Template Week 2 – Logic

Student number: 590173

Assignment 2.1: Parking lot

Which gates do you need?

NAND gate

Complete this table

Parking lot 1	Parking lot 2	Parking lot 3	Result (full)
0	0	0	1
0	0	1	1
0	1	0	1
1	0	0	1
1	0	1	1
0	1	1	1
1	1	0	1
1	1	1	0

Assignment 2.2: Android or iPhone

Which gates do you need?

OR gate

Complete this table

Android phone	iPhone	Result (Phone in possession)
0	0	0
1	0	1
0	1	1
1	1	1

Assignment 2.3: Four NAND gates

Complete this table

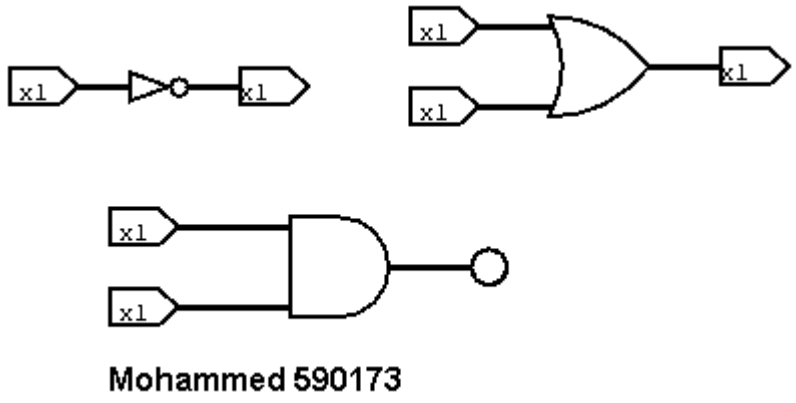
A	B	Q
0	0	1
1	1	0
1	0	1
0	1	1

How can the design be simplified?

Most simplified would be an XOR gate.

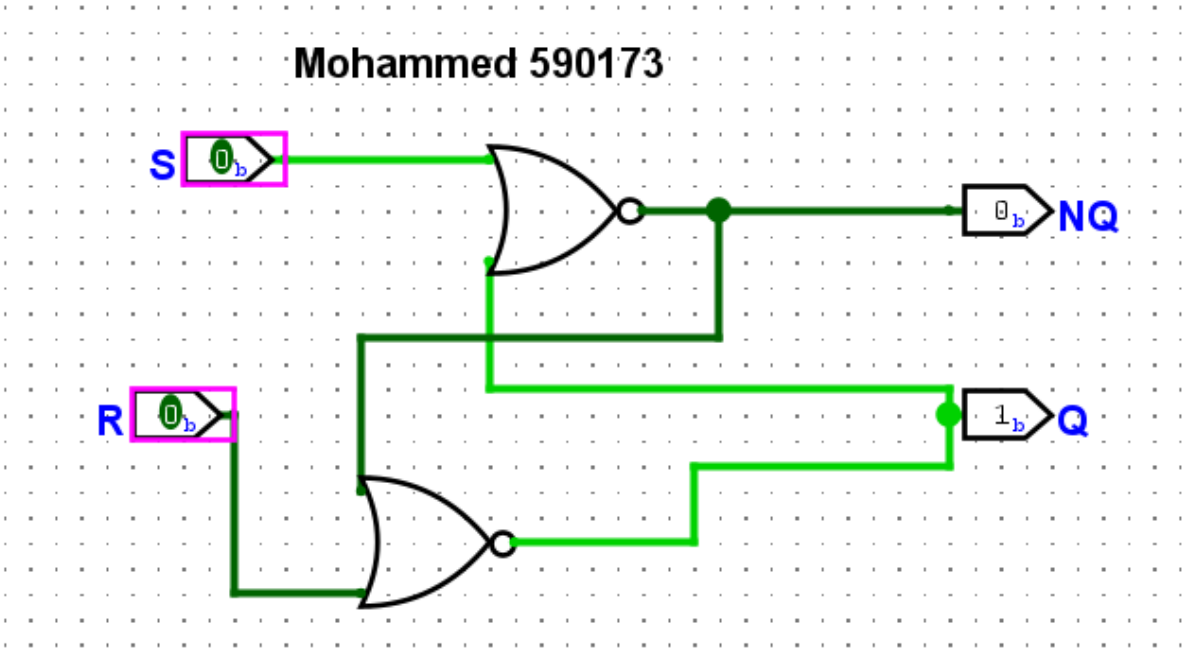
Assignment 2.4: Getting to know Logisim evolution

