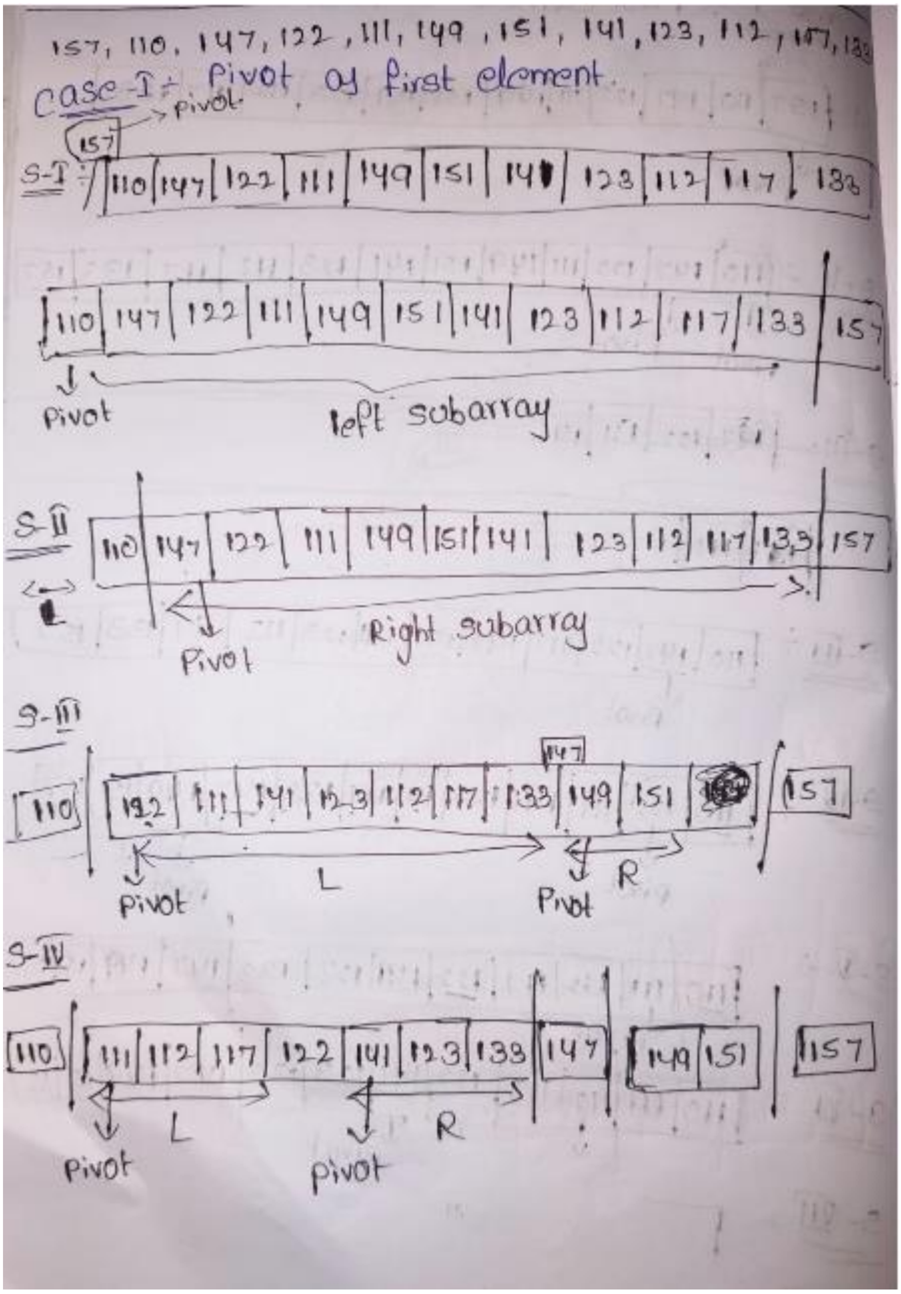
NAME : T. VASANTHA

ROLL NO : CH.SC.U4CSE24147

WEEK – 5

QUICK SORT:

Logic:



157, 110, 147, 122, 111, 149, 151, 141, 123, 112, 117, 133

Case-I ÷ Pivot as first element

S-I ÷ 157 → pivot

| 110 | 147 | 122 | 111 | 149 | 151 | 141 | 123 | 112 | 117 | 133 |

| 110 | 147 | 122 | 111 | 149 | 151 | 141 | 123 | 112 | 117 | 133 | 157 |

S-II

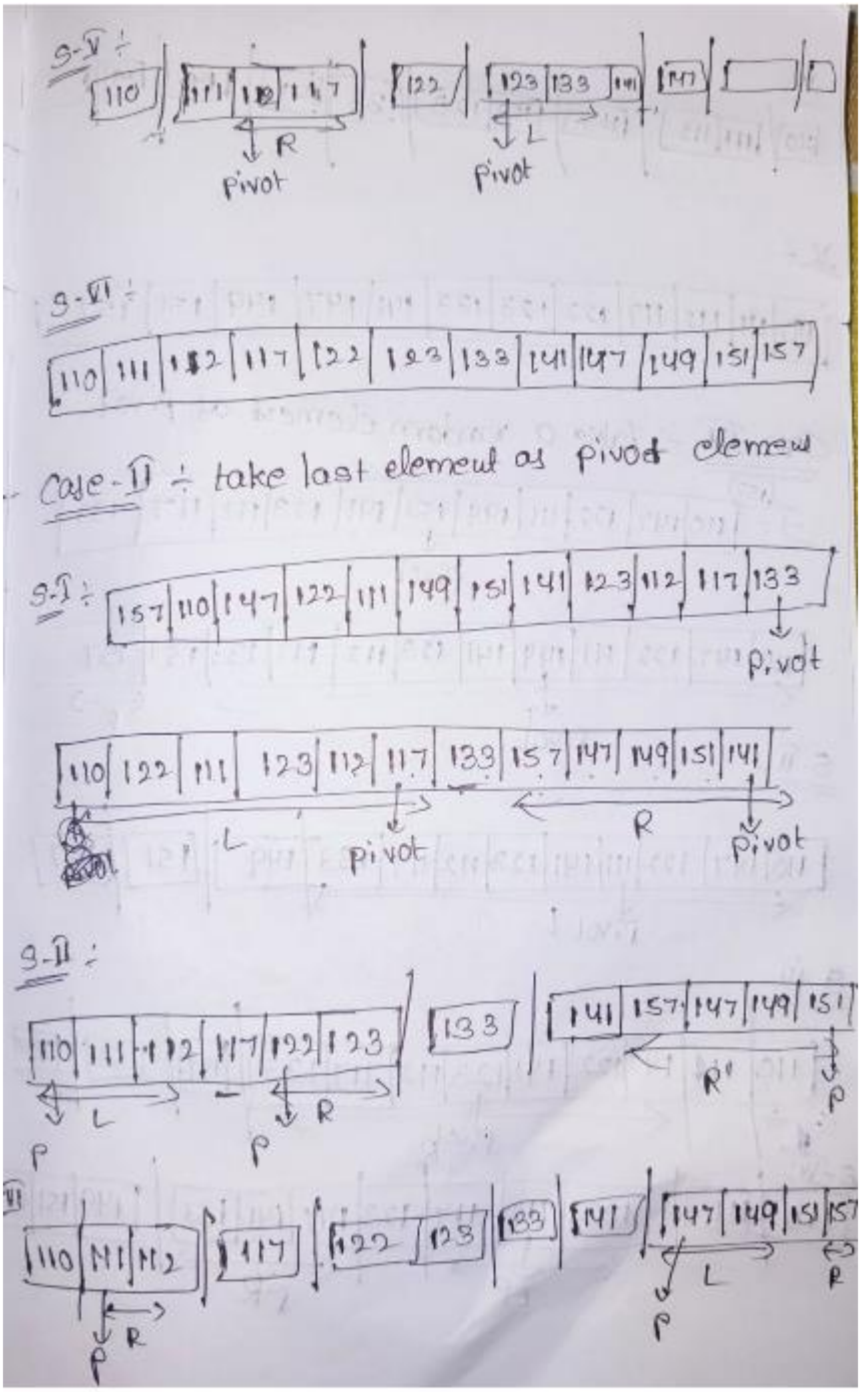
| 110 | 147 | 122 | 111 | 149 | 151 | 141 | 123 | 112 | 117 | 133 | 157 |

