Cathal McSweeney : 19731485

OOP ASSIGNMENT THREE – PALINDROMES

Problem Statement:

For this assignment we are faced with testing if a number is a palindrome i.e. If it is the same reversed as it is forwards. We are also required to make a number of methods to complete this task which we must test and complete a complexity analysis on.

Frist we identified what methods would be required and what they would be required to do. For this assignment a total of 7 was required. 4 Four of these made up the methods as outlined in the assignment. We then have the main method that call these methods. We have a function that is used to populate an array with binary numbers, finally we have a recursive method that is to be used in conjunction with the fourth method that we are use for the complexity analysis. We also need to keep in mind that method 3 will be requiring the use of a queue and stack class. For each of the methods we are to have them check all numbers between 0 & 1million. Identifying which ones are palindromes and which are not.

First we create a method that instantiates an array of binary numbers between 0 & 1million. This calls on a method that will take each decimal number and through using modulus will find the binary equivalent of that number then store it as a string into the array.

Method one: reversing all digits in a string using a loop then storing them in another string. We then compare both strings to each other to determine if it is a palindrome and if it is a palindrome a Boolean value of true is returned, if not then a false is returned identifying that the number is in fact not a palindrome.

Method Two: Through using a loop we are going to compare a number to its reversed version through using two string. The first digit of the number will be compared to the last digit of the same number in a loop. As the loop iterates the numbers both move closer to the centre. If at any point a match isn’t found the loop breaks and a Boolean of false is returned. When they all match then a Boolean of true is returned.

Method Three: Implementing the use of the “ArrayStack” and “ArrayQueue” classes we would pass each individual character of each number sent to this method to both the ArrayQueue and the ArrayStack using their methods called “pop” and “enqueue”. These add the chars onto a stack where later in the method we call the removal function for both of these, comparing the results to eachother. The pop function gets the char at the top of the stack where as the dequeue gets the char at the bottom of the stack, effectively getting the first and last chars from a string. We then compare these chars to eachother. If they are no the same we then remove the remainder of the chars off the stacks and exit the method returning a false Boolean.

Method Four: We create a method that will take in a number string then through using a recursive method we get a reversed string of that same number. Once the string is returned we then compare the two strings using a “.equals()” method. If it is a palindrome then a true is returned if not a false is returned.

Reverse Function: This is a recursive function that calls itself for the length of a string that is passed into it, each subsequent call of itself uses a substring to get the string from the second char in the string and the first number being held in that instance of the recursion. Once the recursive method has iterated through each of the chars in the string it returns the appending string with the reverse version.

Decimal to Binary: this method takes an input in the form of an int and returns a string. Using an array, The input is iterated through in a loop where the modulus of 2 is used to divide the number the result of which is then stored into the array. The number in the loop is then divided by two. As the binary version of the input number is in reverse order in the array. A loop is used to rearrange it into the correct sequence through taking the char at the end of the array and adding it to the front of a string. Once this loop has been complete the correct binary number is then returned in the form of a string.

Analysis and Design Notes

Pseudocode :

- Main Method

```
For(1000000){
    Initialize array with objects
}
Initialize Array of binary nums
For(1000000){
    Call binary conversion method for each num up to 1 million
}

Get start time
For(1000000){
    Pass number into method one to be checked if a palindrome
    If true change object decimal boolean value to true
}
Get end time
Total time taken

Get start time
For(1000000){
    Pass binary number into method one to be checked if a palindrome
    If true change object binary boolean value to true
}
Get end time
Total time taken

Get start time
For(1000000){
    Pass number into method two to be checked if a palindrome
}
Get end time
```

```
Total time taken

Get start time
For(1000000){
    Pass binary number into method two to be checked if a palindrome
}
Get end time
Total time taken

Get start time
For(1000000){
    Pass number into method three to be checked if a palindrome
}
Get end time
Total time taken

Get start time
For(1000000){
    Pass binary number into method three to be checked if a palindrome
}
Get end time
Total time taken

Get start time
For(1000000){
    Pass number into method four to be checked if a palindrome
}
Get end time
Total time taken

Get start time
For(1000000){
    Pass binary number into method four to be checked if a palindrome
}
Get end time
Total time taken

Print out times taken per method
Print out numbers which are both palindromes
Print out testing results to ensure code is correct
```

- Method One

```
Public Boolean reversedString(input){
        Palindrome boolean
        String input
        String reversed
        For(length of input){
            Reversed += input.charAt(i)
        }

        If(reversed = input){
            Boolean = true
        }
        Return boolean
    }
```

- Method Two

```
    Public Boolean elementByElementCheck(input){
        Palindrome boolean
        String forward
        Int length of input
        For(length of input){
            If(forwardCharat(i)==forwardCharAt(length)){
                Boolean = true
                Length--
            }
            Else{
            Boolean = false
            break
            }
        }
        Return boolean
    }
```

