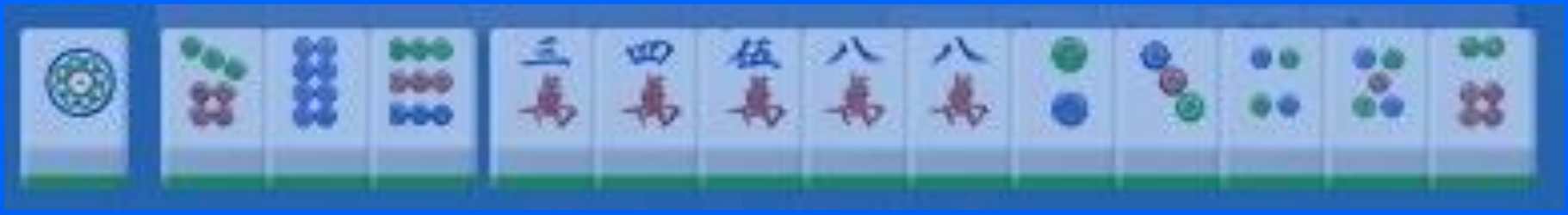
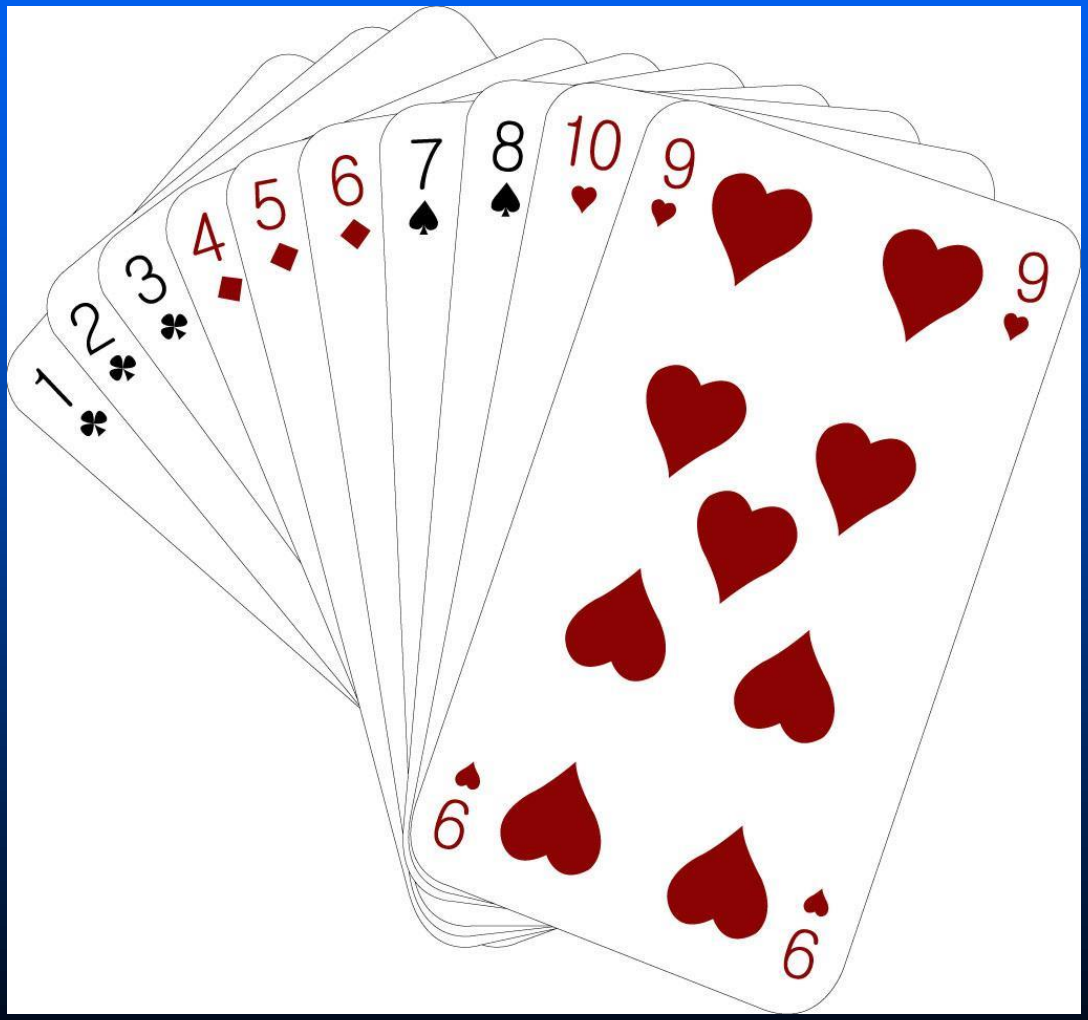
6.3 查找元素的方法

