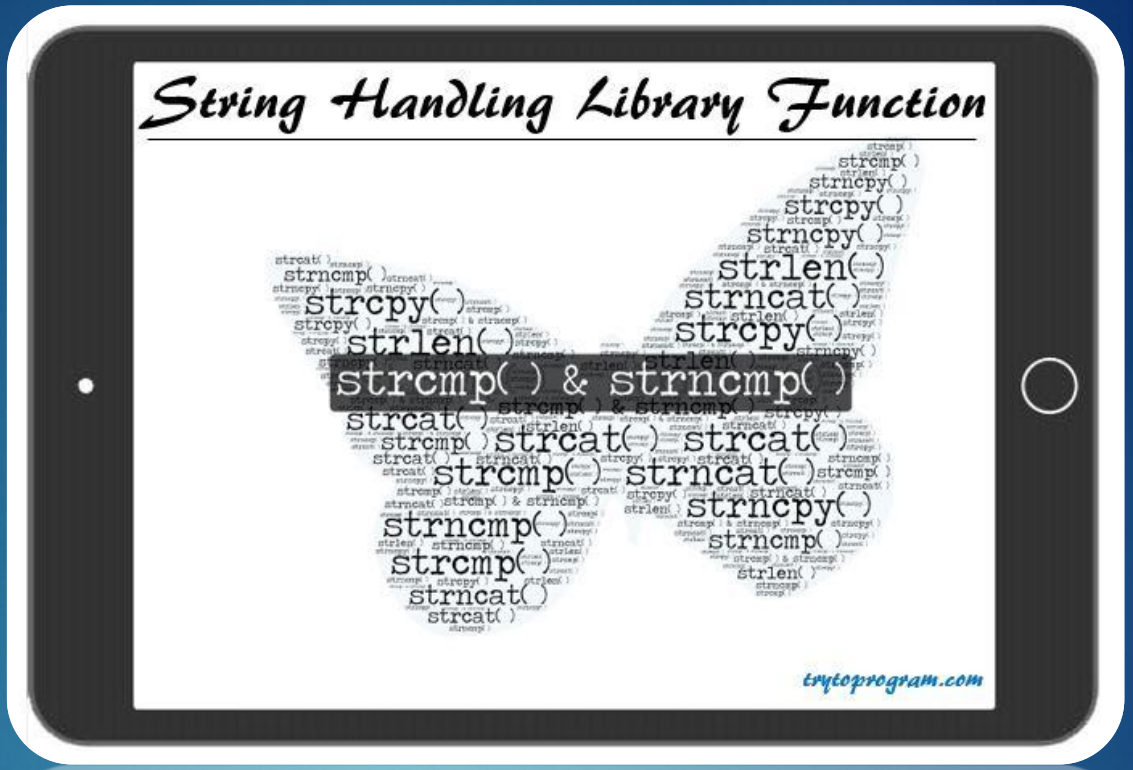
Chapter 7



Arrays & Strings

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Arrays

- 1D Arrays
- Declaration of 1D Arrays
- Global Declaration
- Local Declaration
- Initialization of Arrays
- Compile Time Initialization
- Run Time Initialization
- Accessing the Array Elements
  - Assigning values to array elements,
  - Displaying the array elements
- 2D Arrays
- Elements of 2D Arrays
- Initialization of 2D Arrays
- Passing Array Element to a Function
- Passing Array to a Function
- Passing 2D Array to a Function
- Returning Array Element from a Function
- Returning Array from a Function

One Dimensional Array

- Declaration of One-Dimensional Arrays
  - [storage_class] data_type variable_name[size];
- Global Declaration

```
char string[50]; /* Global Declaration */
void main(){
        ……….
}
```

- Local Declaration

```
void main(){
        int age[] = {21,22,19,20}; /* Local Declaration & Initialization */
        ……….
}
```

Initialization of Arrays

1. Compile Time Initialization
   - int number[3]={0,0,0};
2. Run Time Initialization
   - int x[3];
   - scanf("%d%d%d",&x[0],&x[1],&x[2]);

