



វិទ្យាស្ថានបច្ចេកវិទ្យាកម្ពុជា
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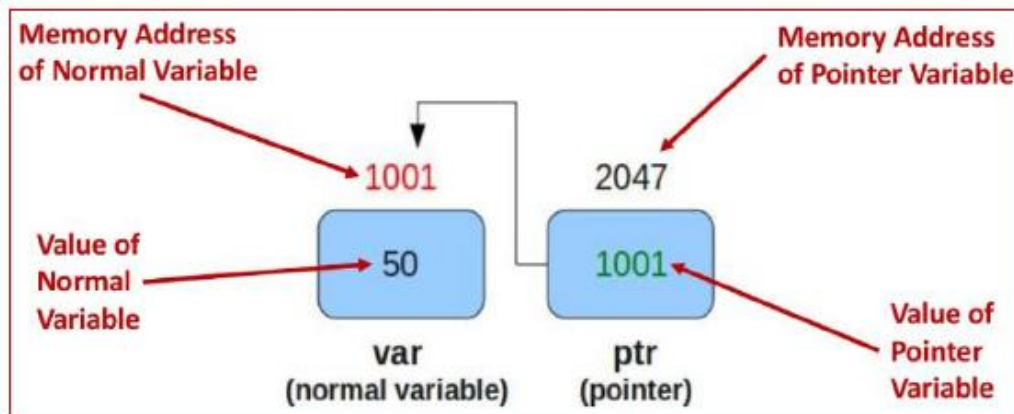
TP-14

**Pointers
in C++**

Academic Year: 2022 - 2023

1. What is pointer?:

- A pointer is a variable that holds the memory address of another variable of the same type.
- Pointers are used to access the memory address and values at that address.



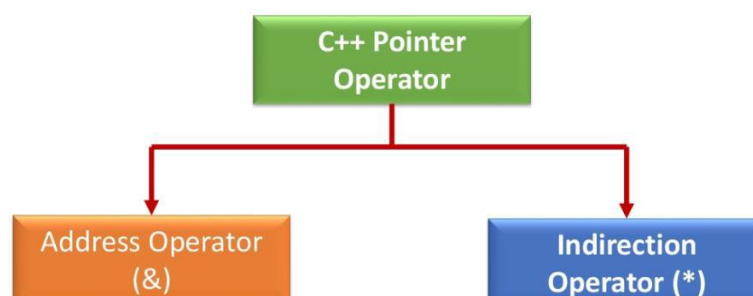
2. Advantages of using pointer:

- Use less memory
- Dynamic memory allocation
- Program runs faster
- Increase execution speed and reduce execution time
- Efficient when work with array, structure, list, stack, queue, ...
- Provide another way to access array element
- Instead of copying data, pointer just point to an existing data
- A function can return more than one value by passing via function argument.

3. Pointer Operator:

Two operators when work with pointer

- Address operator (**reference** operator)
 - It uses &
 - It returns memory address
- Indirection operator (**deference** operator or value operator)
 - It uses *
 - It returns value



4. Pointer Using:

- **Pointer Declaration**

```
int *pointVar;  
int* pointVar;    // preferred syntax  
int* pointVar, p; // pointer and variable
```

- **Addresses and Value of Pointers**

```
int* pointVar, var;  
var = 5;  
  
// assign address of var to pointVar  
pointVar = &var;  
  
// print address & value of var  
cout << "var address: " << &var << endl; // Output: 0x61ff08  
cout << "var value: " << var << endl; // Output: 5  
  
// print address & value of pointVar  
cout << "pointVar address: " << pointVar << endl; // Output: 0x61ff08  
cout << "pointVar value: " << *pointVar << endl; // Output: 5  
  
// change value at address pointVar  
*pointVar = 1;  
cout << var << endl; // Output: 1  
  
// change value of var  
var = 2;  
cout << *pointVar << endl; // Output: 2
```

- **Array Using Pointers**

```
#include <iostream>  
using namespace std;  
int main() {  
    int *ip;  
    int arr[] = { 10, 34, 13, 76, 5, 46 };  
    ip = arr;  
    for (int x = 0; x < 6; x++) {  
        cout << *ip << endl;  
        ip++;  
    }  
    return 0;}
```

- **Function Using Pointers**

```
#include <iostream>
using namespace std;

void testChange(int*, int*);
void sum(double*, int);

int main() {
    int a = 5, b = 5;
    cout << "Before changing:" << endl;
    cout << "a = " << a << endl;
    cout << "b = " << b << endl;

    testChange(&a, &b);

    cout << "\nAfter changing" << endl;
    cout << "a = " << a << endl;
    cout << "b = " << b << endl;

    int n;
    double result;
    cout << "Enter value of n: ";
    cin >> n;
    sum(&result, n);
    cout << " => Sum Square of n = " << result << endl;

    return 0;
}

void testChange(int* n1, int* n2) {
    *n1 = 10;
    *n2 = 11;
}

void sum(double *sum, int n){
    int *ptr;
    ptr = &n;
    while(*ptr > 0){
        cout << *ptr << "^" << *ptr;
        if(*ptr != 1) cout << " + ";

        *sum += *ptr * *ptr;
        *ptr = *ptr - 1;
    }
}
```

Write program using pointer for each problem below:

1. Write a C++ program to create two integer numbers **n1** and **n2**. Assign values of 7 and 3 to **n1** and **n2**, respectively. Next create two pointer variables **p1** and **p2**, where **p1** points to **n1** and **p2** points to **n2**. Display the address and value of **n1** through **p1**. Similarly, display the address and value of **n2** through **p2**.

2. Write a C++ program to get a number, say **n**, from a user. Then modify the value of **n** to **n+5** using a pointer variable.

Note: We don't use: $n = n + 5$

3. Write a function in C++ program to exchange two numbers. These two variables are passed through parameters of the function using pointer.

void exchange(int *a, int *b)

4. Write a C++ program to ask a user for 7 integer numbers and store in an array. Then write a function that can return min and max values from this array. The prototype of this function is defined by:

void findMaxMin(int number[], int *max, int *min);

5. Write a C++ program to ask a user for 7 integer numbers and store in an array. Display all numbers stored in an array by using another pointer variable. Computer summation and multiplication of all numbers in this array using pointer operation.

REMARK: We don't use [] to access to data element. Need to use pointer operation.

6. Write a C++ program which calculates the sum of $1/1^2 + 1/2^2 + 1/3^2 + \dots + 1/n^2$, where **n** is a positive integer. The program has two functions which both calculate the sum above. The prototypes of these two functions are:

```
void sum1(double *sum, int n);  
double sum2(int n);
```

```
#include<iostream>  
using namespace std;  
  
void sum1(double *sum, int n){  
    //your codes  
}  
double sum2(int n){  
    //your codes  
}  
  
main(){  
    double result;  
    sum1(&result, 5);  
    cout<<result<<endl;  
    result=sum2(5);  
    cout<<result<<endl;  
}
```