- Method Three

```
    Public Boolean stackAndQueue(input){
        Palindrome boolean
        String input
        For(length of input){
            Push(input per char)
            Enqueue(input per char)
        }
        While(stack is not empty){
            If(pop == dequeue){
                continue
            }
            Else{
                Boolean is false
                Empty queue and stack
            }
        }
        Return boolean
    }
```

- Method Four

```
    Public Boolean elementByElementCheck(input){
        Palindrome boolean
        String forward = input
        String reverse = reverse(input)

        If(forward = reverse){
            Boolean = true
        }
        Else{
            Boolean = false
        }
        Return boolean
    }
```

- Recursive Method Reverse

```
    Public string reverse(input){
        If(input is empty){
            Return input
        }
        Return reverse(input.substring(1)) + first char
    }
```

- Decimal to Binary Method

```
    Public string stringToBinary(number){
        String binary
        Int array[]
        Int index
        While(num>0){
            Array[index++] = num%2
            Num = num/2
        }

        For(length of index, decrement each iteration){
            string += array[i]
        }
        Return string
    }
```

Flow of control

The order in which the code runs is the main class instantiates the class by calling the palindromes method.

This method begins with creating 1 million objects from the DecimalBinaryPalindromes class which contains only 2 Boolean values. Next it gets the binary representation of each number between 0 and 1 million, storing them in an array of strings. Next a variable gets the start time, followed by a loops that iterates through the decimal numbers 0 to 1 million which calls the reversedString method. In this method the string is reversed and using the .equals method identifies if it is a palindrome. Each time a palindrome is found a Boolean value of true is returned and a counter is iterated and the array of palindrome objects decimal Boolean is changed to true. Upon completion of the loop an end time is taken and the total time calculated. Next we have again a timer getting the start time followed by a loop of 1 million iterations starting at 0. The string being passed to the reversedString method is the binary representation of the decimal number. When a palindrome is found then a Boolean value is returned. The binary Boolean value of the palindrome is then changed to true. Upon completion of the loop a end time is taken and the total time calculated.

We then move onto testing method two which has the same layout as the testing for method one. Takes the time before commencing the loop to a million where each number is passed to the method called elementByElement. In this method the first char of a string is compared to the last char of the same string. If they match it continues to check the second char to the second last char and so on. If a non-match is found the method Returns a false Boolean value. If all are matches for the string are the same a true Boolean value is returned. The End time is taken and then the total time calculated. The binary version follows the same loop this time passing the binary representation as a string into the method with the return Boolean values being returned if it is a palindrome or not.

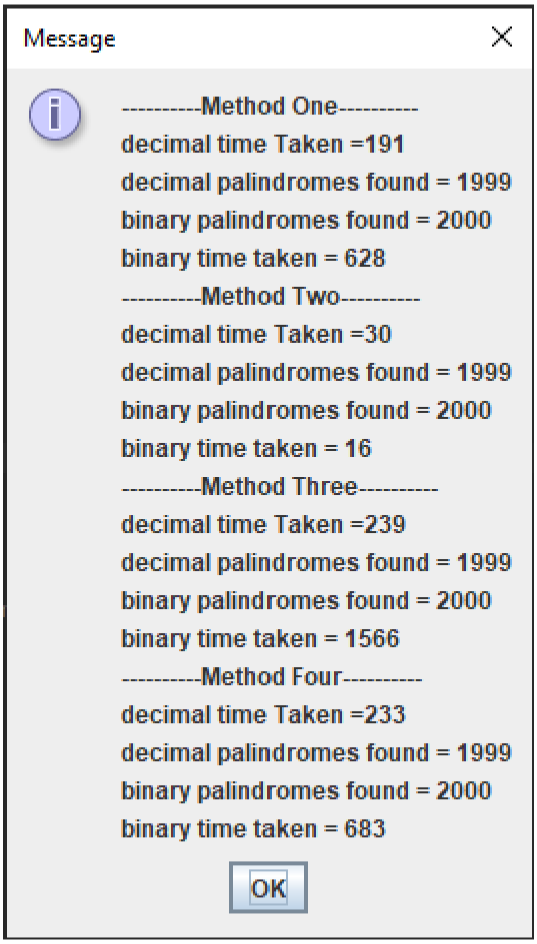
The third method is tested using the timing method and loop as the previous two methods. Both decimal and binary are passed to the method in separate loops with the return values being either a true or false boolean value depending if the string is a palindrome or not. The third method called stackAndQueue utilizes the ArrayStack and ArrayQueue classes by pushing and enqueueing the input string character by character to both the stack and queue. The program then uses the pop and dequeue methods of these classes to remove the first and last char of the same string and compare them. If they match the code continues to check the length of the string if a set doesn’t match then it exits the code and returns a false boolean value.

