Foundations of R Software
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Basics of Calculations
Lecture - 21
Functions for Conditional Executions - switch and which commands

Hello, friend. Welcome to the course Foundations of R Software. And, you may recall that in the last two lectures, we had talked about the conditional executions and we have talked about four different commands which are used for the conditional executions under different conditions.

So, now, continuing on the same broader topic in this lecture, today, I am going to talk about two more commands which are switch and which; which are also used in the conditional executions and they try to give you different type of outcome. And, these type of outcome they are many times helpful in the programming. So, we begin this lecture and we try to understand what are the roles of this switch and which commands ok.

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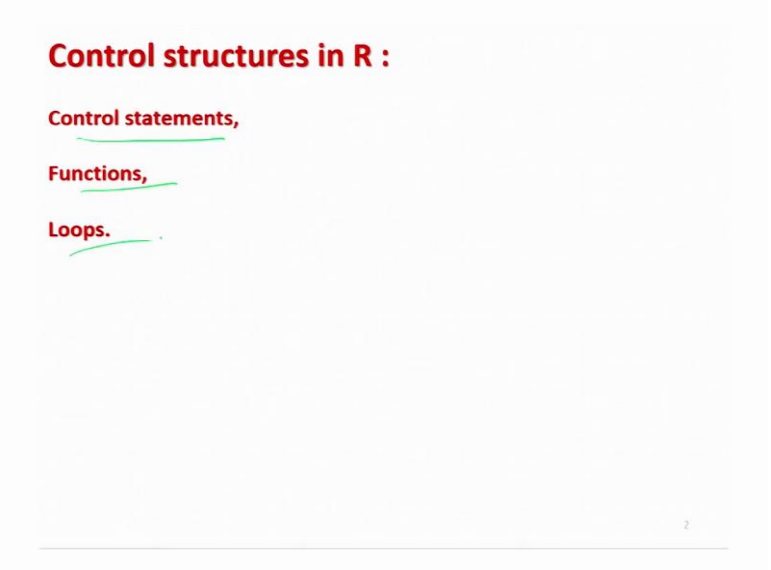

So, as we had discussed earlier that we are trying to understand the broader topic of the control structure in the R software and we are trying to deal about control statement, functions and loops one by one.

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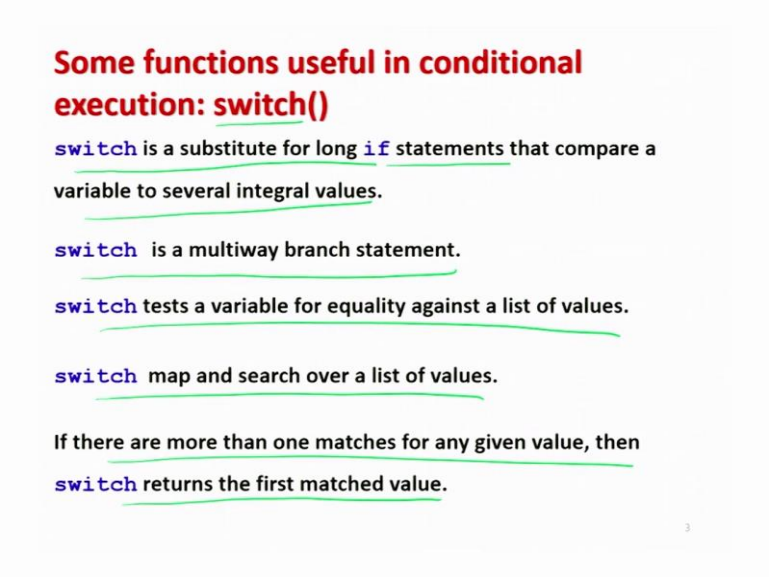

So, today we first try to consider the command switch the spelling is s w i t c h and the R command is written in s w i t c h with all the lower case alphabets. Actually do you know what is the meaning of a switch? Switch means sometime you say ok you switch from this classroom to another classroom and what do you do? You just try to jump from one class room to another classroom.

But, on the other hand if the teacher asks you more specifically that ok if there are suppose five classes and teacher ask you, ok, you are at present you are sitting somewhere, but you please try to go to the class number 3. So, what you will do? You will simply try to jump to the class number 3, ok. So, this switch is just like this and yeah do not try to get confused with the meaning of the switch which is the sort of electrical switch, right.

This electrical switch will give you only on-off whether this switch is another English words and which is used in the sense that you please try to switch from this place to another place. People try to switch from different offices, in different countries, in

different cities and so on so that is what you have to keep in mind while understanding this control statement.

So, actually this switch is a substitute for long if statements that compare a variable to several integer values, right. I mean suppose if you want to know that you have a some sequence of numbers say 1 to 100 and if you want to know where is this number 99 is coming. So, this type of information you can obtain from such as function.

So, actually this switch is a sort of multi way branch statement and it tests a variable for the equality against the list of values. So, you have to give the different options like as you said that there are five class room. So, the list of classroom is class number 1, class number 2 up to class number 5 and then you are asking to do something out of that list. So, this actually switch maps and search over a list of values, right.

So, if there are more than one matches for any given value then switch will return only the first matched value. Suppose, if you try to say that there are two rooms whose numbers are 3. So, and if you ask the someone to go to the room number 3, the person will start searching for the room number 3 as that the person will go to room number 1, room number 2 and then the room number 3 is there and the person will go there.

