Object Oriented Programming

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chapter 6

Outline

- Dynamic allocation and de-allocation of memory spaces

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Memory areas

Fact. Generally, programmers deal with five areas of memory

- Global name space
- The heap
- Registers
- Code space
- The stack

Memory areas (continue...)

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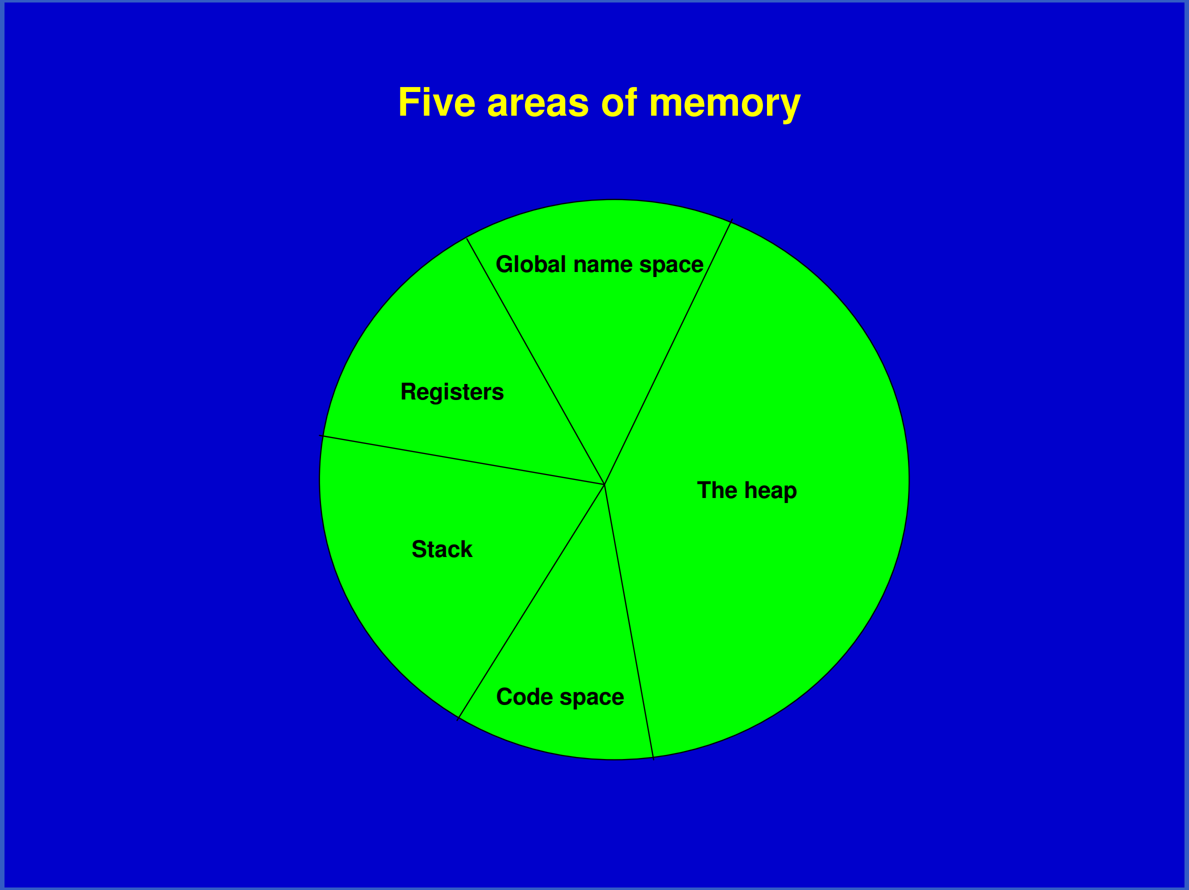
- **The stack.** Local variables are on the stack.
- **Code space.** Code is in code space.
- **Registers.** are used for internal housekeeping functions, such as keeping track of the top of the stack and instruction pointer.
- **The heap.** About all remaining memory is given over to the heap; it is sometimes referred to as the free store.

Visual representation: memory areas



The heap

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- Local variable. The problem with local variables is that they don’t persist; when the function returns, the local variables are thrown away.
- Global variable. Global variables solve that problem at the cost of unrestricted access throughout the program, which leads to the creation of code that is difficult to understand and maintain.

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A: Putting data in the heap solves both of these problems.