The Fourth and final method also follows the same format with the time being taken before and after the loop to calculate the total time taken. The loop the iterates one million times for both the binary and decimal representations of all numbers between 0 and one million. The method take in a string as an input, stores it and uses a recursive function called reverse to store a reversed version of the input. The recursive function works by taking the input, calling reverse again with the input being a substringing from the second char on of the current input string until there is an empty string being sent in which case it then returns the chars with each being appended to the end of the return string. Once method four gets the reversed string it compares it to the original using .equals. If a palindrome it returns a true Boolean value, if not it returns a false.

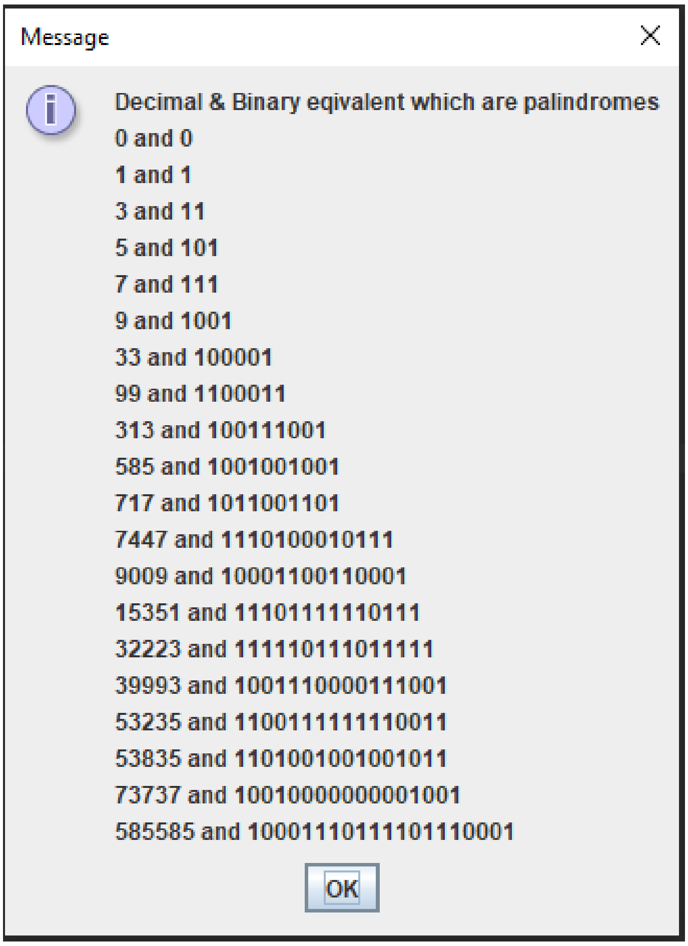
Finally the results are printed to screen using a JOptionPane.

Testing:

To ensure that the testing of the methods was correct and that it was correctly identifying which decimal and binary numbers were palindromes we used a counter that would be iterated each time a palindrome was found in each of the methods. The reasoning for this was that palindrome decimal numbers between 0 and 1 million consist of a total of 1999 palindromes with the binary equivalent having 200 palindromes between 0 and 1 million. The time taken to calculate each of the method 1 million times was also calculated identifying which of the methods was the fastest at carrying out identification of which number were palindromes. Using the utility class that stored the Boolean values of decimal numbers found to be palindromes and binary numbers that are palindromes it is possible to find the 20 palindromes between 0 and 1 million that have both a decimal number as a palindrome and a binary representation which too is a palindrome.



```
----------Method One----------
decimal time Taken =191
decimal palindromes found = 1999
binary palindromes found = 2000
binary time taken = 628
----------Method Two----------
decimal time Taken =30
decimal palindromes found = 1999
binary palindromes found = 2000
binary time taken = 16
----------Method Three----------
decimal time Taken =239
decimal palindromes found = 1999
binary palindromes found = 2000
binary time taken = 1566
----------Method Four----------
decimal time Taken =233
decimal palindromes found = 1999
binary palindromes found = 2000
binary time taken = 683
```



```
Decimal & Binary eqivalent which are palindromes
0 and 0
1 and 1
3 and 11
5 and 101
7 and 111
9 and 1001
33 and 100001
99 and 1100011
313 and 100111001
585 and 1001001001
717 and 1011001101
7447 and 1110100010111
9009 and 10001100110001
15351 and 11101111110111
32223 and 111110111011111
39993 and 1001110000111001
53235 and 1100111111110011
53835 and 1101001001001011
73737 and 10010000000001001
585585 and 10001110111101110001
```

In counting the primitive operations of each method four global variables are created to be populated with the number of primitive operations carried out. We count the number of primitive operations in each method using a standard procedure throughout all four methods including any utility methods that are utilized. Throughout the running of each method the current count of a counter is printed to the console every 50,000 iterations throughout the loop to be used in graphing the methods and comparing later.