Now, after some time if you say ok there is another room number where you have to go then the person will get confused. So, the way the switch works exactly in the same way the R will also work.

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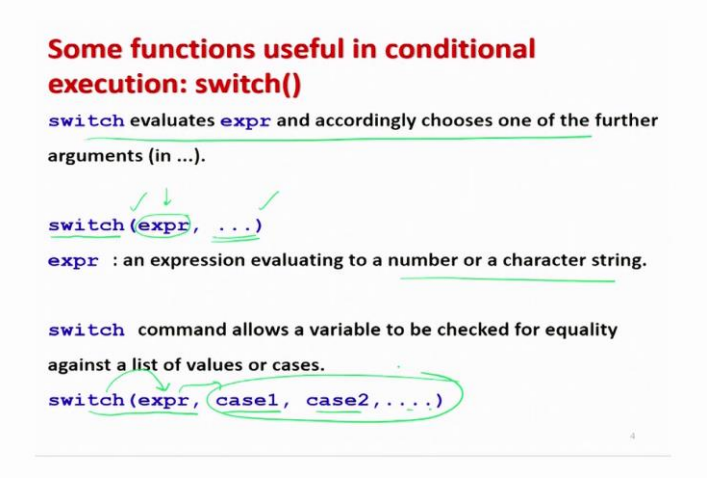

So, switch actually evaluates an expression also and accordingly chooses one of the further arguments which are there inside the parenthesis. For example, means if there is some expression that can be a number or that can be a character string which you want to evaluate and then there are several options and you want to match this expression with those options.

So, what you will do that you will try to write down here the command switch s w i t c h, all in lower case alphabets and within this parenthesis you try to write down the value of that expression that can be a number or a character string and then after that you try to write down here the list of values here, right.

And, then for example, you can write down here switch and then expr the expression and then say suppose case 1, case 2, etc. So, what it will try to do? The switch will try to operate, it will come inside the parenthesis, it will try to read the expressions and then it will try to seek the information required about this expression from any of these possible values which are listed after that, ok.

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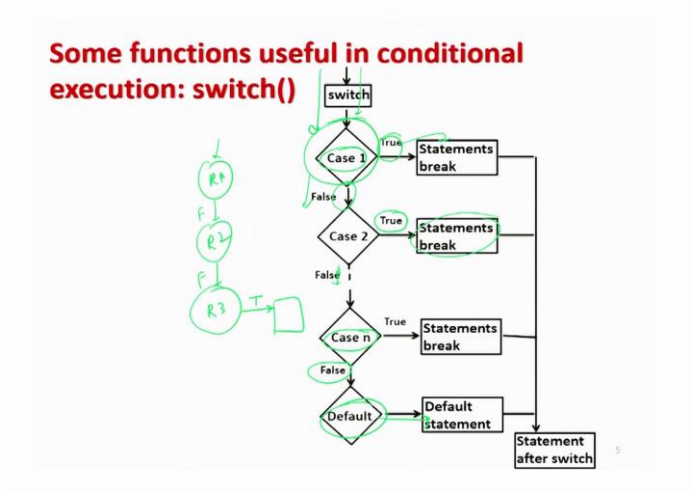

So, the flow chart of this switch command will look like this one that the you start the operating the switch command it will come to the Case 1 and it will try to compare it with the values which are available which are listed after that. And, if this found find out to be True, then the Statement break and if the this condition comes out to be here False so, then this control will come to the next value and it will try to compare.

And, if that comes out to be True; that means, there is a match then the statement will break and if this comes out to be False, then this operation will continue until it finds out the true statement. And, if suppose if there are say small n number of cases and suppose at every place the switch is finding only the false outcome then finally, whatever is the default that default statement will be executed, right. So, this is the way the switch will actually work.

So, it is something like this, you are trying to ask someone to go to the room number 3 out of those five rooms. So, the person will start it will try to see this is suppose room number 1, so, it will try to see is this matching with the room number 3 and the answer comes out to be no. So, it will come move forward and then it will come to the room number say here 2 and it will try to match that the person has to go to the room number 3 and this is room number 2, is it matching, answer comes out to be here false.

So, once again it will be here false and then in case if the person come to the third room and it tries to match with the third room with the room number 3 and it matches. So, it will become here True and this will give you the outcome here and whatever is outcome has to be evaluated after the switch statement that will be evaluated.

For example, if the person has to sit in the room the person will sit; in case if the person has to take the food in the room number 3 it will take the food and so on. So, that is a pretty simple operation, but a very useful operation.

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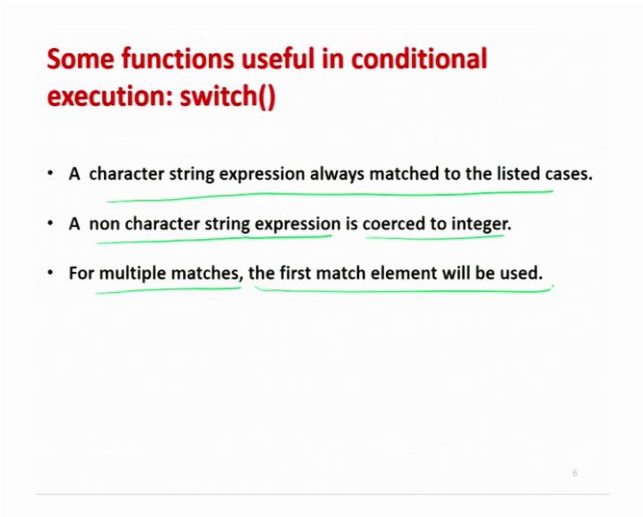

And, in the switch character string expression always match to the listed cases that is what you have to keep in mind. And, whenever we are trying to consider a non character string expression that is coerced to the integer and if there are multiple matches as I said only the first match element will be used, right.

