An Introduction o Programming through C++
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Lecture No.15 Part-4
Array Part-1
Marks display variation

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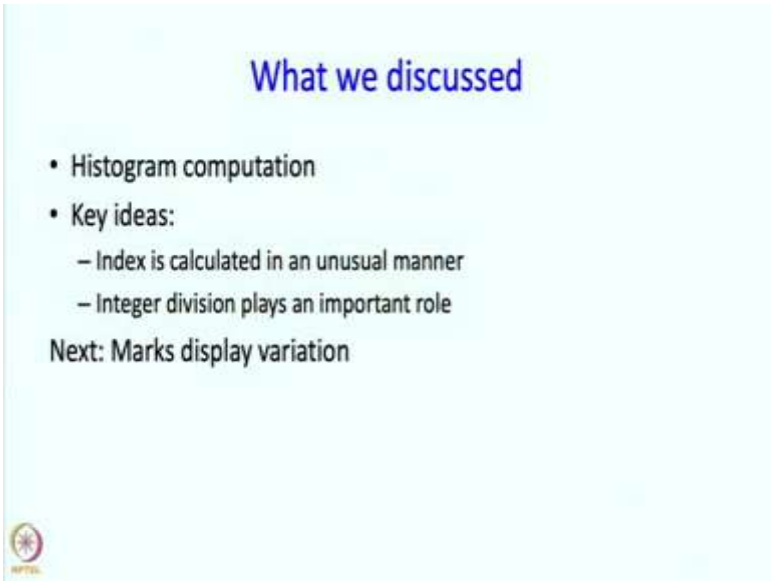

Welcome back in the last segment we talked about histogram computation. And that showed off how the index which decides which element you are accessing can be, can be computed in a somewhat clever manner. Now we are going to take another variation on the marks display problem.

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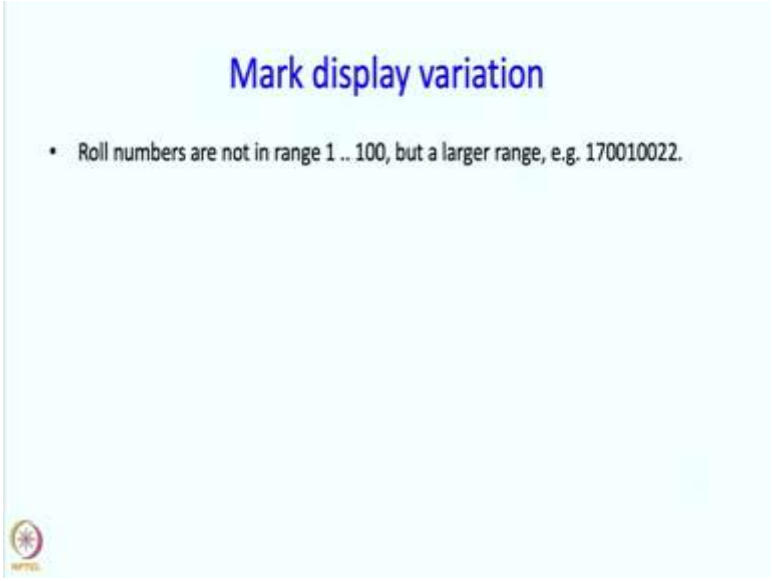

So in this variation the roll numbers are not consecutive in the range 1 through 100 or 0 through 99 for that matter but the roll numbers occupy a larger range, so maybe the roll numbers are whatever 10 digits or whatever many digits that you have in your institution. And of course in many institutions the roll numbers can containing can contain alphabets as well, but let us keep things simple for now, let us say that the roll numbers only contain digits and further more let us say they are at most 9 digits long. So they are actually numbers and in fact numbers which can fit in an int variable. Alright so in this case, what is the marks display problem?

