

## 快排

```
#include "pch.h"
#include <iostream>

#include <vector>

using namespace std;
void swap1(int &a, int &b)
{
    int tmp = a;
    a = b;
    b = tmp;
}
void helper(vector<int> &nums,int start,int end)
{
    if (start >= end)
        return;

    int pivot = nums[start];
    int left = start;
    int right = end;
    while (left < right)
    {
        while (left < right && nums[right] >= pivot)
            right--;
        while (left < right && nums[left] <= pivot)
            left++;

        swap1(nums[left], nums[right]);
    }
    swap1(nums[start], nums[left]);
    helper(nums, start, left - 1);
    helper(nums, left + 1, end);
}
int main()
{
    vector<int> nums = { 1,6,4,3,5,9,8,2 };
    int len = nums.size();

    helper(nums, 0, len - 1);

    for (auto it = nums.begin(); it != nums.end(); it++)
    {
        cout << (*it) << " ";
    }
}
```

## 冒泡

```
<?php

$arr = array(1,3,2,5,9,8,7);
// 计算长度
$len = count($arr);

for($i = 0;$i<$len-1;$i++)    // 第几次重复循环
```

```

{
    for($j = 0;$j<$len-$i-1;$j++) // 第几次交换
    {
        if($arr[$j] > $arr[$j+1])
            swap1($arr[$j],$arr[$j+1]);
    }
}
var_dump($arr);

// 交换值
function swap1(&$a,&$b)
{
    $tmp = $a;
    $a = $b;
    $b = $tmp;
}

```

## 选择

```

<?php

$arr = array(1,5,2,5,9,6,3,4);
$min_index = 0;

$len = count($arr);

for($i = 0; $i<$len-1; $i++)
{
    $min_index = $i;
    for($j = $min_index + 1;$j<$len;$j++)
    {
        if($arr[$min_index] > $arr[$j])
            $min_index = $j;
    }
    if($min_index != $i)
        swap1($arr[$min_index],$arr[$i]);
}
var_dump($arr);

// 交换值
function swap1(&$a,&$b)
{
    $tmp = $a;
    $a = $b;
    $b = $tmp;
}

```

## 插入

```

for (int i = 0; i < len - 1; i++)
{
    int tmp = nums[i + 1];
    for (int j = i; j >= 0; j--)
    {
        if (tmp > nums[j])
        {
            if (nums[j + 1] != tmp) nums[j + 1] = tmp;
            break;
        }
    }
}

```

```
        else
            nums[j+1] = nums[j];
    }
}
```