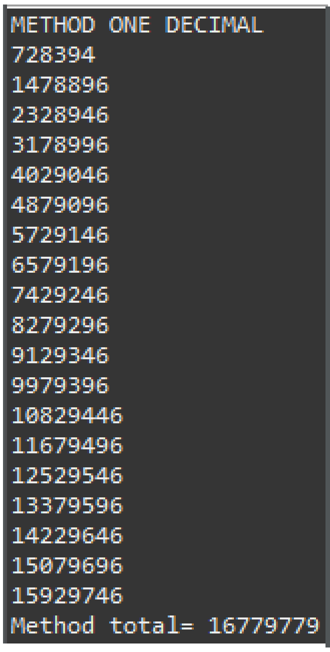
Method One has a counter called “n1b” this is incremented by one each time a line is called. The for loop that is present in this method contains 2 counters which account for the single line of code in the loop and for the line read each time the loop parameters are checked. The remainder of the code also increments the counter by one per line checked.

Method Two follows the same rules as method one, each line carries a counter weight of 1. This method contains a loop which increments the counter everytime its conditions are checked with the if statement within the loop also incrementing the counter once per check, with its contents carrying the weight of one incrementation per line.

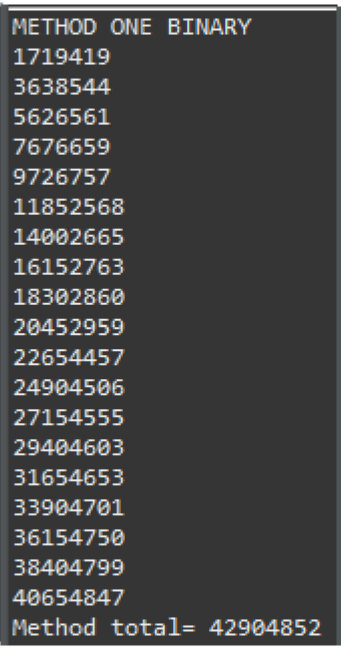
Method Three for the most part follows the same rules for incrementating the counter as the previous two methods, however due to the implementation of the ArrayStack and ArrayQueue classes and the calling of their isEmpty, push, pop, enqueue and dequeue methods a different approach was required. The push and enqueue methods when called both carry a weight of 4 due to the number of lines that these methods consisted of. The while loop due to utilizing the isEmpty method is given the incrementation weight of 2 as a result of only containing a single line. The if statement that is contained within the while loop has a changing weight that is dependent on the length of the string that has been passed into the method, this is due to the dequeue method requiring re-shuffling each time it is called to the length of the string. The else statement also utilizes this incrementation in the case a non-palindrome is found in order to empty the remaining contents of the stack and queue.

Method Four increments the counter similar to methods one and two for the most part. However when it comes to the recursive method utilized for method four. The return line increments the counter by 3 due to the use of the substring method, the charAt method and the calling of the recursive method.

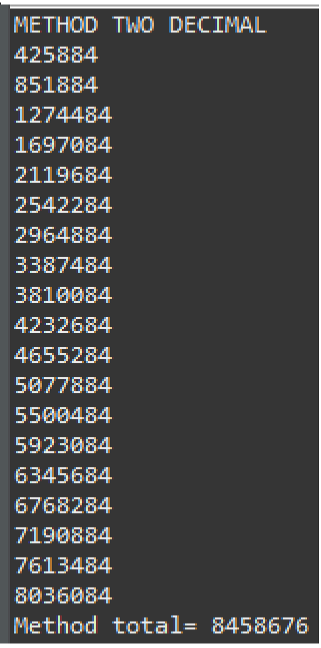
Using the console data we developed an excel spreadsheet that helped in developing the graphs to demonstrate the difference in primitive operations for each of the methods used.



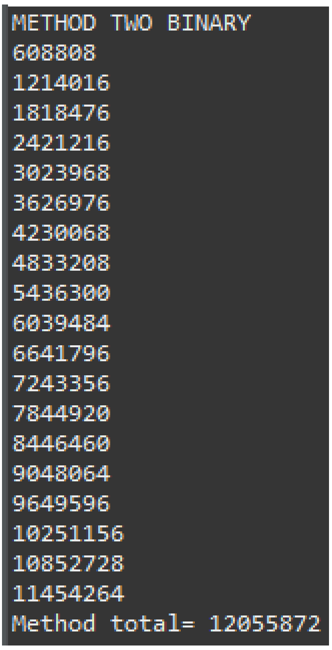
```
METHOD ONE DECIMAL
728394
1478896
2328946
3178996
4029046
4879096
5729146
6579196
7429246
8279296
9129346
9979396
10829446
11679496
12529546
13379596
14229646
15079696
15929746
Method total= 16779779
```