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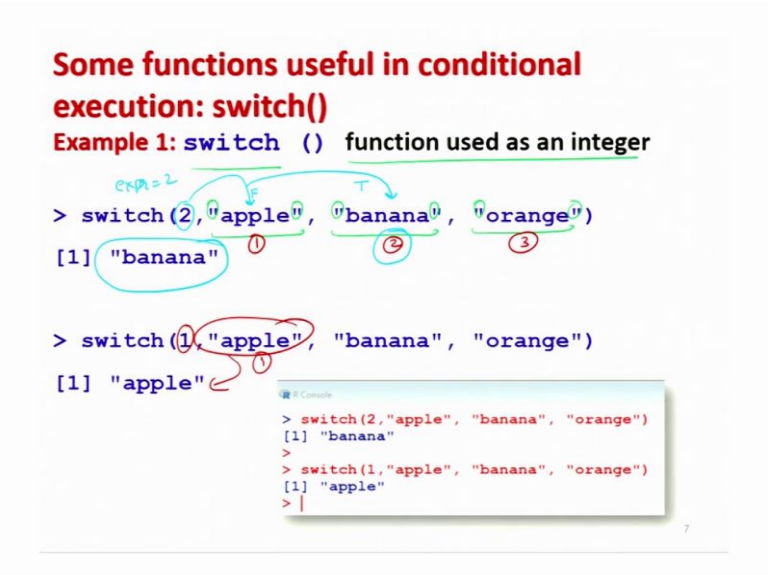

So, now we try to take here some examples and try to understand the functionalities of this switch statement. So, the first example I am trying to take here where I am trying to use this switch function as an integer. Suppose, I have here a list and this list has three values say apple, banana and orange and because these are characters so, I am trying to give them inside the parenthesis.

So, now you have two options. The first option is that you want to know what is there in the second place and yeah after that I will try to consider that you want to know what is the name at the second place. So, anyway if you try to first understand in this case what are the different location or position of these three values in the list. So, apple has position number 1, banana is written as at a position number 2 and orange is written at position number 3.

Now, in the switch command you are asking the expression your earlier command expr is equal to here 2. So, you write here 2 and you are asking where is this 2 or what is there at second location. So, this 2 starts here it comes to the first location and it tries to

matches. This is false because this is the position number 1. So, it moves forward and it tries to matches the position number.

So, this position number is 2 and this matches with this here 2. So, it stops here and it says that the condition here is true and it will give you the value here which is written here as say banana. So, you can see here you have used here an integer 2 and it is matched to the value which is present at the second position.

Similarly, if you try to repeat this experiment and try to write down here 1 then obviously, whatever is written at the place number 1 which is here apple this will come here as an outcome, right.

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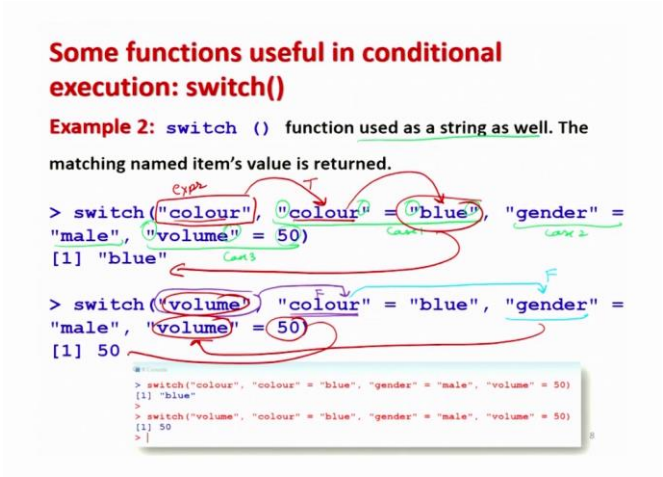

And, similarly in case if I try to take here one more example before I go to the R console, suppose I try to use here a string in place of an integer. So, for example, you have seen here I have used here this 2 and here 1 as an integer, now, I would like to use here a string. So, this switch function can also be used in the string as well and the matching name will be written in this case.

For example, I try to create here a list as here like this. So, this is here the first element in my list so called what we had written here as a case 1. Case 1 if you remember here I had given you this idea. These are your here case 1, case 2 and so on. So, this is your here case number 1 where you are trying to write down colour and blue and colour is equal to blue and both are taken as characters. So, they are written inside the double quotes.

And, similarly you try to take here second value as case 2 which is here gender is equal to male and third case that the third string this is here volume is equal to 50, right. So, volume is a string, so, that is given inside the double quotes and 50 is the number. So, I am writing it like this. So, now, you want to know where is this colour. So, you try to write down your expression expr as c o l o u r colour within the double quotes and now this expression will start working.