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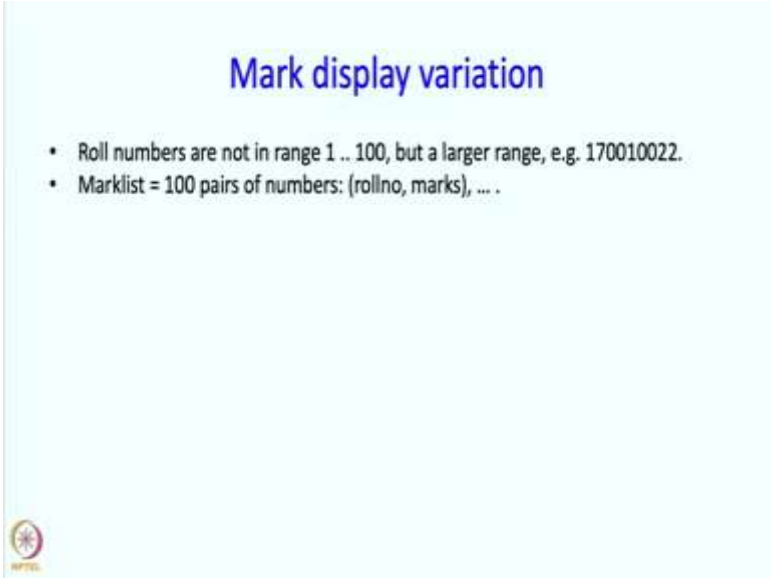

Well the teacher now does not have to just type in the marks but the teacher also has to type in the roll number because there is no implicit roll number for which the ith mark is being typed. So the teacher has to type 100 pairs of numbers roll number followed by mark, roll number followed by mark. The teacher has to do this 100 times. Let us say the number of students in the class still remains 100 and later on,

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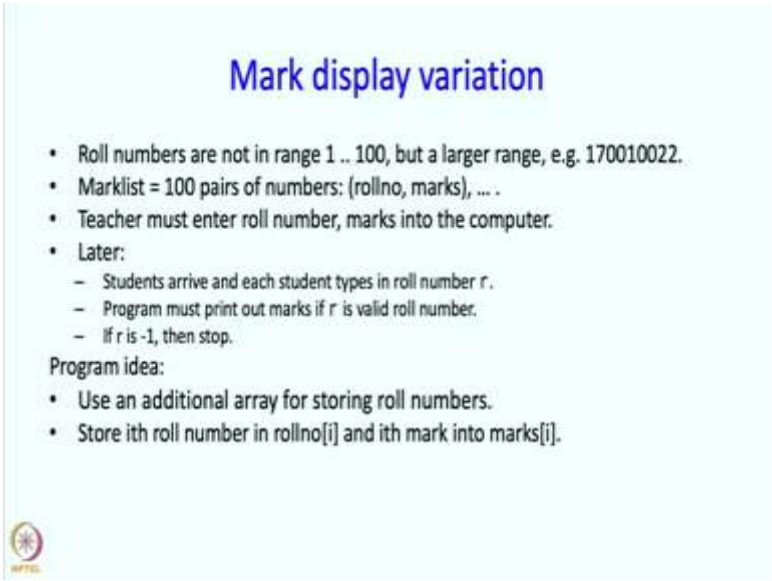

The ideas as before students arrive and each student types in the roll number and the program must print out marks if r is a valid number. If r is -1 then the program must stop. So, what is the program idea? Well we should use an array for storing marks but we now need an array for storing roll numbers as well and our idea will be that the ith roll number that the teacher enters will be stored in element rollno[i], which is our array for storing roll numbers. And the ith marks will be entered into marks[i]. So, the data corresponding to student i will be present in rollno[i] and marks[i].

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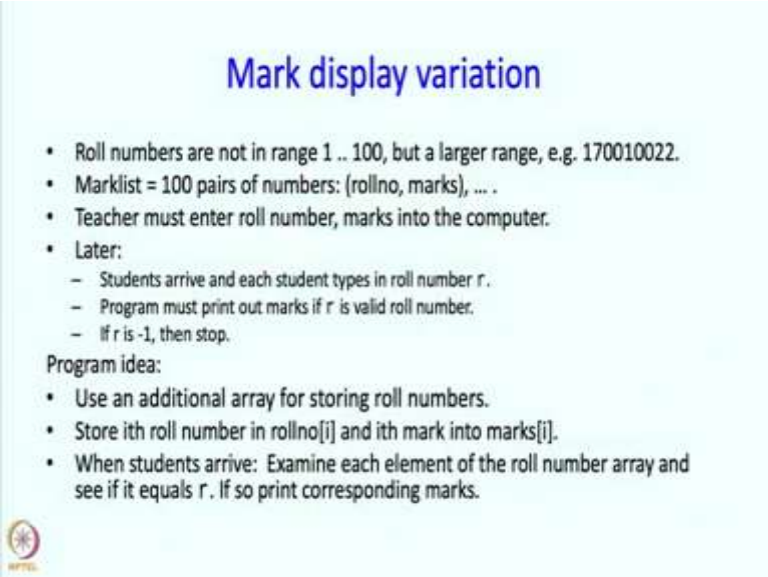

