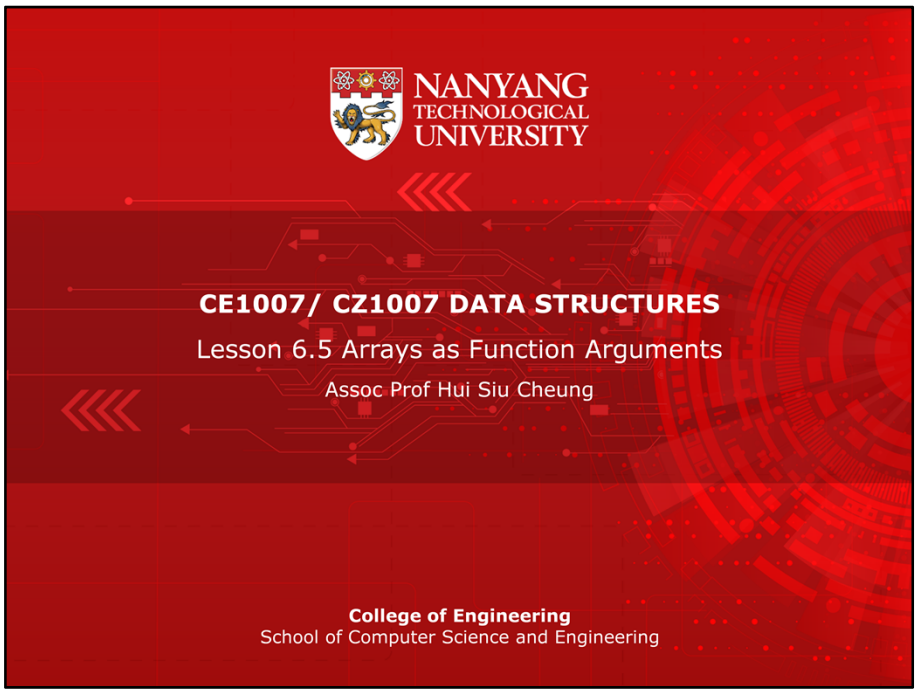
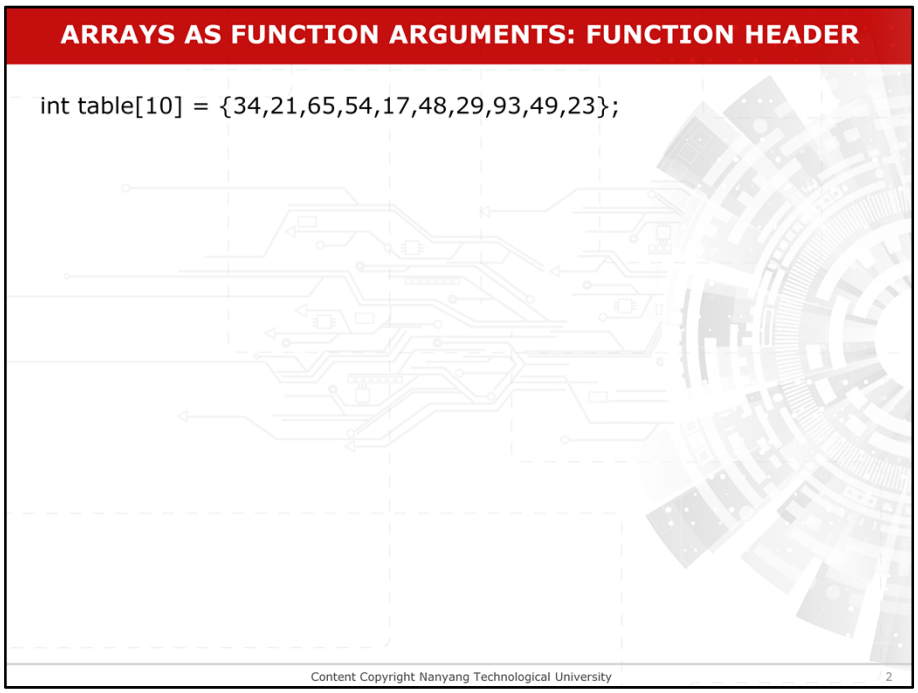
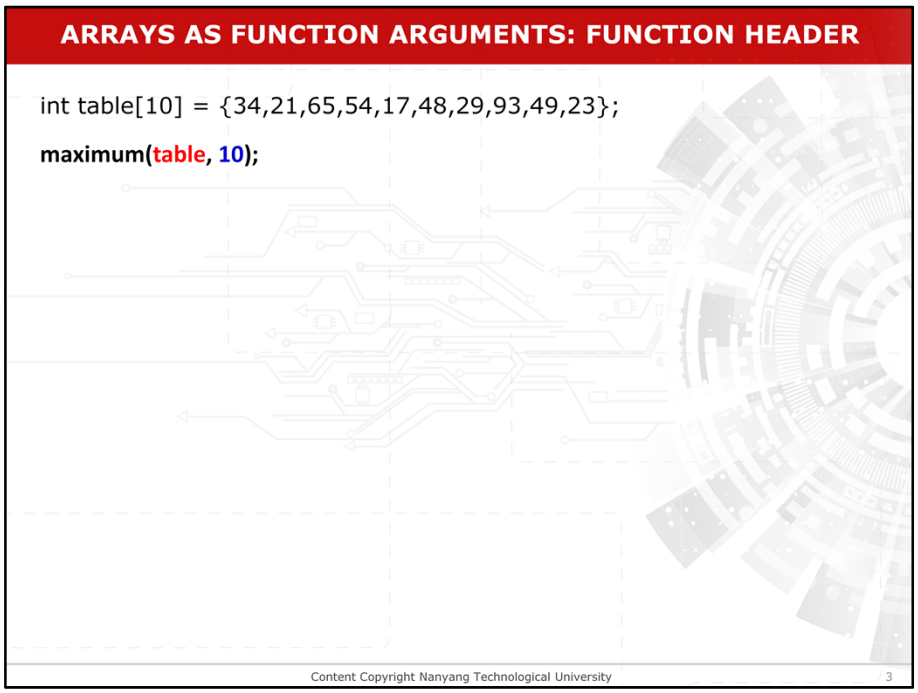


Lesson 6.5 Arrays as Function Arguments.