It will come to the position number 1 and it will try to match whether this colour is matched with this colour or not, answer comes out to be here true. So, it finds out what is the value of this here blue this colour which is here blue and this blue is printed here. So, this is how you can actually switch works. So, you are trying to give here name and it is try to give you the value assigned to that name.

Now, as an another example if I try to repeat the same thing, but now I try to give here the expression as a volume. So, what will happen now? This volume will start working. It comes to the here first situation and it finds that volume is not matching with this colour. So, it becomes here false. So, now, what it will do? Then it will now come to the next case and it tries to matches this volume with gender. Once again it comes out to be here false.

So, now, it will move further and it will come to the case number 3. Now, this volume matches with this volume and whatever is the value assigned to this volume it is 50, this is reported here. So, you can see here that is a very simple operation, but it is very useful when you are trying to do programming and you want to have this control structure.

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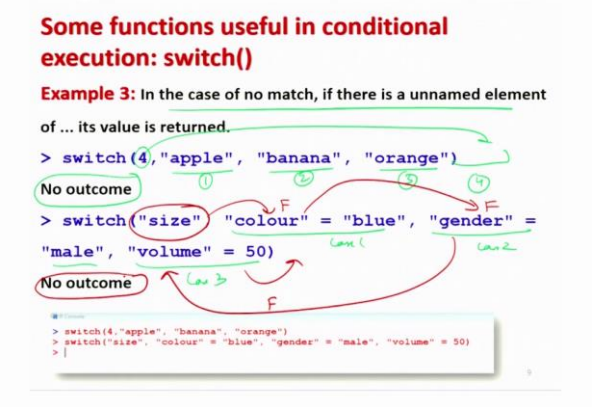

Now, in these examples in both these examples what can happen? Suppose, if you try to give a value either integer or a string which is not available in the list then what happens. So, in the case that if there is a no match and or if there is an unnamed element, then whatever is there that is written; that means, there is no value no name. So, nothing will be written and there will be no outcome.

So, if you try to see here in the same example where I took apple banana and orange I try to write down here 4. So, you can see here that apple is at position number 1, banana at 2, orange at 3 and there is 4th, there is nothing here. So, 4th will come here, but there is nothing. So, there would not be any outcome.

And, similarly if you try to take the earlier example where I took the colour as the case 1 gender as the case 2 and volume as the case 3 – in this case you are trying to give here a value which is here, size. So, size comes here, it is there is no match, it gives here False. Then it comes to here, second case. This is here a gender, there is no match. So, it comes to here third case, here it is volume so, there is no match and after that it moves ahead, but there is nothing. So, it will give you here no outcome. So, there will be no outcome, right.

So, let us try to first try to execute these examples on the R console so that you get here more confidence.

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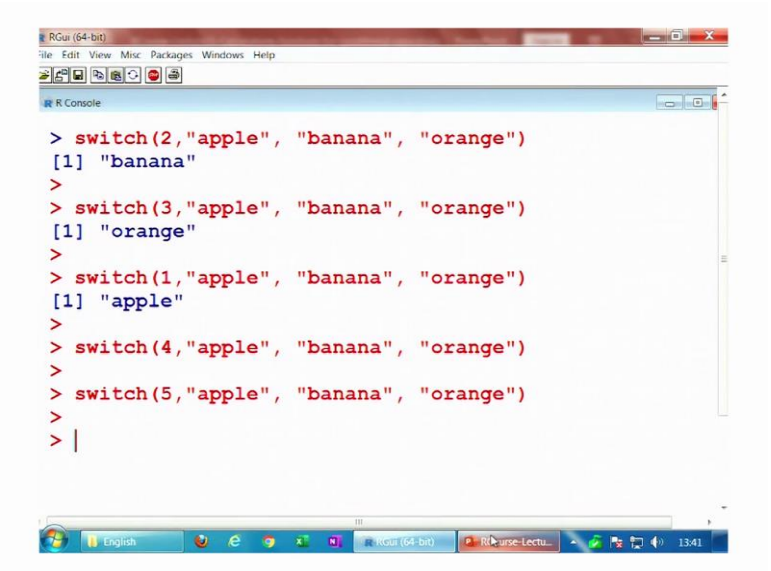

So, if you try to see here I try to copy and paste here this command you can see here when you are trying to take here switch 2, then whatever is written in the place number 2 that comes here banana. And, if you try to replace 2 by here suppose 3 you can see here now the orange will come, right and in case if you try to replace 3 by here 1, then apple will come.

And, now I try to make it here 4 instead of 1. So, you can see here there is no element in the 4th place. So, it will not give you anything, right. It is just like this even if you try to take here say here instead of 4 you try to take care 5, there is no outcome. So, that is what I was trying to explain you, right. Similarly, in case if you try to take here a string, then let us see what happens.