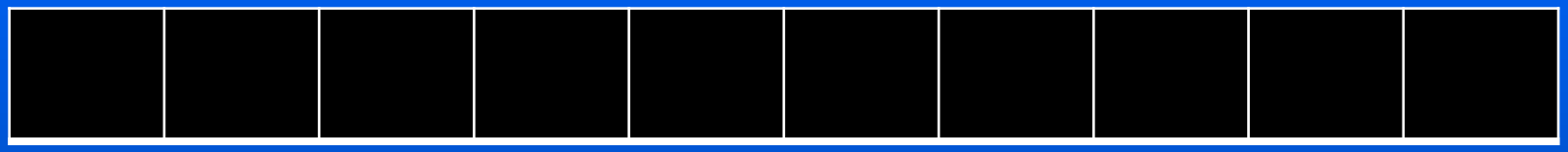
任务描述：

如何在一个数组中查找某个指定的元素，即回答该元素是否存在？如果存在，它在哪里？




1
2
3
4
5
6
7
8
10
9
9
6
6

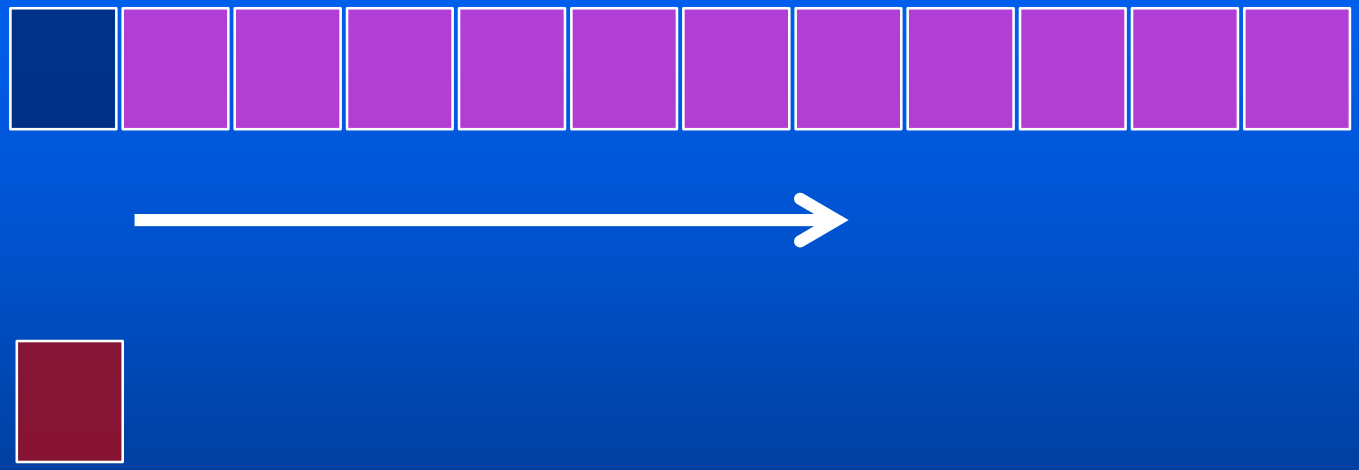
线性查找与折半查找



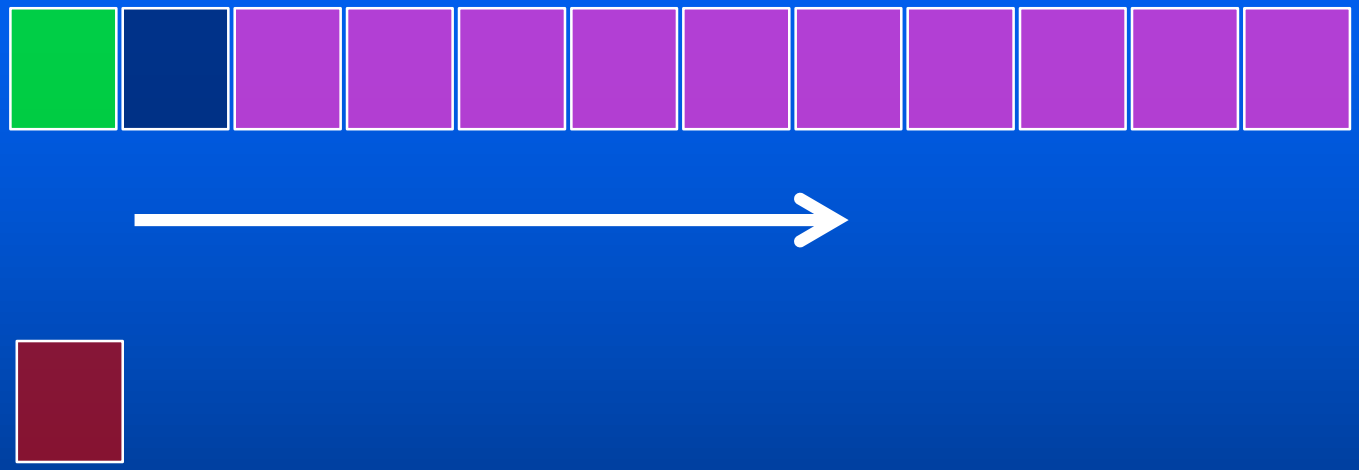
如何在数组中查找一个指定的数?

或者：回答某个数是否在数组中?

