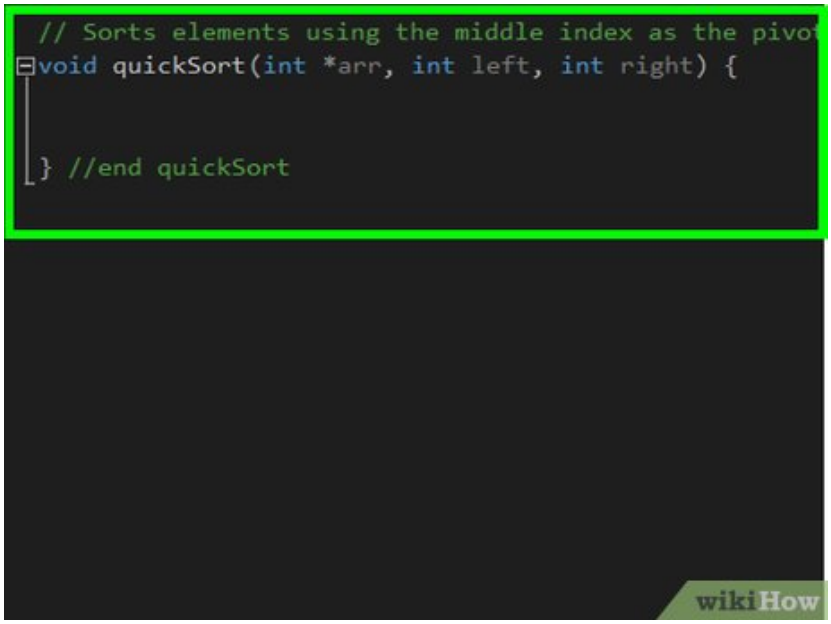
How to Quick Sort an Array in C++

Sorting is a very useful tool in programming. It is often necessary to arrange the members of a list in ascending or descending order. A sorted list allows a user to search and find information very quickly. Sorting a list requires the...

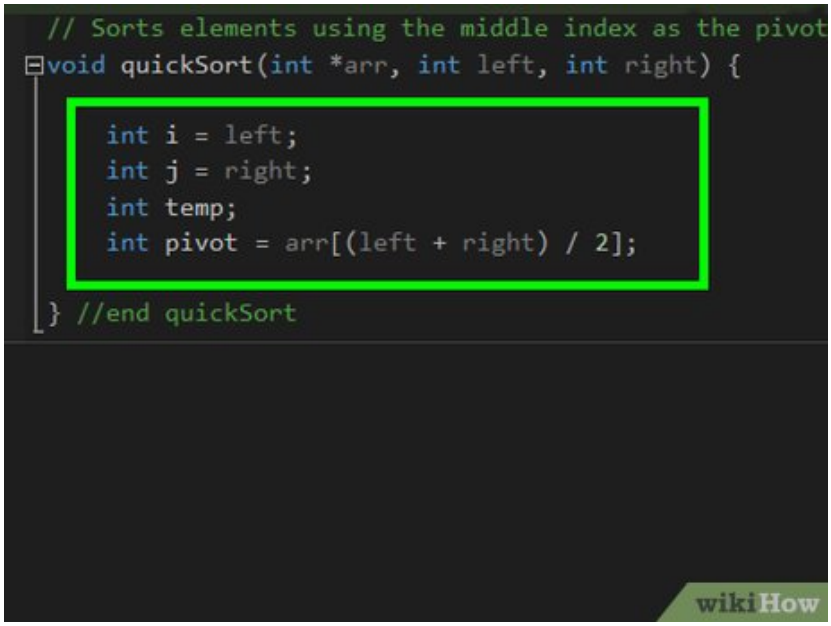
Part 1 of 2:

Creating the quickSort Function

1. 

