INTRODUCTION

- Strings
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  2. Creating String
     a. Using string literal.
     b. Using new keyword.
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  4. **String methods**
     a. Length method
     b. Searching character in a String : indexof() , lastindexof()
     c. Searching substring
     d. String comparison
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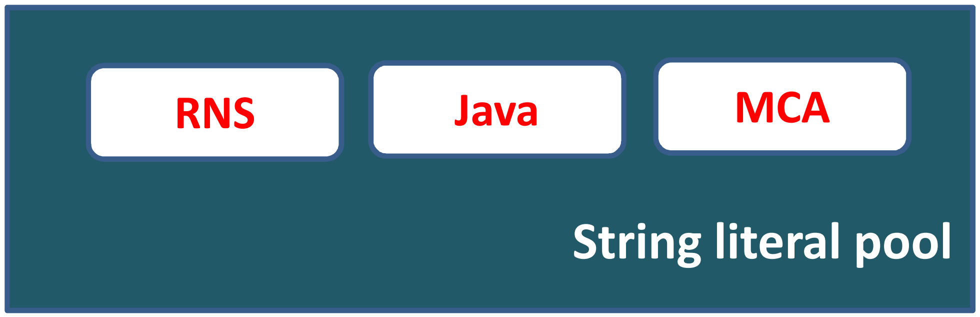
     f. Extracting characters
  5. String Buffer and String Builder

1. String fundamentals

- Package: *java.lang.String*
- String is a *final* class
  - means no class can extend it.
- String is *immutable object.*
  - means once created and initialized, cannot be changed.
  - is a constant

1. String fundamentals

- String literal pool
  - Java maintains special memory called: “String literal pool”
  - *is a pool of unique Strings: avoid duplicate*



2. Creating String

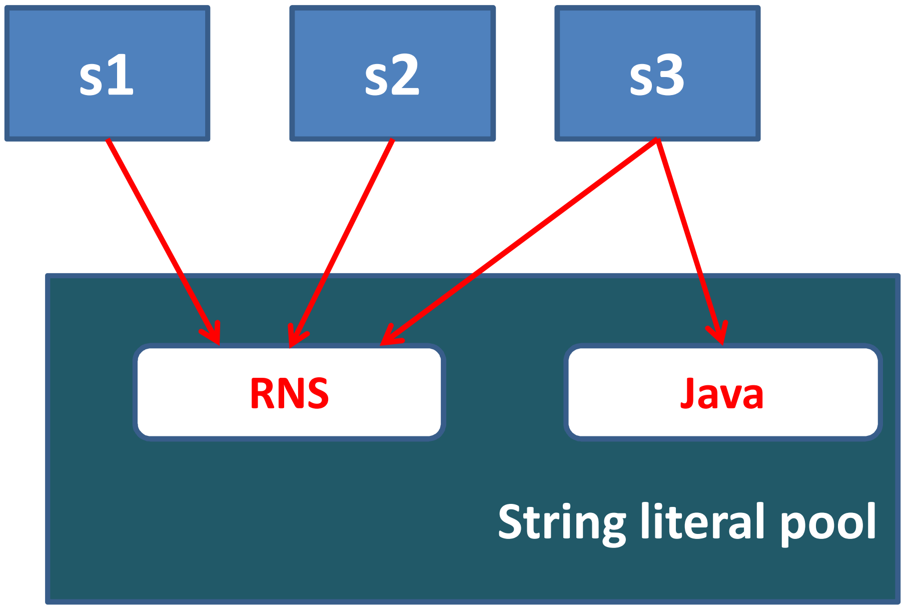
– String literal

– Using *new* keyword

2. Creating String

- Using String literal:

```
String  s1 = "RNS" ;
String  s2 = "RNS" ;
String  s3 = "RNS" ;
        s3 = "Java";
```