S-III

| 110 | | 122 | 111 | 141 | 123 | 112 | 117 | 133 | 149 | 151 | | 157 |

S-IV

| 110 | | 111 | 112 | 117 | 122 | 141 | 123 | 133 | 147 | 149 | 151 | | 157 |



S-V ÷

110	111	112	117	122	123	133	141	147		

S-VI ÷

110	111	112	117	122	123	133	141	147	149	151	157

Case-II ÷ take last element as pivot elemew

S-I ÷

157	110	147	122	111	149	151	141	123	112	117	133

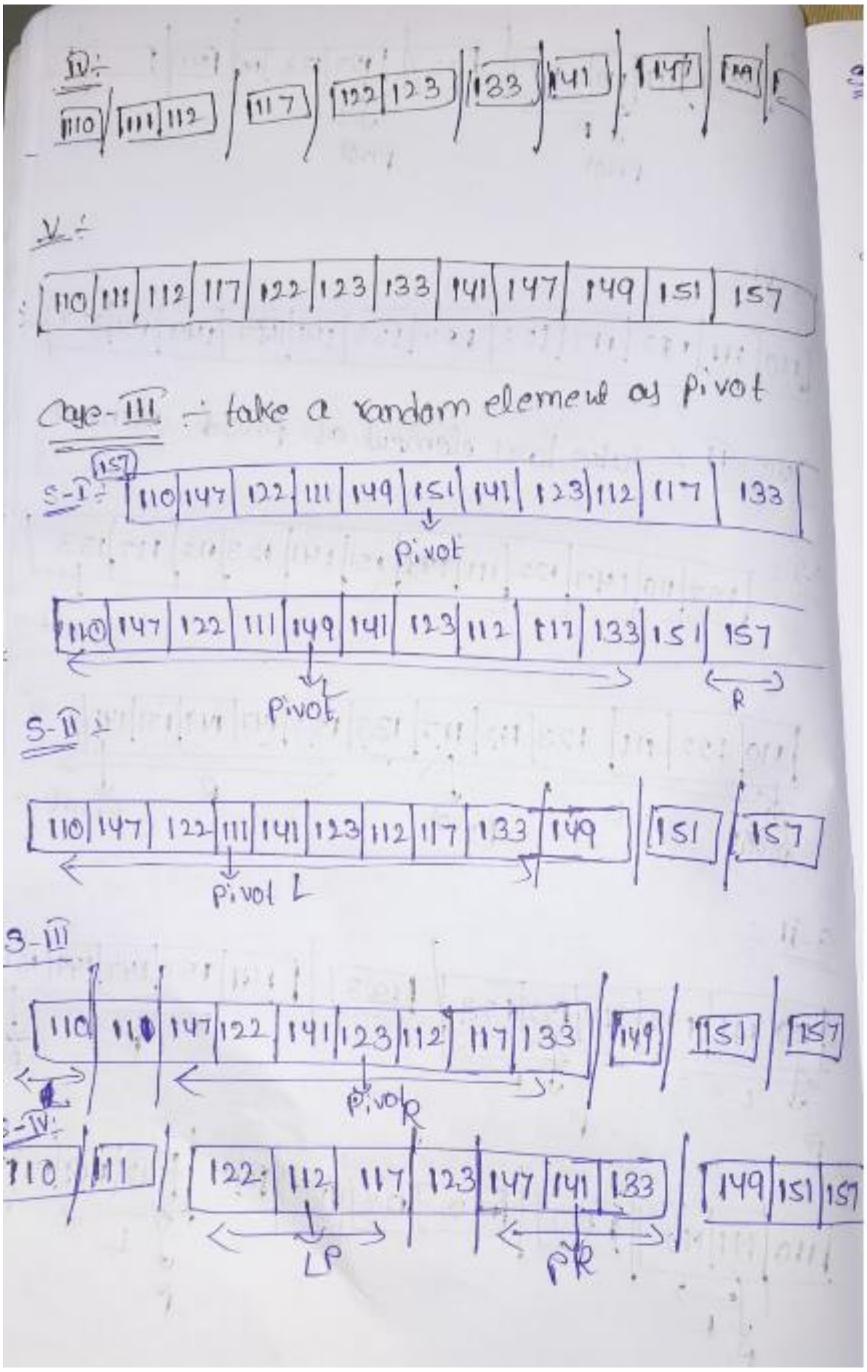
110	122	111	123	112	117	133	157	147	149	151	141

