

# [String definition and concatenation of strings](https://assignbuster.com/string-definition-and-concatenation-of-strings/)

For this mini group project, me and my partner have been given a project title to be discussed which is string definition, null string and length, concatenation of strings, substring, and also languages and natural languages. This topic is the subtopics from the main chapter 3 which is Sequences and String. From this chapter basically this chapter help student especially in the application of computer programming.

In this era of information technology humans have been doing math and physics for a long time until now in such from the geometry and logic of the Greek era of the Mediterranean, the numeracy of the Hindus in India, and also the development of algebra by Islamic scholars in Baghdad, until to the explosion of knowledge and learning in Europe after the invention of movable type.

In 1970’s, the string theory was born. Three particle theorists have been independently realize that the dual theories developed in 1968 to describe the particle spectrum. The quantum mechanics of oscillating strings also have been described. Thus it marks the official birth of string theory.

Moreover, string theory is the leading candidate theory of quantum gravity. In fact, there are several consistent variants and they all have the certain common features. The most obvious are the replacement of point particles by strings and the six extra “ curled-up” space-time dimensions. Thus, due to their “ extra mathematical” origin, these distinct string theories can admit very and various different mathematical descriptions. Besides that, from the research, it says that the string currently know it there is not much indication that string theory is discrete. Strings can be described as the continuous loops in space. But, there has been some interesting work by Susskind and others which does seem to suggest that string theory could be discrete.

As for the early conclusion, string theory has produced “ derivations” of mathematical theories like toric geometry and K-theory, and a host of string-motivated conjectures in virtually every field of mathematics. Whatever its the inevitability of string theory as a mathematical theory of the highest order is hard to dispute. In light of this, perhaps we should turn Wigner’s remark around and marvel instead at the unreasonable effectiveness of string theory in mathematics.

## INTRODUCTION OF THE RESEARCH

All of mathematics, as well as subjects that rely on mathematics, such as computer science and engineering, always make use of functions, sequences and string and also relations. And nowadays, most modern computer programs are represented by finite sequences of characters.

## String definition

From the book, it says that “ finite sequences of the form a1, a2, …, an are called strings”. Strings are normally restricted to sequences composed of symbols drawn from a finite alphabet, and are often indexed from 0 or 1. A string is just a finite sequence where S is a set of characters. Strings denoted by putting the characters together, for the example 12345. Besides that, strings are the fundamental object of computer science. Everything discrete can be described as a string of characters.

Decimal numbers: 1010230824879

Binary numbers: 011101010111

## String Notation

A string notation can be described as a string which is a finite sequence of 0 or more letters in some pre-set alphabet Î£. For example decimal numbers: Î£ ={0, 1, 2, 3, 4, 5, 6, 7, 8, 9} and for binary numbers: Î£ = {0, 1}.

## Null string and length

The unique string with no elements is called null string, will represented the lambda symbol l . Its length is zero: | l| = 0. Besides that, null string also be known as empty string which the string with no elements. Either way, the length of a finite string is just its number of terms (or of distinct indices). The length | s| of a finite string s is its number of positions which is the number of index values i.

## Concatenation of strings, substring

The operation which be known as concatenation which is concatenation of two strings and it is formed by joining two end-to-end. We can say that the concatenation of the strings “ book” and “ case” is the string “ bookcase”. In discrete mathematics we often use the concatenation of two strings such as a and b which the operation on strings consisting of writing a and followed by b to produce a new string of ab. Next is the concatenation of two or more numbers is the number formed by concatenating their numerals. For example, the concatenation of 1, 234, and 5678 is 12345678. The value of the result depends on the numeric base, which is typically understood from the context. For substring, given a group G of order g, then let U denote the set of all ordered multi-sets of elements of G. This will let V denote the subset of U consisting of multi-sets with exactly g components, and let A denote the subset of V consisting of multi-sets of exactly g distinct components.

## Languages and natural languages

In information technology (IT), especially in computer programming, we are sometimes required to process a language. So, basically from discrete mathematics we will learn the concept of languages in a systematic way. For example, a compiler is a software that can translate a computer program written in a particular language into another language which is usually into a machine language. While for natural language processing is a study of how to produce the computer software that is capable of understanding natural language. We start with the 26 characters A-Z, and string them to form a word. Thus, the language will consist of a collection of such words.