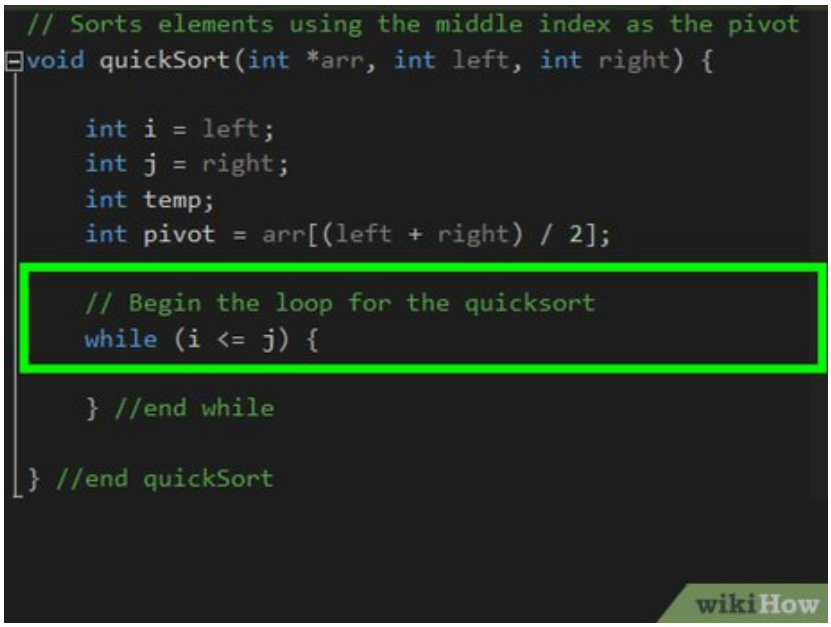
Create the quickSort function. This is a recursive `void` function. It requires three parameters:

1. The `array` (an `int array`)
2. The `left` bound (an `int` variable)
3. The `right` bound (an `int` variable; the size of the `array` subtracted by 1)

2. 

Create the variables. These variables will be used to go through the list and to swap the values. Four variables are needed:

1. An `int i` (the left bound)
2. An `int j` (the right bound)
3. An `int temp` (a temporary variable used for swapping without losing any data)
4. An `int pivot` (the value of the middle point that splits the list to make it easier to sort)

3. 

Create a `while` loop to begin sorting. A loop `while i ? j` is used to go through the indexes of the list. These values will be changed as the sublists that are being sorted change.

4.

```
    int i = left;
    int j = right;
    int temp;
    int pivot = arr[(left + right) / 2];

    // Begin the loop for the quicksort
    while (i <= j) {

        // For the left hand side (smaller values)
        while (arr[i] < pivot)
            i++;

    } //end while

} //end quickSort
```

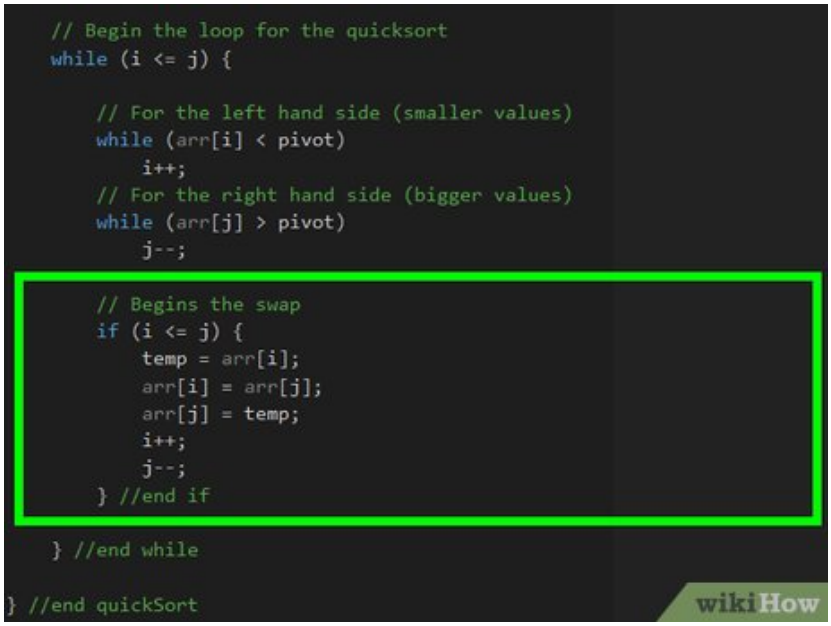

Iterate through the left side. Another `while` loop checking if the element is less than `pivot` iterates through the list. If it is less than `pivot` value, increase `i` by 1. This checks if the left side of the sublist needs to be sorted.