In this lesson, we will learn about pointer constants.



For example, the array table has been declared.

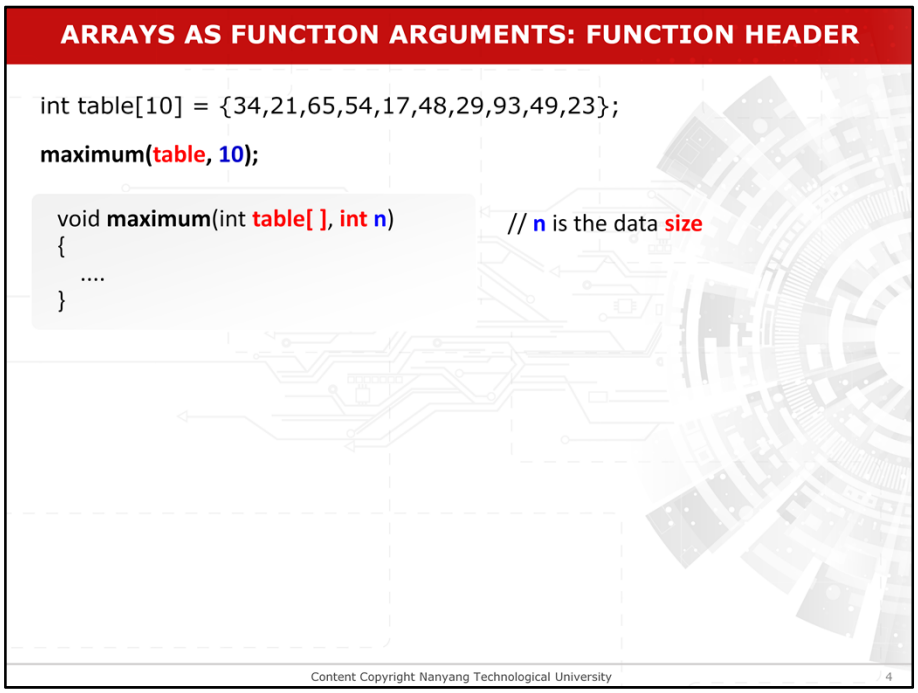


Assume a function called **maximum()** that finds the maximum value of the array table.

We may call the function as follows:

maximum(table, 10);

To receive the array argument, the function must be defined with a parameter that is an array. There are three ways to define a function with a one-dimensional array as the argument.



The first way is to define the function as

integer maximum (integer table[], integer n)

The parameter list includes an array **table** and an integer **n**. The data type of the array is specified, and empty square brackets follow the array name. The integer **n** is used to indicate the size of the array.

ARRAYS AS FUNCTION ARGUMENTS: FUNCTION HEADER

```
int table[10] = {34,21,65,54,17,48,29,93,49,23};
maximum(table, 10);
```

```
void maximum(int table[ ], int n)
{
   ....
}
```

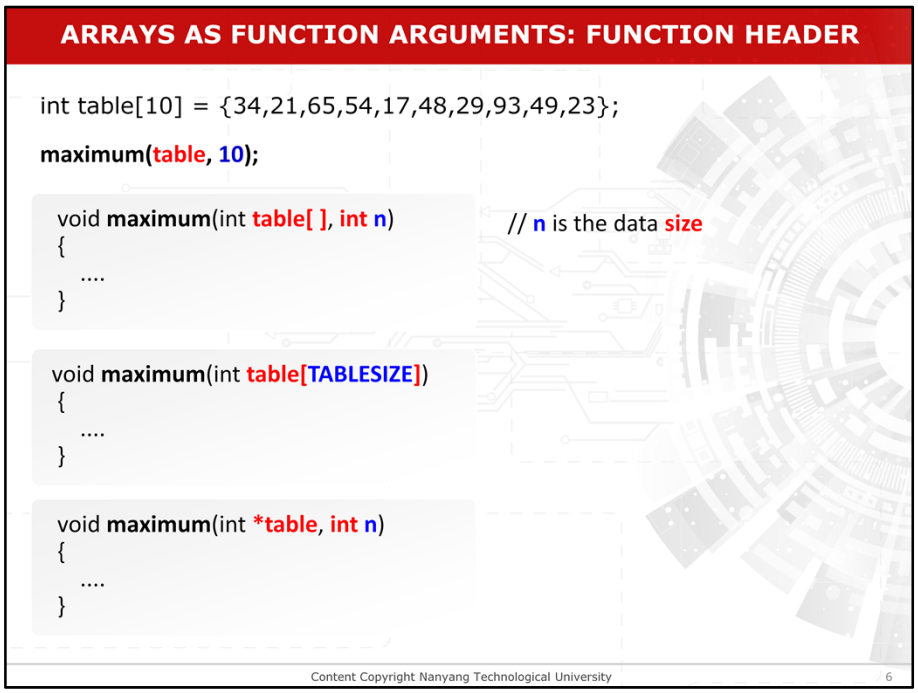
// n is the data size

```
void maximum(int table[TABLESIZE])
{
   ....
}
```


Another way is to define the function as

integer maximum(integer table [TABLESIZE])

The parameter list includes an array only. The array size **TABLESIZE** is also specified in the square brackets of the array **table**.



The third way is to define the function as

integer maximum(integer asterisk table, integer n)

The parameter list includes a pointer **table** of type **integer**, and an integer **n**. The integer **n** is used to indicate the size of the array.

