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INSERTION SORTING:

```
#include <stdio.h>
void insertionSort(int arr[], int n) {
    int i, key, j;
    for (i = 1; i < n; i++) {
        key = arr[i];
        j = i - 1;
        while (j >= 0 && arr[j] > key) {
            arr[j + 1] = arr[j];
            j = j - 1;
        }
        arr[j + 1] = key;
    }
}
void printArray(int arr[], int size) {
    int i;
    for (i = 0; i < size; i++)
        printf("%d ", arr[i]);
    printf("\n");
}
int main() {
    int arr[] = {7,3,10,4,1,11};
    int n = sizeof(arr) / sizeof(arr[0]);
    printf("Original array: \n");
    printArray(arr, n);
```

```
    insertionSort(arr, n);
    printf("Sorted array: \n");
    printArray(arr, n);
return 0;
}
```

OUTPUT:

```
Original array:
7 3 10 4 1 11
Sorted array:
1 3 4 7 10 11
```

MERGE SORTING:

```
#include <stdio.h>
#include <stdlib.h>
void merge(int arr[], int l, int m, int r) {
    int n1 = m - l + 1;
    int n2 = r - m;
    int *L = (int *)malloc(n1 * sizeof(int));
    int *R = (int *)malloc(n2 * sizeof(int));
    for (int i = 0; i < n1; i++)
        L[i] = arr[l + i];
    for (int j = 0; j < n2; j++)
        R[j] = arr[m + 1 + j];
    int i = 0; // Initial index of first subarray
    int j = 0; // Initial index of second subarray
    int k = l; // Initial index of merged subarray
    while (i < n1 && j < n2) {
        if (L[i] <= R[j]) {
            arr[k] = L[i];
            i++;
        } else {
```

```
            arr[k] = R[j];
            j++;
        }
        k++;
    }
    while (i < n1) {
        arr[k] = L[i];
        i++;
        k++;
    }
    while (j < n2) {
        arr[k] = R[j];
        j++;
        k++;
    }
    free(L);
    free(R);
}
void mergeSort(int arr[], int l, int r) {
    if (l < r) {
        int m = l + (r - l) / 2;
        mergeSort(arr, l, m);
        mergeSort(arr, m + 1, r);
        merge(arr, l, m, r);
    }
}
void printArray(int arr[], int size) {
    for (int i = 0; i < size; i++)
        printf("%d ", arr[i]);
    printf("\n");
}
```

```
int main() {
    int arr[] = {16,9,2,20,14,3,10,7};
    int size = sizeof(arr) / sizeof(arr[0]);
    printf("Original array: \n");
    printArray(arr, size);
    mergeSort(arr, 0, size - 1);
    printf("Sorted array: \n");
    printArray(arr, size);
    return 0;
}
```

OUTPUT:

```
Original array:
16 9 2 20 14 3 10 7
Sorted array:
2 3 7 9 10 14 16 20
```

REDIX SORTING:

```
#include <stdio.h>
#include <stdlib.h>
int getMax(int arr[], int n) {
    int max = arr[0];
    for (int i = 1; i < n; i++)
        if (arr[i] > max)
            max = arr[i];
    return max;
}
void countingSort(int arr[], int n, int exp) {
    int *output = (int *)malloc(n * sizeof(int));
    int count[10] = {0};
    for (int i = 0; i < n; i++)
        count[(arr[i] / exp) % 10]++;
```

```
    for (int i = 1; i < 10; i++)
        count[i] += count[i - 1];
    for (int i = n - 1; i >= 0; i--) {
        output[count[(arr[i] / exp) % 10] - 1] = arr[i];
        count[(arr[i] / exp) % 10]--;
    }
    for (int i = 0; i < n; i++)
        arr[i] = output[i];
    free(output);
}
void radixSort(int arr[], int n) {
    int max = getMax(arr, n);
    for (int exp = 1; max / exp > 0; exp *= 10)
        countingSort(arr, n, exp);
}
void printArray(int arr[], int size) {
    for (int i = 0; i < size; i++)
        printf("%d ", arr[i]);
    printf("\n");
}
int main() {
    int arr[] = {170, 45, 75, 90, 802, 24, 2, 66};
    int n = sizeof(arr) / sizeof(arr[0]);
    printf("Original array: \n");
    printArray(arr, n);
    radixSort(arr, n);
    printf("Sorted array: \n");
    printArray(arr, n);
    return 0;
}
```

OUTPUT:

Original array:

170 45 75 90 802 24 2 66

Sorted array:

2 24 45 66 75 90 170 802