Accessing the Array Elements

i. Assigning values to array elements,
   - ✓ int a[5], b[3];
   - ✓ a=0; /* wrong*/
   - ✓ b=a; /* wrong*/
   - ✓ if(a<b)
   - ✓ {…} /* wrong*/

Another Example

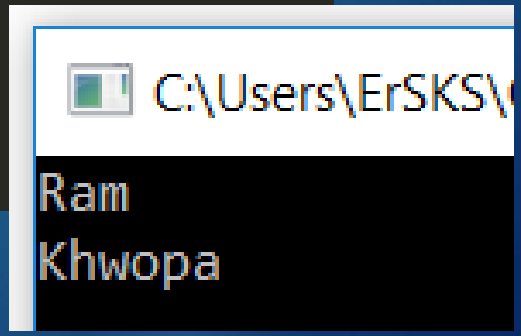
```
float marks[3];
marks[0] = 90.05;
marks[1] = 88.77;
marks[2] = 78.12;
marks[3] = 90.77; /* Invalid */
```

Compile Time Initialization


```
char name[] = “Ram”;
/*
Same as
char name[] = {‘R’,’a’,’m’,’\0’};
*/
```

C7_1.C

```
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      char name[] = {'R','a','m','\0'};
5      char name2[] = "Khwopa";
6      printf("%s", name);
7      printf("\n%s", name2);
8      getch();
9      return 0;
10 }
```



Run Time Initialization

Program to count negative, positive & zeros from entered numbers

C7_2.C

```c
#include<stdio.h>
#include<conio.h>
int main(){
    int a[50],n,count_n=0,count_z=0,count_p=0,i;
    printf("Enter size of array: ");
    scanf("%d",&n);
    printf("Enter the elements of the array\n");
    for(i=0;i<n;i++){
        scanf("%d",&a[i]);
    }
    for(i=0;i<n;i++){
        if(a[i]<0){
            count_n++;
        }else if(a[i]>0){
            count_p++;
        }else{
            count_z++;
        }
    }
    printf("Negative = %d\n",count_n);
    printf("Zero = %d\n",count_z);
    printf("Positive = %d.\n",count_p);
    getch();
    return 0;
}
```

```
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Enter size of array: 7
Enter the elements of the array
1 0 3 -8 5 6 -2
Negative = 2
Zero = 1
Positive = 4.
```

2D Array

[storage_class] data_type array_name[row_size][column_size];

Declaration of 2D Array

```
int m[3][3];
```

Initialization of 2D Array

```
int a[3][3]={{5,6,7},{4,3,8},{1,5,9}};
```

is equivalent to

```
a[0][0]=5;  a[0][1]=6;  a[0][2]=7;
a[1][0]=4;  a[1][1]=3;  a[1][2]=8;
a[2][0]=1;  a[2][1]=5;  a[2][2]=9;
```

a[0][0]	a[0][1]	a[0][2]
5	6	7
a[1][0]	a[1][1]	a[1][2]
4	3	8
a[2][0]	a[2][1]	a[2][2]
1	5	9

Accessing 2D Array Element


```
int b[4][4] = {
{5,6,7,8},
{1,2,3,4},
{8,5,2,0},
{7,5,2,0}
};
```

b[2][1] = ?