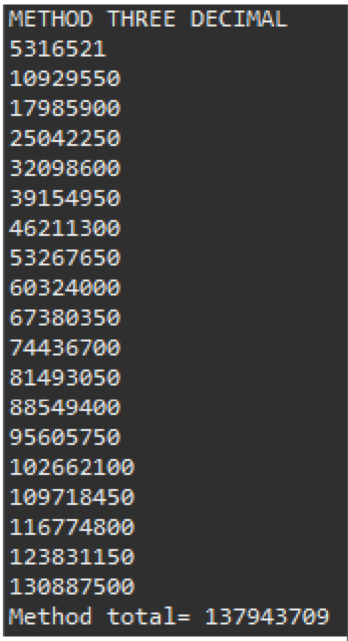
```
METHOD ONE BINARY
1719419
3638544
5626561
7676659
9726757
11852568
14002665
16152763
18302860
20452959
22654457
24904506
27154555
29404603
31654653
33904701
36154750
38404799
40654847
Method total= 42904852
```



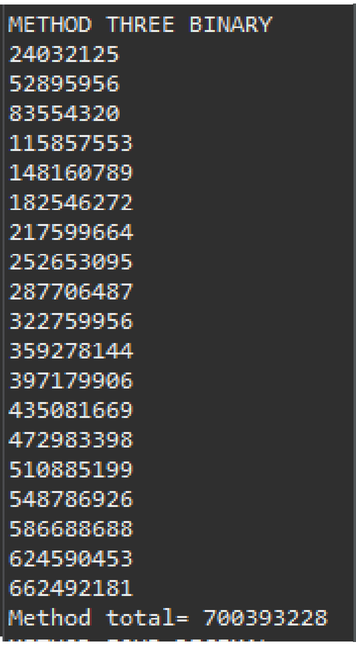
```
METHOD TWO DECIMAL
425884
851884
1274484
1697084
2119684
2542284
2964884
3387484
3810084
4232684
4655284
5077884
5500484
5923084
6345684
6768284
7190884
7613484
8036084
Method total= 8458676
```



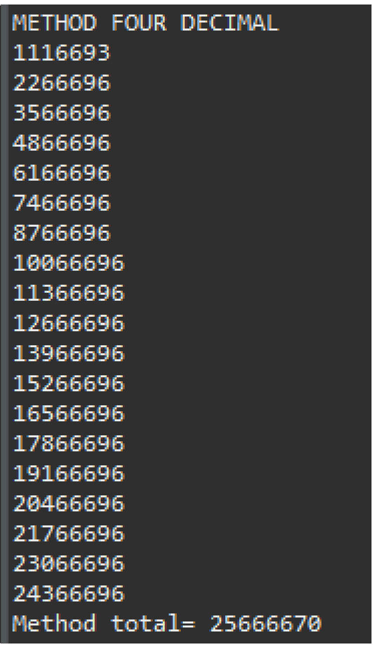
```
METHOD TWO BINARY
608808
1214016
1818476
2421216
3023968
3626976
4230068
4833208
5436300
6039484
6641796
7243356
7844920
8446460
9048064
9649596
10251156
10852728
11454264
Method total= 12055872
```



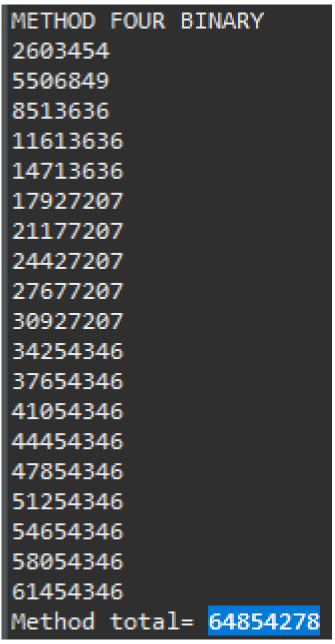
```
METHOD THREE DECIMAL
5316521
10929550
17985900
25042250
32098600
39154950
46211300
53267650
60324000
67380350
74436700
81493050
88549400
95605750
102662100
109718450
116774800
123831150
130887500
Method total= 137943709
```



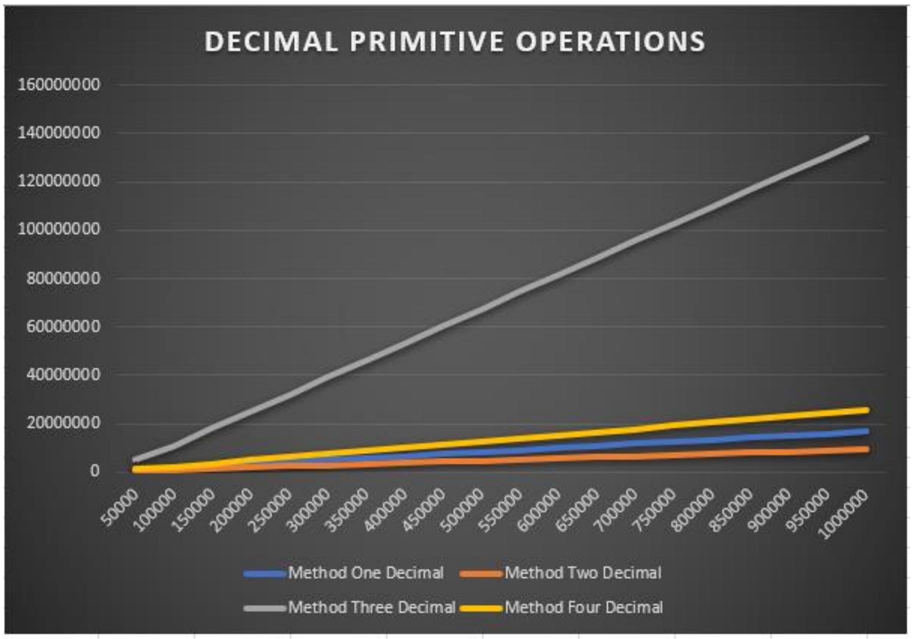
```
METHOD THREE BINARY
24032125
52895956
83554320
115857553
148160789
182546272
217599664
252653095
287706487
322759956
359278144
397179906
435081669
472983398
510885199
548786926
586688688
624590453
662492181
Method total= 700393228
```