ARRAYS AS FUNCTION ARGUMENTS: FUNCTION HEADER

```
int table[10] = {34,21,65,54,17,48,29,93,49,23};
maximum(table, 10);
```

```
void maximum(int table[ ], int n)
{
   ....
}
```

```
void maximum(int table[TABLESIZE])
{
   ....
}
```

```
void maximum(int *table, int n)
{
   ....
}
```

```
void maximum(int table[ ], int n);
```


The function prototypes of the function become

integer maximum (integer table[], integer n);

ARRAYS AS FUNCTION ARGUMENTS: FUNCTION HEADER

```
int table[10] = {34,21,65,54,17,48,29,93,49,23};
maximum(table, 10);
```

```
void maximum(int table[ ], int n)
{
   ....
}
```

```
void maximum(int table[ ], int n);
```

```
void maximum(int table[TABLESIZE])
{
   ....
}
```

```
void maximum(int table[TABLESIZE]);
```

```
void maximum(int *table, int n)
{
   ....
}
```


or **integer maximum (integer table [TABLESIZE]);**

ARRAYS AS FUNCTION ARGUMENTS: FUNCTION HEADER

```
int table[10] = {34,21,65,54,17,48,29,93,49,23};
maximum(table, 10);
```

```
void maximum(int table[ ], int n)
{
   ....
}
```

```
void maximum(int table[ ], int n);
```

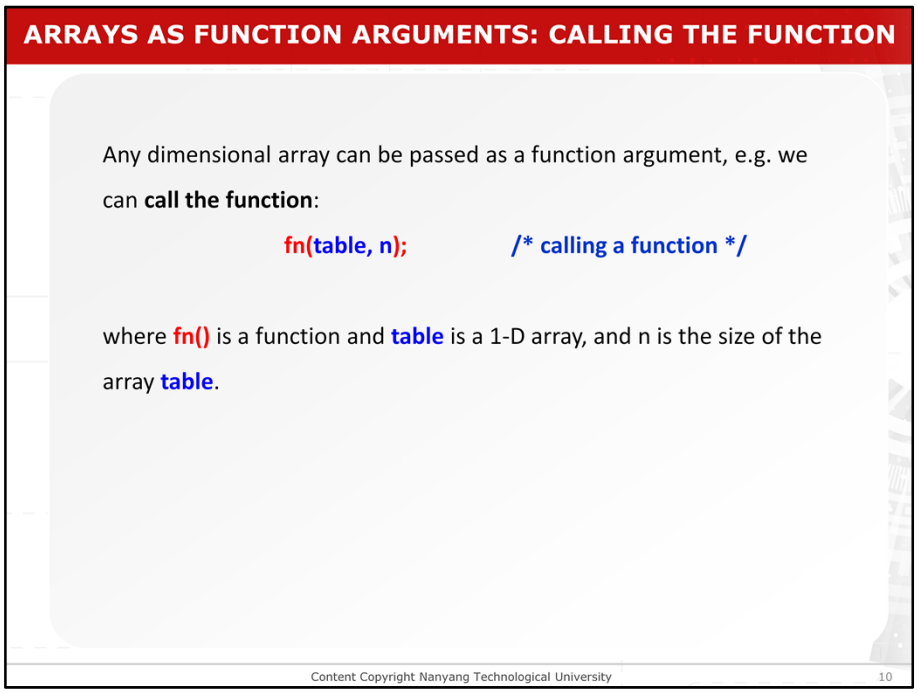
```
void maximum(int table[TABLESIZE])
{
   ....
}
```

```
void maximum(int table[TABLESIZE]);
```

```
void maximum(int *table, int n)
{
   ....
}
```

```
void maximum(int *table, int n);
```


or **integer maximum (integer asterisk table, integer n);**



An array can also be passed to a function as an argument, e.g.,

f n (table, n);

where **f n** is a function and **table** is a 1-D array.

When we pass an array as a function argument, the original array is passed to the function. There is no local copy of the array to be maintained in the function. This is mainly due to efficiency as arrays can be quite large and thereby taking a considerably large storage space if a local copy is stored.

ARRAYS AS FUNCTION ARGUMENTS: CALLING THE FUNCTION

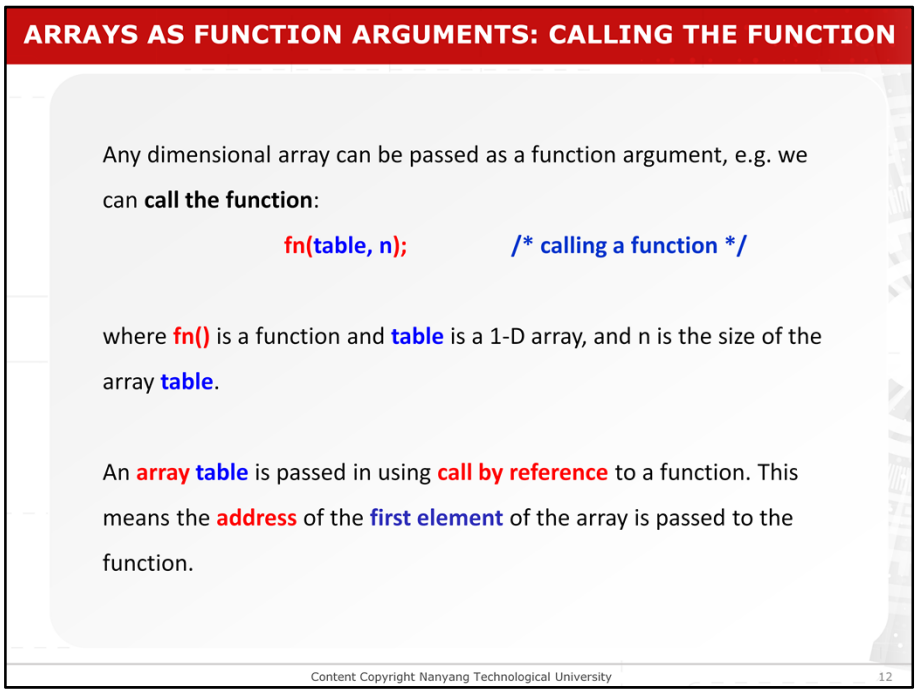
Any dimensional array can be passed as a function argument, e.g. we can **call the function**:

```
fn(table, n);          /* calling a function */
```

where **fn()** is a function and **table** is a 1-D array, and n is the size of the array **table**.