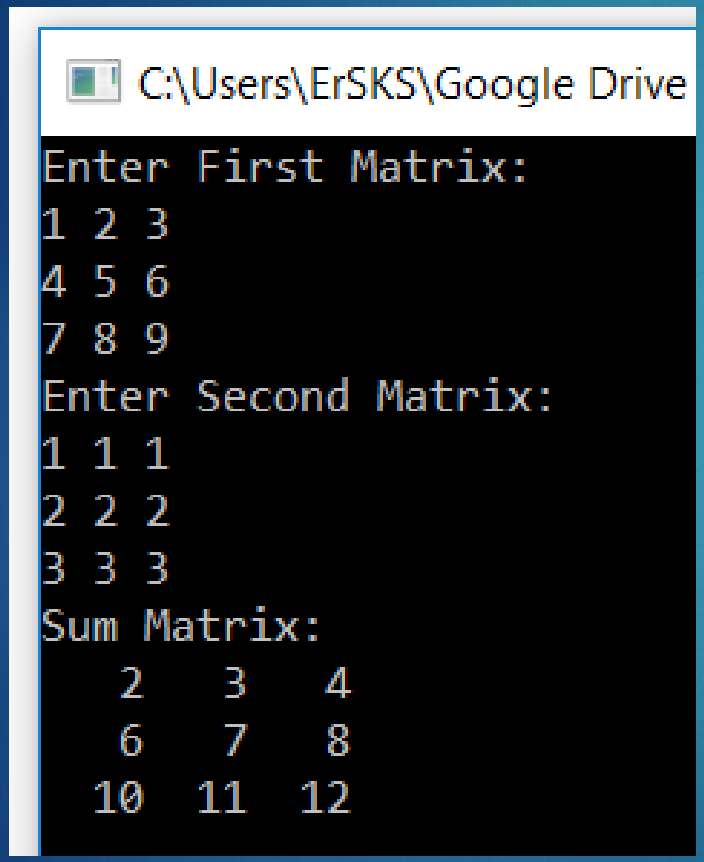
b[0][3] = ?

b[3][3] = ?

b[1][1] = ?

5	6	7	8
1	2	3	4
8	5	2	0
7	5	3	4

WAP to read m*n matrices and display their sum.



C7_3.C

```c
#include<stdio.h>
#include<conio.h>
int main(){
    int m=3, n=3;
    int a[m][n], b[m][n], sum[m][n], i, j;
    printf("Enter First Matrix:\n");
    for (i=0; i<m; i++){
        for (j=0; j<n; j++){
            scanf("%d", &a[i][j]);
        }
    }
    printf("Enter Second Matrix:\n");
    for (i=0; i<m; i++){
        for (j=0; j<n; j++){
            scanf("%d", &b[i][j]);
        }
    }
    printf("Sum Matrix:\n");
    for (i=0; i<m; i++){
        for (j=0; j<n; j++){
            sum[i][j] = a[i][j] + b[i][j];
            printf("%4d", sum[i][j]);
        }
        printf("\n");
    }
    getch();
    return 0;
}
```

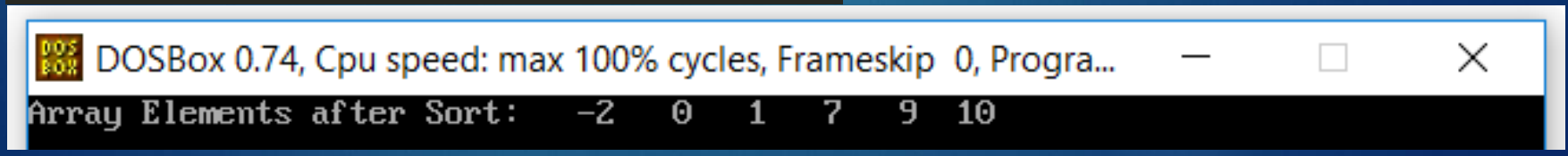
Task

- WAP to read m*n matrices and display their product.

Sort Array Element

C7_4_v2.C

```c
#include<stdio.h>
#include<conio.h>
int main(){
    int a[6]={7,-2,10,9,1,0};
    int i, j, temp;
    clrscr();
    for(i=0;i<5;i++){
        for(j=0;j<5;j++){
            if(a[j]>a[j+1]){
                temp=a[j];
                a[j]=a[j+1];
                a[j+1]=temp;
            }
        }
    }
    printf("Array Elements after Sort: ");
    for(i=0;i<6;i++){
        printf("%4d",a[i]);
    }
    getch();
    return 0;
}
```



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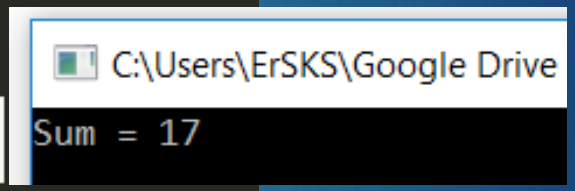
Passing Array Element to a Function