## RESULT OF THE RESEARCH

## STRING DEFINITION

A string over X, which X is such a finite set that is a finite of a sequence of element X

Let, X = {a, b, c} and then we let:

a = ccabbb this is a string over X and than the string will be written notation ccabbb = c2ab3

String is a sequence and the order is taken. The example that can we see is the string given accbbb that is different from the string ccabbb even that has same value but it is still different because of the order.

In internet (computer science)

Let Î£ be an alphabet, a non-empty finite. A string over Î£ is any finite sequence of characters from Î£. For example;

If Î£ = {0, 1}, then 0101 is a string over Î£

From both example given, we can see that in computer science also use, that it is same but just difference in using the symbol of X and Î£.

## NULL STRING

The null string also known as empty set that is the string with no elements . It is denoted by letter l (lambda). It has length zero. We also denote X\* is the set of all string over X and also denote X+ is the set of all non-null string over X.

Let, X\* = {all strings over X including l}

Example1:

Let X= {3, 4}

Some elements in X\* are:

44, 33, 43, 4433, 4, 3, 44034343, l

Example2:

Let X = {b, c}

Some of element in X\* are:

c, b, bcbc, b40c4bc, l

For X+ we Let X+ = X\* – {l}, the set of all non-null strings over X.

## LENGTH OF STRING

The length of a string a is the number of elements of a and that it is denoted by | a|.

If a = a2bc3 or aabccc then | a| = 6.

If | yet|= 3, | another|= 7, | usage|= 5, | pipe|= 4, | symbol|= 6.

## CONCATENATION OF STRING

Concatenation of two strings a and b is the operation on strings consisting of writing a followed by b and it produce ab

a = bbaccc and b = caaba,

Then,

ab = bbaccccaaba = b2ac4a2ba

Clearly, | ab| = | a| + | b|

In computer programming

String concatenation is the operation of joining two end to end.

Example:

The strings “ beach” and “ ball” may be concatenated to give “ beachball”.

First example:

The following expression use the “+” symbol as the concatenation operator to join 2 strings:

Print “ hi, ” + “ dear”; produces the concatenated string “ hi, dear” by joining those 2 strings

Second example,

(“ wet”+” land”) is equals to (“ wetland”). It shows that concatenation can be achieved with the + string operator.

## LANGUAGE AND NATURAL LANGUAGE

Let B = {2, 3};-

The example is languages over B:

L1 = {2, 23, 233, 2333,…}

L2 = {2m3m | m > 0}

L3 = {2m3n | m > 0, n > 0}

Suppose that B is a set of alphabet. That it is define a language L over B is a collection of strings over X. A language L is simply a subset of A.

## CONCLUSIONS AND RECOMMENDATIONS

As for the conclusions, this topic of sequence and string help both of us to think and link what we have learnt in the module of discrete mathematics within computer science and information technology. From this topic we have doing research about string definition, null string and length, concatenation of string, substring, languages and also natural languages. By doing this mini project we have investigated that the applications of this topic in discrete mathematics involve in the areas of computer science and IT. Nowadays, most modern computer program are represented by finite sequences of characters. We therefore need to develop the algebraic way such as string for handling such finite sequences. Moreover, this string topic is important to be learned by the student as it much involve in the application of computer programming.

In computer programming, essentially, the string is a sequence of characters which is generally understood as a data type usually storing data values usually bytes. The elements usually stand for characters according to a character encoding, which will differentiates it from the other general array data type. Thus, the terms binary string and byte string are used to suggest strings in which the stored data does not necessarily represent text. While in discrete mathematics we learn string as mathematical structures. As we have doing our research on this topic, we can see that this topic involve much in the application of computer programming. As both of us are from science computer course, we can apply what we have learned in discrete mathematics into our application programming.

Finally for the recommendations to improve more this topic which is Sequence and String, both of us have think that while in the lectures student should given more detail and explanation of string involving the subtopics of null string and non null string. Moreover, deep explanation about the function of language and natural languages in string also will help much the student to understand more this topic, apply it in the programming skills, and can do well in our final examination. The benefit of doing this mini project is both of can develop our understanding of the concepts and the applications of discrete mathematics through experiences which enable both us to explore more and model a variety or real-world situations. Special thanks to our lecturer Prof Dr. Haslina which have help both of us in giving the guidelines to do well for this our discrete mathematics mini project.