An **array table** is passed in using **call by reference** to a function.

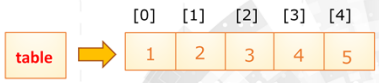
In fact, the array is passed using *call by reference* to the function.



This means that the address of the first element of the array is passed to the function. Since the function has the address of the array, any changes to the array are made to the original array.

ARRAY AS A FUNCTION ARGUMENT: MAXIMUM

```
#include <stdio.h>
int maximum(int table[ ], int n);
int main( )
{
     int max, index, n;
     int numArray[10];

     printf("Enter the number of values: ");
     scanf("%d", &n);
     printf("Enter %d values: ", n);
     for (index = 0; index < n; index++)
          scanf("%d", &numArray[index]);

     // find maximum
     max = maximum(numArray, n);
     printf("The maximum value is %d\n", max);

    return 0 ;
}
```



In the program, the **main()** function calls the function **maximum()** to compute the maximum value in an array.

Output

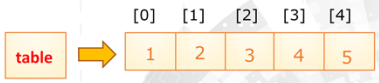
Enter the number of values:
1 2 3 4 5

The max value is 5.

In the program, the **main()** function calls the function **maximum()** to compute the maximum value in an array.

ARRAY AS A FUNCTION ARGUMENT: MAXIMUM

```
#include <stdio.h>
int maximum(int table[ ], int n);
int main( )
{
     int max, index, n;
     int numArray[10];

     printf("Enter the number of values: ");
     scanf("%d", &n);
     printf("Enter %d values: ", n);
     for (index = 0; index < n; index++)
            scanf("%d", &numArray[index]);

     // find maximum
     max = maximum(numArray, n);
     printf("The maximum value is %d\n", max);

    return 0 ;
}
```



When the function **maximum()** is called, it passes an array as the function argument.

The function **maximum()** determines the maximum value stored in the array.

Output

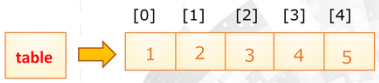
Enter the number of values:
1 2 3 4 5

The max value is 5.

When the function **maximum()** is called, it passes an array as the function argument. The function **maximum()** determines the maximum value stored in the array.

ARRAY AS A FUNCTION ARGUMENT: MAXIMUM

```
#include <stdio.h>
int maximum(int table[ ], int n);
int main( )
{
     int max, index, n;
     int numArray[10];

     printf("Enter the number of values: ");
     scanf("%d", &n);
     printf("Enter %d values: ", n);
     for (index = 0; index < n; index++)
            scanf("%d", &numArray[index]);

    // find maximum
     max = maximum(numArray, n);
     printf("The maximum value is %d\n", max);

    return 0 ;
}
```



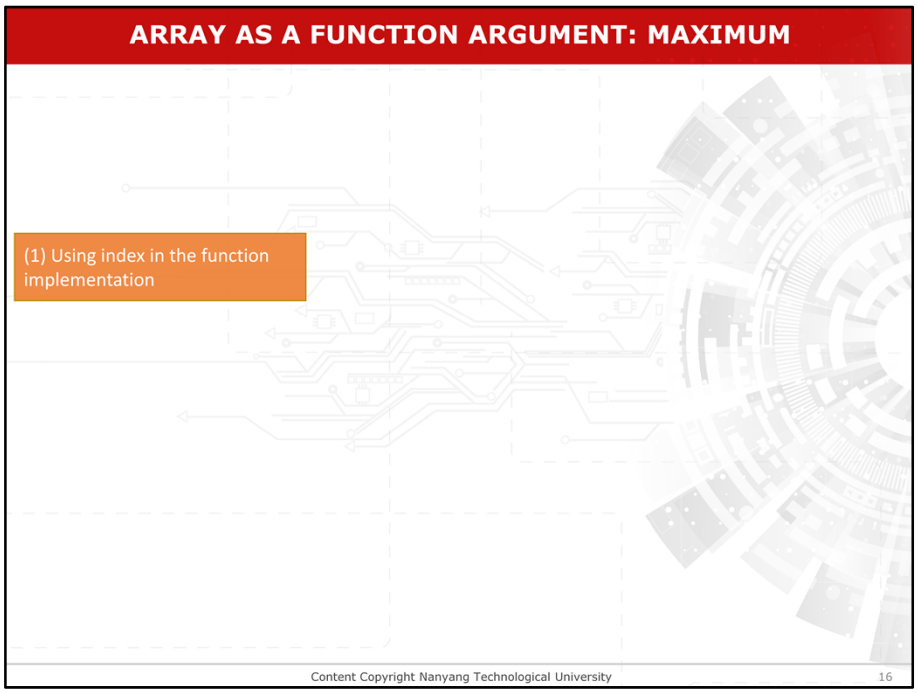
Apart from the array argument **numArray**, the number of elements stored in the array is also passed as an integer argument **n**.

Output

Enter the number of values:
1 2 3 4 5

The max value is 5.

Apart from the array argument **numArray**, the number of elements stored in the array is also passed as an integer argument **n**.



Arrays as Function Arguments: Version 1

The implementation of the function **maximum()** uses array indexes.

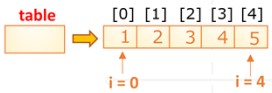
ARRAY AS A FUNCTION ARGUMENT: MAXIMUM

(1) Using index in the function implementation

```
int maximum(int table[ ], int n)
{
      int i, max;

      max = table[0];
      for (i = 1; i < n; i++)
         if (table[i] > max)
            max = table[i];
      return max;
}
```


It has two parameters: **table** and **n**.