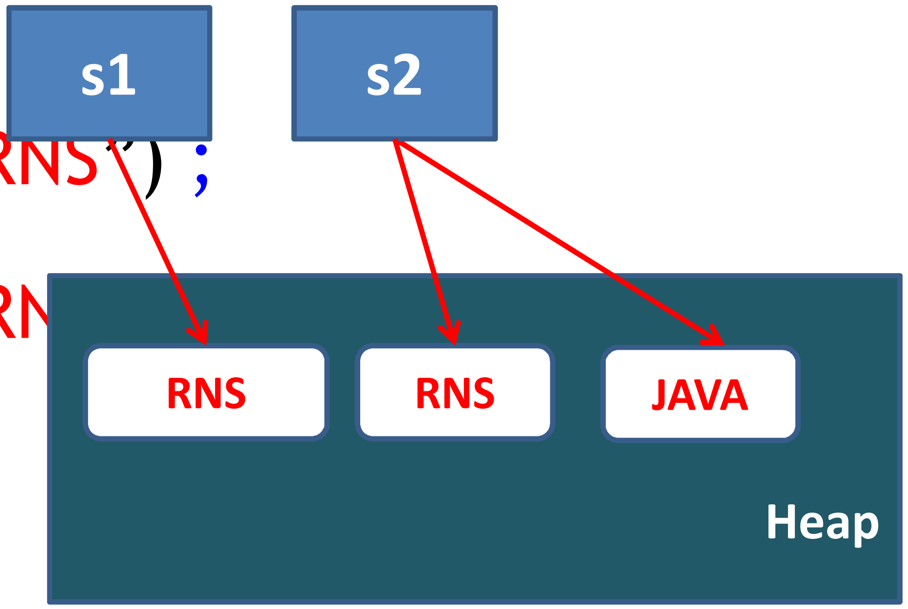
2. Creating String

- Using *new* :

```
String  s1 = new String("RNS") ;

String  s2 = new String("RN

s2 = new String("JAVA") ;
```



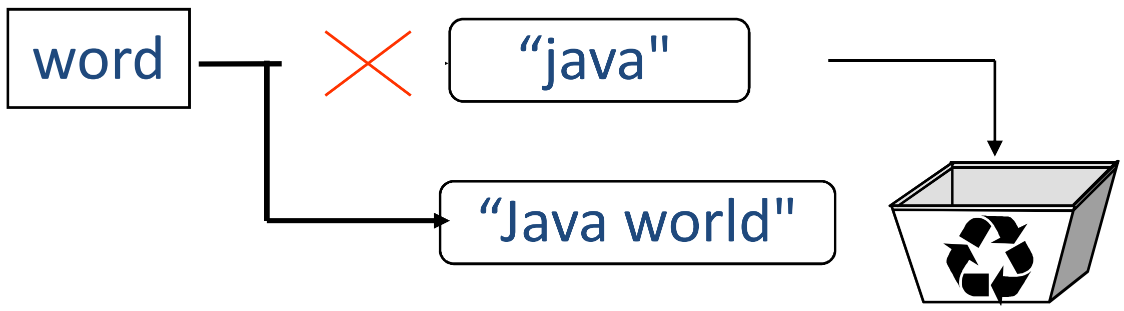
The *new* keyword always creates new string object in Heap.

Disadvantages of Immutability

Less efficient —

- creates a new string even for small changes.
- and throw away the old one

```
String word = “Java";
word = word + “ world”;
```



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Forms of Constructors

- Using Constructors: *Different forms*

  1. Creating Empty string:
     - *String ( )*

  2. Creating string with other string object
     - *String (String strObj)*

  3. Creating String from character array
     - *String (char charArr[])*
     - *String (char charArr[], int startIndex, int numChars)*

  4. Creating String from character array
     - *String (byte ascii[])*
     - *String (byte ascii[], int startIndex, int numChars)*

Forms of Constructors

- Examples:

1. Creating Empty string:

```
String  str = new String( );
```

2. Creating string with other string object

```
String strOb = new String("Apple");
String newStr = new String(strOb);
```

Creating String from character array

3. Sample program to Create String from character array

char [] charArray = {'R', 'N', 'S', ‘I', ‘T', ‘M', ‘C', ‘A’} ;

	“RNSITMCA”
	“MCA”

Read from index 5,

Read 3 characters

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4.a) length Methods

- Length method
    - returns the number of characters contained in the string object.
- Syntax:

```
int    String.length ()
```

- Example: *find the return value*

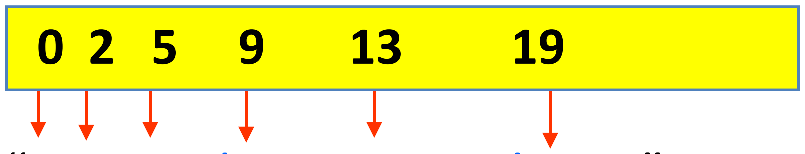
```
int len = “Google”.length();
String s1 = “Google”;
len = s1.length();
```