C7_5.C

```
1  #include<stdio.h>
2  #include<conio.h>
3  void findSum(int,int);
4  int main(){
5      int a[2]={8,9};
6      findSum(a[0],a[1]);
7      getch();
8      return 0;
9  }
10 void findSum(int a,int b){
11     printf("Sum = %d", (a+b));
12 }
```



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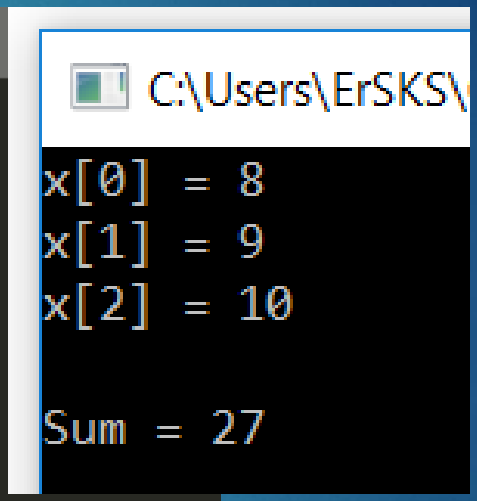
Passing Array to a Function

C7_6.C

```c
#include<stdio.h>
#include<conio.h>
void findSum(int a[]);
int main(){
    int a[3]={8,9,10};
    findSum(a);
    getch();
    return 0;
}
void findSum(int x[]){
    int i, sum=0;
    for(i=0;i<3;i++){
        printf("x[%d] = %d\n", i, x[i]);
        sum += x[i];
    }
    printf("\nSum = %d", sum);
}
```



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Task

- WAP to add n numbers entered by user. Use the concept of array & function.

Passing 2-D Array to a Function

C7_7.C

```
1  #include<stdio.h>
2  #include<conio.h>
3  void fxn(int a[3][3]);
4  int main(){
5      int i, a[3][3]={{1,2,3},{4,5,6},{7,8,9}};
6      fxn(a);
7      getch();
8      return 0;
9  }
10 void fxn(int x[3][3]){
11     int i,j;
12     for(i=0;i<3;i++){
13         for(j=0;j<3;j++){
14             printf("x[%d][%d]=%d\t",i,j,x[i][j]);
15         }
16         printf("\n");
17     }
18 }
```

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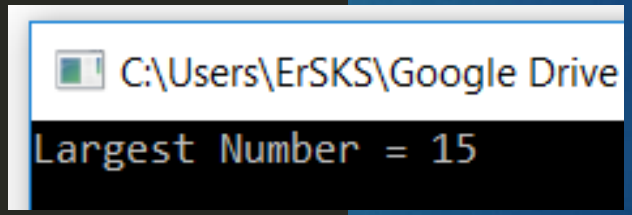
```
x[0][0]=1       x[0][1]=2       x[0][2]=3
x[1][0]=4       x[1][1]=5       x[1][2]=6
x[2][0]=7       x[2][1]=8       x[2][2]=9
```

Returning Array Element from a Function

C7_8.C

```c
/* Returning Array Element from a function */
#include<stdio.h>
#include<conio.h>
int findLargest(int a[]);
int main(){
      int n[] = {5,10,2,-14,15};
      printf("Largest Number = %d",findLargest(n));
      getch();
      return 0;
}
int findLargest(int x[]){
    int i;
    int largest = x[0];
    for (i=1;i<5;i++){
        if(largest<x[i]){
            largest = x[i];
        }
    }
    return largest;
}
```



Returning Array from a Fxn

C7_9.C

```c
/* Program to generate prime numbers */
#include<stdio.h>
#include<conio.h>
int generatePrime(int *, int);
int isPrime(int);
int main(){
     int i, prime[100], status=0, n_prime=20;
     status = generatePrime(&prime[0],n_prime);
     printf("Prime Numbers:\n");
     for (i = 0; i<n_prime && status == 1; ++i){
        printf("%d\t", prime[i]);
     }
     getch();
}
int generatePrime(int *el, int n){
    int i, count=0;
    for (i=2; ; i++){
        if(isPrime(i)==1){
            *el = i;
            el++;
            count++;
            if (count>=n){
                break;
            }
        }
    }
    return 1;
}
```

```c
int isPrime(int n) {
    int i, countFactor = 0, result = 1;
    if (n < 2) {
        return 0;
    }

    for (i = 1; i < n && result == 1; i++) {
        if (n % i == 0) {
            countFactor++;
        }
        if (countFactor > 1) {
            result = 0;
        }
    }
    return result;
}
```