ARRAY AS A FUNCTION ARGUMENT: MAXIMUM

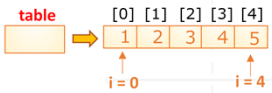


(1) Using index in the function implementation

```
int maximum(int table[ ], int n)
{
      int i, max;

      max = table[0];
      for (i = 1; i < n; i++)
         if (table[i] > max)
            max = table[i];
      return max;
}
```


The array is traversed element by element using indexing with **table[i]**, where **i** is the index from 0 to **n**-1, in order to find the maximum number.

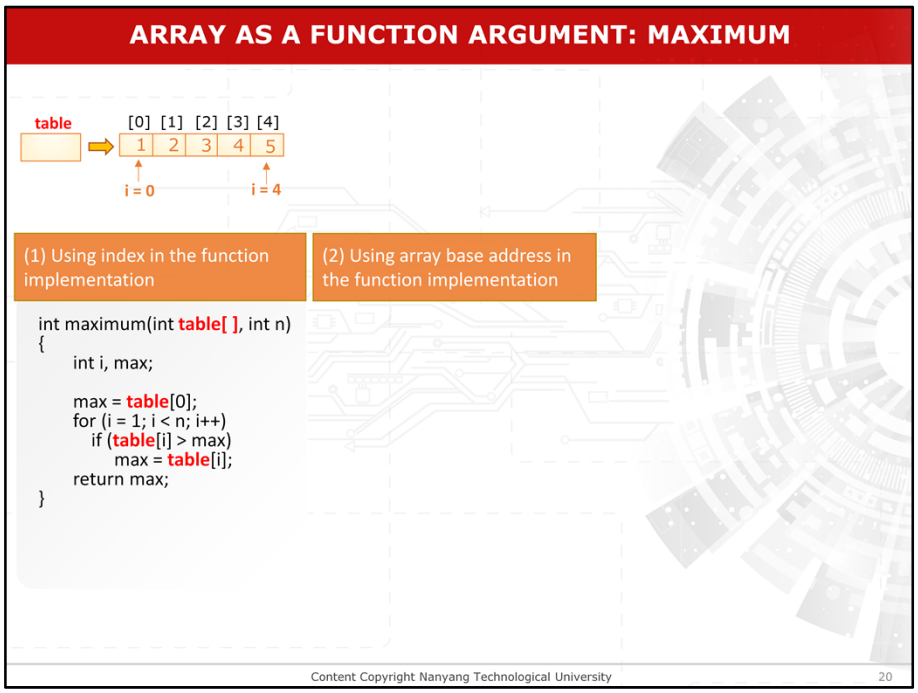
ARRAY AS A FUNCTION ARGUMENT: MAXIMUM



(1) Using index in the function implementation

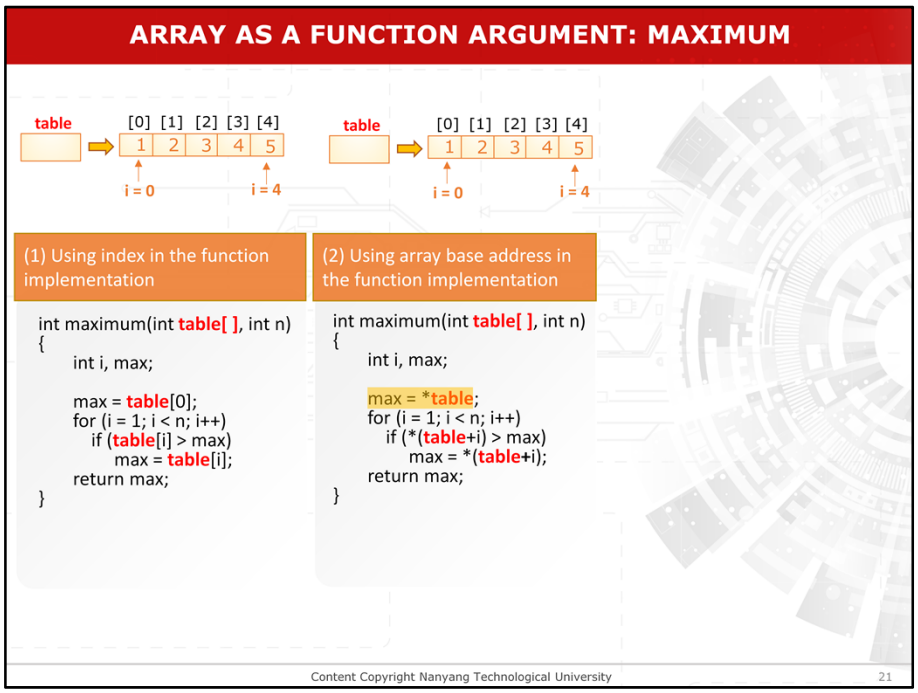
```
int maximum(int table[ ], int n)
{
      int i, max;

      max = table[0];
      for (i = 1; i < n; i++)
         if (table[i] > max)
            max = table[i];
   return max;
}
```


At the end of the function, the maximum number stored in **max** is passed back to the calling function.