The heap (Continue...)

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- The advantage of accessing memory in this way, rather than using global variable, is that only functions with access to the pointer have access to data; it eliminates the problem of one function changing that data in unexpected and unanticipated ways.

The heap (Continue...)

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- The stack is cleaned automatically when a function returns; all local variables are removed from the stack.
- The heap is not cleaned until your program ends. It is your responsibility to free any memory that you've reserved when you are done with it; Otherwise, it will cause a memory leak.

Using the new operator

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Example 2.

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```
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                    ......
                 delete pPtr;
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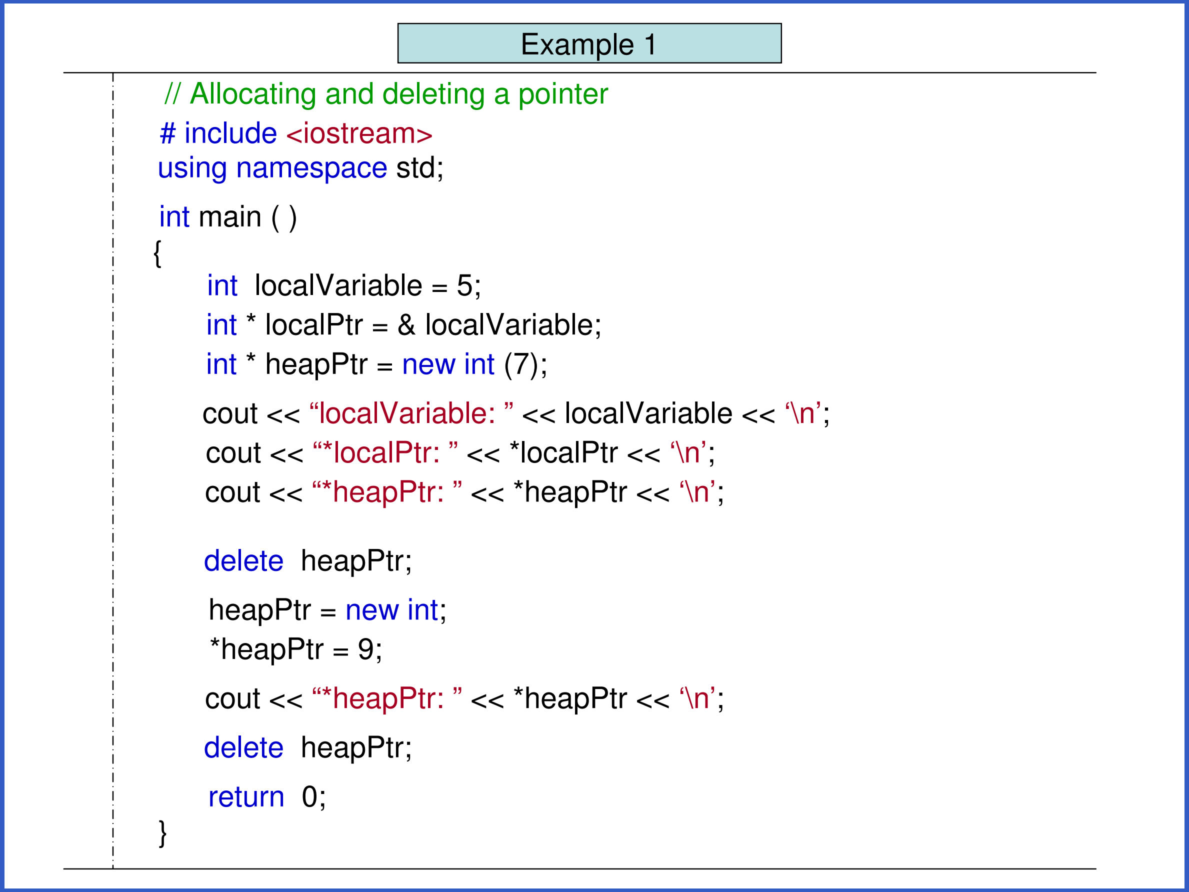
Fact. When you delete the pointer, what you are really doing is freeing up the memory whose address is stored in the pointer.