5.

```
    int j = right;
    int temp;
    int pivot = arr[(left + right) / 2];

    // Begin the loop for the quicksort
    while (i <= j) {

        // For the left hand side (smaller values)
        while (arr[i] < pivot)
            i++;

        // For the right hand side (bigger values)
        while (arr[j] > pivot)
            j--;

    } //end while

} //end quickSort
```


Iterate through the right side. Another `while` loop checking if the element is greater than `pivot` iterates through the list. If it is greater than `pivot`, decrease `j` by 1. This checks if the right side of the sublist needs to be sorted.

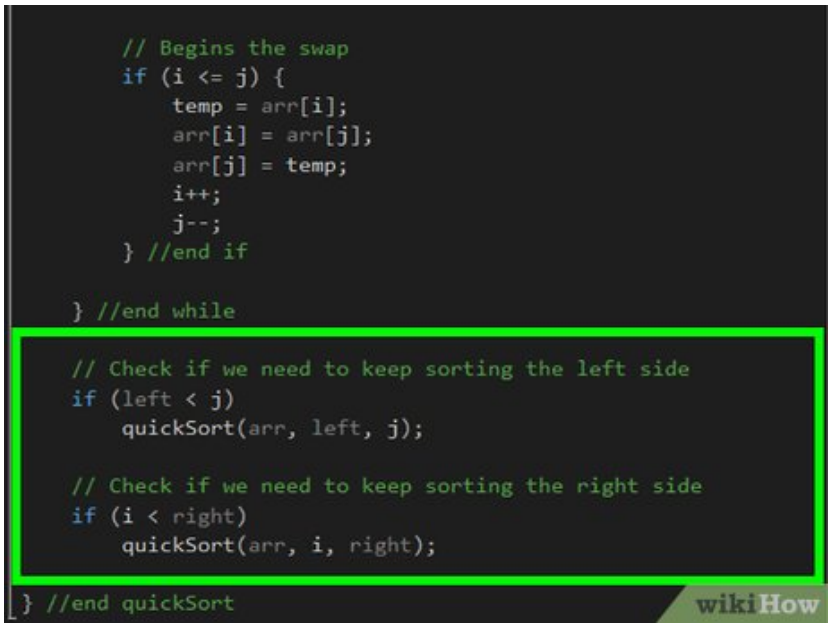
6.



Begin swapping the values if `i ? j`. Swapping the values of the list puts the values in ascending order. Assigning one value to another without a temporary variable will result in a loss of data. To avoid this, this procedure is used:

1. Assign the value of the list at index `i` to `temp`.
2. Assign the value of the list at index `j` to the list at index `i`.
3. Assign temp to the list at index `j`.
4. Add 1 to `i`.
5. Subtract 1 from `j`.

7.



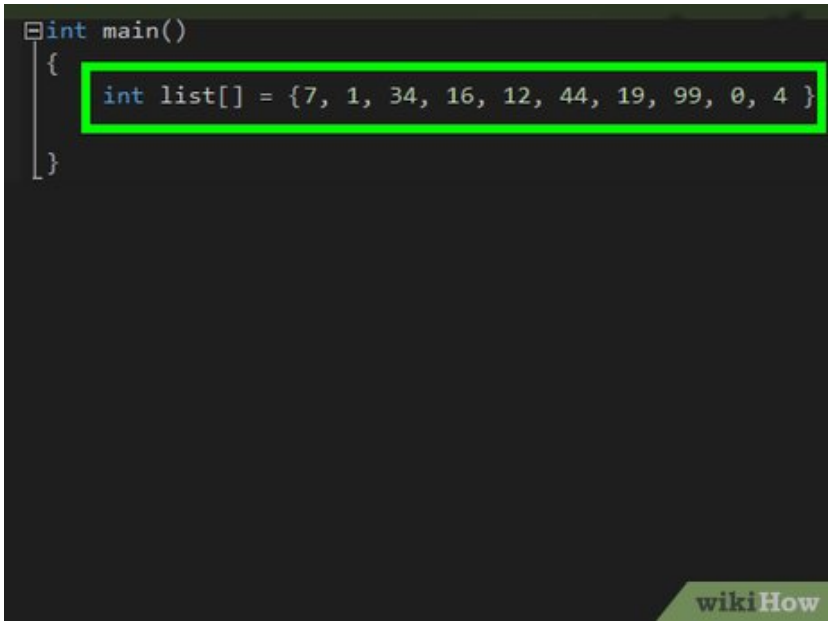
Check if each half of the list is sorted. This is done by two recursive calls. The first function call sorts the left sublist created by changing the bounds. When the left side is completely sorted, the next recursive call sorts the right sublist by changing its bounds.

