

CME1211

Algorithms and Programming I

Strings

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Outline

- Characters
- Strings
- String Operations
- Examples

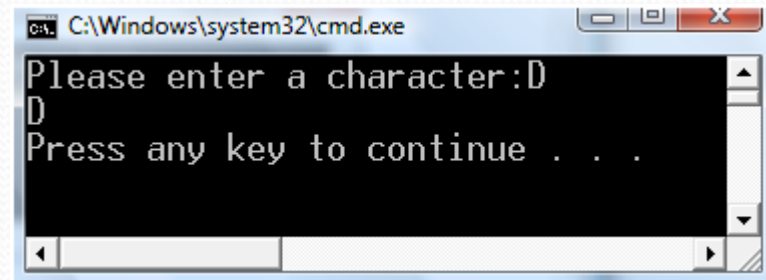
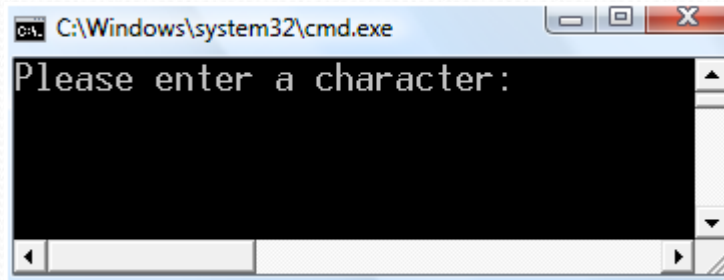
Characters

- ***Character*** data type is used to store one alphanumeric data, such as letters, numbers, spaces, symbols, and punctuation.
- Examples: A B a b 1 2 ; ? # % ...

Characters in C#

- The statement **char ch;** declares a single-byte variable named "**ch**" which holds one character.
- Example:

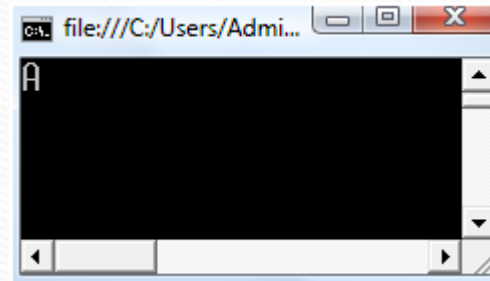
```
char ch;  
Console.Write("Please enter a character:");  
ch = Convert.ToChar(Console.Read());  
Console.WriteLine(ch);
```



Characters in C#

- The value of a *char* is assigned in single quote (') using the standard assignment operator (=) .
- Example:

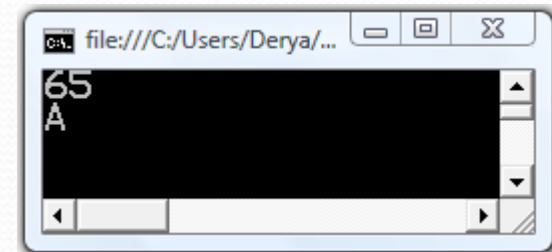
```
char ch;  
ch = 'A';  
Console.WriteLine(ch);
```



ASCII Character Codes

| ASCII | Symbol | ASCII | Symbol | ASCII | Symbol | ASCII | Symbol |
|-------|--------|-------|--------|-------|---------|-------|--------|
| 0 | NUL | 16 | DLE | 32 | (space) | 48 | 0 |
| 1 | SOH | 17 | DC1 | 33 | ! | 49 | 1 |
| 2 | STX | 18 | DC2 | 34 | " | 50 | 2 |
| 3 | ETX | 19 | DC3 | 35 | # | 51 | 3 |
| 4 | EOT | 20 | DC4 | 36 | \$ | 52 | 4 |
| 5 | ENQ | 21 | NAK | 37 | % | 53 | 5 |
| 6 | ACK | 22 | SYN | 38 | & | 54 | 6 |
| 7 | BEL | 23 | ETB | 39 | ' | 55 | 7 |
| 8 | BS | 24 | CAN | 40 | (| 56 | 8 |
| 9 | TAB | 25 | EM | 41 |) | 57 | 9 |
| 10 | LF | 26 | SUB | 42 | * | 58 | : |
| 11 | VT | 27 | ESC | 43 | + | 59 | ; |
| 12 | FF | 28 | FS | 44 | , | 60 | < |
| 13 | CR | 29 | GS | 45 | - | 61 | = |
| 14 | SO | 30 | RS | 46 | . | 62 | > |
| 15 | SI | 31 | US | 47 | / | 63 | ? |

```
Console.WriteLine(Convert.ToInt16('A'));
Console.WriteLine(Convert.ToChar(65));
```