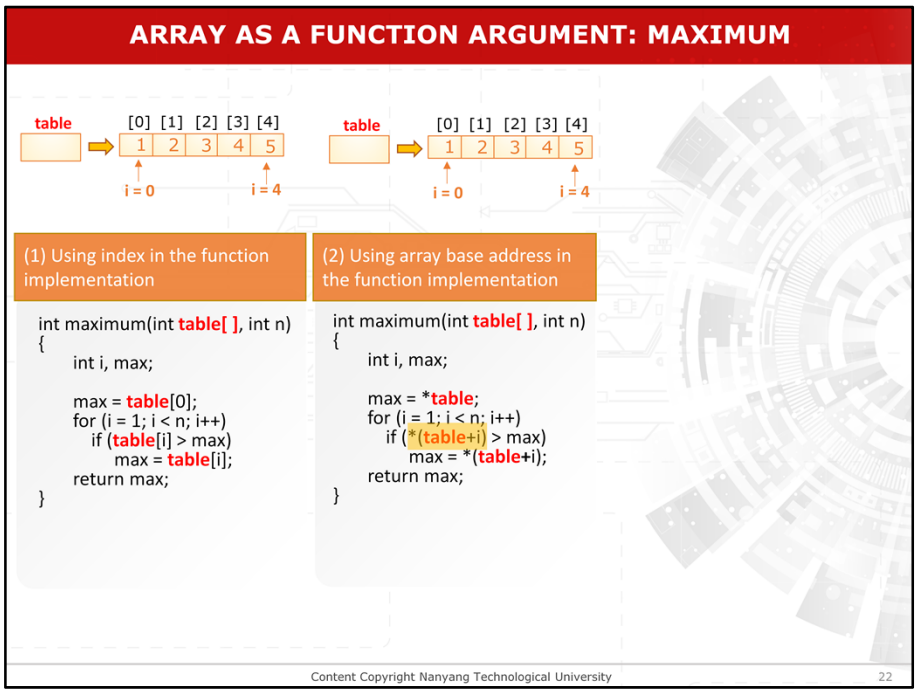


Arrays as Function Arguments: Version 2

The implementation of the function **maximum()** uses array base address.

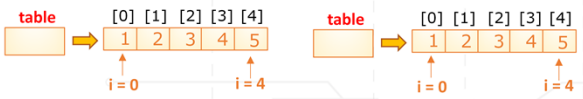


As shown, the base address of the array **table** is used.



The array element is accessed via **asterisk (table + i)**, where **i** is the index from 0 to **n**-1.

ARRAY AS A FUNCTION ARGUMENT: MAXIMUM



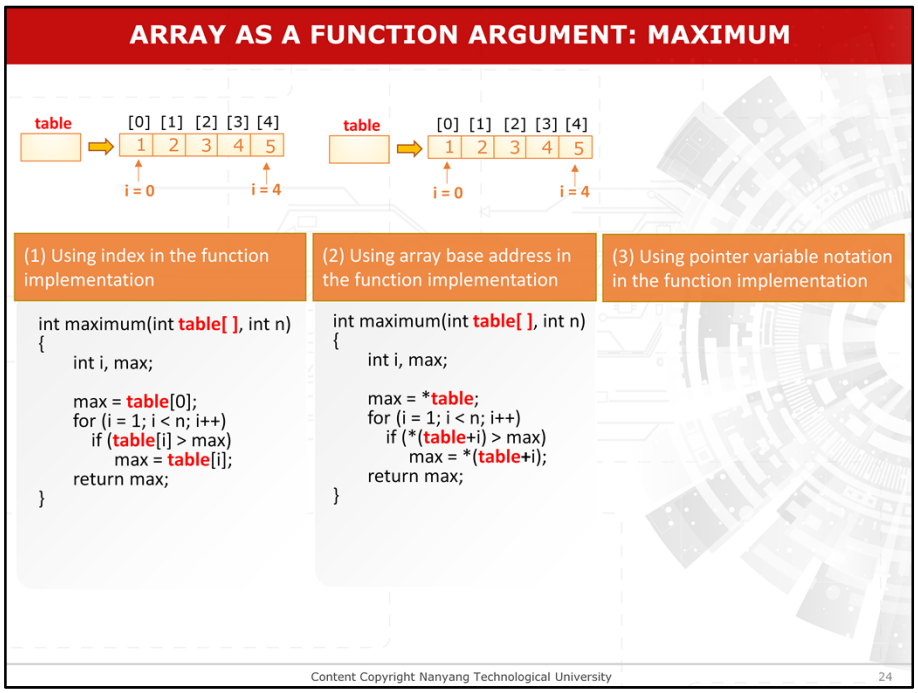
(1) Using index in the function implementation

```
int maximum(int table[ ], int n)
{
      int i, max;

      max = table[0];
      for (i = 1; i < n; i++)
         if (table[i] > max)
            max = table[i];
      return max;
}
```

(2) Using array base address in the function implementation

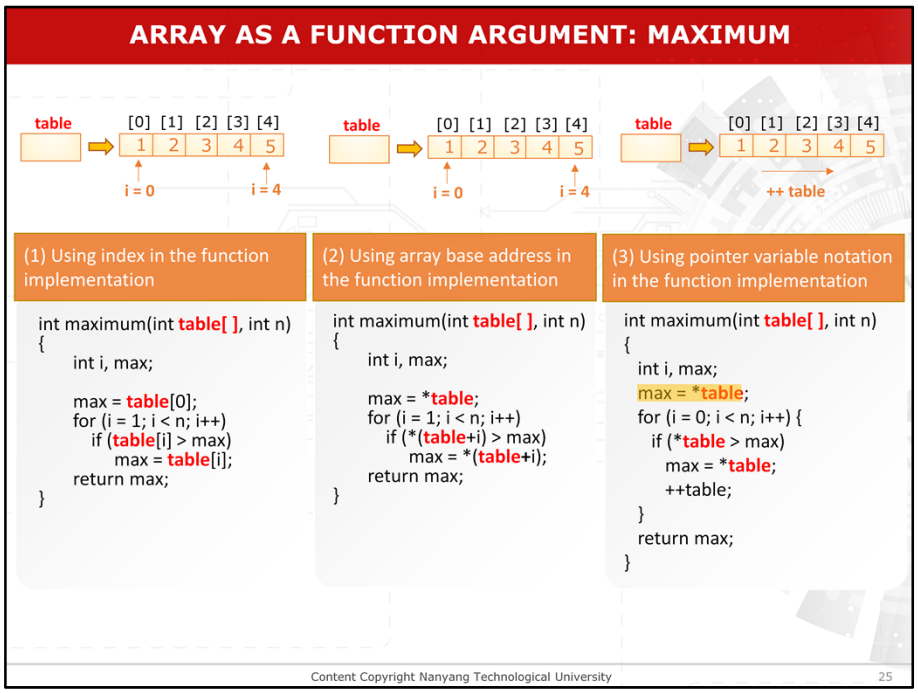
```
int maximum(int table[ ], int n)
{
      int i, max;

      max = *table;
      for (i = 1; i < n; i++)
         if (*(table+i) > max)
            max = *(table+i);
      return max;
}
```


The maximum number is then determined at the end of the loop.