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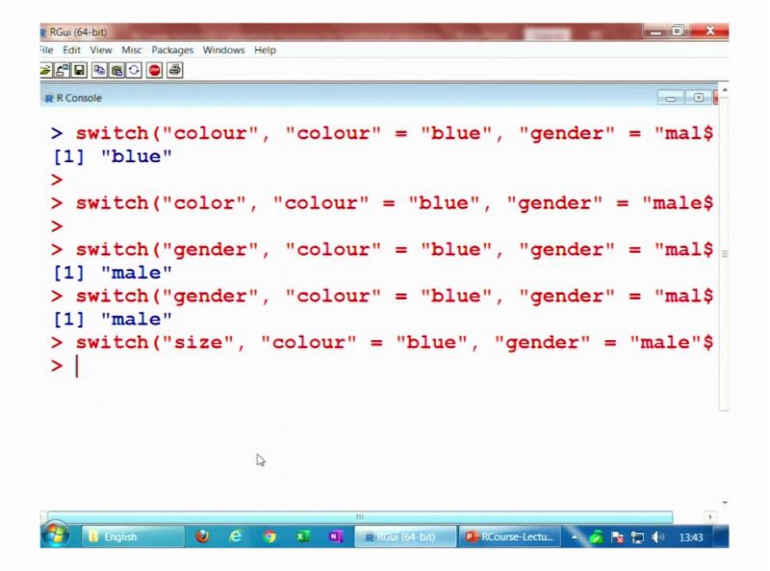

So, if you try to take here this string you can see here I have written here colour, colour blue, gender etc. and if you try to see here this colour is matched and you get here blue, right. And, now in case if you try to write down here something like here instead of here suppose I make here one mistake I want to show you. Sometime you have seen that the spelling of the colour is something like c o l o r. So, I make it.

Now, what do you expect what will happen it will not give you any outcome because this spelling is not matched with the spelling of this colour its c o l o r where its c o l o u r. So, this is what you have to be very careful then when you are trying to do it. And, then

similarly if you try to find out here say gender, so, gender will come out to be here male. This is the value here which is given to be here like this you can see here gender is equal to here male, right.

So, similarly if you try to take here one more value which is not available here, suppose I say here suppose I say here size you can see here there is no outcome, right. So, this is what I meant when I was trying to explain you. So, you can see here these are very simple outcomes.

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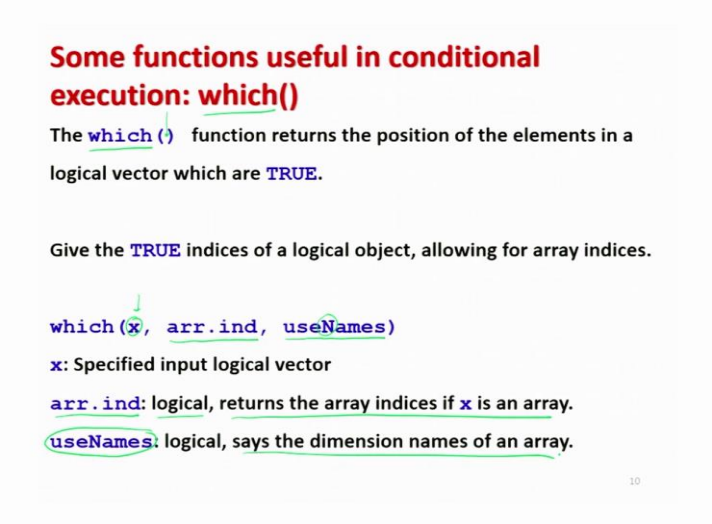

And, now after this I try to give you some details about another simple operation which is very useful in the conditional execution. This is which w h i c h and you know what is the meaning of the which. So, whatever is the meaning of this switch exactly in the same way this command is also used in the R software. When you try to use this which command it will try to give you the position of the element in the logical vector when it is find that the outcome is TRUE, right.

So, I will try to explain you with some examples but, before that let us try to understand that how it is done. So, when you try to write down here which w h i c h all in lowercase alphabets and whatever you want to give the give the data that is inside the parenthesis. So, this will give you here two types of outcome TRUE and FALSE and based on that it will give you the position of the element in that data vector, right.

So, for example, if you want to suppose there is a logical vector which is given here as a x, after that you have here two option arr dot ind and useNames where this N is in the capital letters. So, if you try to give here a double r dot ind, this is a logical value and it returns the array indices if this x is an array for a matrix, right. And, after that if you also use this command use names that it is also logical variable and it tells about the dimension names of an array x, right.

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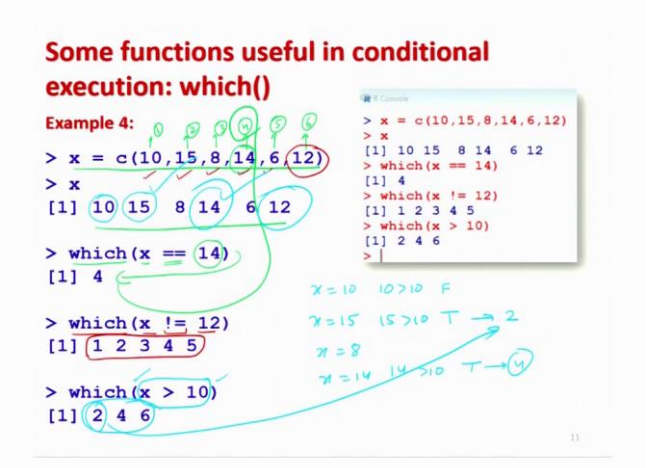

So, why not to take this example and try to see that how this which command is going to be useful for us? So, let me try to take here r data vector x which has here these values 10, 15, 8, 14, 6 and 12. So, this is your data vector.

