



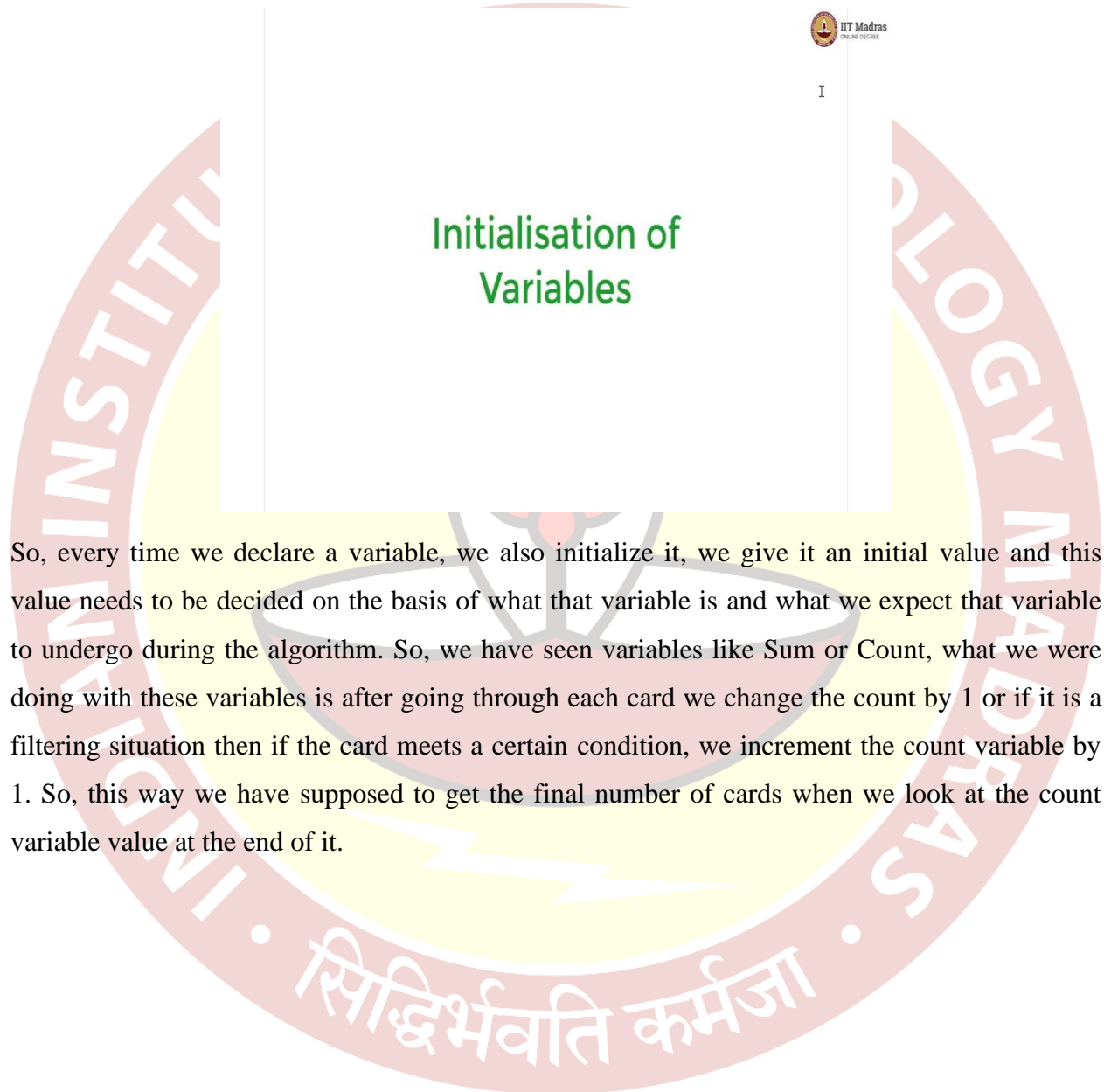
# IIT Madras

ONLINE DEGREE

## Computational Thinking Tutorial 2.7

Hello CT students. In this tutorial we are just going to talk about the initialization of variables.

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The slide features a large, semi-transparent watermark of the IIT Madras logo in the background. The logo is circular with a red border containing the text 'INSTITUTE OF TECHNOLOGY MADRAS' in white. Inside the circle is a yellow field with a red and white emblem. At the bottom of the circle, the Sanskrit motto 'सिद्धिर्भवति कर्मजा' is written in white. The slide itself has a white background with a thin red horizontal line at the top. In the top right corner, there is a small IIT Madras logo and the text 'IIT Madras ONLINE DEGREE'. Below this, the letter 'I' is centered. The main title 'Initialisation of Variables' is written in a green, sans-serif font in the center of the slide.

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### Initialisation of Variables

So, every time we declare a variable, we also initialize it, we give it an initial value and this value needs to be decided on the basis of what that variable is and what we expect that variable to undergo during the algorithm. So, we have seen variables like Sum or Count, what we were doing with these variables is after going through each card we change the count by 1 or if it is a filtering situation then if the card meets a certain condition, we increment the count variable by 1. So, this way we have supposed to get the final number of cards when we look at the count variable value at the end of it.

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Count : 0



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Sum : 0

Name : NONE

For this to work, Count should be initialized to 0, only then each time we add a card we are adding 1 to this count and only then at the end of it we will get the total number of cards which satisfy our particular condition. Same logic applies to Sum, Sum also needs to be initialized to 0 because the Sum that we are supposed to obtain at the end of the algorithm is what we get from the cards.