1. If `left j`, call the function with `left` and `i` as the bounds.

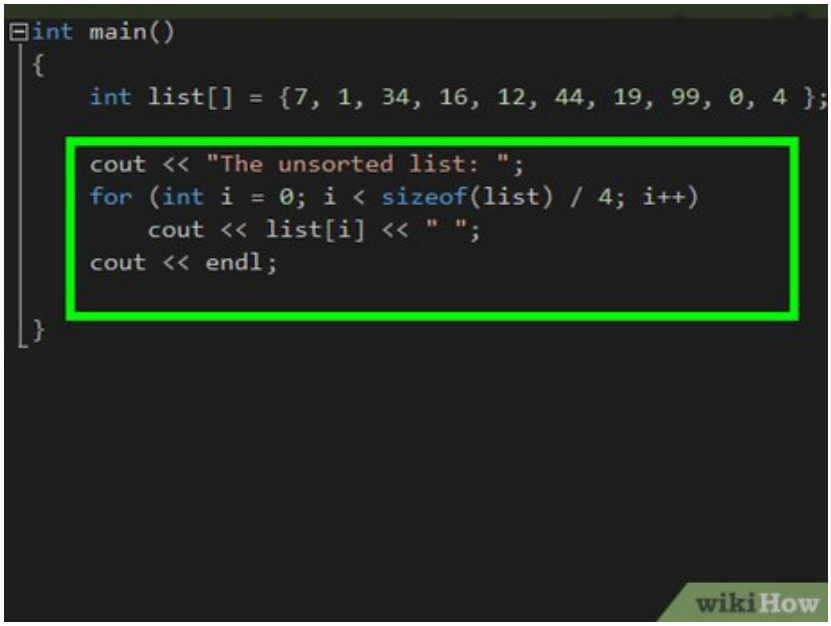
2. If `right i`, call the function with `i` and `right` as the bounds.

Part 2 of 2:

Testing the quickSort Function

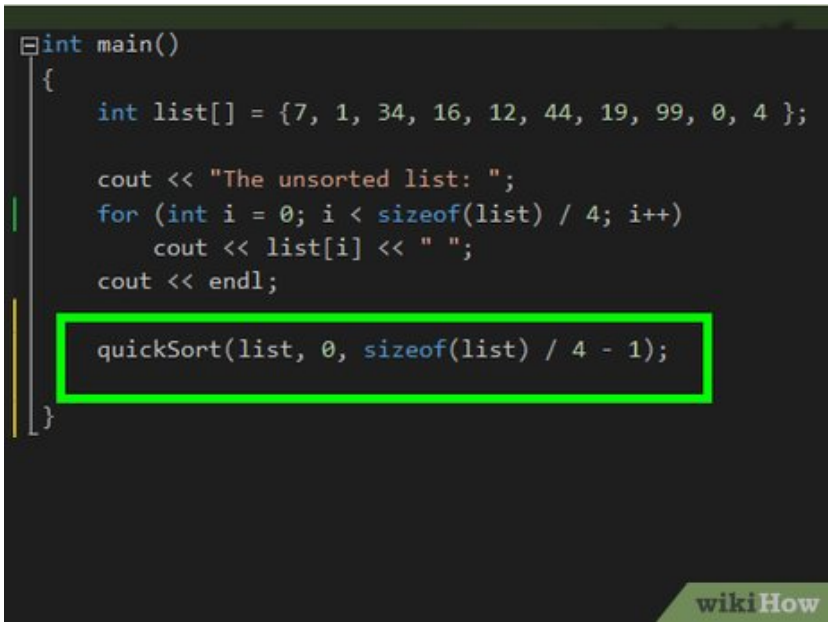
1. 