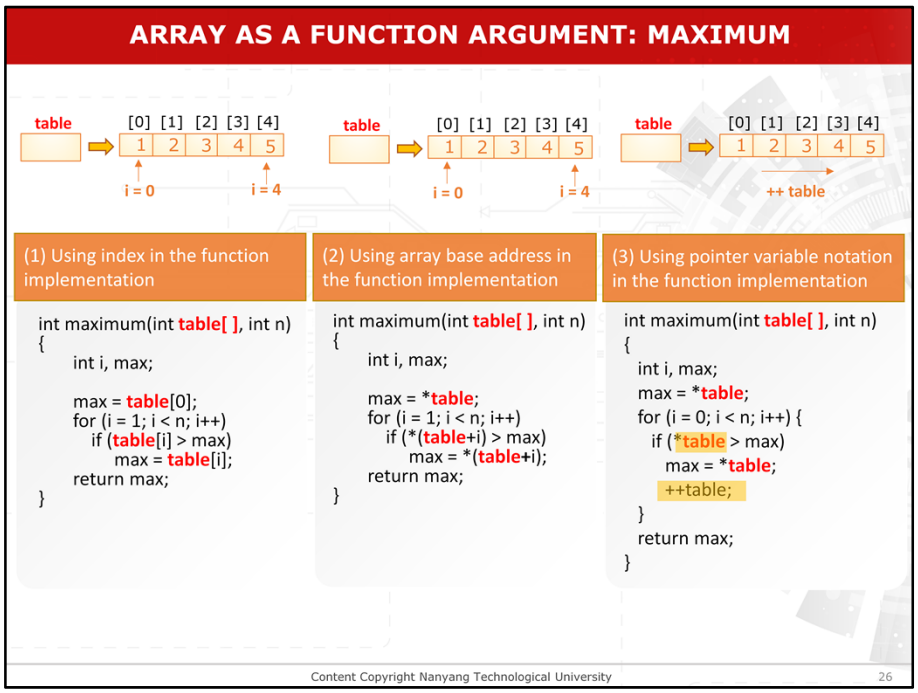


Arrays as Function Arguments: Version 3

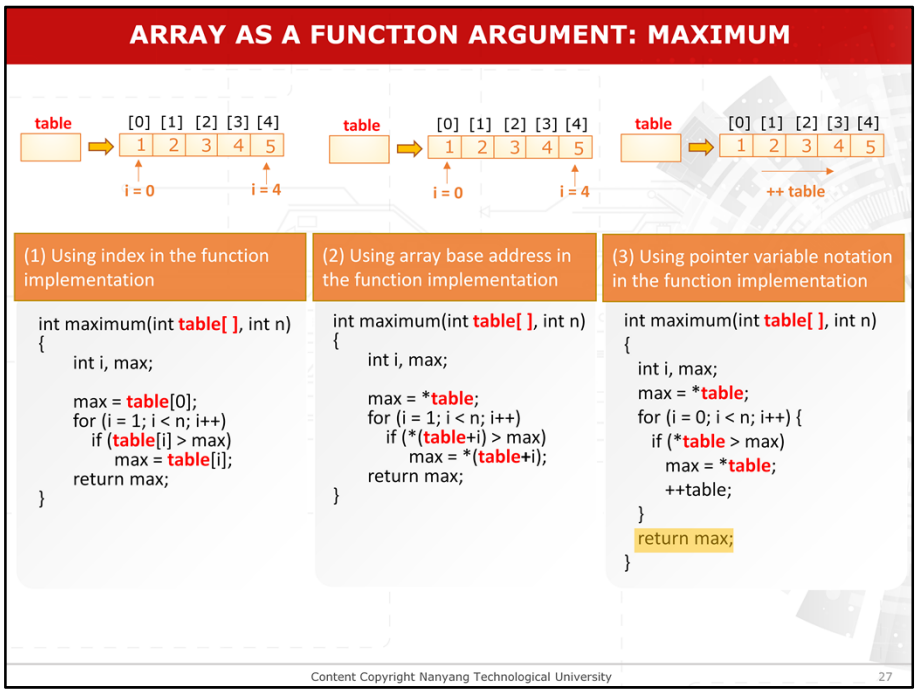
The implementation of the function **maximum()** uses pointer variable notation.