So, when the student arrives, we have to examine each element of the roll number array and see if it equals r. If so, we should print the corresponding marks. Otherwise maybe we should print out some message. Here is the program it is a reasonably simple program. So let us try to just write it.

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So first we will declare the 2 arrays that we want and then here is the code that reads in the roll number and the mark. So earlier we were just reading the marks and now we are also reading the roll number the roll number is going to be typed in first which is sort of the natural thing to do. Next this is the loop where the program waits for the students to type in their roll number. So, this time we have dispensed with the message but I guess, we could have a message and we are just reading in the roll number into a into a variable called r. And we said that, if r is -1 then we should exit. So that is what this is going to do. Next, we now are going to do something a little bit more elaborate we are going to check whether r is present in the array roll number. If it present, then we should print out the marks corresponding to the index in which it is present. But if is not present then we would like to print out a message so this found variable will come in handy for that purpose.

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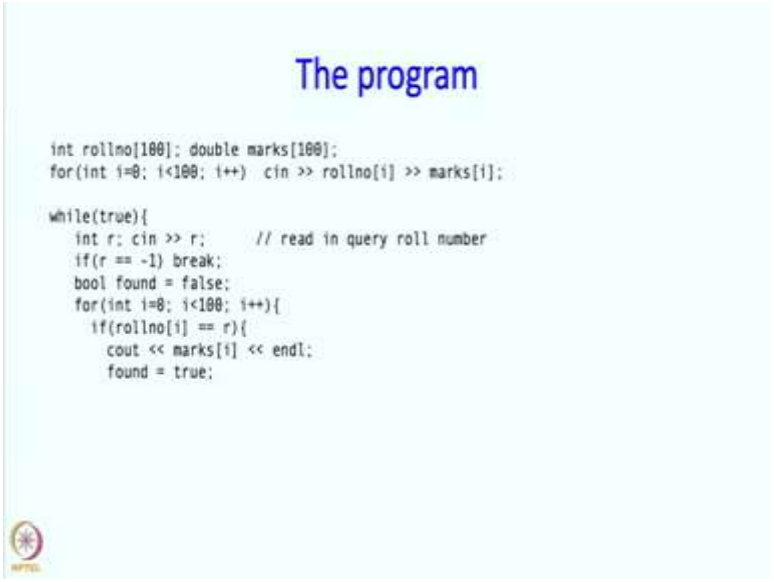

So, here is the step were we go through all the entire roll number array to see whether the roll number are that the user typed in is present in that array. So if rollno[i] equals r then we can print out the corresponding marks and we will set found to be true. So, this is going to say look, I did find the roll number and because I have found the roll number I do not need to do any of the future iteration so I can break over here. So, that is really the end of that for statement as well.

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So now observe what happens, so if the program in the control arrives at this statement. How could the control have arrived over here, it could have arrived either because it came from this break statement. So from this break statement, if it came from this break statement it is because the program found the roll number and printed it out, in which case it has also sent set found to true and therefore, this condition will not be true and therefore this massage will not get printed

And the program will just exit from here as it should. On the other hand suppose it went through all this iterations, it went through the entire array rollno but did not find the roll number r anywhere in that array. So, then that means this condition would never be true and therefore, found would never be become true, so it would come to this point and found would still be false but found is false then not found will be true and so now the program will print a message saying the roll that you typed in is not found.

