**Home Work 5b**

(a) How the strings are hashed? What are the ways to form unique integers/numbers from the strings?

**Ans:** There are various methods to convert strings to unique integers/numbers

Sometimes, a number is input as a string. To use it for any mathematical operation, we have to convert the string to integer. There are two ways to do this.

1. The first method is to manually convert the string into an integer.
2. The second method is to use the built-in functions.

**Manual Conversion**

Below is a list of ASCII (American Standard Code for Information Interchange) characters and their decimal value.

**ASCII Character                 Decimal Value**

0                                              48

1                                              49

2                                              50

3                                              51

4                                              52

5                                              53

6                                              54

7                                              55

8                                              56

9                                              57

Numbers are stored in character format within the string. In order to get the decimal value of each string element, we have to subtract it with decimal value of character ‘0.’ Let’s make this clear with the help of an example.

**Example 1: Program to Manually Convert a String to an Integer**

#include <stdio.h>  
#include <string.h>  
main()  
{  
 char num[50];

int  i, len;  
int result=0;  
printf("Enter a number: ");  
gets(num);  
len = strlen(num);  
for(i=0; i<len; i++){  
result = result \* 10 + ( num[i] - '0' );  
}  
printf("%d", result);  
}

Initially, in this program, we include the two header files stdio.h and string.h. This is done in order to use the functions present in this two header files. The C programming language does not have its own functions. The main function is used to execute the C program. Hence, it is mandatory to have it in every C program. The program code is written within the curly braces of the main function.  Inside the main function we first define and declare the  different variables along with their data types. Variables i, len and result are declared as of integer data type. The result variable is initialized to zero. The printf() function is then called to display the message “enter a number” on the output screen. gets(num) will read the input number and store it as a string.  In this case, the string is an array of characters pointed to by num. Then, we calculate the length of the string using the strlen() function. Next, we loop through the string and convert the string into decimal value. Finally, the string is converted into an integer and printed on the screen.

**Example 2: A Program to Convert String to Integer Using the atoi() Function**

atoi() is a function that converts a string data type to integer data type in the C language. The syntax of this function is as follows

int atoi((const char \* str);

Here, str is of type pointer to a character. The const keyword is used to make variables non-modifiable. This function returns an integer value after execution. The atoi() function is present in the stdlib.h header file. This header file contains all the type casting functions used in the C language.

#include <stdio.h>  
#include <stdlib.h>  
main()  
{  
char x[10] = "450";  
int result = atoi(x);  
printf("integer value of the string is %d\n", result);  
}

The list of other string to numerical values in-built type casting functions used in C programs include

atof()- This function is used to convert string to a floating point value.

atol()- Use this function to convert a string to a long integer value.

To convert CString to int ,u can use the following func. :

int HashTable::hashing (CString word)

{

int result = 0;

for(size\_t i = 0; i < word.getLength(); ++i)

{

result += word[i] \* pow(31, i);

}

return result;

}

Also there are various other ways ,for example :

It's simple,use the stringstream to stream the class to operate on strings  
for example: convert the string "12345" to integer:  
1-first use the library that include the class stringsream and it's sstream  
2-use a copy from this class  
3-code

**string** s="12345";

**int** x=0;

stringstream convert(s);*//object from the class stringstream*

convert>>x; *//the object has the value 12345 and stream it to the integer x*

*//now the variable x holds the value 12345*

(c) What hashing algorithms are used in the built-in hashing libraries for strings in different languages i.e. Java, C-Sharp and C++?

* C++ :

1. str\_hash
2. Strings.Unbounded.Hash is equivalent to the function call Strings.Hash (To\_String (Key));
3. Hashlib.new(‘ripemd160’)

* C-Sharp :