S-II ÷

110	111	112	117	122	123	133	141	157	147	149	151

III

110	111	112	117	122	123	133	141	147	149	151	157



IV :-

110	111	112	117	122	123	133	141	147	149	1

V :-

110	111	112	117	122	123	133	141	147	149	151	157

Case-III :- take a random element as pivot

S-I :- 157

110	147	122	111	149	151	141	123	112	117	133

Pivot

110	147	122	111	149	141	123	112	117	133	151	157

Pivot R

S-II :-

110	147	122	111	141	123	112	117	133	149	151	157

pivot L

S-III

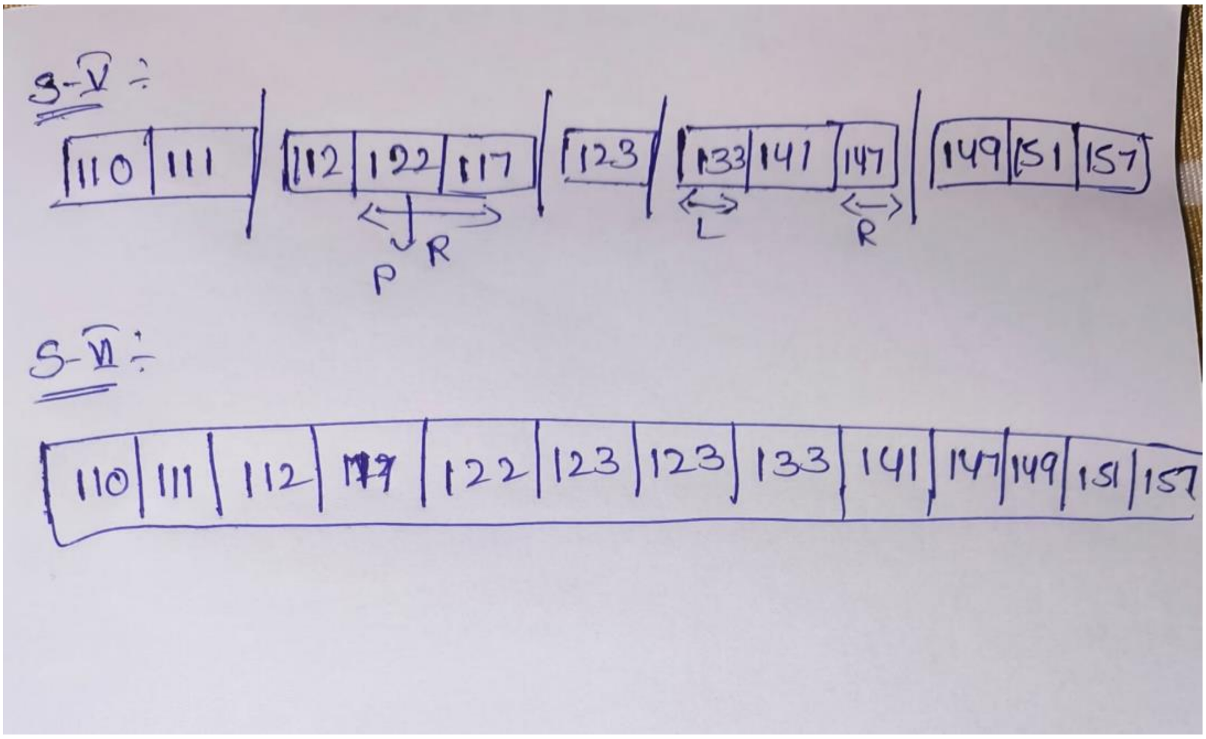
110	111	147	122	141	123	112	117	133	149	151	157

L pivot R

S-IV:

110	111	122	112	117	123	147	141	133	149	151	157

LP PR



S-V ÷

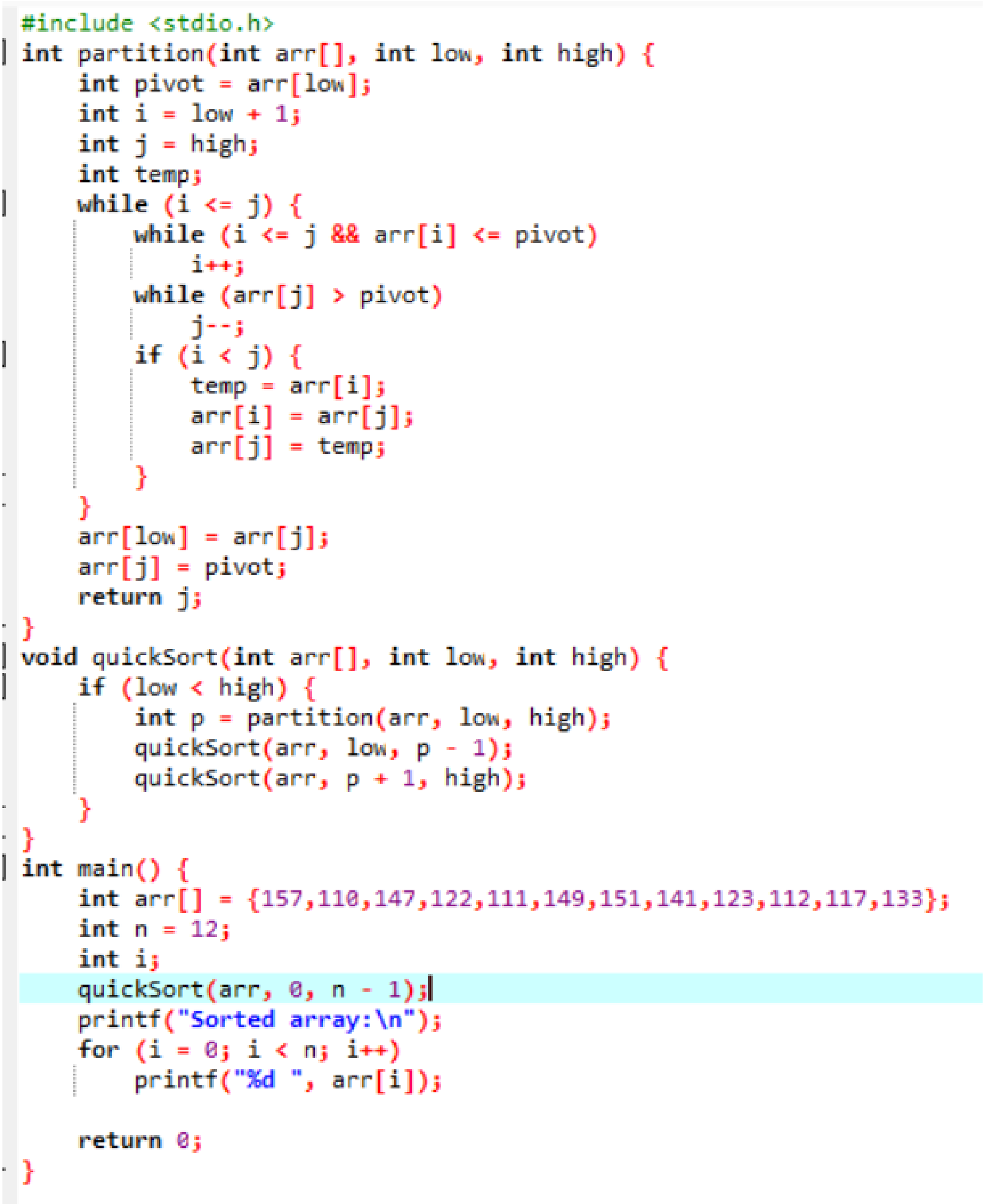
| 110 | 111 | | 112 | 122 | 117 | | 123 | | 133 | 141 | 147 | | 149 | 151 | 157 |

S-VI ÷

| 110 | 111 | 112 | 117 | 122 | 123 | 123 | 133 | 141 | 147 | 149 | 151 | 157 |

First Element as Pivot

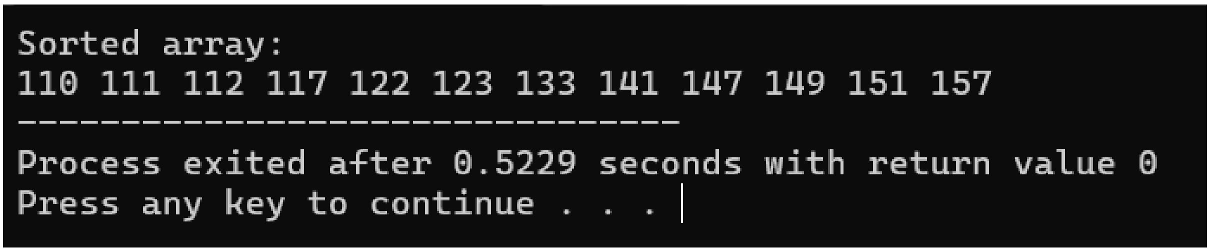
Code :



```c
#include <stdio.h>
int partition(int arr[], int low, int high) {
    int pivot = arr[low];
    int i = low + 1;
    int j = high;
    int temp;
    while (i <= j) {
        while (i <= j && arr[i] <= pivot)
            i++;
        while (arr[j] > pivot)
            j--;
        if (i < j) {
            temp = arr[i];
            arr[i] = arr[j];
            arr[j] = temp;
        }
    }
    arr[low] = arr[j];
    arr[j] = pivot;
    return j;
}
void quickSort(int arr[], int low, int high) {
    if (low < high) {
        int p = partition(arr, low, high);
        quickSort(arr, low, p - 1);
        quickSort(arr, p + 1, high);
    }
}
int main() {
    int arr[] = {157,110,147,122,111,149,151,141,123,112,117,133};
    int n = 12;
    int i;
    quickSort(arr, 0, n - 1);
    printf("Sorted array:\n");
    for (i = 0; i < n; i++)
        printf("%d ", arr[i]);

    return 0;
}
```