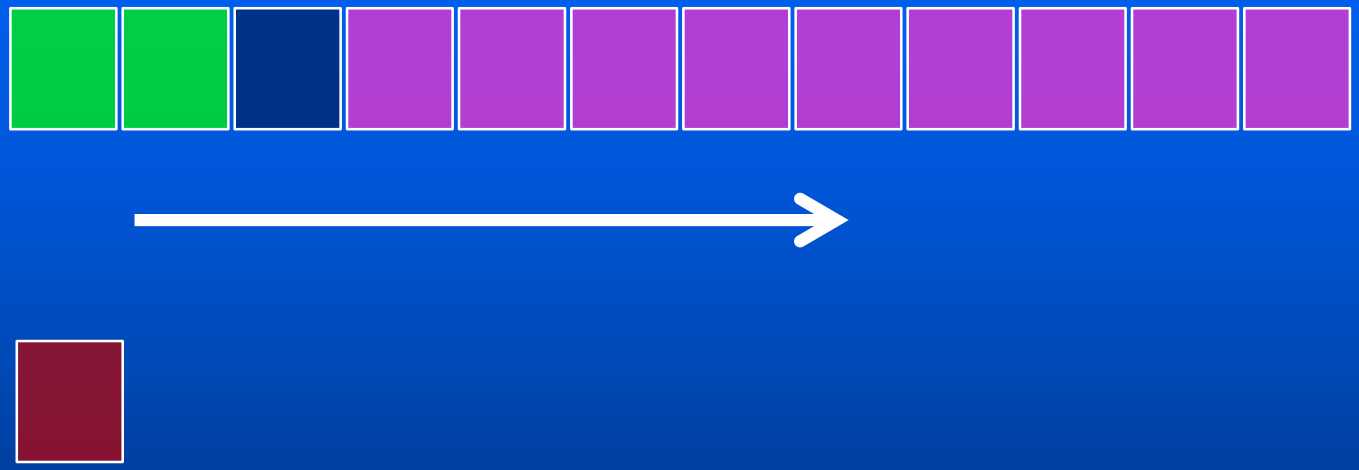
线性查找与折半查找



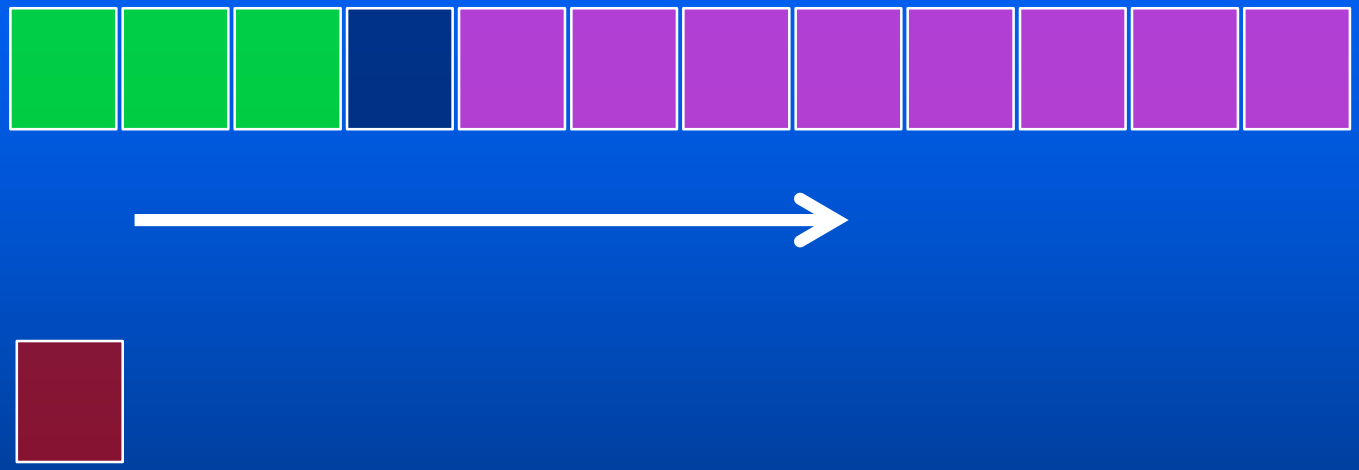
线性查找与折半查找



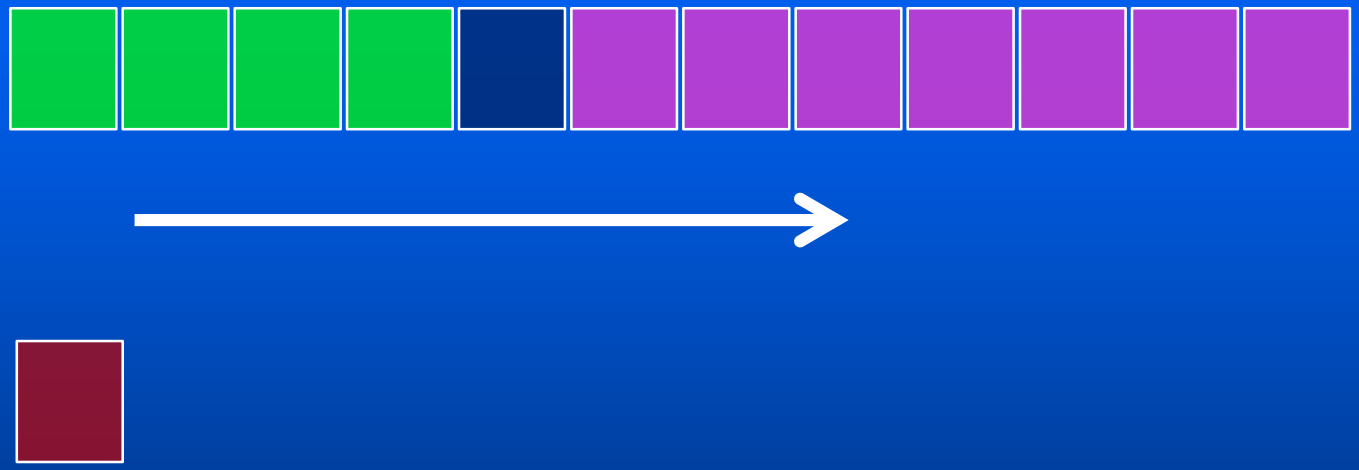
线性查找与折半查找



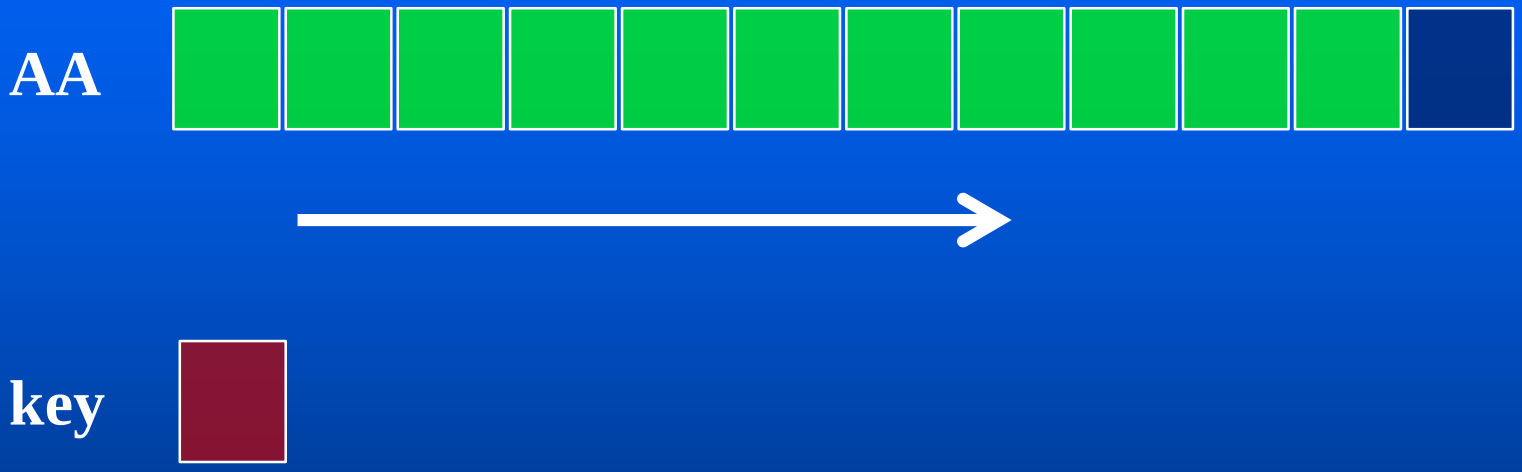