4.a) String searching Methods

- Serching in a string:

int ***indexOf*** (*searchKey*, [*startIndex*])	returns the position of ***first occurrence*** of a ***searchKey*** in a target string. Returns **-1** if *searchKey* not found.
int ***lastIndexOf*** (*searchKey*, [*startIndex*])	returns the position of ***last occurrence*** of a ***searchKey*** in a target string. Returns **-1** if *searchKey* not found.
String ***subString*** (*i*, *k*)	returns substring from position ***i to k-1,*** where ***i*** and ***k*** are the start and end Index
boolean ***contains***(String)	method returns true if this string contains s, else false.

Example..



String name =“Principal.RNS@gmail.com";

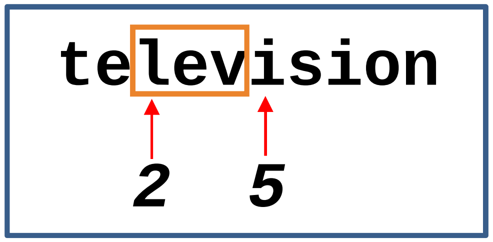
	Returns:
name.indexOf (‘i');	2
name.indexOf (‘i', 3);	5
name.indexOf (“RNS");	10
name.indexOf (‘@');	13
name.indexOf (“Bob");	-1
Name.IndexOf (‘.');	9
name.lastIndexOf (‘.');	19

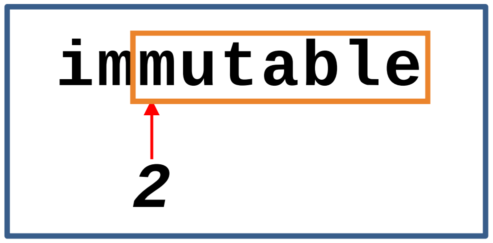
4.b) Obtaining a string: subString

- Example..

Returns:

“television”.substring (2,5); $\longrightarrow$	“lev"
“immutable”.substring (2); $\longrightarrow$	“mutable"
“RNS”.substring (9); $\longrightarrow$	“” (empty string)





4.a) String searching Methods: subString

- Example..

```
String  campus = “Student@RNS.Campus.connect”;
String college = “rns";
if( campus.contains(college))
          System.out.println (“Student belongs to RNS college”);
```

4.c) String Comparison -

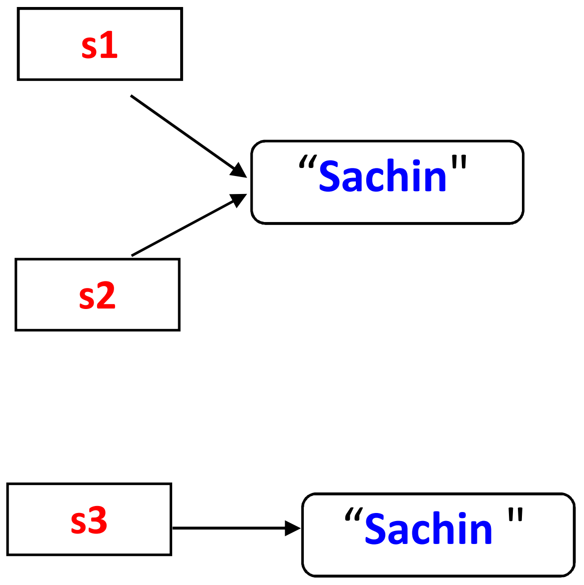
1. *Comparing with “==“ operator*
2. *equals() and equalsIgnoreCase()*
3. *compareTo()*
4. *regionMatches()*
5. *startsWith() and endsWith()*

Comparing with ==

✓ *The '==' operator compares references not values.*

- Example:

```
class CompareDemo1 {
      public static void main(String args[])   {

            String s1 = "Sachin";
            String  s2 = "Sachin";
            String  s3 = new String("Sachin");

            if(s1==s2)
                              System.out.println ( "Both points to same object" );

            if(s1==s3)
               System.out.println ("Both points to different object" );
      }
}
```



equals() *and* *equalsIgnoreCase()*

- Syntax:

boolean ***equals*** ***(Object)*** ***boolean*** ***equalsIgnoreCase*** ***(Object)***	▪ **compares two strings for equality** ▪ ***both returns true if both the strings are same , false otherwise.***

equals() and equalsIgnoreCase()

