these two lists and then we try to first try to use the command here append right.

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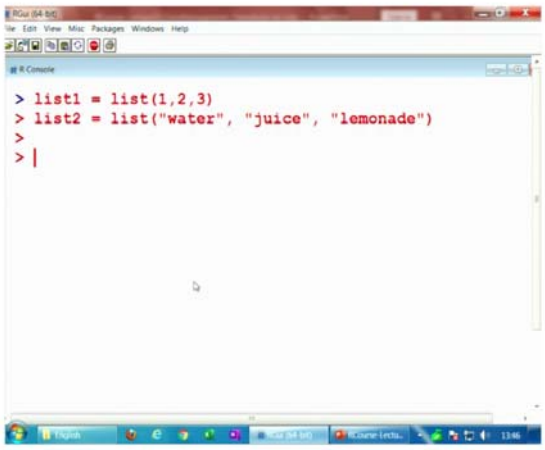

So, I try to consider here say here list1 and list2, that we already had clear have created.

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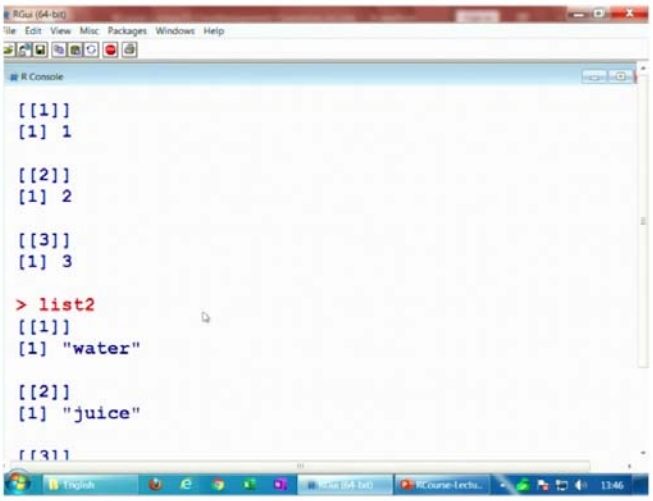

So, you can see here this is your here list1 and this is your here list2, right.

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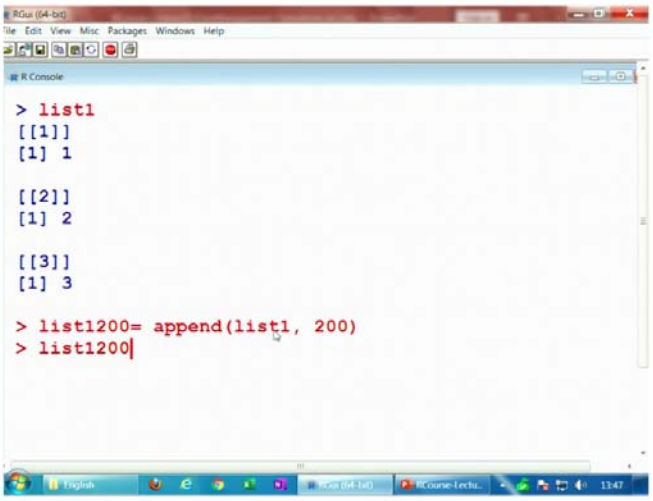

So, now, suppose I consider the list1 and I want to append here this 100. So, you can write down here, see here append and the name of the list, list1. And, then suppose I want to append here 200. You can see here, now in the list1 there is only see here 3 elements and suppose I want to save it as say here list say 1 with 200, right.

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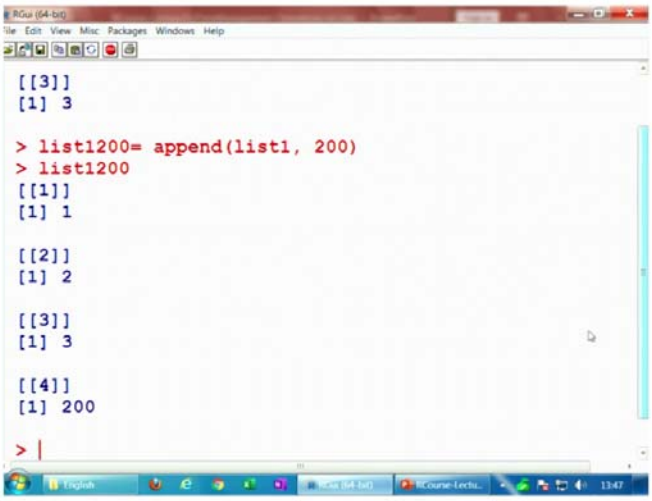

So, you can see here this is now very clear 1200. What is this value comes out to be? You can see here that now at the 4th position, this 200 is added.

