Program: SHA

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import java.util.*;
public class p7{
   public static int messLength = 0;
   public static void main(String[] args) {
      Scanner scn = new Scanner(System.in);
      //Getting the word
      System.out.println("\tName : Vaibhav Mehar");
      System.out.println("\tRoll No : 58   Sec : B");
      System.out.println("\tPractical No : 07");
      System.out.println("\tAim : Implement SHA-1 Hashing function");
      System.out.print("\tInsert a word a phrase to be hashed\t");
      String word = scn.nextLine();
      System.out.println("Plain Text: " + word);
      //Converting the word to binary
      String binary = convertToBinary(word);
      System.out.println(binary);
      messLength = binary.length();
      calculateMod(word, binary);
   }
   public static String convertToBinary(String word) {
      byte[] bytes = word.getBytes();
      StringBuilder binary = new StringBuilder();
      for (byte b : bytes) {
         int val = b;
         for (int i = 0; i < 8; i++){
            binary.append((val & 128) == 0 ? 0 : 1);
            val <<= 1;
         }
         binary.append(' ');
      }
      return binary.toString();
   }
   public static void calculateMod(String word, String binary) {
      int binaryMessageLength = word.length() * 8 - 8; //the -8 will be taken into account below.
      String endBitLength = calculateMessageLength(binaryMessageLength+8); //add back 8 for
accuracy
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        int subMod = endBitLength.length();
        int temp = (binaryMessageLength) % 512;
        if (432 - temp < 0) {
            int x = 512 - temp;
            temp = x + 440 + temp + 64;
        } else {
            temp = 432 - temp;
        }
        int binaryZeros = temp;
        String onePadded = "10000000"; //add back the removed 8
        binary = binary.replaceAll("\\s+", ""); //remove spaces
        createMessageLength(binary, onePadded, binaryZeros, endBitLength); //creates the 512 bit message
    }
    public static String calculateMessageLength(int bitLength) {
        String tempBitsLength = Integer.toBinaryString(bitLength);
        StringBuilder sb = new StringBuilder(tempBitsLength);
        int temp = 64 - tempBitsLength.length();
        while (temp > 0) {
            sb.insert(0, 0);
            temp--;
        }
        return sb.toString();
    }
    //create complete message
    public static String createMessageLength(String message, String paddedOne, int zeros, String endLength) {
        StringBuilder messageBinary = new StringBuilder(message);
        messageBinary.insert(messageBinary.toString().length(), paddedOne);
        while (zeros > 0) {
            messageBinary.insert(messageBinary.toString().length(), 0);
            zeros--;
        }
        messageBinary.insert(messageBinary.toString().length(), endLength);
        String m = printMessage(messageBinary.toString());
        m = m.replaceAll("\\s+", "");
        int[] mArray = new int[m.toString().length()/32];
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        for (int i = 0; i < m.toString().length(); i+=32) {
            mArray[i/32] = Integer.valueOf(m.substring(i+1, i+32),2);
            if(m.charAt(i) == '1'){
                mArray[i/32] |= 0X80000000;
            }
           // System.out.printf("Decimal(iterator), String(Binary), Hex values of input: %d %s %x\n", i,
m.substring(i, i+32),mArray[i/32]);
        }
        hash(mArray);
        return messageBinary.toString();
    }
    public static String printMessage(String message) {
        StringBuilder sb = new StringBuilder(message);
        int num = message.length();
        while (num > 0) {
            if (num % 32 == 0) {
                sb.insert(num, " ");
            }
            num--;
        }
        return sb.toString();
    }