- Example

returns

“rnsmotors”.equals(“rnsmotors”) ; → ***true***

“rnsmotors”.equals(“RNSmotors”) ; → ***false***

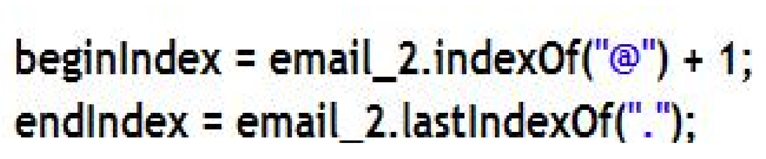
“rnsmotors”.equalsIgnoreCase(“RNSmotors”); → ***true***

Example..

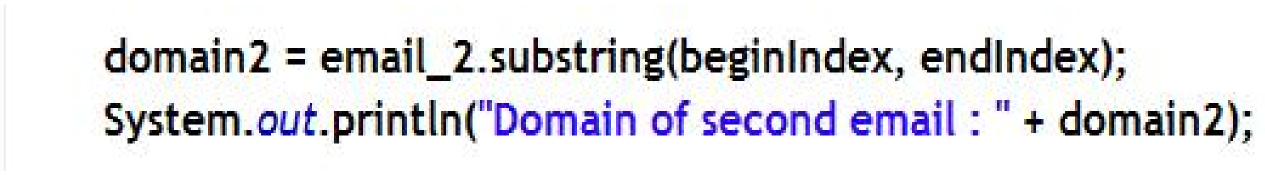
- Example: write program
  - ➢ Read 2 emails from user
  - ➢ Display domain of both emails
  - ➢ Check if two emails belong to same domain or not
- Say
  - ➢ email1 = raj@gmail.com and
  - ➢ email2 = usha@rediffmail.com
- Output:
  - Domain of 1st email is : gmail
  - Domain of 2nd email is : rediffmail
  - Result: Domain not matching

```java
public class DomainDemo {
  public static void main(String [] a)  throws Exception  {

      BufferedReader input = new BufferedReader( new InputStreamReader (System.in) );
      String email_1, email_2, domain1, domain2;
      int beginIndex, endIndex;



       // a) input the 2 emails
       System.out.print("Enter first email : ");
       email_1 = input.readLine();

       System.out.print("Enter Second email : ");
       email_2 = input.readLine();


       // b) extract the domain
       beginIndex = email_1.indexOf("@") + 1;
       endIndex = email_1.lastIndexOf(".");

       domain1 = email_1.substring(beginIndex, endIndex);
       System.out.println("Domain of first email : " + domain1);
```

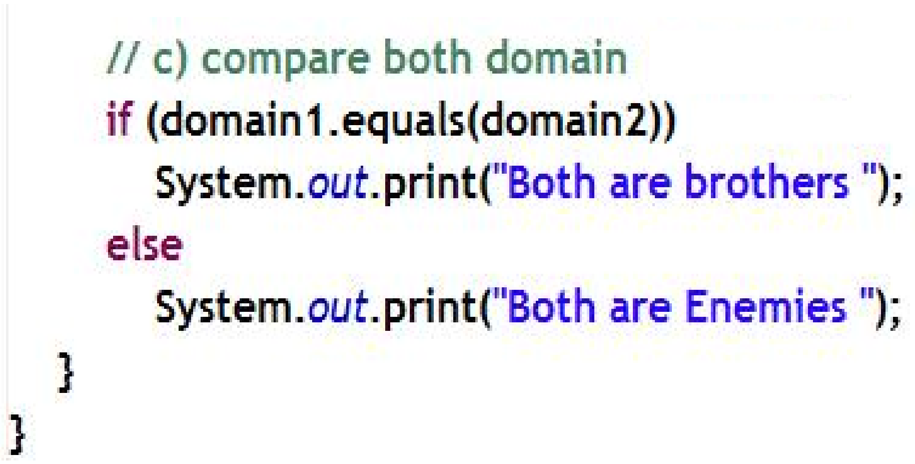
Example..



```
beginIndex = email_2.indexOf("@") + 1;
endIndex = email_2.lastIndexOf(".");
```



```
domain2 = email_2.substring(beginIndex, endIndex);
System.out.println("Domain of second email : " + domain2);
```



```
        // c) compare both domain
        if (domain1.equals(domain2))
            System.out.print("Both are brothers ");
        else
            System.out.print("Both are Enemies ");
    }
}
```

compaeTo()