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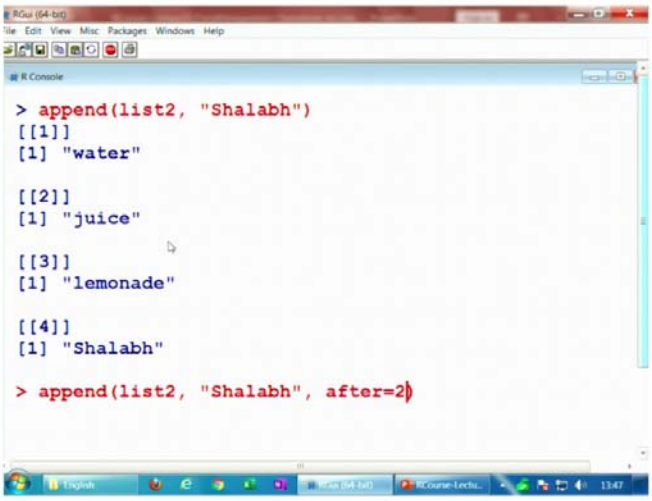

And, similarly if you try to take here suppose here the list number 2 and you suppose, I want to add here my own name. So, I write down here Shalabh. You can see here now this water, juice, lemonade and after this my name Shalabh is added here, right. And, now in case if I want to add suppose this Shalabh here means after 2. So, what I will do here that I will simply try to write down here after is equal to 2.

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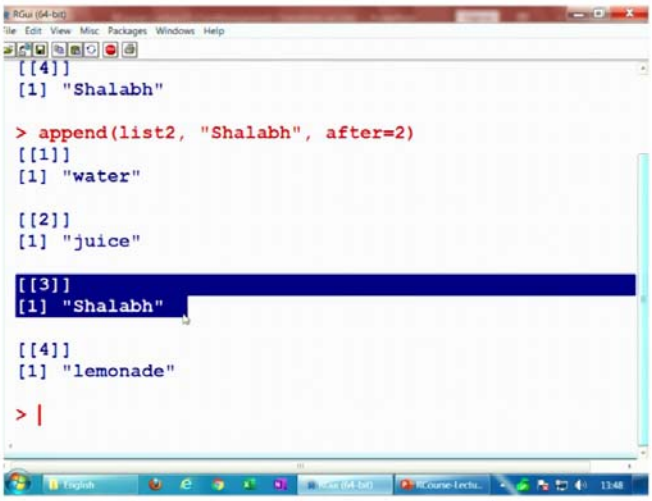

And, you can see here that now the Shalabh is added. Earlier, it was at the 4th position, now it is at the 3rd position.

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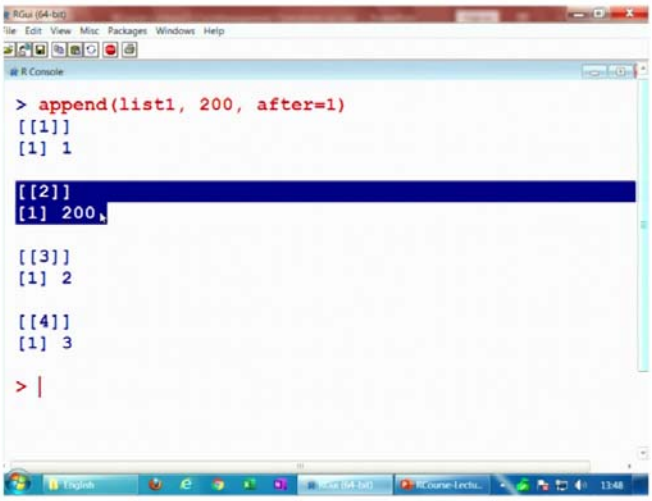

And, similarly in case if you want to add here means in this list1. Suppose, you want to append here a value like this one, that earlier you had added only here the value 200, but I want to add 200 say after say equal to 1, right. You can see here. So, now, it is added here, in the example you had added it after 2, right. So, this 1 2 3 etc., they are going to

give you the location, the index, right. So, you can see here now it is added at here after the 1st position that is at the position number 2, right, ok.