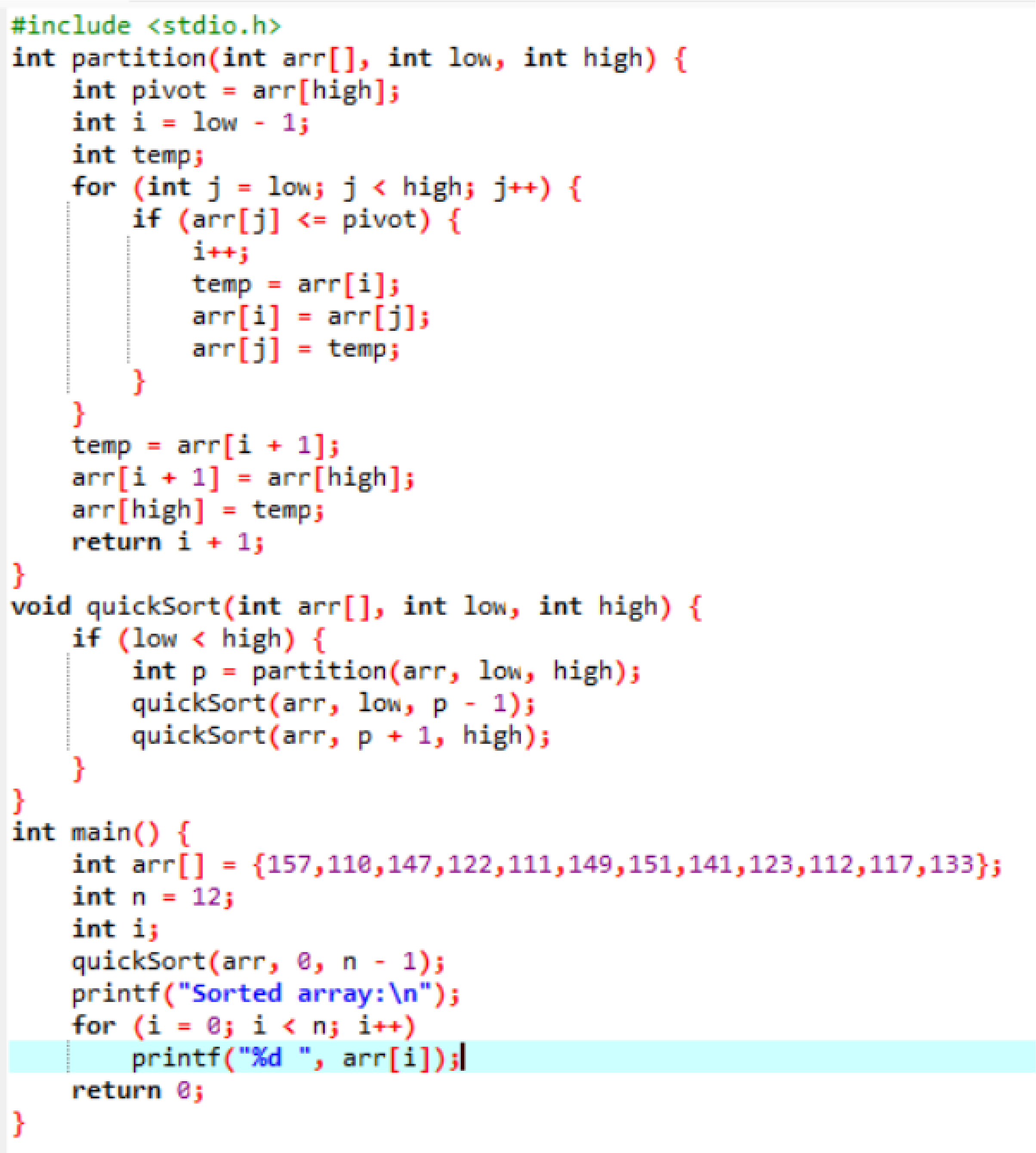
Output :



```
Sorted array:
110 111 112 117 122 123 133 141 147 149 151 157
--------------------------------
Process exited after 0.5229 seconds with return value 0
Press any key to continue . . .
```