线性查找与折半查找



线性查找与折半查找



线性查找与折半查找




```
for (int i=0; i<SizeofAA; i++)
      if (AA[i] == key)
            return i;  // found!
```

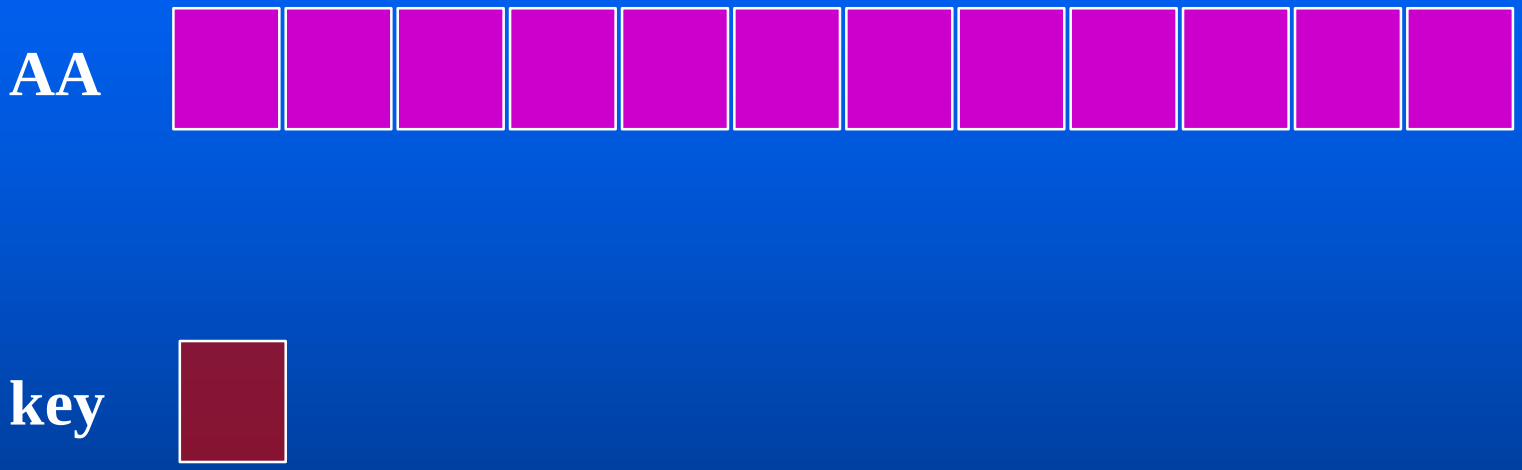

YU GONG YI SHAN
愚公移山


愚公对着全家说：
“一定要移走山两座！”
你挖土来我挑担，
土石运到渤海边。

线性查找方法是一种典型的

“枚举思想”的应用

线性查找与折半查找



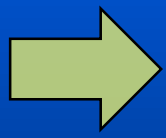
前提：数组AA中元素是有序存放的。

不妨设 AA[0] < … < AA[sizeof(AA)]

