

# Arrays & Strings

Er. Shiva K. Shrestha (HoD)

Department of Computer Engineering,  
Khwopa College of Engineering



# Arrays

2

- ▶ 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*/`
- ✓ `{...} /* 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 x
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 }
```



C:\Users\ErSKS\

Ram

Khwopa

# Run Time Initialization

Program to  
count  
negative,  
positive &  
zeros from  
entered  
numbers

```
C7_2.C x
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      int a[50],n,count_n=0,count_z=0,count_p=0,i;
5      printf("Enter size of array: ");
6      scanf("%d",&n);
7      printf("Enter the elements of the array\n");
8      for(i=0;i<n;i++){
9          scanf("%d",&a[i]);
10     }
11     for(i=0;i<n;i++){
12         if(a[i]<0){
13             count_n++;
14         }else if(a[i]>0){
15             count_p++;
16         }else{
17             count_z++;
18         }
19     }
20     printf("Negative = %d\n",count_n);
21     printf("Zero = %d\n",count_z);
22     printf("Positive = %d.\n",count_p);
23     getch();
24     return 0;
25 }
```

C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com)

```
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}  
};
```

$b[2][1] = ?$

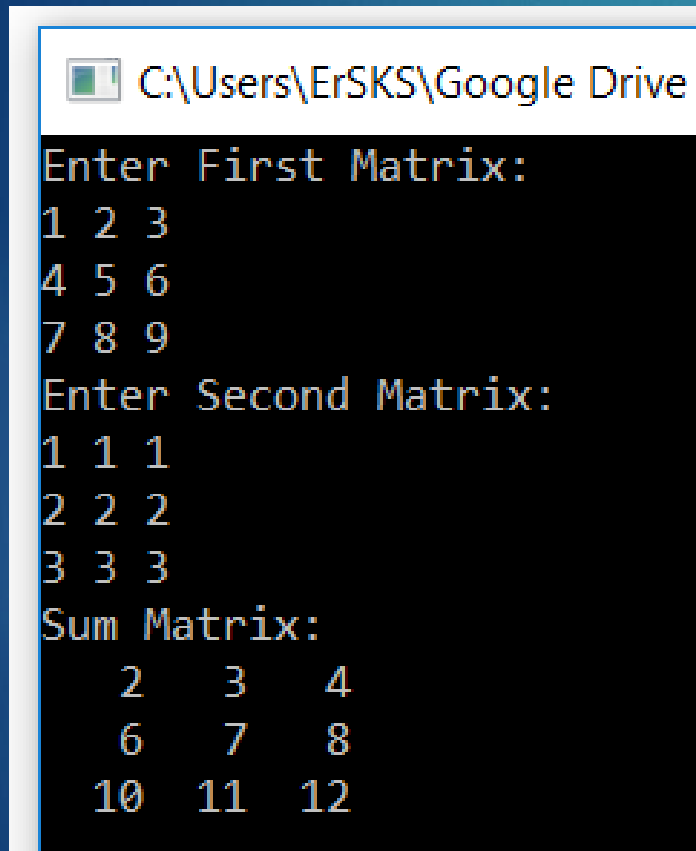
$b[0][3] = ?$

$b[3][3] = ?$

$b[1][1] = ?$

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.