Now, I want to know at which place we have a value 14 in this data vector. So, you can see here this 10 has got the value; that means, the location number 1, 15 is at the position number 2, 3 8 is at the location number 3, 14 is at the location number 4, 6 is at the location number 5 and 12 at the location number 6, right.

So, you want to know that what is the position of this number 14 in this data vector. So, you try to write down here which inside the parenthesis x and logical equal; that means, two equal to sign equal to 14 and this will give you answer here 4. So, what is this 4? This 4 is the location which is here given in here 4, right.

And, similarly you can operate here some other commands also without any problem. Suppose, you want to know that which are the numbers in this data vector x which are

not equal to 12. So, you try to ask here which inside the parenthesis you write x not equal to 12. So, you can see here in this data vector what are the numbers which are not equal to 10 12 their positions will be reported.

So, you can see here the number 12 is here at the location number 6 and all are the other number 10, 15, 8, 14 and 6 they are at location number 1, 2, 3, 4 and 5 which is reported here. So, which command will provide you the location of those numbers where the number is not equal to 12. Similarly, if you want to know out of this data set which xs are there whose value is greater than 10. So, I try to write down here which and then I write inside the parenthesis x is greater than 10.

So, what will happen this operation will start going inside the parenthesis and it will try to see here that what are the values where the value is more than 10. So, you can see here that it will come to here try to observe my this blue pen. So, the control will come to the position number one and the value here is 10.

So, so you want here the value greater than 10. So, it will not be reported, then it comes to the second position, it has the value 1, 5, 15; 15 is greater than 10. So, the answer is TRUE, right. So, I can write down here. So, if I try to take here x equal to 10 which is if you it will try to compare 10 greater than 10, answer is here FALSE, it will not be reported.

Then it comes to the next value x equal to 15 and it tries to check 15 is greater than 10 answer is true. So, it will try to report the position of the number 15. So, the position is at 2. So, this 2 is going to be reported here and similarly, it will go for x equal to 8, x equal to 14. So, it will try to see at 14 the answer is coming out to be TRUE and the 14 is at position number 4 you can see here, right.

So, similarly it will try to search for all the numbers and you can see here that here there are three numbers which are more than 10, 15, 14 and 12. So, it will give you here the, their location 2, 4 and 6. So, this is what is happening, right. And, so, before I move further let me try to give you this thing in on the R software also R console also so that you can be more confident.

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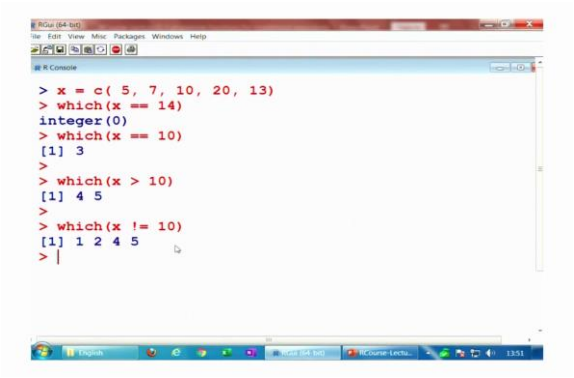

So, if I try to take here x is equal to suppose I take any value say 5, say 7, 10 and say here 20 and say here 13, right. And, suppose if I say here which of the x is equal to 14, do you find here any value which is equal to 14? No. So, this will give you here there is no value integer 0, but if you try to write down here 10 then you can see here it gives you here yes first, second and third that the value 10 is at the location number 3, right.

And, similarly, if you want to find out here that which are the values which are greater than 10. So, you can see here it will give you the value here 4 and 5 which are corresponding to the values in the data vector x which are at fourth and fifth position which are 20 and 13 respectively.

And, similarly if you want to find out here that all other values in this data vector x which are not equal to 10 so, you can see here the 10 is occurring at the third position and all other values 5, 7 and 20, 13 they are not equal to 10 and they are occurring at 1, 2 and 4, 5 location, right 1, 2, 4, 5 positions. So, that is what is here. So, you can see here that it is not a very difficult thing.

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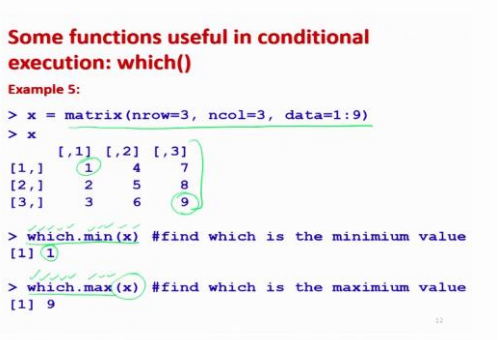

So, this was an operation over the data vector, now I try to give such an operation on an array. So, I try to consider here a matrix. So, I try to create here a matrix of order 3 by 3 with the data 1 to 9, now you know how to create a matrix and this matrix x is here like this. Suppose, I want to know in this array that which of the value is the minimum value. So, for that I have a command here like it is which dot minimum or it is written here w h i c h dot m i n and inside the parenthesis you try to write down the name of the array.

So, you can see here in these values 1 2 3 4 5 6 7 8 9 this one is the minimum value, ok. So, it is coming here one and you want to know suppose which is the maximum values. So, for that the command here is which dot max which is which maximum and it is written like w h i c h dot m a x and inside the parenthesis you try to write down the array which is here x.

