Name: Vijay Misal

Div: C Batch: C3

Roll No: 233073

PRN No: 22320079

**Practical No: 9**

**Title:** a) The internship is offered to students based on rank obtained in second year of graduation. Create suitable non-linear data structure to identify next topper student for internship. (Create max-heap).

b) Sort the student data in ascending order of grades

**Code:**

*// a) The internship is offered to students based on rank obtained in second year of graduation. Create*

*// suitable non-linear data structure to identify next topper student for internship. (Create max-heap).*

*// b) Sort the student data in ascending order of grades.*

import **java**.**util**.**Scanner**;

class **Main** {

    public static void **main**(**String**[] args) {

**Scanner** sc = new **Scanner**(**System**.in);

**System**.out.**println**("Enter the number of students: ");

        int n = sc.**nextInt**();

**MaxHeap** heap = new **MaxHeap**(n);

        for (int i = 0; i < n; i++) {

**System**.out.**println**("Enter the name of student " + (i + 1) + ": ");

**String** name = sc.**next**();

**System**.out.**println**("Enter the rank of student " + (i + 1) + ": ");

            int rank = sc.**nextInt**();

            heap.**insert**(name, rank);

        }

**System**.out.**println**("The next topper student for internship is: ");

        heap.**peek**();

**System**.out.**println**("The students sorted in ascending order of grades are: ");

        heap.**sort**();

        sc.**close**();

    }

}

class **MaxHeap** {

    private **Student**[] heap;

    private int size;

    private int maxSize;

    public **MaxHeap**(int maxSize) {

        this.maxSize = maxSize;

        this.size = 0;

        heap = new **Student**[this.maxSize + 1];

        heap[0] = new **Student**("", **Integer**.MAX\_VALUE);

    }

    private int **parent**(int pos) {

        return pos / 2;

    }

    private int **leftChild**(int pos) {

        return 2 \* pos;

    }

    private int **rightChild**(int pos) {

        return 2 \* pos + 1;

    }

    private boolean **isLeaf**(int pos) {

        return pos >= (size / 2) && pos <= size;

    }

    private void **swap**(int fpos, int spos) {

**Student** tmp;

        tmp = heap[fpos];

        heap[fpos] = heap[spos];

        heap[spos] = tmp;

    }

    private void **maxHeapify**(int pos) {

        if (!**isLeaf**(pos)) {

            if (heap[pos].rank < heap[**leftChild**(pos)].rank || heap[pos].rank < heap[**rightChild**(pos)].rank) {

                if (heap[**leftChild**(pos)].rank > heap[**rightChild**(pos)].rank) {

**swap**(pos, **leftChild**(pos));

**maxHeapify**(**leftChild**(pos));

                } else {

**swap**(pos, **rightChild**(pos));

**maxHeapify**(**rightChild**(pos));

                }

            }

        }

    }

    public void **insert**(**String** name, int rank) {

        heap[++size] = new **Student**(name, rank);

        int current = size;

        while (heap[current].rank > heap[**parent**(current)].rank) {

**swap**(current, **parent**(current));

            current = **parent**(current);

        }

    }

    public void **peek**() {

**System**.out.**println**(heap[1].name);

    }

    public void **sort**() {

        for (int i = size / 2; i >= 1; i--) {

**maxHeapify**(i);

        }

        for (int i = size; i > 1; i--) {

**swap**(1, i);

            size--;

**maxHeapify**(1);

        }

        for (int i = 1; i <= size; i++) {

**System**.out.**println**(heap[i].name + " " + heap[i].rank);

        }

    }

}

class **Student** {

**String** name;

    int rank;

    public **Student**(**String** name, int rank) {

        this.name = name;

        this.rank = rank;

    }

}

**Output:**Enter the number of students:

5

Enter the name of student 1:

vijay

Enter the rank of student 1:

2

Enter the name of student 2:

shubham

Enter the rank of student 2:

3

Enter the name of student 3:

kanhaiya

Enter the rank of student 3:

5

Enter the name of student 4:

siddhant

Enter the rank of student 4:

4

Enter the name of student 5:

vedant

Enter the rank of student 5:

1

The next topper student for internship is:

kanhaiya

The students sorted in ascending order of grades are:

vedant 1