- Syntax:

int word1.compareTo (word2)	Returns the "*difference*" [word1 - word2] If the "*difference*" is ✓ Negative - (word1 comes before word2), ✓ Zero - (word1 and word2 are equal) ✓ Positive - (word1 comes after word2). Often used in conditional statements.

compareTo()

- Example..

```
public class StringDemo {
     public static void main(String[] args) {
            String str1 = “RNS", str2 = “PQR";
            if ( str1.compareTo(str2)  == 0 )
                        System.out.println ( “Strings are EQUAL“ );
             if ( str1.compareTo(str2)  > 0 )
                        System.out.println ( "str1 is greater than str2“ );
            else
                        System.out.println ( "str1 is less than str2“ );
    }
}
```

4. String Comparison -

boolean regionMatches (int *startIndex*, String *str2*, int *str2StartIndex*, int *length*)

boolean regionMatches (boolean *IgnoreCase,* int *startIndex*, String *str2*, int *str2StartIndex*, int *length*)

- *compares a specific region of one string with another specific region of another string.*
- *Second form ignore the case.*

Methods — Changing Case

- *Example:*

	returns
"campus.rns.in". regionMatches(7, "rnsit", 0,3);	// true
"campus.rns.in". regionMatches(7, "RNSIT", 0,3);	// false
"campus.rns.in". regionMatches(true, 7, "RNSIT", 0,3);	// true

4. String Comparison -

- *Example*.

```
String  s1 = new String("principal@RNSIT.ac.in");
String  s2 = new String("rnsit");
String  s3 = new String("RNSIT");

int  startIndex = s1.indexOf("@") + 1;
System.out.print ("Found RNSIT : " );
System.out.println (s1.regionMatches(startIndex, s2, 0, 3));

System.out.print ("Found  rnsit: " );
System.out.println (s1.regionMatches(startIndex,, s3, 0, 3));

System.out.print ("Found  rnsit: " );
System.out.println (s1.regionMatches(true, startIndex, s3, 0, 3));
```

```
Found RNSIT:   true

Found rnsit:   false

Found rnsit:   true
```

4. String Comparison -

- Syntax

boolean startsWith (String *str*)	***determines whether a given String begins with a specified string.***
boolean endsWith (String *str*)	***determines whether a given String ends with a specified string.***

*If string is found returns **true** otherwise **false***

compareTo()

- Example..

```
public class StringDemo {
    public static void main(String[] args) {

            String str1 = “Welcome to RNSIT, MCA “;

            boolean  val =  str1.startsWith(“Welcome”) ;
            System.out.println ( “Does string starts with welcome : “  + val );

            val =  str1.endsWith(“MCA”) ;
            System.out.println ( “Does string ends with MCA : “  + val );
    }
}
```

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Methods — to modify a string

String replace(oldCh, newCh)	*returns a new string formed from word1 by replacing all occurrences of oldCh with newCh*
String trim ();	*returns a new string after removing white space at both ends of word1.* *does not affect whites space in the middle*

String toUpperCase();
String toLowerCase();
	returns a new string after converting all characters to upper (or lower) case

String concat(String)	*appends one String to the end of another.*
Concatenating with +	

All method returns a new string resulting from old String, as String can not be modified

Methods — replace

- Example:

```
String word1 = “rare“;
String word2 = word1.replace(‘r’, ‘d’);


// word2 is “dade”, but word1 is still “rare“
```

Methods — trim

Example:

```
String word1 = “  Hi John  ” ;

String word2 = word1.trim();

//word2  is  “Hi John” - no spaces on either end

//word1  is still  “ Hi John  “ - with spaces
```

Methods — Changing Case

- *Example:*

```
                                                        returns
String   word1 = “HeLLo“;
String   word2 = word1.toUpperCase();                   //  “HELLO”
String   word3 = word1.toLowerCase();                   //  “hello”
System.out.println ( word1 ) ;                          //  “HeLLo“
```

3.d) Concatenating using ‘+’ operator

1. *concatenating two strings with* **‘+’**

Statements	***returns***
String s1 = “RNS” + “MCA” ;	// “RNSMCA”
System.out.println(“RNS” + “Motors” *);*	// prints “RNSMotors”