```
Enter First Matrix:
1 2 3
4 5 6
7 8 9
Enter Second Matrix:
1 1 1
2 2 2
3 3 3
Sum Matrix:
    2    3    4
    6    7    8
   10   11   12
```

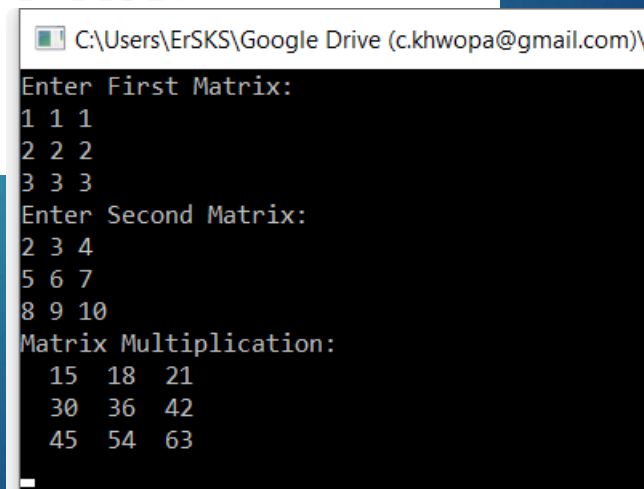
```
C7_3.C
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      int m=3, n=3;
5      int a[m][n], b[m][n], sum[m][n], i, j;
6      printf("Enter First Matrix:\n");
7      for (i=0; i<m; i++){
8          for (j=0; j<n; j++){
9              scanf("%d", &a[i][j]);
10             }
11         }
12     printf("Enter Second Matrix:\n");
13     for (i=0; i<m; i++){
14         for (j=0; j<n; j++){
15             scanf("%d", &b[i][j]);
16         }
17     }
18     printf("Sum Matrix:\n");
19     for (i=0; i<m; i++){
20         for (j=0; j<n; j++){
21             sum[i][j] = a[i][j] + b[i][j];
22             printf("%4d", sum[i][j]);
23         }
24         printf("\n");
25     }
26     getch();
27     return 0;
28 }
```

# Assignment

11

- WAP to read two  $m \times n$  matrices and display their product.

```
18      printf("Matrix Multiplication:\n");
19      for (i=0; i<m; i++){
20          for (j=0; j<n; j++){
21              mult[i][j] = 0;
22              for (k = 0; k < n; ++k) {
23                  mult[i][j] += a[i][k] * b[k][j];
24              }
25              printf("%4d", mult[i][j]);
26          }
27          printf("\n");
28      }
```



```
C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com)\
Enter First Matrix:
1 1 1
2 2 2
3 3 3
Enter Second Matrix:
2 3 4
5 6 7
8 9 10
Matrix Multiplication:
15 18 21
30 36 42
45 54 63
```

```

1 #include<stdio.h>
2 #include<conio.h>
3 int main(){
4     int m=10, n=10, p=10, q=10;
5     int a[m][n], b[m][n], mult[m][n], i, j, k;
6     re: printf("Enter rows & column for 1st matrix: ");
7     scanf("%d %d", &m, &n);
8     printf("Enter rows & column for 2nd matrix: ");
9     scanf("%d %d", &p, &q);
10    if(n != p){
11        printf("Error! Enter rows & columns again.\n");
12        goto re;
13    }
14    printf("Enter First Matrix:\n");
15    for(i=0; i<m; i++){
16        for(j=0; j<n; j++){
17            scanf("%d", &a[i][j]);
18        }
19    }

```

```

Error! Enter rows & columns again.
Enter rows & column for 1st matrix: 3 3
Enter rows & column for 2nd matrix: 3 3
Enter First Matrix:
1 1 1
2 2 2
3 3 3
Enter Second Matrix:
2 3 4
5 6 7
8 9 10
Matrix Multiplication:
15 18 21
30 36 42
45 54 63

```

```

20
21    printf("Enter Second Matrix:\n");
22    for (i=0; i<p; i++){
23        for (j=0; j<q; j++){
24            scanf("%d", &b[i][j]);
25        }
26    }
27    printf("Matrix Multiplication:\n");
28    for (i=0; i<m; i++){
29        for (j=0; j<q; j++){
30            mult[i][j] = 0;
31            for (k = 0; k < n; k++) {
32                mult[i][j] += a[i][k] * b[k][j];
33            }
34            printf("%4d", mult[i][j]);
35        }
36        printf("\n");
37    } getch(); return 0;