So, that was sort of polite message to say rather then tell the user nothing so that is what the program is doing it is either printing out the marks, or it is printing out that roll number that you have typed is incorrect. So that is the program so let us see a demo. This program is in a file called generalRollNos.cpp

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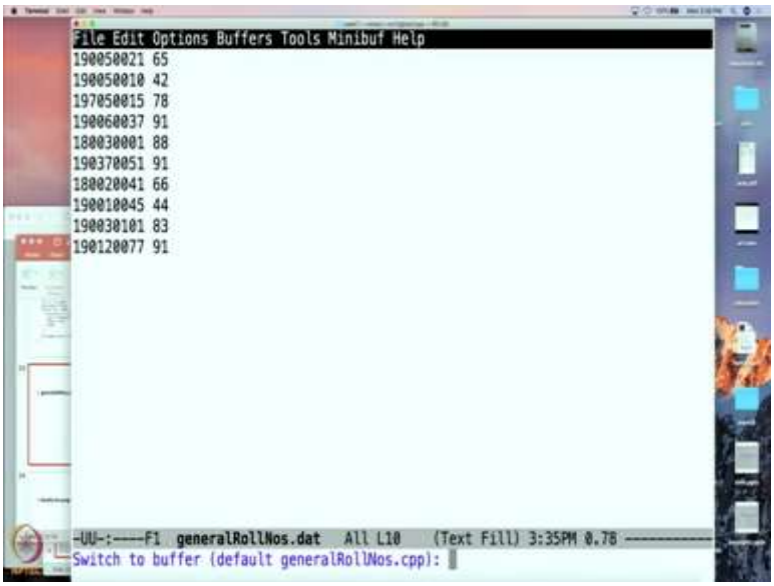

Now, this program is pretty much the same as we had earlier except for one change, so what is that change? Earlier I said that the roll numbers would be typed in by the teacher from the keyboard and the students would also type in their roll numbers from the keyboard. I am going to make a slight change. Let us say that the teacher has earlier typed in all the roll numbers and the marks into this file called generalRollNos.dat. Let me show you that file

This is this is a file that you can create however you wish by using an appropriate text editor so this contains some roll numbers and the corresponding marks and in this case there are only 10 roll numbers and 10 marks.

So, this program is going to read the roll numbers and marks information, not from the keyboard, but from this file and reading from a file in C++ is very simple. So first of all let me take you to the reading statement so if you remember in this loop you are reading the marks and you had cin over here so that was saying read in from the keyboard now you have something in here called marksfile. What is this marksfile? Well it has been defined over here. So marksfile is the name that you are going to use inside the program and it is going to be something called a stream it's going to be something called a input stream.

So, inside the program C++ likes to think of files as streams of information so somehow things come to you flowing and those are those are input stream. So in fact this a special kind of an input stream. It is an input file stream so you are declaring something called a marks file which for your program is going to be an input file stream and which is going to be for the external purposes. It is going to be this file, so this statement sets up the connection with the marks file which is appearing over here and the file that you have on your system called generalRollNos.dat.

So, instead so because marks file appears over here what you type in what you already typed in into that file will redeemed and that will be taken in roll number I, roll number marks of i and so on. So, basically in the first iteration the first word that file will be placed into rollno[i] and the second word in that file will be placed into marks[i]. So, let me show you the file again

So, because of that loop the first time around this would be become rollno[0] then this would became marks[0] this would become the next iteration this would be placed in mark in roll number 1 and this would be placed in marks 1 and so on.

So reading from a file is a useful idea especially in situation like this where you have two roles you have a teacher role and a student role and you can put the marks of 1 role into a file, because that often is very convenient and I should point you to this header file that is included fstream so you need to include this file fstream, if you want to use this this name fstream. So if you want to have files, if you have input files in your stream you should have this header fstream.

fstream also allows you to use output files and will use output files at some point whenever we need them. But I am not going to worry about files as such. This is something incidental and you can you can see that it is actually very simple and from now on you can start using files in this

manner if you wish and there also discussed in the book by the way not in this chapter but in a later chapter. So the rest of the code as I said is as before I have put in a variable or a constant rather a name called nStud for number of students, and I have use 10, I do not want to have too many numbers to type in and anyway the rest of the code is exactly like this so, that is about it.