So, only when we start from 0 can the Sum variable actually represent the Sum that has been obtained through the cards. So, these variables would be initialized like this, these are numerical variables. However, we could have a text variable such as Name. In case of name it is text, it is a string as they would call it and it is not a number. So, we at the end of the algorithm we expect a particular name to come out, it could be the name of the highest scorer or the name of the customer who has purchased maximum something.

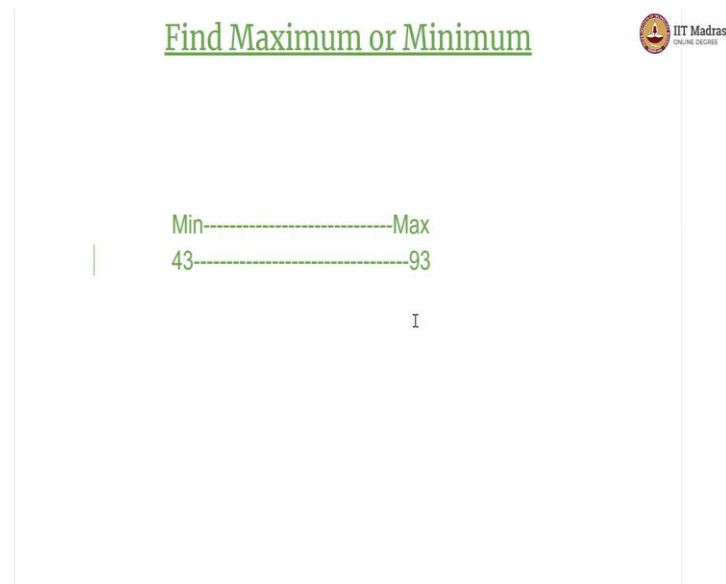
In all these cases it is not a number we are looking at. Therefore, in order to make sure it is text we can initialize to None, which is a text but we know that None is not going to be a customer's name nor is it going to be the name of a student. So, None is what we would initialize to names in this situation. Now, let us discuss the situation of finding maximum or a minimum.

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Find Maximum or Minimum

Min-----Max  
43-----93

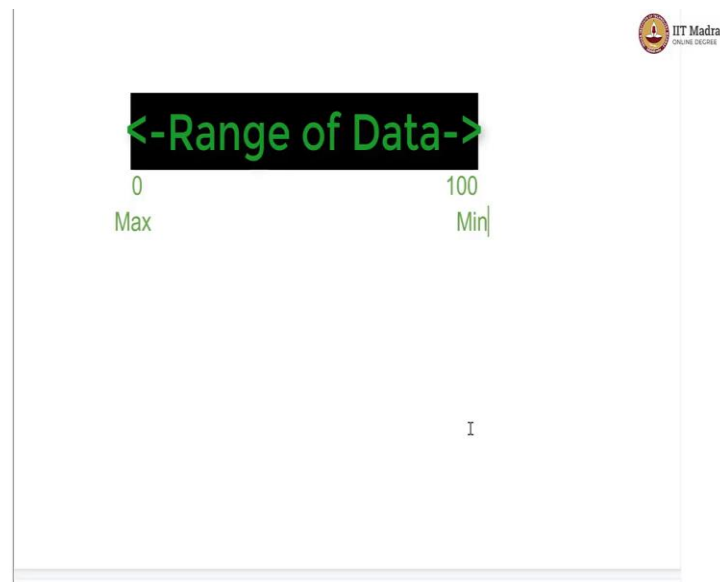
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Now, let us imagine this is a particular range in the data, what I mean is let us say these are chemistry scores then this minimum is the least chemistry score in that data and this maximum is the maximum highest chemistry score in that data, and all the scores are falling within this range. So, to give you an example, the actual data, the minimum was 43, and the maximum was 93. So, if in order to find the maximum if I took a maximum variable and initialized it to say 94 that would be very wrong because it will never get updated to 93 because it is always greater than every score on the sheet, so this is wrong.

Likewise, if I initialize the minimum variable to say 35, this would also be wrong because it is always going to be lesser than everything in the data. Thus, this is also a wrong initialization. And what happens often is you would not know what is actual data range in the dataset.

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So, suppose you did not know these values, all you know is there is this particular range within which your data will fall. So, the maximization is best done lesser than the maximum, so you keep it lesser than the possible range. For example, this range here is going to be 0 and 100. This is the range suppose, in that case in order to make sure you get the maximum you would initialize the maximum variable to this point, this would be your chosen initialization because every value in this dataset is going to be greater than this.

Likewise, you could choose the minimum variable to be here which is 100 because you know that every value in this data set is going to be lesser than 100, so it will be lesser than this particular value, so your actual minimum will be formed. But often we would not, we cannot know what is the least possible and max possible. So, we do not know what is the allowed range for a certain variable. So, in that case what do you do? Well, if your variable is certainly positive, so its upper bound could be something.

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Max = -1 (Any score will be  $> -1$ )

Min = 1000 (Any word length will be  $< 1000$ )

But you know it is positive, then the max should be initialized to 0 or some negative number, you could even do minus 1, so definitely every value in the dataset is going to be greater than this. And supposing you do not know the range again but you know it is some finite value, then for minimization you should use some sort of a meaningful logic, ideally you should use the largest number that the system provides to you but you could use a meaningful logic such as suppose it is the smallest word in the paragraph dataset.

So, we know that a word cannot be very long, so let us say we take 1000 as our initialization for the shortest word length, and obviously there is no word which has 1000 letters in it and therefore when you perform the operation, you will always land at the actual smallest word in the dataset. So, in this way you have to use your knowledge about the data and its range in order to initialize your maximum variables and minimum variables properly. Thank you.

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