| ASCII | Symbol | ASCII | Symbol | ASCII | Symbol | ASCII | Symbol |
|-------|--------|-------|--------|-------|--------|-------|--------|
| 64 | @ | 80 | P | 96 | ^ | 112 | p |
| 65 | A | 81 | Q | 97 | a | 113 | q |
| 66 | B | 82 | R | 98 | b | 114 | r |
| 67 | C | 83 | S | 99 | c | 115 | s |
| 68 | D | 84 | T | 100 | d | 116 | t |
| 69 | E | 85 | U | 101 | e | 117 | u |
| 70 | F | 86 | V | 102 | f | 118 | v |
| 71 | G | 87 | W | 103 | g | 119 | w |
| 72 | H | 88 | X | 104 | h | 120 | x |
| 73 | I | 89 | Y | 105 | i | 121 | y |
| 74 | J | 90 | Z | 106 | j | 122 | z |
| 75 | K | 91 | [| 107 | k | 123 | { |
| 76 | L | 92 | \ | 108 | l | 124 | |
| 77 | M | 93 |] | 109 | m | 125 | } |
| 78 | N | 94 | ^ | 110 | n | 126 | ~ |
| 79 | O | 95 | _ | 111 | o | 127 | |

Strings

- A ***string*** is an ordered sequence of characters.
- Examples: "Apple" "Sea"
- A ***string data type*** is a data type storing a sequence of data values, usually bytes, in which elements usually stand for characters.

Strings in C#

- A *string variable* can be declared in different ways:

```
// Declare without initializing.
```

```
string s1;
```

```
// Initialize to null.
```

```
string s2 = null;
```

```
// Initialize as an empty string.
```

```
string s3 = "";
```

```
//Initialize with an initial value.
```

```
string s4 = "Hello Word!";
```


Strings in C#

- The value of a *string* is assigned in double quotes (" ") using the standard assignment operator (=).

- Example:

```
string name;
```

```
Console.Write("Enter your name: ");
```

```
name= Console.ReadLine();
```

```
Console.WriteLine(name);
```

```
name= "Ali";
```

```
Console.WriteLine(name);
```

String Operations

Most popular operations over strings:

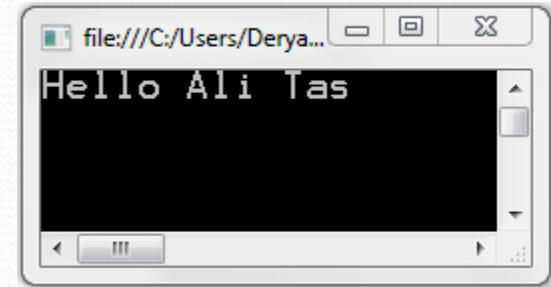
- Concatenate
- Equals
- CompareTo
- Length
- Indexer
- Substring
- ToLower and ToUpper
- Split
- Indexof
- Contains
- ...