|  |  |
| --- | --- |
| **Name** | **Description** |
| System_CAPS_pubmethod | [Clear()](https://msdn.microsoft.com/en-us/library/system.security.cryptography.hashalgorithm.clear(v=vs.110).aspx) | Releases all resources used by the HashAlgorithm class. |
| System_CAPS_pubmethod | [ComputeHash(Byte[])](https://msdn.microsoft.com/en-us/library/s02tk69a(v=vs.110).aspx) | Computes the hash value for the specified byte array. |
| System_CAPS_pubmethod | [ComputeHashInt32) Int32, (Byte[],](https://msdn.microsoft.com/en-us/library/1e59xaaz(v=vs.110).aspx) | Computes the hash value for the specified region of the specified byte array. |
| System_CAPS_pubmethod | [ComputeHash(Stream)](https://msdn.microsoft.com/en-us/library/xa627k19(v=vs.110).aspx) | Computes the hash value for the specified [Stream](https://msdn.microsoft.com/en-us/library/system.io.stream(v=vs.110).aspx) object. |
| System_CAPS_pubmethodSystem_CAPS_static | [Create()](https://msdn.microsoft.com/en-us/library/b0ky3sbb(v=vs.110).aspx) | Creates an instance of the default implementation of a hash algorithm. |
| System_CAPS_pubmethodSystem_CAPS_static | [Create(String)](https://msdn.microsoft.com/en-us/library/wet69s13(v=vs.110).aspx) | Creates an instance of the specified implementation of a hash algorithm. |
| System_CAPS_pubmethod | [Dispose()](https://msdn.microsoft.com/en-us/library/dd289076(v=vs.110).aspx) | Releases all resources used by the current instance of the HashAlgorithm class. |
| System_CAPS_protmethod | [Dispose(Boolean)](https://msdn.microsoft.com/en-us/library/07ebee0c(v=vs.110).aspx) | Releases the unmanaged resources used by the HashAlgorithm and optionally releases the managed resources. |
| System_CAPS_pubmethod | [Equals(Object)](https://msdn.microsoft.com/en-us/library/bsc2ak47(v=vs.110).aspx) | Determines whether the specified object is equal to the current object.(Inherited from [Object](https://msdn.microsoft.com/en-us/library/system.object(v=vs.110).aspx).) |
| System_CAPS_protmethod | [Finalize()](https://msdn.microsoft.com/en-us/library/system.object.finalize(v=vs.110).aspx) | Allows an object to try to free resources and perform other cleanup operations before it is reclaimed by garbage collection.(Inherited from [Object](https://msdn.microsoft.com/en-us/library/system.object(v=vs.110).aspx).) |
| System_CAPS_pubmethod | [GetHashCode()](https://msdn.microsoft.com/en-us/library/system.object.gethashcode(v=vs.110).aspx) | Serves as the default hash function. (Inherited from [Object](https://msdn.microsoft.com/en-us/library/system.object(v=vs.110).aspx).) |
| System_CAPS_pubmethod | [GetType()](https://msdn.microsoft.com/en-us/library/system.object.gettype(v=vs.110).aspx) | Gets the [Type](https://msdn.microsoft.com/en-us/library/system.type(v=vs.110).aspx) of the current instance.(Inherited from [Object](https://msdn.microsoft.com/en-us/library/system.object(v=vs.110).aspx).) |
| System_CAPS_protmethod | [HashCoreInt32) Int32, (Byte[],](https://msdn.microsoft.com/en-us/library/system.security.cryptography.hashalgorithm.hashcore(v=vs.110).aspx) | When overridden in a derived class, routes data written to the object into the hash algorithm for computing the hash. |
| System_CAPS_protmethod | [HashFinal()](https://msdn.microsoft.com/en-us/library/system.security.cryptography.hashalgorithm.hashfinal(v=vs.110).aspx) | When overridden in a derived class, finalizes the hash computation after the last data is processed by the cryptographic stream object. |
| System_CAPS_pubmethod | [Initialize()](https://msdn.microsoft.com/en-us/library/system.security.cryptography.hashalgorithm.initialize(v=vs.110).aspx) | Initializes an implementation of the HashAlgorithm class. |
| System_CAPS_protmethod | [MemberwiseClone()](https://msdn.microsoft.com/en-us/library/system.object.memberwiseclone(v=vs.110).aspx) | Creates a shallow copy of the current [Object](https://msdn.microsoft.com/en-us/library/system.object(v=vs.110).aspx).(Inherited from [Object](https://msdn.microsoft.com/en-us/library/system.object(v=vs.110).aspx).) |
| System_CAPS_pubmethod | [ToString()](https://msdn.microsoft.com/en-us/library/system.object.tostring(v=vs.110).aspx) | Returns a string that represents the current object.(Inherited from [Object](https://msdn.microsoft.com/en-us/library/system.object(v=vs.110).aspx).) |
| System_CAPS_pubmethod | [TransformBlockInt32) Byte[], Int32, Int32, (Byte[],](https://msdn.microsoft.com/en-us/library/system.security.cryptography.hashalgorithm.transformblock(v=vs.110).aspx) | Computes the hash value for the specified region of the input byte array and copies the specified region of the input byte array to the specified region of the output byte array. |
| System_CAPS_pubmethod | [TransformFinalBlockInt32) Int32, (Byte[],](https://msdn.microsoft.com/en-us/library/system.security.cryptography.hashalgorithm.transformfinalblock(v=vs.110).aspx) | Computes the hash value for the specified region of the specified byte array. |