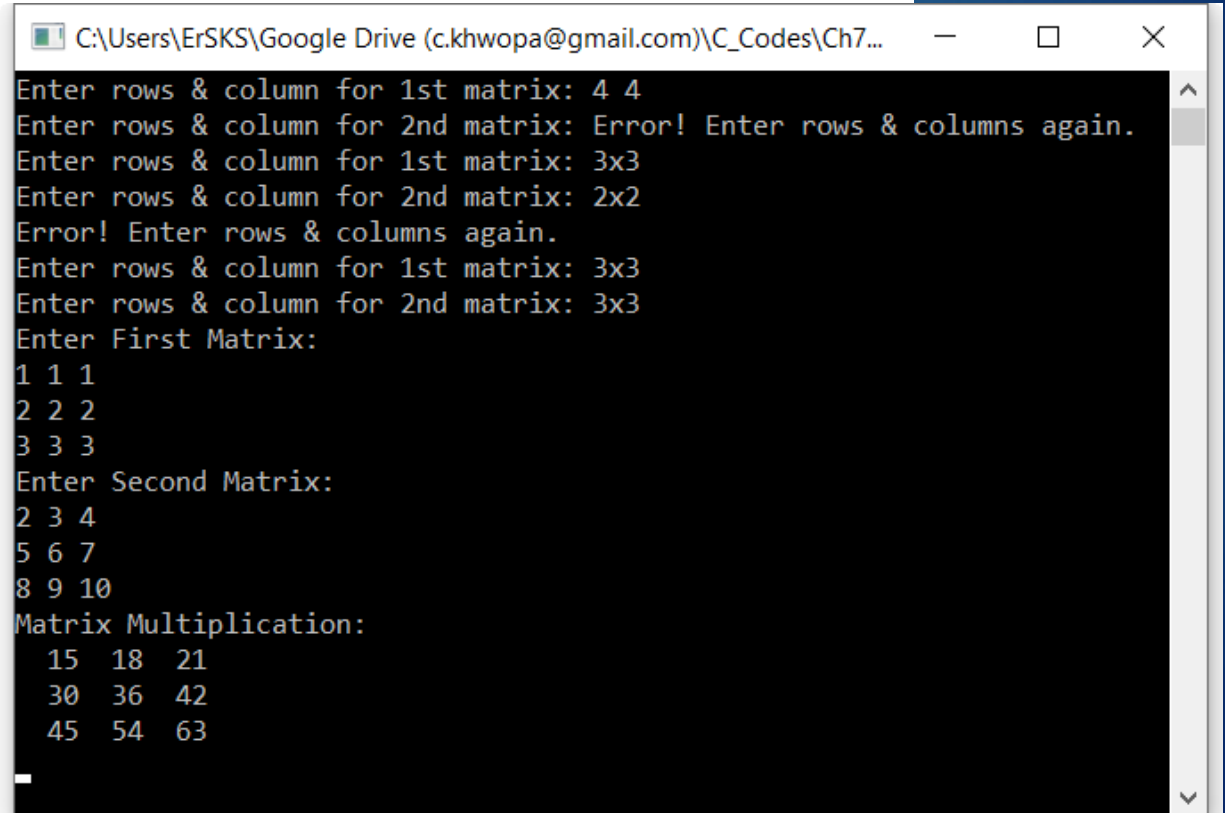
```

$m \times n$  &  $p \times q$   
Matrix Multiplication

# scanf ()

13

```
6 re: printf("Enter rows & column for 1st matrix: ");
7 scanf("%dx%d", &m, &n);
8 printf("Enter rows & column for 2nd matrix: ");
9 scanf("%dx%d", &p, &q);
10 if(n != p){
11     printf("Error! Enter rows & columns again.\n");
12     goto re;
13 }
```



```
C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com)\C_Codes\Ch7...
Enter rows & column for 1st matrix: 4 4
Enter rows & column for 2nd matrix: Error! Enter rows & columns again.
Enter rows & column for 1st matrix: 3x3
Enter rows & column for 2nd matrix: 2x2
Error! Enter rows & columns again.
Enter rows & column for 1st matrix: 3x3
Enter rows & column for 2nd matrix: 3x3
Enter First Matrix:
1 1 1
2 2 2
3 3 3
Enter Second Matrix:
2 3 4
5 6 7
8 9 10
Matrix Multiplication:
15 18 21
30 36 42
45 54 63
```



# Sort Array Element

14

Er. Shiva K. Shrestha (HoD, Computer Department)  
2019-12-24