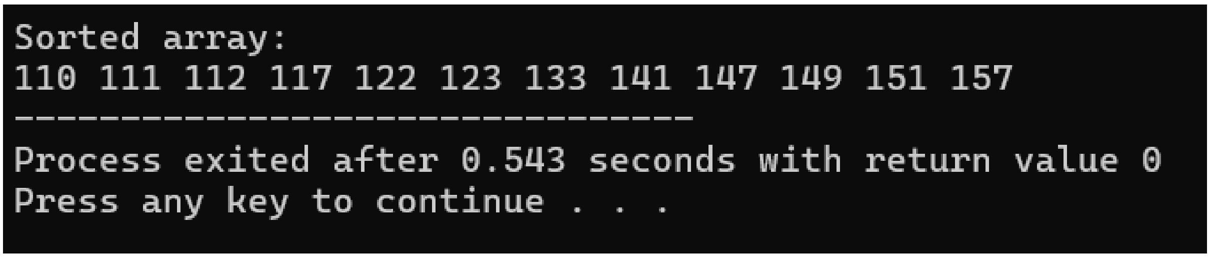
Last Element as Pivot

Code :



```c
#include <stdio.h>
int partition(int arr[], int low, int high) {
    int pivot = arr[high];
    int i = low - 1;
    int temp;
    for (int j = low; j < high; j++) {
        if (arr[j] <= pivot) {
            i++;
            temp = arr[i];
            arr[i] = arr[j];
            arr[j] = temp;
        }
    }
    temp = arr[i + 1];
    arr[i + 1] = arr[high];
    arr[high] = temp;
    return i + 1;
}
void quickSort(int arr[], int low, int high) {
    if (low < high) {
        int p = partition(arr, low, high);
        quickSort(arr, low, p - 1);
        quickSort(arr, p + 1, high);
    }
}
int main() {
    int arr[] = {157,110,147,122,111,149,151,141,123,112,117,133};
    int n = 12;
    int i;
    quickSort(arr, 0, n - 1);
    printf("Sorted array:\n");
    for (i = 0; i < n; i++)
        printf("%d ", arr[i]);
    return 0;
}
```

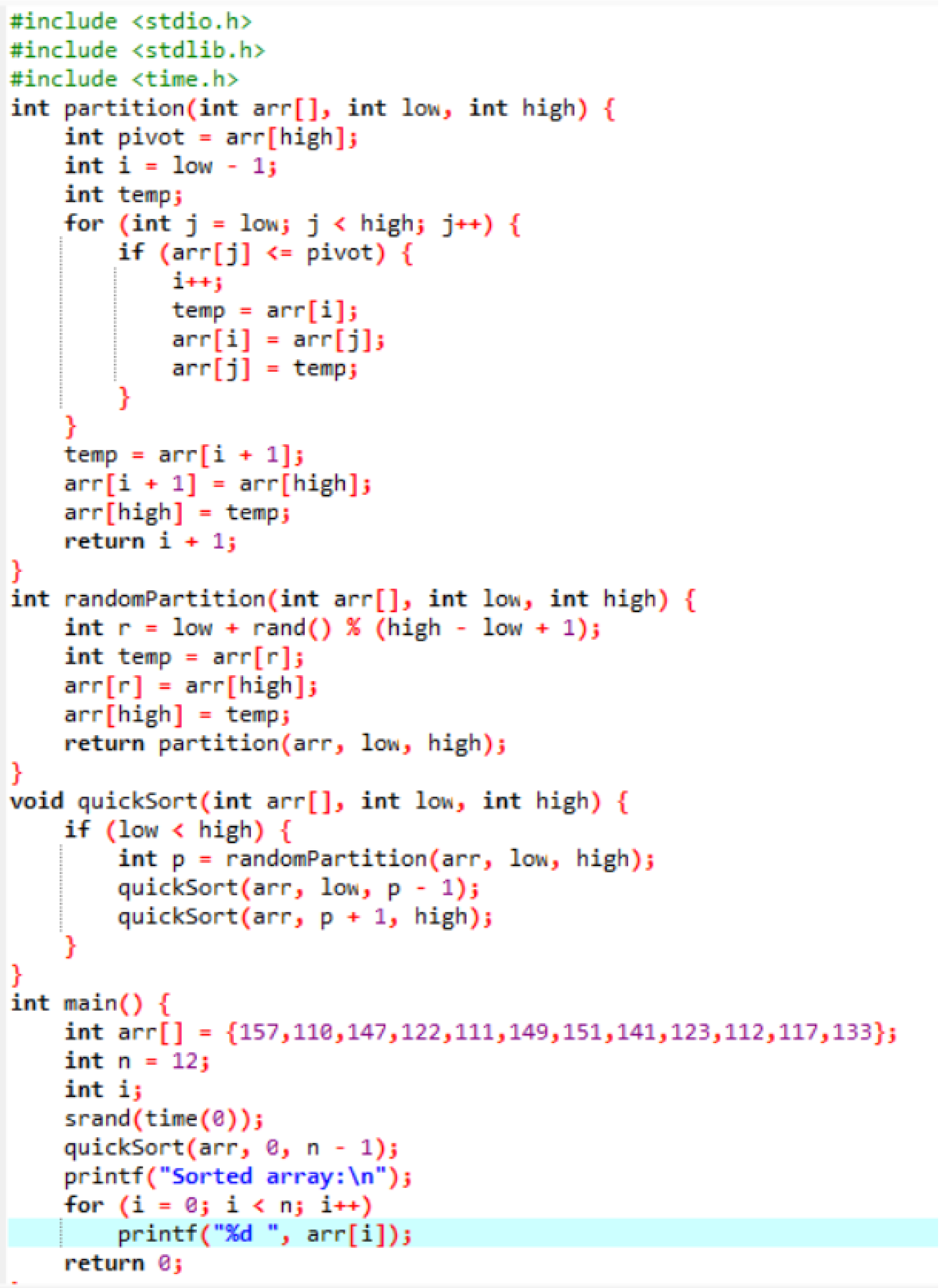
Output :



```
Sorted array:
110 111 112 117 122 123 133 141 147 149 151 157
--------------------------------
Process exited after 0.543 seconds with return value 0
Press any key to continue . . .
```