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So, now if you try to see here this is your here list1 and suppose I want to remove here something, so if I try to write down here; suppose I want to remove the say this 2nd position. So, I will try to write down here list1 and inside the square bracket I will write down here -2 and you can see here this 1 and only 3 are there and 2 is removed.

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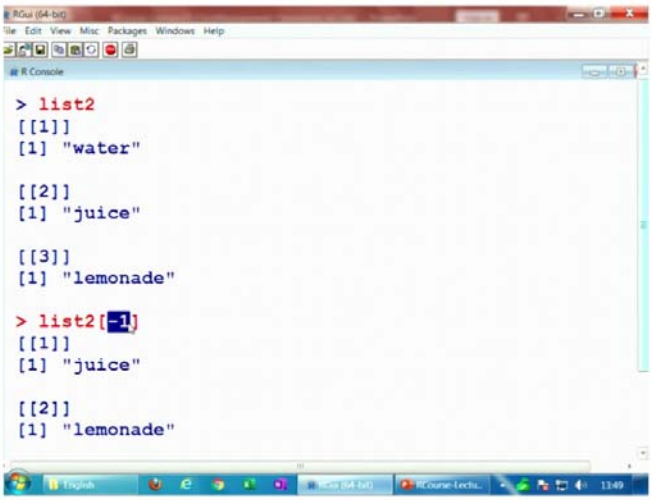

And, similarly if I try to consider the list number 2 and suppose I want to remove here the 1st element. You can see here, you simply write down here -1 inside the square bracket and you will get here juice and lemonade, right. So, these are not very difficult operation, but you have to simply keep in mind that what are the things that can you can do and how this R is working over them.

So, now, I try to give you here one more operation that you have got here a list and you want to extract a list or from this list. So, you want to create a sub list. So, how to get it done? So, the operation is very simple, that you simply try to give here the name of the list from where you want to extract and inside the square brackets you try to give the location in terms of indexes and then it will work.

So, I try to consider here one more example where I try to take the list1 as the number 1, 2, 3, 4, 5, 6 and in list number 2, I try to add here water, juice, lemonade, tea, coffee and milk. So, I have added some more elements in the earlier list1 and list 2. And, now I try to execute these four commands right and I try to show you what happens, right.

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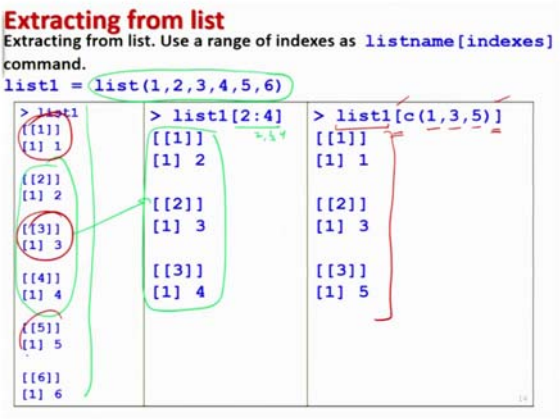

So, yeah, so, I have written it here like this. So, this is your here list1 consisting of here six numbers which is here like this, you can see here. Now, if you try to see I am writing here list1 inside the square bracket 2 colon 4 which is 2, 3 and 4. So, you can see here that the elements at the 2nd, 3rd and 4th position they will come here. So, the elements at the 2nd, 3rd and 4th position were 2, 3, 4, now they are here.

And, similarly if you want to extract only some elements which are at particular given position, simply suppose I want to the extract the elements at the 1st, 3rd and 5th position. So, I give here list1, a name of the list and inside the square bracket I try to give here the location of these values, the data vector.

So, I write down here square brackets and then 1 comma 3 comma 5 and you can see here that it is going to give you this outcome. So, you can see here the elements at the 1st position, 3rd position and 5th position they are extracted here, right.