```
C7_4_v2.C
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      int a[6]={7,-2,10,9,1,0};
5      int i, j, temp;
6      clrscr();
7      for(i=0;i<5;i++){
8          for(j=0;j<5;j++){
9              if(a[j]>a[j+1]){
10                 temp=a[j];
11                 a[j]=a[j+1];
12                 a[j+1]=temp;
13             }
14         }
15     }
16     printf("Array Elements after Sort: ");
17     for(i=0;i<6;i++){
18         printf("%4d",a[i]);
19     }
20     getch();
21     return 0;
22 }
```

DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Pr  
Array Elements after Sort: -2 0 1 7 9 10

# Passing Array Element to a Function

15

Er. Shiva K. Shrestha (HoD, Computer Department)  
2019-12-24

```
C7_5.C x
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 }
```

C:\Users\ErSKS\Google Drive  
Sum = 17

# Passing Array to a Function

16

Er. Shiva K. Shrestha (HoD, Computer Department)  
2019-12-24

```
C7_6.C
1  #include<stdio.h>
2  #include<conio.h>
3  void findSum(int a[]);
4  int main(){
5      int a[3]={8,9,10};
6      findSum(a);
7      getch();
8      return 0;
9  }
10 void findSum(int x[]){
11     int i, sum=0;
12     for(i=0;i<3;i++){
13         printf("x[%d] = %d\n", i, x[i]);
14         sum += x[i];
15     }
16     printf("\nSum = %d", sum);
17 }
```

```
C:\Users\ErSKS\
x[0] = 8
x[1] = 9
x[2] = 10

Sum = 27
```

# Task

17

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

# Passing 2-D Array to a Function

18

```
C7_7.C x
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 }
```

C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com)

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

19

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

C:\Users\ErSKS\Google Drive  
Largest Number = 15

# Returning Array from a Fxn

20

```
1  /* Program to generate prime numbers */
2  #include<stdio.h>
3  #include<conio.h>
4  int generatePrime(int *, int);
5  int isPrime(int);
6  int main(){
7      int i, prime[100], status=0, n_prime=20;
8      status = generatePrime(&prime[0],n_prime);
9      printf("Prime Numbers:\n");
10     for (i = 0; i<n_prime && status == 1; ++i){
11         printf("%d\t", prime[i]);
12     }
13     getch();
14 }
15 int generatePrime(int *el, int n){
16     int i, count=0;
17     for (i=2; ; i++){
18         if(isPrime(i)==1){
19             *el = i;
20             el++;
21             count++;
22             if (count>=n){
23                 break;
24             }
25         }
26     }
27     return 1;
28 }
```

```
29 int isPrime(int n) {
30     int i, countFactor = 0, result = 1;
31     if (n < 2) {
32         return 0;
33     }
34
35     for (i = 1; i < n && result == 1; i++) {
36         if (n % i == 0) {
37             countFactor++;
38         }
39         if (countFactor > 1) {
40             result = 0;
41         }
42     }
43     return result;
44 }
```

C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com)\C\_...

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

# Multidimensional Arrays

21

General Syntax:

► `[storage_class] data_type`  
`array_name [s1][s2][s3]...[sn];`

# Task

22

- ▶ WAP to read  $3 \times 3$  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

## Declaration and Initializing String Variable

- ▶ *Syntax:* `char string_name[size];`

K	H	W	O	P	A	\0	\0	\0	\0
---	---	---	---	---	---	----	----	----	----

- ▶ `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
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      char word1[40], word2[40], word3[40], word4[40];
5      printf("Enter text: \n");
6      scanf("%s%s", word1, word2);
7      scanf("%s", word3);
8      scanf("%s", word4);
9      printf("\nword1 = %s\nword2 = %s\n", word1, word2);
10     printf("word3 = %s\nword4 = %s\n", word3, word4);
11     getch();
12     return 0;
13 }
```

# Reading a Line of Text

25

Er. Shiva K. Shrestha (HoD, Computer Department)  
2019-12-24

```
C7_11.C x
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      char line[100];
5      printf("Enter Your Sentence:\n");
6      scanf("%[^\\n]",line);
7      printf("%s", line);
8      getch();
9      return 0;
10 }
```

C:\Users\ErSKS\Google Drive (c.khwopa)

```
Enter Your Sentence:
Dedicated to People & Country
Dedicated to People & Country
```

