Código Asignatura:
ISC-314

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Trabajo:
Multiplicación de Karatsuba

```
package logical;

import java.io.IOException;
import java.math.BigInteger;
import java.util.Random;
import java.lang.Math;

public class Karatsub {

	public static BigInteger create_bigi(int size) throws IOException
	{
		String sa;
		BigInteger biA;
		long rgenseed ;
		byte [] arb = new byte[size];
		Random rgen = new Random();
		rgenseed = System.currentTimeMillis();
		rgen.setSeed(rgenseed);
		arb[0] = (byte)(rgen.nextInt(9) + 49); // para asegurar que la primera cifra no
sea 0

		for(int i = 1; i < size; i++)
			arb[i] = (byte)(rgen.nextInt(10) + 48);

		sa = new String(arb,"UTF-8");
		biA = new BigInteger(sa);
		return biA;

	}

	private static void calc_time(long dif)
	{
		int seg, mili, micro, nano, mil;
		mil = 1000;
		nano = (int)dif % mil ;
		dif = dif / mil;
		micro = (int)dif % mil;
		dif = (int)dif / mil;
		mili = (int)dif % mil;
		seg = (int)dif / mil;
		System.out.println( "Tardamos " + seg + " segundos " + mili + " ms " + micro
+ " micro " + nano + " nano\n");

	}
```

```
    private static BigInteger multip(BigInteger x, BigInteger y)
    {
            return x.multiply(y);
    }


    private static BigInteger Normal(BigInteger x, BigInteger y)
    {
            String a, b;
            double multi =0;
            BigInteger result = null;

            result = BigInteger.ZERO;

            a = x.toString();
            b = y.toString();
            b = new StringBuilder(b).reverse().toString();

            for(int i=0; i < b.length();i++)
            {
                    for(int j=0; j < a.length();j++)
                    {
                            multi+=(long)a.charAt(i)*b.charAt(j);
                    }
                    result = result.add(BigInteger.valueOf((long) multi));
            }

            return result;
    }


    private static BigInteger Karatsuba(BigInteger x, BigInteger y)
    {
            int N = Math.max(x.bitLength(), y.bitLength());
if (N <= 1000) return x.multiply(y);

N = (N / 2) + (N % 2);

BigInteger b = x.shiftRight(N);
BigInteger a = x.subtract(b.shiftLeft(N));
BigInteger d = y.shiftRight(N);
BigInteger c = y.subtract(d.shiftLeft(N));

BigInteger ac    = Karatsuba(a, c);
BigInteger bd    = Karatsuba(b, d);
BigInteger abcd  = Karatsuba(a.add(b), c.add(d));
```

```
return ac.add(abcd.subtract(ac).subtract(bd).shiftLeft(N)).add(bd.shiftLeft(2*N));
   }

   public static void main(String[] args) {

            int tam = 2390;
            BigInteger a = null, b = null;
            try {
                     a = create_bigi(tam);
                     b = create_bigi(tam);
                     String s1, s2;
                     s1 = a.toString();
                     s2 = b.toString();

                     System.out.println("BigInt a:" + s1.substring(0, 40));
                     System.out.println("BigInt b:" + s2.substring(s2.length()/2));

            } catch (IOException e) {
                    e.printStackTrace();
            }

            long startTime = System.nanoTime();

            BigInteger result = multip(a, b);
            System.out.println("Resultado:" + result.toString().substring(0,40));

            long difference = System.nanoTime() - startTime;
            calc_time(difference);

            System.out.println("Multiplicacion de Karatsuba");
            long startTime1 = System.nanoTime();
            BigInteger Karatresult = Karatsuba(a, b);

            System.out.println("Resultado:" + Karatresult.toString().substring(0, 40));
            long difference1 = System.nanoTime() - startTime1;
            calc_time(difference1);

            System.out.println("Multiplicacion Normal");
            long startTime2 = System.nanoTime();
            BigInteger Normalresult = Normal(a, b);
            String s;
            s = String.valueOf(Normalresult);
            System.out.println("Resultado:" + s);
            long difference2 = System.nanoTime() - startTime2;
            calc_time(difference2); }}
```