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```
2       3       5       7       11      13      17      19
23      29      31      37      41      43      47
53      59      61      67      71
```

Multidimensional Arrays

General Syntax:

- [storage_class] data_type array_name [s1][s2][s3]…[sn];

Task

- WAP to read 3*3 matrix & display it to screen.
- Give an example program to add two matrices & store the results in the 3rd matrix.

Strings

- Declaration and Initializing String Variable
- Reading Strings from Terminal
- Reading a Line of Text
- String Handling Functions
- Passing String to a Function

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Declaration and Initializing String Variable

- *Syntax*: char string_name[size];

- char college[10] = "KHWOPA";
- char college[4] = "KHWOPA"; /* Illegal */

Reading a Line of Text

Using scanf() Function

- char address[20];
- scanf("%s", adress);

```
C:\Users\ErSKS\Google
Enter text:
Libali, Bhaktapur
Computer
Khwopa

word1 = Libali,
word2 = Bhaktapur
word3 = Computer
word4 = Khwopa
```

C7_10.C

```c
#include<stdio.h>
#include<conio.h>
int main(){
    char word1[40], word2[40], word3[40], word4[40];
    printf("Enter text: \n");
    scanf("%s%s", word1, word2);
    scanf("%s", word3);
    scanf("%s", word4);
    printf("\nword1 = %s\nword2 = %s\n", word1, word2);
    printf("word3 = %s\nword4 = %s\n", word3, word4);
    getch();
    return 0;
}
```

Reading a Line of Text

C7_11.C

```c
#include<stdio.h>
#include<conio.h>
int main(){
    char line[100];
    printf("Enter Your Sentence:\n");
    scanf("%[^\n]",line);
    printf("%s", line);
    getch();
    return 0;
}
```

```
C:\Users\ErSKS\Google Drive (c.khwopa
Enter Your Sentence:
Dedicated to People & Country
Dedicated to People & Country
```

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ASCII Value & Character

C7_12.C

```c
#include<stdio.h>
#include<conio.h>
int main(){
    char c;
    printf("\n\n");
    for(c=65; c<=122; c++){
      if( c > 90  &&  c < 97 ){
        continue;
      }
      if(c==97){
        printf("\n\n");
      }
      printf("|%4d - %c ", c, c);
    }
    printf("|\n");
    getch();
    return 0;
}
```

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```
|  65 - A |  66 - B |  67 - C |  68 - D |  69 - E |  70 - F
|  71 - G |  72 - H |  73 - I |  74 - J |  75 - K |  76 - L
|  77 - M |  78 - N |  79 - O |  80 - P |  81 - Q |  82 - R
|  83 - S |  84 - T |  85 - U |  86 - V |  87 - W |  88 - X
|  89 - Y |  90 - Z

|  97 - a |  98 - b |  99 - c | 100 - d | 101 - e | 102 - f
| 103 - g | 104 - h | 105 - i | 106 - j | 107 - k | 108 - l
| 109 - m | 110 - n | 111 - o | 112 - p | 113 - q | 114 - r
| 115 - s | 116 - t | 117 - u | 118 - v | 119 - w | 120 - x
| 121 - y | 122 - z |
```

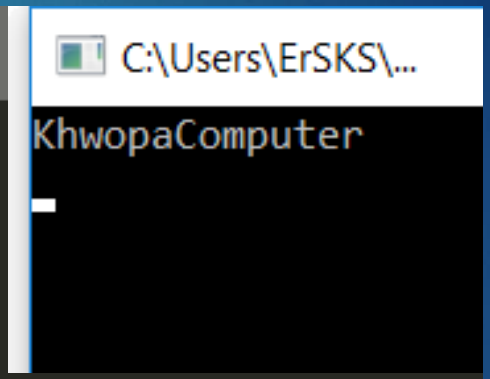
String Handling Functions

i. strlen() – return length of a string
ii. strcpy() – strcpy(destination_string, source_string)
iii. strcat() – concatenates two strings
iv. strcmp() – compares two strings
    i. Returns 0 if both are same
    ii. Returns less than 0 if 1st string is less than 2nd string
    iii. Returns greater than 0 if 1st string is greater than 2nd string
v. strrev() – reverse given string