# ASCII Value & Character

26

```
C7_12.C
1  #include<stdio.h>
2  #include<conio.h>
3  int main(){
4      char c;
5      printf("\n\n");
6      for(c=65; c<=122; c++){
7          if( c > 90  &&  c < 97 ){
8              continue;
9          }
10         if(c==97){
11             printf("\n\n");
12         }
13         printf("|%4d - %c ", c, c);
14     }
15     printf("\n");
16     getch();
17     return 0;
18 }
```

```
C:\Users\ErSKS\Google Drive (c.khwopa@gmail.com...
| 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

27

- 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 1<sup>st</sup> string is less than 2<sup>nd</sup> string
  - iii. Returns greater than 0 if 1<sup>st</sup> string is greater than 2<sup>nd</sup> string
- v. `strrev()` – reverse given string

# String Concatenation

28

```
C7_13.C x
1  #include<stdio.h>
2  #include<conio.h>
3  #include<string.h>
4  int main(){
5      char s1[]="Khwopa", s2[]="Computer";
6      printf("%s\n", strcat(s1,s2));
7      getch();
8      return 0;
9  }
```

C:\Users\ErSKS\...  
KhwopaComputer

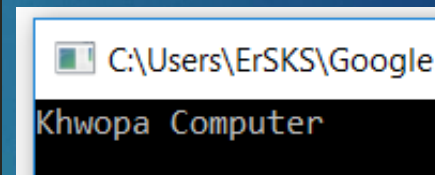


# String Concatenation without using string.h

29

Er. Shiva K. Shrestha (HoD, Computer Department)  
2019-12-24

```
C7_14.C
1  #include<stdio.h>
2  #include<conio.h>
3
4  int main(){
5      int i, j;
6      char s1[10]="Khwopa", s2[10]="Computer";
7      char str[20];
8      /* Copy s1 into str */
9      for(i=0; s1[i] != '\0'; i++){
10         str[i] = s1[i];
11     }
12     /* End s1 with a space */
13     str[i] = ' ';
14     /* Copy s2 into str */
15     for( j = 0 ; s2[j] != '\0' ; j++){
16         str[i+j+1] = s2[j];
17     }
18     /* End str with a null character */
19     str[i+j+2] = '\0';
20
21     printf("%s\n", str);
22     getch();
23     return 0;
24 }
```



C:\Users\ErSKS\Google  
Khwopa Computer

# Illustrations of String-Handling Functions

30

C7\_15.C

```
1  #include<stdio.h>
2  #include<conio.h>
3  #include<string.h>
4  int main(){
5      char s1[20], s2[20], s3[20];
6      int x, l1, l2, l3;
7      printf("Enter Two Strings: ");
8      scanf("%s%s", s1, s2);
9      /* comparing s1 and s2 */
10     x = strcmp(s1, s2);
11     if(x != 0){
12         printf("Strings are not equal.\nMismatch Difference = %d",x);
13         strcat(s1, s2);/*joining s1 & s2, assign result to s1 */
14     }
15     else{
16         printf("Strings are equal.");
17     }
18     strcpy(s3, s1); /* copying s1 to s3 */
19     /* Finding length of strings */
20     l1 = strlen(s1);
21     l2 = strlen(s2);
22     l3 = strlen(s3);
23     printf("\ns1 = %s\t length = %d characters\n", s1, l1);
24     printf("s2 = %s\t\t length = %d characters\n", s2, l2);
25     printf("s3 = %s\t length = %d characters\n", s3, l3);
26     getch();
27     return 0;
28 }
```

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

31

Er. Shiva K. Shrestha (HoD, Computer Department)  
2019-12-24

```

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

32

```
C7_17.C
1  #include<stdio.h>
2  #include<conio.h>
3  void function(char a[3][10]){
4      int i; printf("Passed Strings:\n");
5      for (i=0; i<3; i++){
6          printf("String%d = %s\n",i+1,a[i]);
7      }
8
9  }
10
11 int main(){
12     char text[3][10] = {"BCE","BCT","BEL"};
13     function(text);
14     getch();
15     return 0;
16 }
```

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

# Q/A?

33

## Thank You!

Er. Shiva K. Shrestha

[computer.khwopa@gmail.com](mailto:computer.khwopa@gmail.com)

Er. Shiva K. Shrestha (HoD, Computer Department)  
2019-12-24