Student Lab Activity Report

Course Code:	**223 CSM-3**
Course Name:	**Advanced Object Oriented Programming**
Section Number:	**6465**
Deadline	**9 / 2 / 2021**
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Activity 1: Multithreading

Write a program that finds the maximum value in an array of integers using 4 threads. You should construct your array of random numbers (use the Random class). You may assume in your threaded code that the array has at least 4 elements.
The array will be divided among the four threads so that each one of them will find the maximum of its part. Then the main thread will collect the four results and find the absolute maximum of the array.
The part of each thread is delimited by the value lo, calculated as follows:

lo = (i * len) / 4

where i is the number of the thread part starting by 0, and len is the length of the array.

- Find the following code and add:
  - Two more thread to handle the other parts of the array.*(4 points)*
  - Ues the thread in the main method. *(2 points)*
  - Compare the max value of each part and find the largest one.*(4 points)*

Points out of 10	
Date	**16 / 2 / 2021**
Instructor	**Khalid Alasiri**

Use this code to help you:

```
class Th1 extends Thread {
	int a[];
	public Th1(int arr[]) {
		super();
		a = new int [arr.length /4];
		int lo = (0 * arr.length) /4;
		for (int i = lo, j = 0; j < a.length ; i++, j++) {
			a[j] = arr[i];
		}
	}
	public void run() {
		int max = a[0];
		System.out.println("Part 1 ");
		for (int i = 0; i < a.length; i++)
		{
			System.out.print(a[i] + " ");
			if (max < a[i])
				max = a[i];
		}
		System.out.println("The max value "+ max);
	}
}
class Th2 extends Thread {
	int a[];
	public Th2(int arr[]) {
		super();
		a = new int [arr.length /4];
		int lo = (1 * arr.length) /4;
		for (int i = lo, j = 0; j < a.length ; i++, j++) {
			a[j] = arr[i];
		}
	}

	public void run() {
		int max = a[0];
		System.out.println("Part 2 ");
		for (int i = 0; i < a.length; i++)
		{
			System.out.print(a[i] + " ");
			if (max < a[i])
				max = a[i];
		}
		System.out.println("The max value "+ max);
	}
}

public class ArrayMax {
	public static void main(String[] args) {
		int arr[] = new int [20];

		for (int i = 0; i < arr.length; i++) {
			arr[i] = (int) (Math.random() * 100);
```

```
                }

                for (int i = 0; i < arr.length; i++) {
                        System.out.print(arr[i]+" ");
                }

                System.out.println();
                Th1 th1 = new Th1(arr);
                Th2 th2 = new Th2(arr);
                th1.start();
                th2.start();
        }
}
```

Your Answer:

The Code

```
class Th1 extends Thread {
        int a[];
        public int maxVal;
        public Th1(int arr[]) {
                super();
                a = new int [arr.length /4];
                int lo = (0 * arr.length) /4;
                for (int i = lo, j = 0; j < a.length ; i++, j++) {
                        a[j] = arr[i];
                }
        }
        public void run() {
                int max1 = a[0];
                for (int i = 0; i < a.length; i++)
                {
                        if (max1 < a[i])
                                max1 = a[i];
                }

                System.out.println("The max value of part 1 : "+ max1);
                maxVal = max1;
        }
}
class Th2 extends Thread {
        int a[];
        public int maxVal;

        public Th2(int arr[]) {
                super();
                a = new int [arr.length /4];
```

```
		int lo = (1 * arr.length) /4;
		for (int i = lo, j = 0; j < a.length ; i++, j++) {
			a[j] = arr[i];
		}
	}

	public void run() {
		int max2 = a[0];
		for (int i = 0; i < a.length; i++)
		{
			if (max2 < a[i])
				max2 = a[i];
		}
		System.out.println("The max value of part 2 : "+ max2);
		maxVal = max2;
	}
}

class Th3 extends Thread {
	int a[];
	public int maxVal;

	public Th3(int arr[]) {
		super();
		a = new int [arr.length /4];
		int lo = (2 * arr.length) /4;
		for (int i = lo, j = 0; j < a.length ; i++, j++) {
			a[j] = arr[i];
		}
	}
	public void run() {
		int max3 = a[0];
		for (int i = 0; i < a.length; i++)
		{
			if (max3 < a[i])
				max3 = a[i];
		}
		System.out.println("The max value of part 3 : "+ max3);
		maxVal = max3;
	}
}

class Th4 extends Thread {
	int a[];
	public int maxVal;

	public Th4(int arr[]) {
		super();
		a = new int [arr.length /4];
		int lo = ( 3 * arr.length) /4;
		for (int i = lo, j = 0; j < a.length ; i++, j++) {
			a[j] = arr[i];
		}
	}
	public void run() {
```

```
		int max4 = a[0];
		for (int i = 0; i < a.length; i++)
		{
			if (max4 < a[i])
				max4 = a[i];
		}
		System.out.println("The max value of part 4 : "+ max4);
		maxVal = max4;
	}
}


class Th5 extends Thread {
	int a[];
	public int maxVal;
	public Th5(int arr[]) {
		super();
		a = arr;

	}
	public void run() {


		Th1 th1 = new Th1(a);
		Th2 th2 = new Th2(a);
		Th3 th3 = new Th3(a);
		Th4 th4 = new Th4(a);



		th1.start();
		th2.start();
		th3.start();
		th4.start();

		try {
			th1.join();
			th2.join();
			th3.join();
			th4.join();
			int maxVal = th1.maxVal;
			maxVal = Math.max(maxVal, th2.maxVal);
			maxVal = Math.max(maxVal, th3.maxVal);
			maxVal = Math.max(maxVal, th4.maxVal);
			System.out.println("The max value of all parts : " + maxVal);
	  } catch (InterruptedException e) {
	      e.printStackTrace();
	  }

	}
}
public class ArrayMaxOfAll {
	public static void main(String[] args) {
		int arr[] = new int [20];
```

```
            for (int i = 0; i < arr.length; i++) {
                  arr[i] = (int) (Math.random() * 100);
            }

            for (int i = 0; i < arr.length; i++) {
                  System.out.print(arr[i]+" ");
            }
            System.out.println();

            Th5 th5 = new Th5(arr);
            th5.start();


      }
}
```

Screenshot of outputs