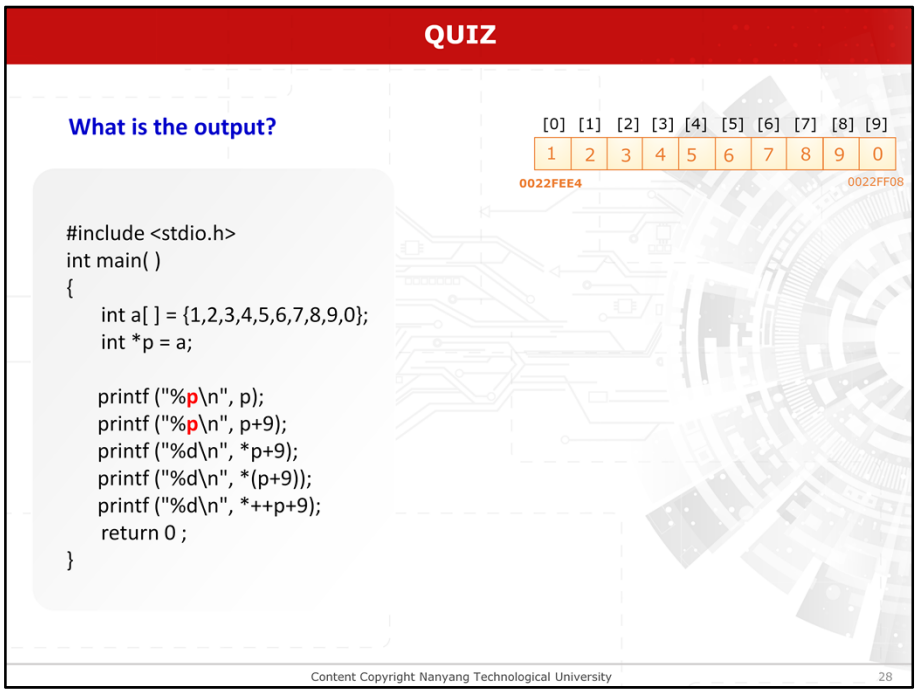
In this version of implementation, the array **table** is used as a pointer variable.



The array element is accessed via **asterisk table**, while it is incremented by using **table++** when traversing the array.

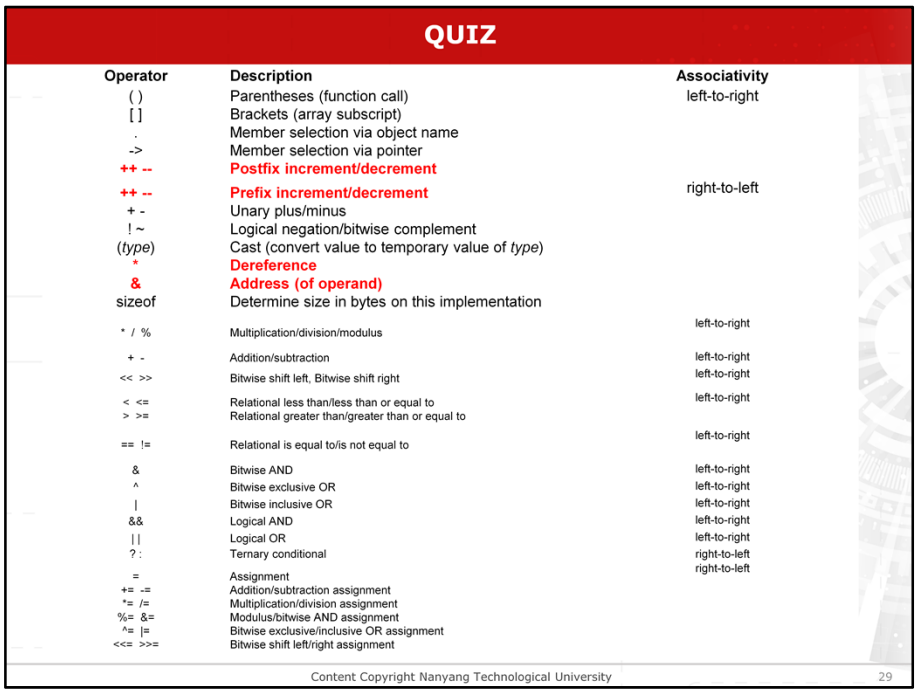


The maximum number is then determined at the end of the loop.



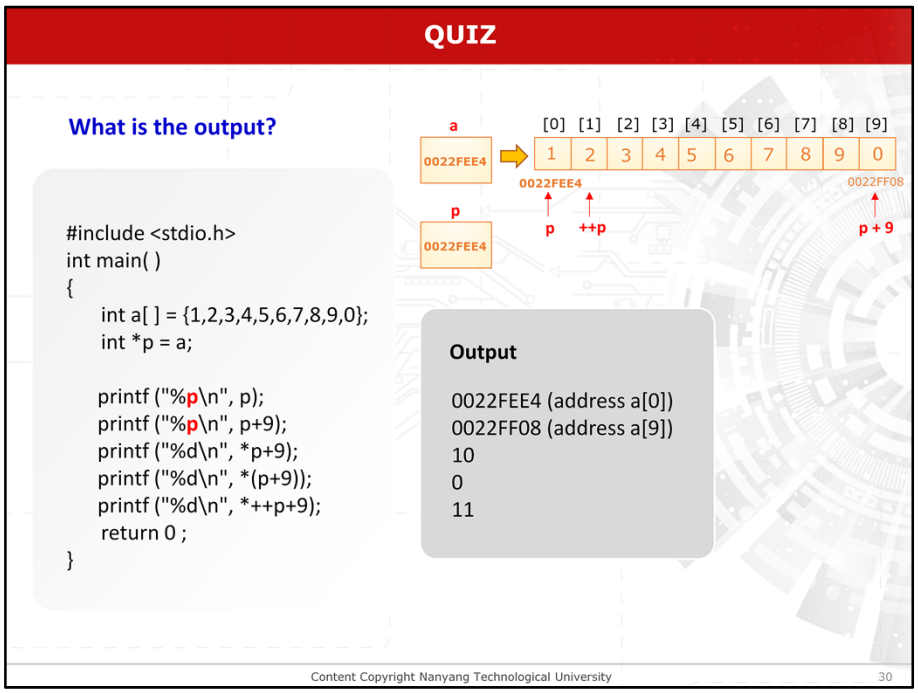
Quiz: Determine the output of the program.

[pause 10 sec]



To find the answer, you may need to understand the operator precedence table in C. Note that the precedence of dereferencing and address operators, and their relative positions when compared with the increment/decrement operators. As shown in the table, the precedence of the increment/decrement operators is higher than the dereferencing operator.

[pause 10 sec]



Did you get the correct output?
[pause 10 sec]