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Let us compile this and lets run it. So now what has happened is that the file that I showed you has been read in and now I really should type in some roll number and see whether my program is printing out exactly that roll number. Well I have forgotten the roll number, So what I am going to do is I am going to do is print minus type in minus 1 if you remember minus 1 says ok stop everything and quit the program so it did. So just to remind myself what was in that file let me type out that file

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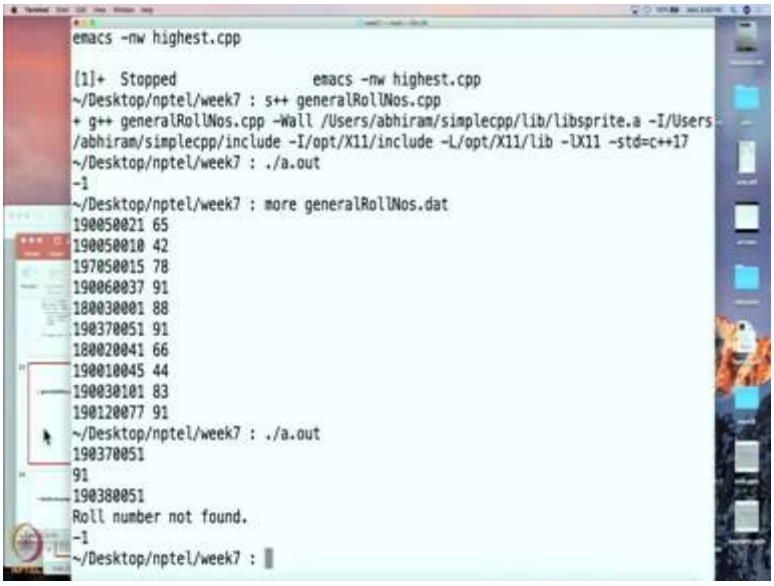

So, This were the numbers in that file. So now if I execute ./a.out the program will expect me to type in some roll number which is present over here, if so it will bring the marks otherwise if I print in a non-existent roll number it will it will say that the roll number is not valid. So let us see suppose I type 190370051, let us see so this is present over here, so I expect the program to type 91 so indeed it is doing that. But let us say I type in a roll number like 190380051 and this roll number is not present, so let us see, so it does say roll number not found.So, you could keep going in this manner but let me just stop and I can do this by typing -1, so let us get back to the presentation.

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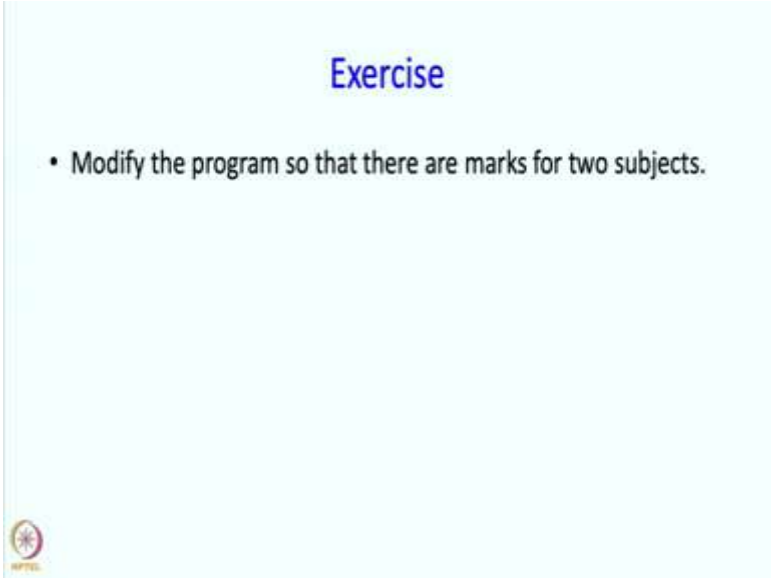

So, a small exercise for you please modify the program, so that there are marks for two subjects. So, when the user when the user types in the roll number let us say you should print the marks for both one after another.