So, this will find the that which of the value is the maximum. So, you know that here out of 1, 2, 3, 4, 5, 6, 7, 8, 9 – 9 is the maximum value which is reported here, ok.

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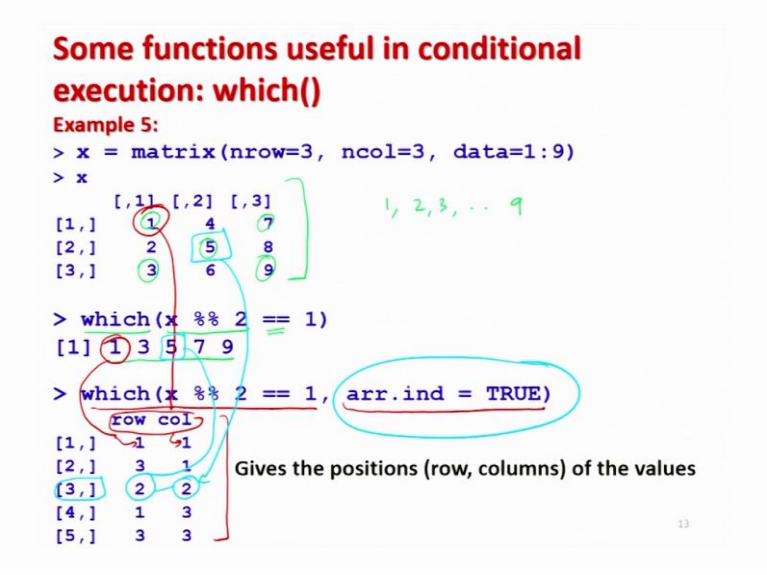

Now, I try to give you some more. Suppose, I want to know out of this matrix which are the elements when they are which are actually odd. So, that means, when they are operated with the modulo division and the division is done by 2, then what are the numbers where the remainder will come out to be 1, which are those number? So, what I

will do here I will simply take the same matrix here x and I will write down here which inside the parenthesis x modulo division 2 and this is logical equal to 1.

So, now you can see here when you are trying to take the number 1, 2, 3, 4 up to here 9 inside this matrix, then all the odd numbers when they are divided by 2 they will give the remainder as 1, they are going to be reported. So, when you try to divide see here 1, 3, 5, 7, 9 they will give you the remainder 1 and you can see here it is giving you all these values 5, 7 and 9, right. So, these are the values.

Now, suppose you want to know what are the location of these values means what are the places in this x where this odd values are occurring they are located. So, I try to use here the same command which with x modulo division 2 is logically equal to 1 with an option here arr dot ind is equal to TRUE.

So, if you remember in the beginning we had talked about this option and now, if you try to operate it will give you this type of outcome. Now, please try to see what it is trying to show you. It is trying to show you that the first outcome which is odd is the value 1 and the 1 is occurring at these are the row and column at row number 1 and column number 1 and you can see here this is here like this.

And, similarly, if you try to take here one more example suppose I try to take here the third value; third value here is 5. So, where this 5 is occurring? This is occurring at row number 2 and column number 2. So, you can see here this is the location of a 5 and so on. So, you can see here by using this option arr dot ind is equal to TRUE, this will also give you the location in an array that what are the places where such things are occurring.

So, you can now think that these things are going to be extremely useful when you are trying to do different type of data manipulations.

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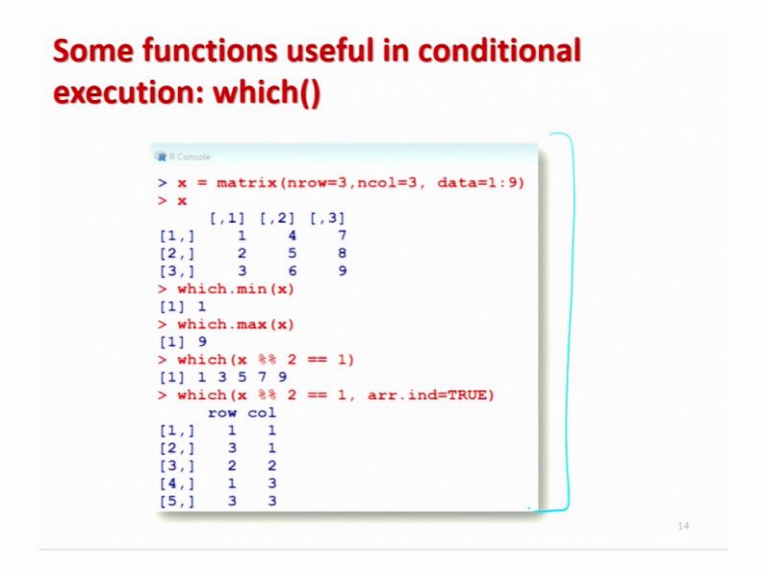

And, this is here the screenshot of the same operation. So, let me try to show you these operations on the R console also so that you get here more confident.