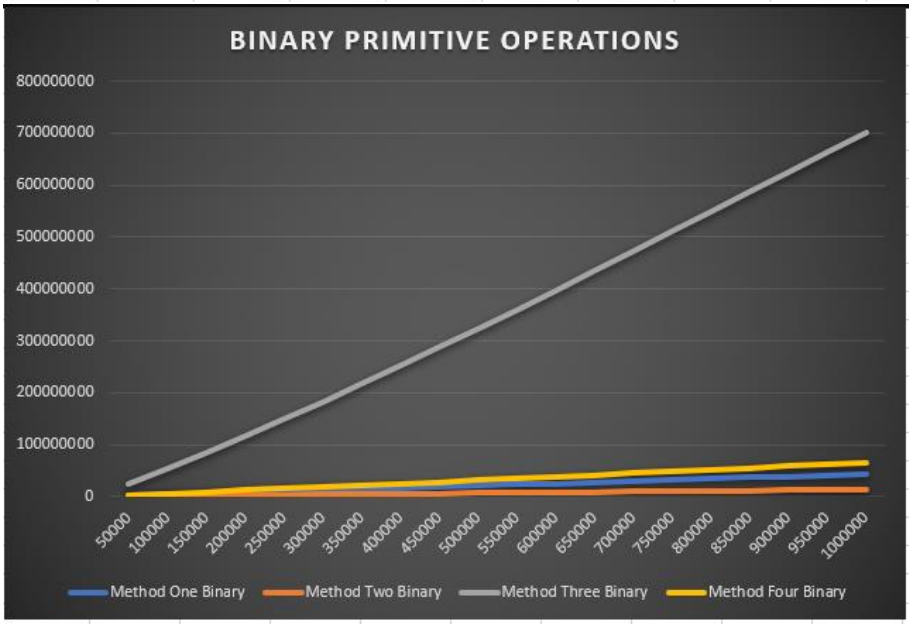


```
METHOD FOUR DECIMAL
1116693
2266696
3566696
4866696
6166696
7466696
8766696
10066696
11366696
12666696
13966696
15266696
16566696
17866696
19166696
20466696
21766696
23066696
24366696
Method total= 25666670
```



```
METHOD FOUR BINARY
2603454
5506849
8513636
11613636
14713636
17927207
21177207
24427207
27677207
30927207
34254346
37654346
41054346
44454346
47854346
51254346
54654346
58054346
61454346
Method total= 64854278
```





From this data we can see that method three is the most demanding in the number of primitive operations which is backed up from the results returned for the timing it takes to carry out method threes functions both in decimal and in binary. This is also true for all the methods tested as the number of primitive operations and the time taken match for which method takes the longest has the highest number of operations with the method taking the shortest amount of time containing the least number of primitive operations.