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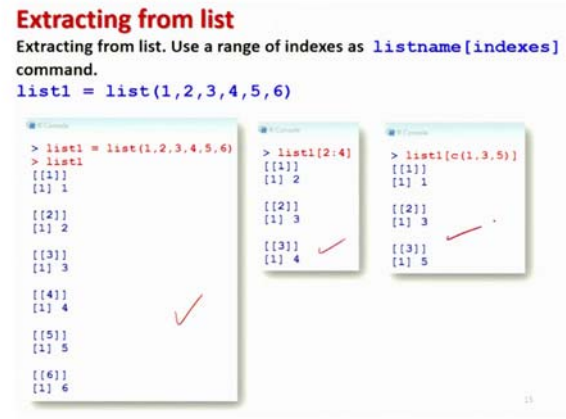

And, similarly if you try to see the screenshot here, this is the screenshot of the same operation which I shown you right.

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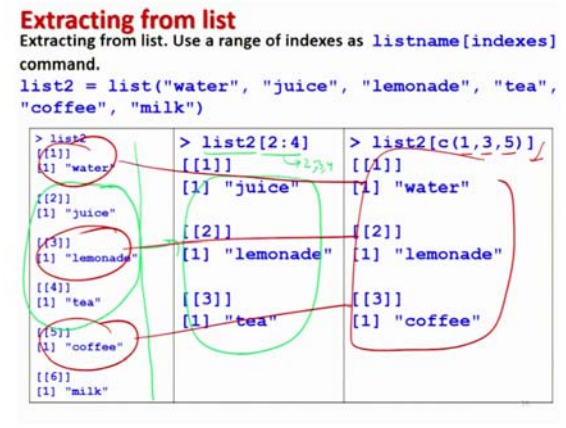

And, now the same operation if you try to do from the list2, so, this list2 is consisting of water, juice, lemonade, tea, coffee and milk. So, now if you try to write down here list2 and then inside the square bracket 2 colon 4, that is 2 comma 3 comma 4. You want to extract a sublist consisting of the elements at the 2nd, 3rd and 4th position in the list2. So, in the list2 if you try to see here at 2nd, 3rd and 4th position you have a three element juice, lemonade and tea.

So, now, they are coming here as a juice, lemonade and tea and this is your here sublist. And, similarly if you want to do the same operation that you did in the case of list1, that you want to extract the elements in the list2 which are at the 1st, 3rd and 5th position. So, you can see here at 1st you have water, then at 3rd you have lemonade and at 5th you have coffee. So, if you try to operate it here, you get here a list which has here these three water, lemonade and coffee.

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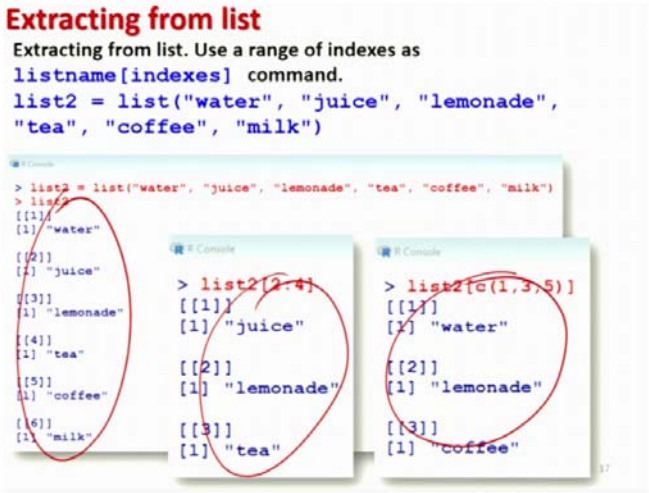

And, this is here the screenshot of the same operation that you have here all the 6 elements and now here are the abstracted elements, right, ok. So, now let us try to do these operations in the R software so that you get convinced that how the things are working. So, if you try to see here, I am trying to create here these two lists.

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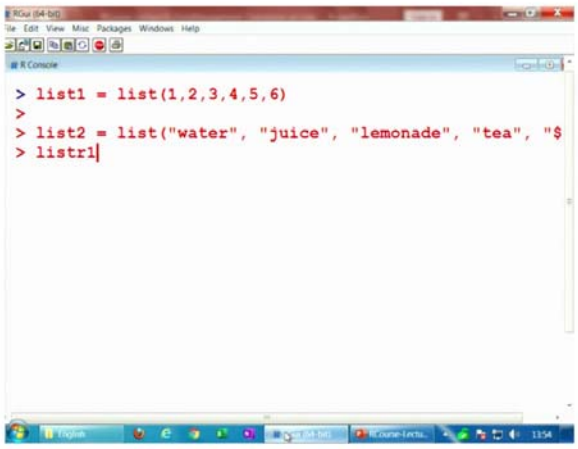

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So, this is my here list1 consisting of 6 values.