Operators: new and delete

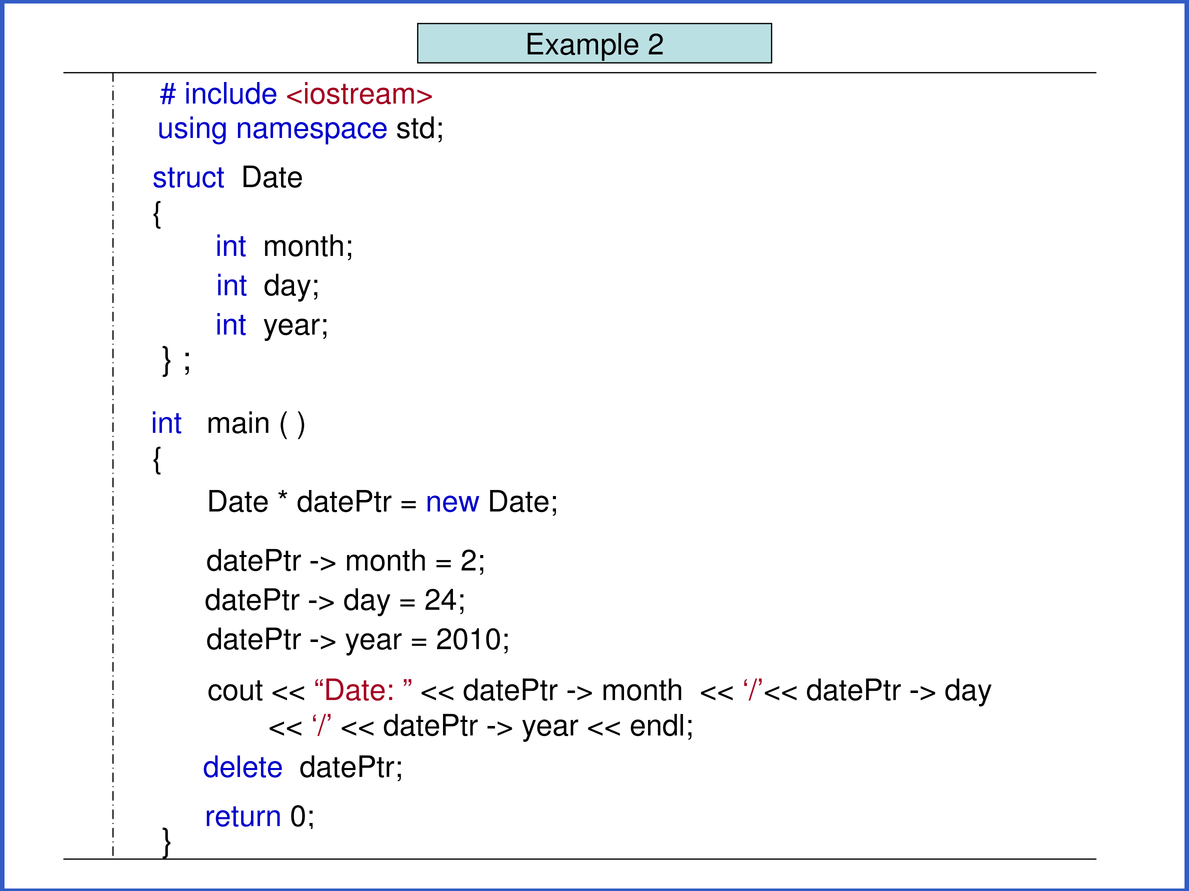


Example 1

```
// Allocating and deleting a pointer
# include <iostream>
using namespace std;
int main ( )
{
     int  localVariable = 5;
     int * localPtr = & localVariable;
     int * heapPtr = new int (7);
     cout << “localVariable: ” << localVariable << ‘\n’;
     cout << “*localPtr: ” << *localPtr << ‘\n’;
     cout << “*heapPtr: ” << *heapPtr << ‘\n’;

     delete  heapPtr;
     heapPtr = new int;
     *heapPtr = 9;
     cout << “*heapPtr: ” << *heapPtr << ‘\n’;
     delete  heapPtr;
     return  0;
}
```

Operators: new and delete (Continue...)



Example 2

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

struct  Date
{
      int  month;
      int  day;
      int  year;
} ;

int   main ( )
{
      Date * datePtr = new Date;

      datePtr -> month = 2;
      datePtr -> day = 24;
      datePtr -> year = 2010;

      cout << “Date: ” << datePtr -> month  << ‘/’<< datePtr -> day
            << ‘/’ << datePtr -> year << endl;
      delete  datePtr;

      return 0;
}
```