String Concatenate

String concatenation can be done using **+** operator

- Example:

```
string name = "Ali";  
string surname = "Tas";  
string str;  
str = "Hello " + name + " " + surname;  
Console.WriteLine(str);
```



Comparing Strings

There are several ways to compare strings for equality

- **Equals()**

- Returns *true* if they are equal, otherwise *false*

- **==** and **!=** operators

- Returns *true* or *false*

- **CompareTo()**

- Returns 0 if equal, negative if less, positive if greater

Comparing Strings

```
string str1 = "hello";  
string str2 = "mello";
```

```
if (str1.Equals(str2))  
    Console.WriteLine("Equal");  
else  
    Console.WriteLine("Not equal");
```

```
if (str1 == str2)  
    Console.WriteLine("Equal");  
else  
    Console.WriteLine("Not equal");
```

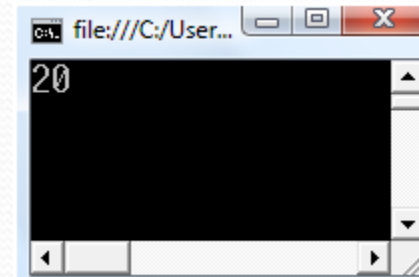
```
int result = str1.CompareTo(str2);  
if (result == 0)  
    Console.WriteLine("Equal");  
else if (result > 0)  
    Console.WriteLine("Greater");  
else  
    Console.WriteLine("Less");
```


String Length

- Returns the length of the string
- Useful for loops

- Example:

```
string str;  
str = "Bugun hava cok guzel";  
Console.WriteLine(str.Length);
```



Question

- Take two strings from the user and print the longest one.
- Example:

Inputs: derya

cem

Output: derya

```
string s1, s2;  
Console.WriteLine("enter two strings");  
  
s1 = Console.ReadLine();  
s2 = Console.ReadLine();  
  
if (s1.Length > s2.Length)  
    Console.WriteLine(s1);  
else if (s2.Length > s1.Length)  
    Console.WriteLine(s2);  
else  
    Console.WriteLine(s1 + " " + s2);
```

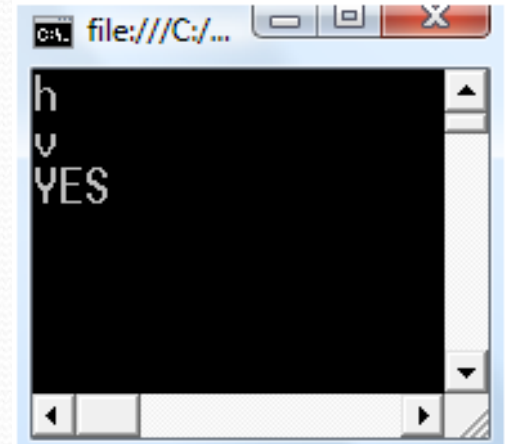
String Indexer

- Retrieves any character in the string using a subscript
- Example:

```
string str;  
str = "Bugun hava cok guzel";
```

```
Console.WriteLine(str[6]);  
Console.WriteLine(str[8]);
```

```
if (str[4]=='n')  
    Console.WriteLine("YES");
```



Example

- Write a program that finds “how many times letter ‘a’ appears in the string”

```
string str = "Bugun hava çok güzel";  
int counter = 0;  
  
for (int i = 0; i < str.Length; i++)  
    if (str[i] == 'a')  
        counter++;  
  
Console.WriteLine(counter);
```


Substring

- Retrieves a substring from this instance.
 - The substring starts at a specified character position.

Substring(startIndex)

- The substring starts at a specified character position and has a specified length

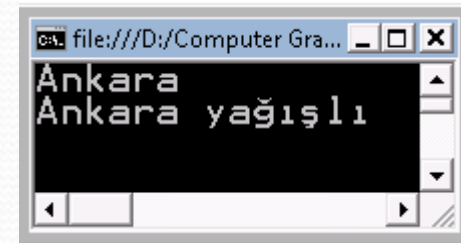
Substring(startIndex, length)

- Example:

```
string str = "İstanbul soğuk, Ankara yağışlı";  
string str2;
```

```
str2 = str.Substring(16, 6);  
Console.WriteLine(str2);
```

```
str2 = str.Substring(16);  
Console.WriteLine(str2);
```