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And this is my here list2 consisting of these 6 values right.

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So, now, if I try to give here, suppose I try to extract here from the list1, so, I try to give here the number 1 and then I try to give you here 2 colon say 5. So, the values as 2nd, 3rd, 4th, 5th will come here, right. So, you can see here.

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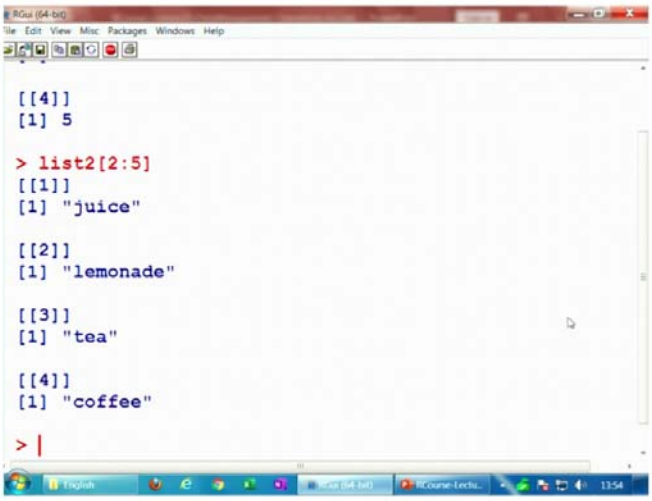

And similarly if I try to do the same operation in the list2 also, you can see here that this juice, lemonade, tea and coffee, they are the outcomes.

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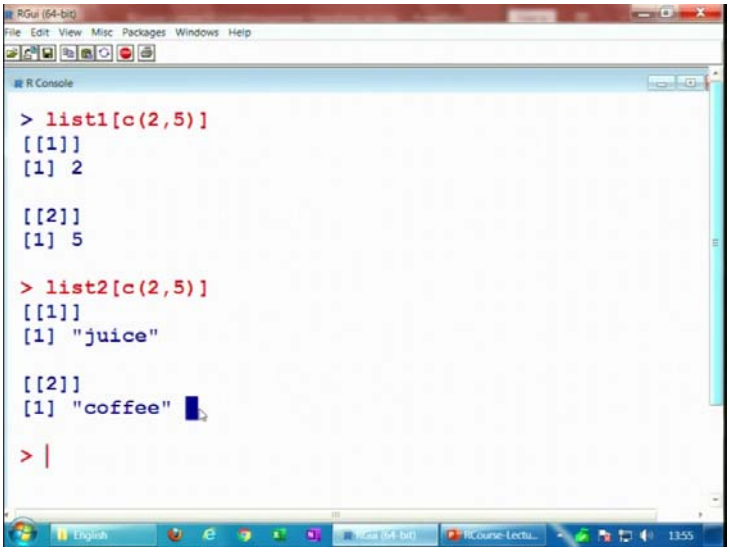

And, suppose if you want to extract a sub list which is consisting of elements at particular position, see here 2 comma 5 only. Let me try to take only 2 values here. So, you can see here now this will give you the 2nd and 5th values in the list1 which are here 2 and 5, easy to remember. And, same operation if you try to do in the list2, you will get here the values at the 2nd and 5th position, which are juice and coffee, right.

So, now we come to an end to this lecture and we stop here. So, you can see here now you have given, we have understood the various types of very elementary operations for the list. And, you can now imagine that whenever you are trying to handle the data, you always try to extract the data, merge the data, combine the data etcetera; then how are you going to do it, right?

So, these are very simple commands. But, the main important part what I always say is that you have to understand that how R is functioning, how R is trying to behave with this commands. So, that once you understand the behavior of this command, then you can modify or you can control your statements to do something in the R software. So, you try to practice it.

Why do not you try to take some examples, try to create examples yourself which are not difficult, because creating a list is not an, not a very difficult thing. And, try to think about the common operations and try to execute them in the R software. And, see are you getting the same outcome what you expected, I am sure you will get it. So, you try to practice it and I will see you in the next lecture.

Till then goodbye.