CODE

```
import java.awt.*;
import javax.swing.JOptionPane;

public class Palindromes {
	private boolean isPalindrome = false;
	private ArrayStack stack = new ArrayStack();
	private ArrayQueue queue = new ArrayQueue();
	private DecimalBinaryPalindromes[] palindromes = new
DecimalBinaryPalindromes[1000000];
	//
	private long test1Decimal;
	private long test1Binary;
	private long test2Decimal;
	private long test2Binary;
	private long test3Decimal;
	private long test3Binary;
	private long test4Decimal;
	private long test4Binary;
	//used to get num of operations at intervals
	private int gNo = 50000;

	//counter for binary operations
	private int n1b=0;
	private int n2b=0;
	private int n3b=0;
	private int n4b=0;

	public static void main(String []args) {
		Palindromes test = new Palindromes();
	}

	public Palindromes() {
		long start, end;
		String decimal;
		String output="";
```

```
        //initialise array of objects with 2 booleans to identify which numbers have
both palindromes
        for(int i = 0; i < palindromes.length; i++) {
            palindromes[i] = new DecimalBinaryPalindromes();
        }

        //Initialise array of binary numbers
        String[] binaryNums = new String[1000000];
        for(int i=0;i<1000000;i++) {
            binaryNums[i]=stringToBinary(i);
        }

        System.out.println("METHOD ONE DECIMAL");
        //decimal test for first method
        start = System.currentTimeMillis();//start time for method
        output+="----------Method One----------\n";
        //counts number of decimal palindroms returned
        int dp1 =0;
        for(int i=0;i<1000000;i++) {
            if(reversedString(decimal =""+ i)) {
                palindromes[i].decimal = true;
                dp1++;
            }
            //printing to console numbers for graphs
            if(i%gNo == 0 && i >0) {
                System.out.println(n1b);
            }
        }
        end = System.currentTimeMillis();
        test1Decimal = end - start;//finds total time taken for the method
        output += "decimal time Taken ="+test1Decimal+"\ndecimal palindromes
found = "+dp1;
        System.out.println("Method total= "+n1b);
        n1b=0;

        System.out.println("METHOD ONE BINARY");
        //binary test for first method
        start = System.currentTimeMillis();
        int bp1 = 0;
        for(int i=0;i<1000000;i++) {
            if(reversedString(binaryNums[i])) {
                palindromes[i].binary = true;
                bp1++;
            }
            if(i%gNo == 0 && i >0) {
                System.out.println(n1b);
            }
        }
        end = System.currentTimeMillis();
        test1Binary = end - start;
        output += "\nbinary palindromes found = "+bp1+"\nbinary time taken =
"+test1Binary;
        System.out.println("Method total= "+n1b);
        //-------------------------------------------------------------------------------------
        //Decimal test for Second method
        start = System.currentTimeMillis();
        output+="\n----------Method Two----------\n";
        int test=0;
        System.out.println("METHOD TWO DECIMAL");
        int dp2 = 0;
        for(int i=0;i<1000000;i++) {
            if(elementByElementCheck(decimal =""+ i)) {
                dp2++;
            }
            if(i%gNo == 0 && i >0) {
                System.out.println(n2b);
            }
        }

        end = System.currentTimeMillis();
        test2Decimal = end - start;
        output += "decimal time Taken ="+test2Decimal+"\ndecimal palindromes
found = "+dp2;
        System.out.println("Method total= "+n2b);
        n2b=0;

        //binary test for Second method
        start = System.currentTimeMillis();
        System.out.println("METHOD TWO BINARY");
        int bp2 =0;
        for(int i=0;i<1000000;i++) {
            if(elementByElementCheck(binaryNums[i])) {
                bp2++;
            }
            if(i%gNo == 0 && i >0) {
                System.out.println(n2b);
            }
        }
        end = System.currentTimeMillis();
        test2Binary = end - start;
        output += "\nbinary palindromes found = "+bp2+"\nbinary time taken =
"+test2Binary;
```

```
        System.out.println("Method total= "+n2b);
        //-------------------------------------------------------------------------------------------
        //Decimal test for Third method
        start = System.currentTimeMillis();
        output+="\n----------Method Three----------\n";
        System.out.println("METHOD THREE DECIMAL");
        int dp3 = 0;
        for(int i=0;i<1000000;i++) {
            if(stackAndQueue(decimal =""+ i)) {
                dp3++;
            }
            if(i%gNo == 0 && i >0) {
                System.out.println(n3b);
            }
        }
        end = System.currentTimeMillis();
        test3Decimal = end - start;
        output += "decimal time Taken ="+test3Decimal+"\ndecimal palindromes
found = "+dp3;
        System.out.println("Method total= "+n3b);
        n3b = 0;

        //binary test for Third method
        start = System.currentTimeMillis();
        System.out.println("METHOD THREE BINARY");
        int bp3 =0;
        for(int i=0;i<1000000;i++) {
            if(stackAndQueue(binaryNums[i])) {
                bp3++;
            }
            if(i%gNo == 0 && i >0) {
                System.out.println(n3b);
            }
        }
        end = System.currentTimeMillis();
        test3Binary = end - start;
        output += "\nbinary palindromes found = "+bp3+"\nbinary time taken =
"+test3Binary;
        System.out.println("Method total= "+n3b);
        //-------------------------------------------------------------------------------------------
        //Decimal test for Fourth method
        start = System.currentTimeMillis();
        output+="\n----------Method Four----------\n";
        System.out.println("METHOD FOUR DECIMAL");
        int dp4 =0;