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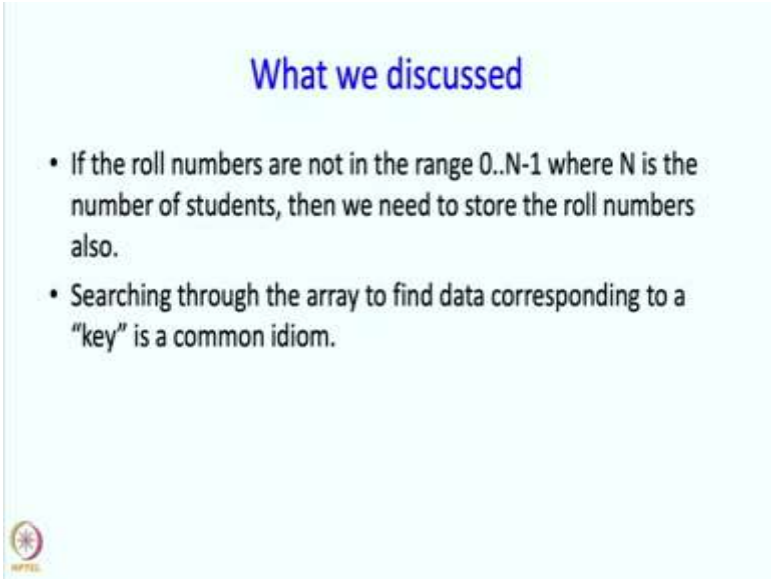

So, what have we discussed in this segment, we have said that if the roll numbers we said that the roll if the roll numbers are not in range 0 through N-1 where N is the number of student then we need to explicitly store the roll numbers. So for that we need an additional array and if want to know the roll number the marks of certain roll number then we have to search through that that additional array and so here we are storing roll number and marks. And usually we are going to be given the roll number and we might want to print out the marks. So in such cases the roll is sort of called the key to this data that we are storing and indeed this whole idiom that you are given a key you go through your data and you see that key is present so if the key is roll number you check the roll number array to see if the given key is present over there and if so print out the other parts of the data so that idiom is a very common idiom.

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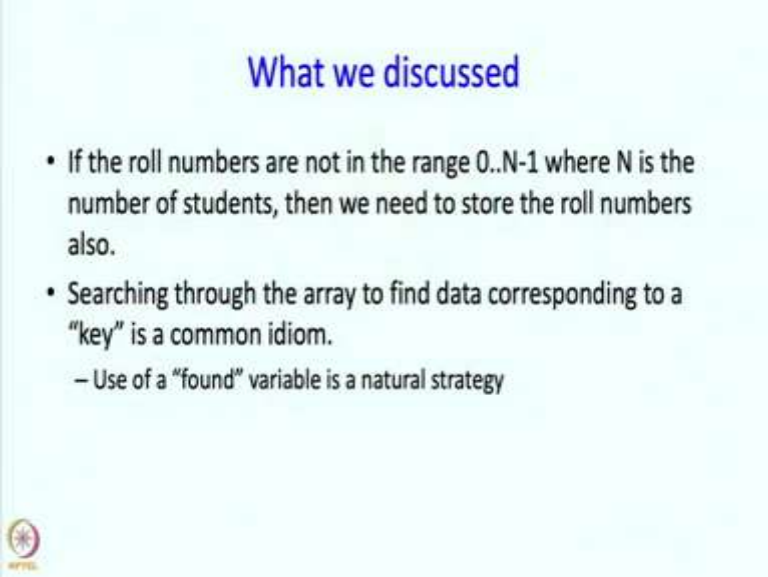

Then we also used this found variable, the bool found variable. Just to see just to record whether we have found the element we wanted because we were going to the end of the program either after finding that element, or without finding that element and when we go to that go to that last statement we would like to know did we come here, did we actually find that element, or did we not find it. And so if we have an element bull it records what we did earlier and that will help us decide, at the last statement whether we should print out a message saying you typed in a invalid roll number which is what we should do, if that roll number was not found. So this bool variable found tells us exactly this kind of information.

Next, we are going to look at polynomial multiplication which happens to use arrays in a rather nice manner but before that we will take a small break.