

CSCI 1370

APRIL 17, 2017

PROGRAM MEMORY

When a program runs, relevant data is stored in the computer's **memory**.

Memory includes CPU cache, RAM, hard drives, and network.

A program does not “see” these different types of memory; every place in memory is just another location, called an **address**.

ADDRESSES

A computer's memory is just a very long sequence of addresses that start at 0x0 (0 in "address-speak", i.e., hexadecimal) and end at a very large number.

To get the address of a variable, use the `&` operator.

For example:

```
void printingAddresses()  
{  
    int n = 7;  
    cout << "The address of n is: " << &n;  
  
    float f = 3.14;  
    cout << "\nThe address of f is: " << &f;  
}
```

To get the address of a variable, use the `&` operator.

For example:

```
void sumThreeNums(int x, int y, int z, int &res)
{
    res = x + y + z;
}
```


POINTERS

If `n` is an `int`, then what is the type of `&n`?

(It should be a type that denotes an address of an `int`.)

Variables that store addresses are called **pointers**.

The syntax for pointers is **vartype***.

For example:

```
void declaringPointers()  
{  
    int n = 7;  
    int* np = &n;  
    cout << "The address of n is: " << np;  
  
    float f = 3.14;  
    float* fp = &f;  
    cout << "\nThe address of f is: " << fp;  
}
```

DEREFERENCING POINTERS

If an address is stored in a pointer, the value stored in the address can be obtained by **dereferencing** the pointer.

Adding an asterisk before the pointer's name gives an expression that acts like the variable.

```
void dereferencingPointers()  
{  
    int n = 7;  
    int* p = &n;  
  
    cout << "The address of n is: " << p;  
    cout << "\nThe value of n is: " << n;  
    cout << "\nThe value of n is: " << *p;  
  
    n = 8;  
    cout << "\nThe value of n is: " << *p;  
  
    *p = 9;  
    cout << "\nThe value of n is: " << n;  
}
```



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}
```

ARRAYS

Arrays are just pointers that point to the first element of the array.

```
void arraysArePointers()
{
    int A[3] = {1, 2, 3};

    int* p;
    p = A; //Point p at the beginning of A.

    cout << "The first element of A is located at:" << p;
    cout << "\nThe first element of A is: " << *p;

    p = &(A[0]); //Does the same thing as p = A.
    cout << "\nThe first element of A is: " << *p;

    p = &(A[1]); //Point p to the second element in A.
    cout << "\nThe second element of A is: " << *p;
}
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