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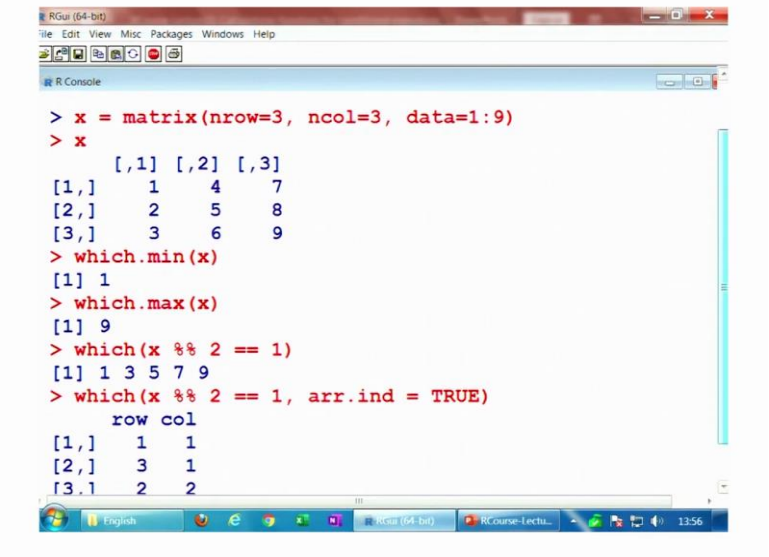

So, this is your here matrix x and now I try to operate here this command here which of the value is the minimum value. So, you can see here. This comes out to be here 1 and similarly if you want to find out the maximum value, this comes out to be here 9.

And, after this you want to know that which are the values which are here odd. So, if you try to see here these are the values which are here odd, and if you want to know the location of these values in the array x which is here a matrix, you have to use this command here like this where arr dot ind is equal to TRUE, right.

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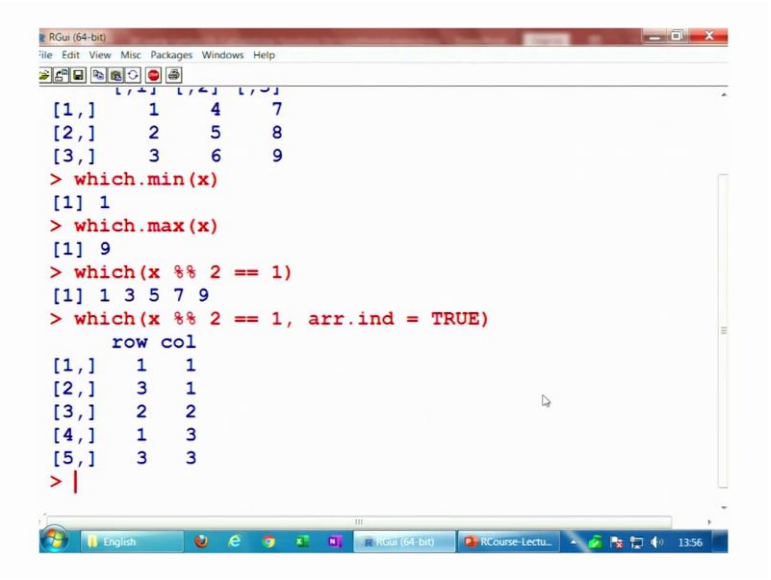

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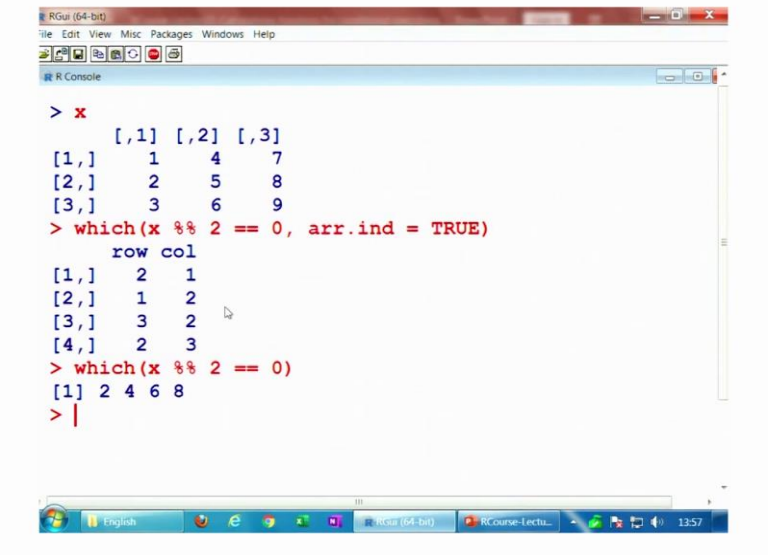

Similarly, if you try to repeat this command and if you want to know about the even numbers, suppose x is here like this and you want to know that where what are the places

where you have even numbers. So, you can see here that it is giving you the value here like this the even number is occurring in the row number 2 and column number 1 which is here 2. Then, similarly here this is occurring at row number 3 and column number 2. So, this is here 6 and so on, right.

And, if you just want to know that what are these values so, you can remove this arr dot ind and it will give you 2, 4, 6, 8, right. So, these are the values which are even right, ok.

So, now, I stop in this lecture and you can see this was a very simple lecture and my objective was to give you some function which are used for the for controlling the programs. So, I have discussed here only two commands switch and which, but you will see that in the R there is a long list of such functions. So, and it is really not possible for me to cover all the things. So, I will leave it up to you, but for you it is very important to understand what this functions are trying to do. So, you try to take some example, try to practice it and I will see you in the next lecture till then, good bye.