    private static int leftrotate(int x, int shift) { //leftrotate function
        return ((x << shift) | (x >>> (32 - shift)));  //>>> is an UNSIGNED shift compared >> which is not
    }
    //instance variables
    private static int h1 = 0x67452301;
    private static int h2 = 0xEFCDAB89;
    private static int h3 = 0x98BADCFE;
    private static int h4 = 0x10325476;
    private static int h5 = 0xC3D2E1F0;
    private static int k1 = 0x5A827999;
    private static int k2 = 0x6ED9EBA1;
    private static int k3 = 0x8F1BBCDC;
    private static int k4 = 0xCA62C1D6;
    private static String hash(int[] z) {
        //Extend the sixteen 32-bit words into eighty 32-bit words
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int integer_count = z.length;
int[] intArray = new int[80];
int j = 0;
for(int i = 0; i < integer_count; i += 16) {
   for(j = 0; j <= 15; j++)
      intArray[j] = z[j+i];
   for ( j = 16; j <= 79; j++ ) {
      //w[i] = (w[i-3] xor w[i-8] xor w[i-14] xor w[i-16]) leftrotate 1
      intArray[j] = leftrotate(intArray[j - 3] ^ intArray[j - 8] ^ intArray[j - 14] ^ intArray[j - 16], 1);
   }
   //  calculate A,B,C,D,E:
   int A = h1;
   int B = h2;
   int C = h3;
   int D = h4;
   int E = h5;
   int t = 0; //temp
   for ( int x = 0; x <= 19; x++ ) {
      //temp = leftrotate(a leftrotate 5) + f(t) + e + w[i] + k
      t = leftrotate(A,5)+((B&C)|((~B)&D))+E+intArray[x]+k1;
      E=D; D=C; C=leftrotate(B,30); B=A; A=t;
   }
   for ( int b = 20; b <= 39; b++ ) {
      t = leftrotate(A,5)+(B^C^D)+E+intArray[b]+k2;
      E=D; D=C; C=leftrotate(B,30); B=A; A=t;
   }
   for (int c = 40; c <= 59; c++ ) {
      t = leftrotate(A,5)+((B&C)|(B&D)|(C&D))+E+intArray[c]+k3;
      E=D; D=C; C=leftrotate(B,30); B=A; A=t;
   }
   for ( int d = 60; d <= 79; d++ ) {
      t = leftrotate(A,5)+(B^C^D)+E+intArray[d]+k4;
      E=D; D=C; C=leftrotate(B,30); B=A; A=t;
   }
   h1+=A; h2+=B; h3+=C; h4+=D; h5+=E;
}
String h1Length = Integer.toHexString(h1);
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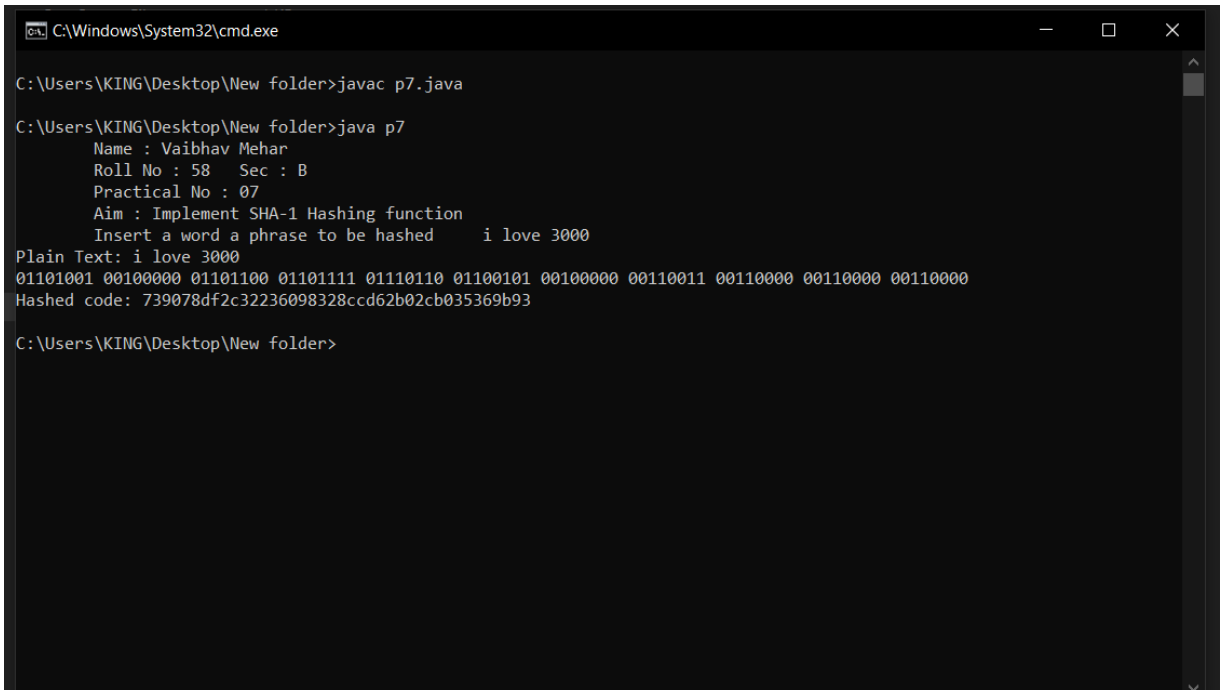
```
        String h2Length = Integer.toHexString(h2);
        String h3Length = Integer.toHexString(h3);
        String h4Length = Integer.toHexString(h4);
        String h5Length = Integer.toHexString(h5);
        //System.out.println(h1Length.length());

        //Integer.toHexString does not include extra leading 0's
        if(h1Length.length() < 8) {
           StringBuilder h1L = new StringBuilder(h1Length);
           h1L.insert(0,0);
           h1Length = h1L.toString();
        } else if(h2Length.length() < 8) {
           StringBuilder h2L = new StringBuilder(h2Length);
           h2L.insert(0,0);
           h2Length = h2L.toString();
        } else if(h3Length.length() < 8) {
           StringBuilder h3L = new StringBuilder(h3Length);
           h3L.insert(0,0);
           h3Length = h3L.toString();
        } else if(h4Length.length() < 8) {
           StringBuilder h4L = new StringBuilder(h4Length);
           h4L.insert(0,0);
           h4Length = h4L.toString();
        } else if(h5Length.length() < 8) {
           StringBuilder h5L = new StringBuilder(h5Length);
           h5L.insert(0,0);
           h5Length = h5L.toString();
        }
        //result
        String hh = h1Length + h2Length + h3Length + h4Length + h5Length;
        System.out.println("Hashed code: " + hh);
        return null;
     }
}
```

Output:


C:\Windows\System32\cmd.exe
C:\Users\KING\Desktop\New folder>javac p7.java
C:\Users\KING\Desktop\New folder>java p7
Name : Vaibhav Mehar
Roll No : 58 Sec : B
Practical No : 07
Aim : Implement SHA-1 Hashing function
Insert a word a phrase to be hashed i love 3000
Plain Text: i love 3000
01101001 00100000 01101100 01101111 01110110 01100101 00100000 00110011 00110000 00110000 00110000
Hashed code: 739078df2c32236098328ccd62b02cb035369b93
C:\Users\KING\Desktop\New folder>