Example

- Write a program that finds “how many times word ‘çok’ appears in the string”

```
string str = "Bugun hava çok ama çok çok güzel";  
int counter = 0;  
  
for (int i = 0; i < str.Length - 2; i++)  
    if (str.Substring(i, 3) == "çok")  
        counter++;  
  
Console.WriteLine(counter);
```


ToLower – ToUpper

- **ToLower** : Returns a copy of the string converted to lowercase
- **ToUpper** : Returns a copy of the string converted to uppercase
- Example:

```
string str = "AlGoRi tmA";  
string output;  
  
output = str.ToUpper();  
Console.WriteLine(output);  
  
output = str.ToLower();  
Console.WriteLine(output);
```



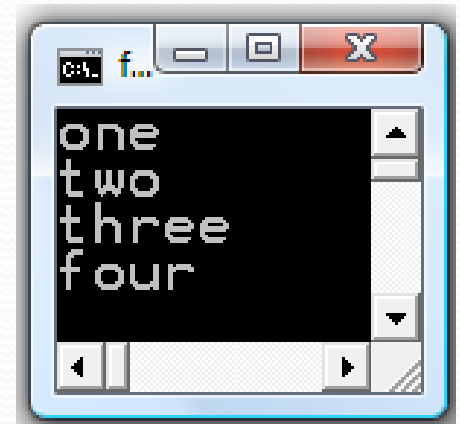
Split

- Returns a string array that contains the substrings in this instance that are delimited by elements of a specified string.

Split(separator)

- Example:

```
string str = "one;two;three;four";  
string[] words = null;  
  
words = str.Split(';');  
  
for (int i = 0; i < words.Length; i++)  
    Console.WriteLine(words[i]);
```



Example

- Print the longest word in the string

```
string str = "I love algorithm course";  
string[] words = str.Split(' ');  
  
int max = 0;  
string result = "";  
  
for (int i = 0; i < words.Length; i++) {  
    if (words[i].Length > max {  
        max = words[i].Length;  
        result = words[i];  
    }  
}  
Console.WriteLine(result);
```


Char/String Search

Finds the position of a char or string

- **IndexOf** (value, startIndex)
 - **value**: The string to seek
 - **startIndex**: The search starting position (optional)

```
int index;  
string letters = "abcdefabcdef";  
  
index = letters.IndexOf('*');  
Console.WriteLine(index);           // -1  
  
index = letters.IndexOf('c');  
Console.WriteLine(index);           // 2  
  
index = letters.IndexOf("def");  
Console.WriteLine(index);           // 3  
  
index = letters.IndexOf('a', 3);  
Console.WriteLine(index);           // 6
```


Contains

- Returns a boolean value indicating whether the specified string occurs within another string

Contains(stringvalue)

- Example:

```
string str1 = "I love algorithm and programming course";  
string str2 = "algorithm";
```

```
if (str1.Contains(str2))  
    Console.WriteLine("yes");
```

```
if (str1.Contains("mathematics"))  
    Console.WriteLine("no");
```

Example

- Write a program that finds a string is palindrome or not

ey edip adanada pide ye
anastas rulo iyi olur satsana
kalas yok kütük koy salak

```
string str = "MADAM";  
bool flag = true;  
for (int i = 0; i < (str.Length - 1) / 2; i++)  
    if (str[i] != str[str.Length - i - 1])  
        flag = false;  
  
if (flag)  
    Console.WriteLine("Palindrome");  
else  
    Console.WriteLine("Not palindrome");
```


Example

- Write a program that finds the similarity percentage of two strings
- Example: "AHMET SABRİ KESGİN"

"AHNET SAPRİ KESKİN"

18 characters, 3 characters are different

$100 - ((3 / 18) * 100) \quad \% 83.3$

```
string str1="AHMET SABRİ KESGİN";  
string str2="AHNET SAPRİ KESKİN";  
double counter = 0;  
  
for (int i = 0; i < str1.Length; i++)  
    if (str1[i] == str2[i])  
        counter++;  
  
Console.WriteLine((counter / str1.Length) * 100);
```