线性查找与折半查找

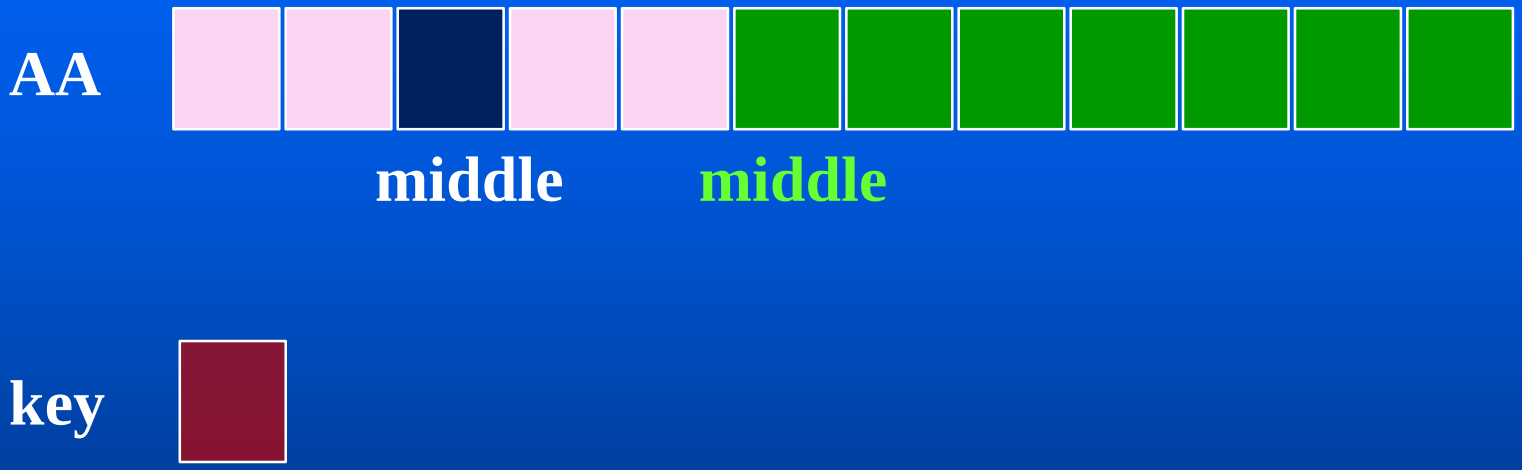

```
key  ?  AA[middle]
```

线性查找与折半查找



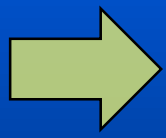
```
1. if (key == AA[middle]) ...
2. if (key  < AA[middle]) ...
3. if (key  > AA[middle]) ...
```

线性查找与折半查找




```
2. if (key  < AA[middle]) ...
```

线性查找与折半查找



```
1. if (key == AA[middle]) ...
2. if (key  < AA[middle]) ...
3. if (key  > AA[middle]) ...
```

线性查找与折半查找

AA

middle middle

key

```
3. if (key  > AA[middle]) ...
```

折半查找的参考源程序

```
//*****************************
//*    作者: wuwh             *
//*    时间: 2003.6.20        *
//*    功能: 二分法查找数      *
//*****************************
#include <iostream>
#include <iomanip>
using namespace std;
```

```
int BinarySearch(int AA[], int Key,
   int low, int high, int sizeofAA) {
   int middle = 0;
   while (low <= high) {
      middle = (low + high) / 2;
      if (Key == AA[middle]) return middle;
      else if (Key < AA[middle])
         high = middle - 1;
      else
         low = middle + 1;
   }
   return -1; // not found!   (why -1?)
}
```

```
int main() {
   const int aSize = 100;
   int a[aSize];
   for (int i=0; i<aSize; i++) {
      a[i] = i*i+1;
      cout << setw(4) << a[i]
      << ((i+1) % 10 == 0 ? '\n' : ' ');
   }

   int searchKey;
   cout << "请输入一个待查正整数: ";
   cin >> searchKey;
```

```
    int b = 0;
    b = BinarySearch(a, searchKey,
                          0, aSize-1, aSize);

    if (b != -1)
       cout << "查到该数在数组中为: a["
            << b << "]\n";
    else
       cout << "数组中无此数!\n";

    return 0;
} // MAIN() END
```

折半查找的程序输出

```
D:\Debug>BinarySearch.exe
   1    2    5   10   17   26   37   50   65   82
 101  122  145  170  197  226  257  290  325  362
 401  442  485  530  577  626  677  730  785  842
 901  962 1025 1090 1157 1226 1297 1370 1445 1522
1601 1682 1765 1850 1937 2026 2117 2210 2305 2402
2501 2602 2705 2810 2917 3026 3137 3250 3365 3482
3601 3722 3845 3970 4097 4226 4357 4490 4625 4762
4901 5042 5185 5330 5477 5626 5777 5930 6085 6242
6401 6562 6725 6890 7057 7226 7397 7570 7745 7922
8101 8282 8465 8650 8837 9026 9217 9410 9605 9802
请输入一个待查正整数: 226
查到该数在数组中为: a[15]
```

结　束