        for(int i=0;i<1000000;i++) {
            if(reverseUsingRecursion(decimal =""+ i)) {
                dp4++;
            }
            if(i%gNo == 0 && i >0) {
                System.out.println(n4b);
            }
        }
        end = System.currentTimeMillis();
        test4Decimal = end - start;
        output += "decimal time Taken ="+test4Decimal+"\ndecimal palindromes
found = "+dp4;
        System.out.println("Method total= "+n4b);
        n4b = 0;

        //binary test for Fourth method
        start = System.currentTimeMillis();
        System.out.println("METHOD FOUR BINARY");
        int bp4 =0;
        for(int i=0;i<1000000;i++) {
            if(reverseUsingRecursion(binaryNums[i])) {
                bp4++;
            }
            if(i%gNo == 0 && i >0) {
                System.out.println(n4b);
            }
        }
        end = System.currentTimeMillis();
        test4Binary = end - start;
        output += "\nbinary palindromes found = "+bp4+"\nbinary time taken =
"+test4Binary;
        System.out.println("Method total= "+n4b);


        String bothPalindromes="Decimal & Binary eqivalent which are
palindromes\n";
        int i =0;
        //iterates through the array of objects and adds those with both boolean values
        //which are true to the string to display which have both numbers as
palindromes
        for(DecimalBinaryPalindromes curObj: palindromes) {
            if(curObj.binary==true && curObj.decimal == true) {
                bothPalindromes+= i+" and "+binaryNums[i]+"\n";
            }
            i++;
        }
        //shows the total time taken and number of palindromes found for each of the
methods
        JOptionPane.showMessageDialog(null,""+output);

        //shows the numbers that are palindromes both in binary and decimal
        JOptionPane.showMessageDialog(null,""+bothPalindromes);

    }



    public boolean reversedString(String s) {
        isPalindrome = false;  n1b++;
        String normal = s;              n1b++;
        String reversed ="";    n1b++;
        //iterates through the length of the input and reverses it

        for(int i = normal.length()-1 ; i >= 0 ; i--,n1b++) {
            reversed += normal.charAt(i);
            n1b++;
        }
        n1b++;
        //compares the two different strings sets return boolean to true
        if(normal.equals(reversed)) {
            isPalindrome = true;n1b++;
        }
        n1b++;
        return isPalindrome;
    }


    public boolean elementByElementCheck(String s) {
        isPalindrome = false;  n2b++;
        String forward = s;             n2b++;
        int length = forward.length()-1;        n2b++;
        //checks the first digit against the last digit needing to only iterate through half
the digits
        for(int i = 0 ; i < forward.length() ; i++, n2b++) {
            n2b++;
            if(forward.charAt(i)==forward.charAt(length)) {
                length--;               n2b++;
                isPalindrome = true;n2b++;
            }
            //if a non-palindrome is found returns false
            else {
                n2b++;
                isPalindrome = false;n2b++;
                n2b++;
                break;
            }
        }
        n2b++;
        return isPalindrome;
    }


    public boolean stackAndQueue(String s) {
        isPalindrome = true;            n3b++;
        String input = s;                       n3b++;
        //pushes the numbers both onto the stack and into the queue
        for(int i =0 ; i < input.length(); i++,n3b++) {
            stack.push(input.charAt(i)); n3b+=4;
            queue.enqueue(input.charAt(i)); n3b+=4;
        }
        n3b++;
        //both being the same length we only need to check one
        while(stack.isEmpty()!=true) {
            n3b+=2;
            //popping from the top of the stack (first digit) and comparing against
the dequeue
            //(the last digit) to see if they are the same
            if(stack.pop()==queue.dequeue()) {
                n3b+=(input.length()+9);
            }
            else {
                n3b++;
                isPalindrome = false;n3b++;
                while(stack.isEmpty()!=true) {n3b++;
                    stack.pop();
                    queue.dequeue();
                    n3b+=(input.length()+9);
                }
                return isPalindrome;
            }
        }
        n3b++;
        return isPalindrome;
    }


    public boolean reverseUsingRecursion(String s) {
        isPalindrome = false;  n4b++;
        String forward = s;             n4b++;
        //returns the reversed version of the number using the recursion method
        String reversed = reverse(forward); n4b++;

        n4b++;
        //checks
        if(forward.equals(reversed)) {
            n4b++;
            isPalindrome = true;
        }
        else {
            n4b++;
            isPalindrome = false;
        }
        n4b++;
        return isPalindrome;
    }

    public String reverse(String s) {
        n4b++;
        if(s.isEmpty()) {
            n4b++;
            return s;
        }
        n4b+=3;
        //creates a recursive method until the length of the number has been iterated through
        //returning the reversed version of the number
        return reverse(s.substring(1)) +s.charAt(0);
    }

    //creates the binary version of a decimal number using modulus
    public String stringToBinary(int num) {
        String binaryReturn = "";
        if(num==0) {binaryReturn = "0";}
        int binary[] = new int[40];
      int index = 0;
      while(num > 0){
       binary[index++] = num%2;
       num = num/2;
      }

      for(int i = index-1;i >= 0;i--){
        binaryReturn += "" + binary[i];
       }
      return binaryReturn;
    }
```

```
}
```

Utility Class DecimalBinaryPalindromes

```
public class DecimalBinaryPalindromes {
        protected boolean decimal=false;
        protected boolean binary=false;
}
```