3.d) Concatenating using ‘+’ operator

2. Concatenating strings with ‘other data types’

Statements	*returns*
`String s1 = “Bring ” + 4 + “ Apples” ;`	`// s1 = “Bring 4 Apples”`
`System.out.println(“Sum is: ” + 2 + 2 );`	`// prints “Sum is 22”`
`System.out.println(“Sum is: ” + (2 + 2) );`	`// prints “Sum is 4”`

Obtaining character within a String

- charAt(int index)
  - extract and return a single character from a String,
- getBytes()
  - ➢ returns the resultant byte array
- toCharArray()
  - returns the resultant character array
- getChars (int sourceStart, int sourceEnd, char target[ ], int targetStart)
  - Reads set of characters from source and copies to destination.

3.e) Extracting character

- Example:

Statements	*returns*
`char ch = “abzde”.charAt(2);`	`// ch = ‘z’`
`byte [] buf = “Aa”.getBytes();`	`// buf = [ 65 , 97 ]`
`char [] buf = “RNS”.toCharArray();`	`// buf = [ ‘R’ , ‘N’, ‘S’]`
`char[] buf = new char[4];`	
`“understand”.getChars(2, 5, buf, 0);`	`// buf = [ ‘d’, ‘e’, ‘r’ ]`

- String Vs StringBuffer/StringBuilder class

String Vs StringBuffer/StringBuilder class

Class → Points↓	String	StringBuffer	StringBuilder
Modifiable	Immutable	Mutable	Mutable
Memory	String Literal pool	Heap	Heap
Thread safe	Yes	Yes	No
Speed	Fast	Slow	Fast
Size	Fixed length	Growable	Growable

Thread Safe:

does not allow two threads to simultaneously access the same method .

StringBuffer

- is mutable - can change the value of the object .
- The default capacity of the buffer is (16 + initialized string length).
- StringBuffer has the same methods as the StringBuilder
  - *but each method in StringBuffer is synchronized (thread safe)*
  - *Only one thread can use a method at a given time.*

StringBuffer

- Constructors:

Constructor	Description
StringBuffer()	Reserves room for **16 characters** default
StringBuffer(int size)	Reserves the size of the object to integer argument passed
StringBuffer(String str)	Sets the initial contents of the object and reserves room for 16 more characters.

StringBuffer

- Methods to modify buffer

method	Description
length( )	Returns Current length of the string
Capacity( )	Returns total allocated capacity for the object.
ensureCapasity (int capacity)	If we want to preallocate room for a certain number of characters after StringBuffer has been constructed, we use ensureCapacity().
setLength(int length)	Set the length of the buffer within a object

StringBuffer

- Other methods

method	Description
Char charAt(int index)	Returns the character at position specified by 'index' .
void setCharAt(int index, char ch)	Sets the character at position 'index' withnew character 'ch'.
SringBuffer append (String str)	If we want to preallocate room for a certain number of characters after StringBuffer has been constructed, we use ensureCapasity().

Array of Strings

- Example:

```
String   []  company = { "RNS", "Jindal", "Relience" };
System.out.println("Elements of array are:");
for( String  name : company )
    System.out.println( name );
```

Using String to control switch

- Example:

```
String color = "red";

switch (color) {
case "red":
        System.out.println("Color is Red");
        break;
case "green":
        System.out.println("Color is Green");
        break;
default:
        System.out.println("Color not found");
}
```

Command line Arguments

```
class CommandLine   {
    public static void main (String [] args)
        System.out.println(" Total Elemnts: " + args.length );
        System.out.println(" Elemnts are: "  );
         for( String str : args )
                System.out.println(str );
    }
}
```

3.1. Creating String from character array

```
class StringWithCharArray {

    public static void main (String [] arg) {

        char  []  charArray =   { 'H', 'e', 'l', 'l', 'o', 'F', 'u', 'n' } ;

        System.out.println("Displaying charater Array values:" ) ;

        for (  int  i = 0 ; i < charArray.length ; i++)
                System.out.println(" " + charArray[i] ) ;

        System.out.println("Creating String with char Array:" ) ;

        String  str = new String(charArray);

        System.out.println("Displaying String value:" ) ;

        System.out.println(" String = " + str) ;

        System.out.println("Another version:" ) ;

        str = new String(charArray, 6, 3);

        System.out.println(" String = " + str) ;

    }
}
```