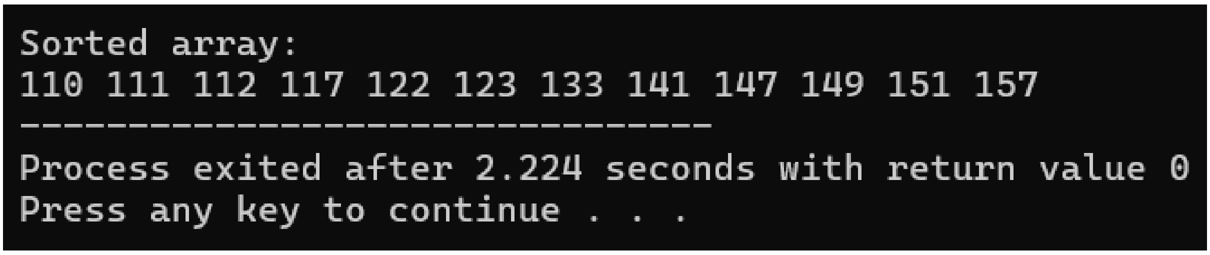
Random Element as Pivot

Code :



```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
int partition(int arr[], int low, int high) {
    int pivot = arr[high];
    int i = low - 1;
    int temp;
    for (int j = low; j < high; j++) {
        if (arr[j] <= pivot) {
            i++;
            temp = arr[i];
            arr[i] = arr[j];
            arr[j] = temp;
        }
    }
    temp = arr[i + 1];
    arr[i + 1] = arr[high];
    arr[high] = temp;
    return i + 1;
}
int randomPartition(int arr[], int low, int high) {
    int r = low + rand() % (high - low + 1);
    int temp = arr[r];
    arr[r] = arr[high];
    arr[high] = temp;
    return partition(arr, low, high);
}
void quickSort(int arr[], int low, int high) {
    if (low < high) {
        int p = randomPartition(arr, low, high);
        quickSort(arr, low, p - 1);
        quickSort(arr, p + 1, high);
    }
}
int main() {
    int arr[] = {157,110,147,122,111,149,151,141,123,112,117,133};
    int n = 12;
    int i;
    srand(time(0));
    quickSort(arr, 0, n - 1);
    printf("Sorted array:\n");
    for (i = 0; i < n; i++)
        printf("%d ", arr[i]);
    return 0;
```

Output :



```
Sorted array:
110 111 112 117 122 123 133 141 147 149 151 157
--------------------------------
Process exited after 2.224 seconds with return value 0
Press any key to continue . . .
```