Create the `list` in the `main` function. The array can be any size and can be initialized both explicitly and through other methods.

2. 

Output the unsorted `list` using a `for-loop`. The bounds of the loop go from 0 to the `sizeof(list)/4`. This piece of code gives the number of elements in `list`.

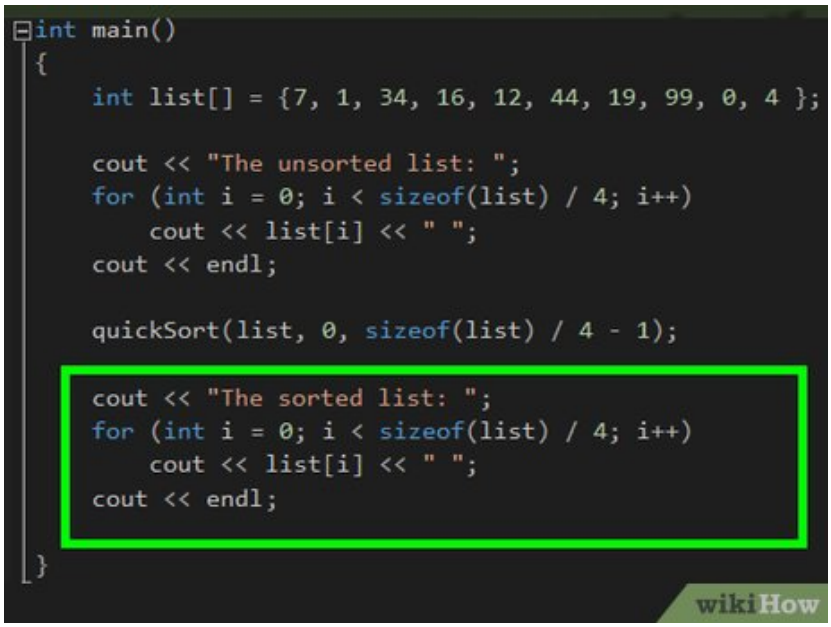
3.



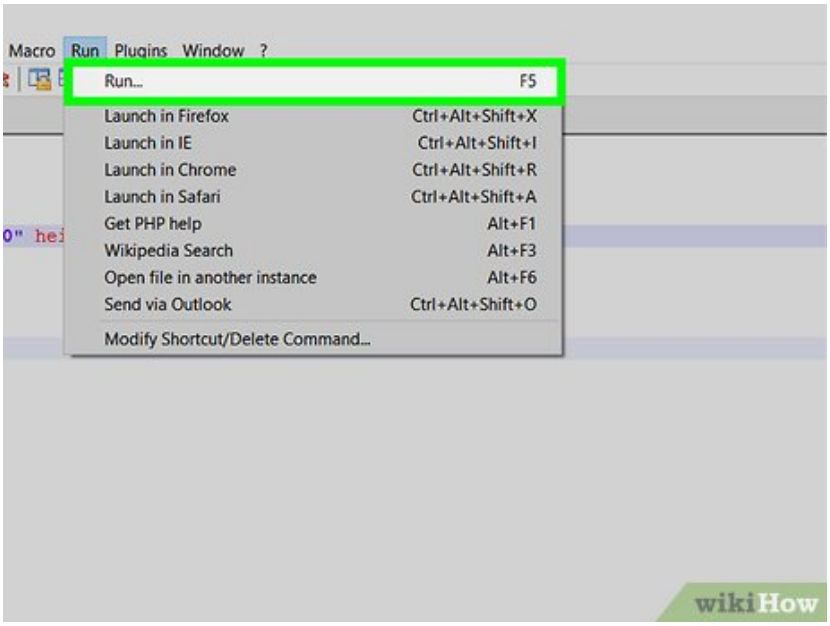
Call the quickSort function. The three needed parameters are:

1. The `list`
2. The `left` bound (0)
3. The `right` bound (the size of the `array` subtracted by 1)

4.



Output the new list using a `for-loop`. Again, the bounds of the loop go from 0 to the `sizeof(list)/4`. This is because the sorted list contains the same amount of elements as the unsorted list (no data was lost).

5. 

Run the program to see the sorted list. The number of items in `list` should be the same in both lists.