String Concatenation

C7_13.C

```c
#include<stdio.h>
#include<conio.h>
#include<string.h>
int main(){
    char s1[]="Khwopa", s2[]="Computer";
    printf("%s\n", strcat(s1,s2));
    getch();
    return 0;
}
```

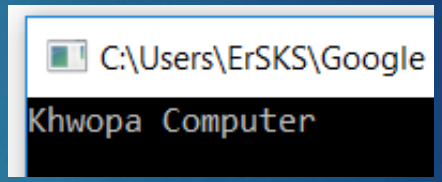


String Concatenation without using string.h

C7_14.C

```c
#include<stdio.h>
#include<conio.h>
[redacted]
int main(){
    int  i, j;
    char  s1[10]="Khwopa", s2[10]="Computer";
    char  str[20];
    /* Copy s1 into str */
    for(i=0; s1[i] != '\0'; i++ ){
      str[i] = s1[i];
    }
    /* End s1 with a space */
    str[i] = ' ' ;
    /* Copy s2 into str */
    for( j = 0 ; s2[j] != '\0' ; j++ ){
      str[i+j+1] = s2[j];
    }
    /* End str with a null character */
    str[i+j+2] = '\0';

    printf("%s\n", str);
    getch();
    return 0;
}
```



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Illustrations of String-Handling Functions

C7_15.C

```c
#include<stdio.h>
#include<conio.h>
#include<string.h>
int main(){
    char s1[20], s2[20], s3[20];
    int x, l1, l2, l3;
    printf("Enter Two Strings: ");
    scanf("%s%s", s1, s2);
    /* comparing s1 and s2 */
    x = strcmp(s1, s2);
    if(x != 0){
       printf("Strings are not equal.\nMismatch Difference = %d",x);
       strcat(s1, s2);/*joining s1 & s2, assign result to s1 */
    }
    else{
        printf("Strings are equal.");
    }
    strcpy(s3, s1); /* copying s1 to s3 */
    /* Finding length of strings */
    l1 = strlen(s1);
    l2 = strlen(s2);
    l3 = strlen(s3);
    printf("\ns1 = %s\t length = %d characters\n", s1, l1);
    printf("s2 = %s\t\t length = %d characters\n", s2, l2);
    printf("s3 = %s\t length = %d characters\n", s3, l3);
    getch();
    return 0;
}
```

```
C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com)\C_Codes\
Enter Two Strings: Prashisha Prabesh
Strings are not equal.
Mismatch Difference = 1
s1 = PrashishaPrabesh    length = 16 characters
s2 = Prabesh             length = 7 characters
s3 = PrashishaPrabesh    length = 16 characters
```

Passing String to a Function

C7_16.C

```
1  #include<stdio.h>
2  #include<conio.h>
3  void function(char a[]){
4      printf("Passed String: %s", a);
5  }
6
7  int main(){
8      char text[] = {"Engineering"};
9      function(text);
10     getch();
11     return 0;
12 }
```

```
C:\Users\ErSKS\Google Drive (c.khwopa
Passed String: Engineering
```

Passing Multiple Strings to a Function

C7_17.C

```c
#include<stdio.h>
#include<conio.h>
void function(char a[3][10]){
    int i; printf("Passed Strings:\n");
    for (i=0; i<3; i++){
        printf("String%d = %s\n",i+1,a[i]);
    }

}

int main(){
    char text[3][10] = {"BCE","BCT","BEL"};
    function(text);
    getch();
    return 0;
}
```

```
C:\Users\ErSKS\Google Drive
Passed Strings:
String1 = BCE
String2 = BCT
String3 = BEL
```

Q/A?

Thank You!

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