Screenshot of the design with your name and student number in it:



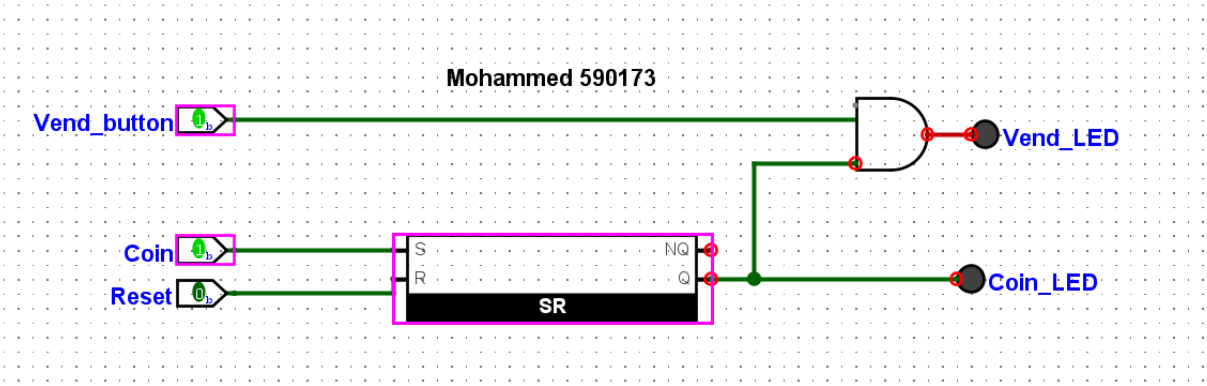
Assignment 2.5: SR Latch

Screenshot SR Latch in Logisim with your name and student number:



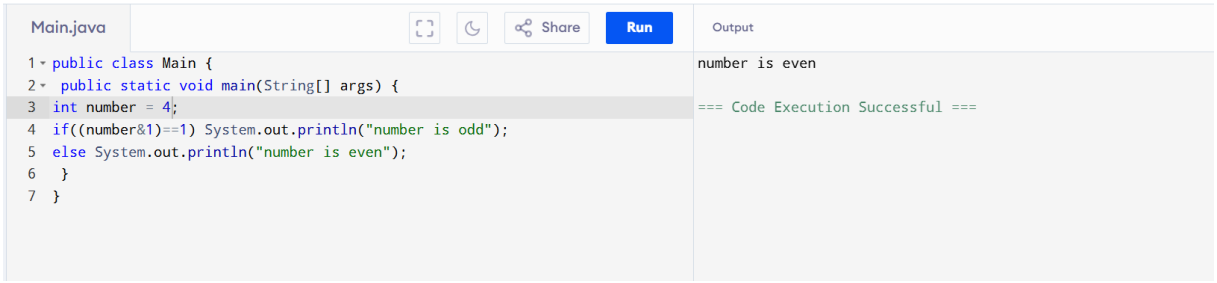
Assignment 2.6: Vending Machine

Screenshot Vending Machine in Logisim with your name and student number:

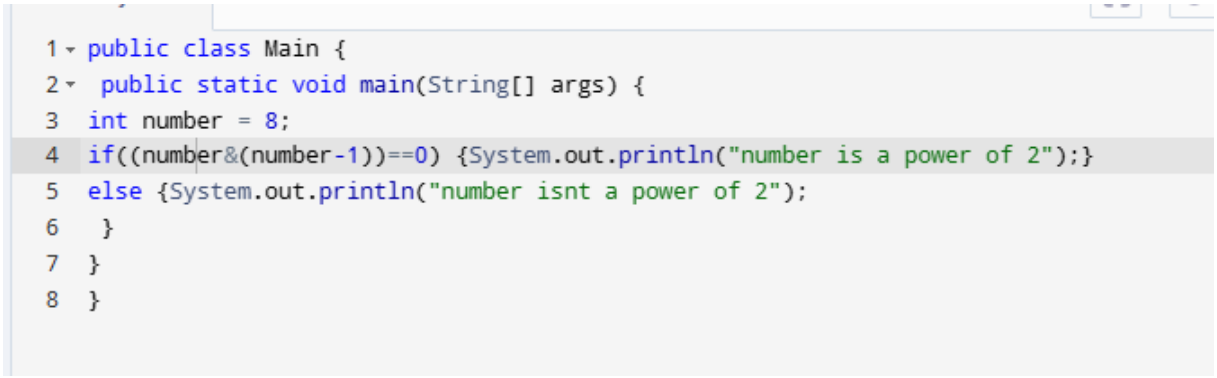


Assignment 2.7: Bitwise operators

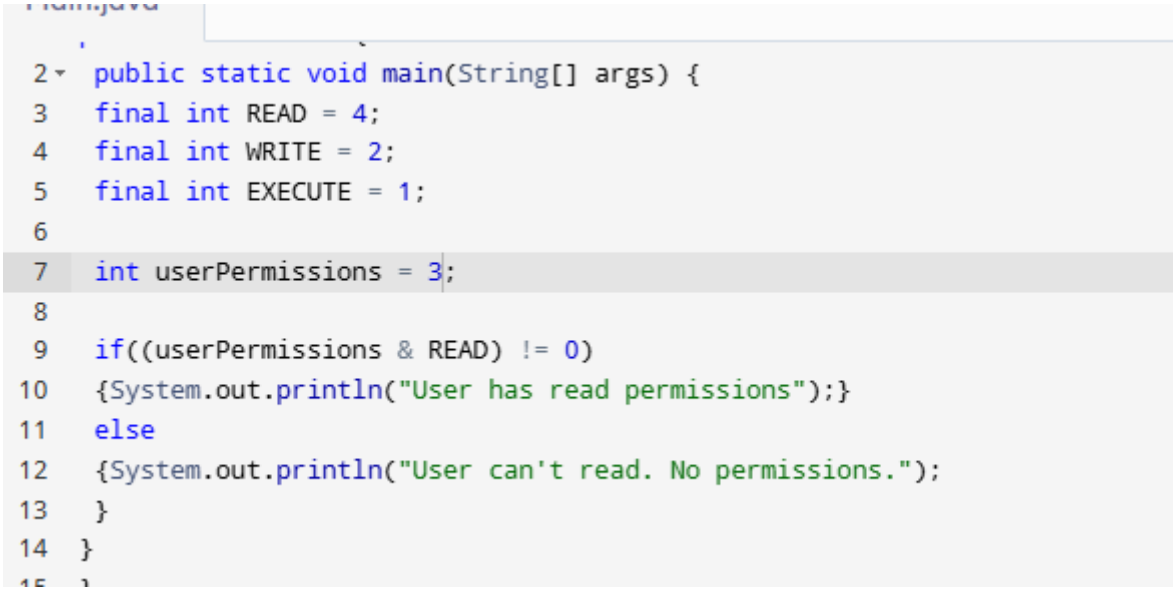
Complete the java source code for bitwise operators. Put the source code here.



If number is Odd or Even^^^



If number is power of 2



IF user has read permission

Main.java

Share Run

```java
public class Main {
    public static void main(String[] args) {
        final int READ = 4;
        final int WRITE = 2;
        final int EXECUTE = 1;

        int userPermissions = 0;

    // done by mohammed 590173
        userPermissions = userPermissions | READ | EXECUTE;


        System.out.println("User permissions: " + userPermissions);
    }
}
```

User can read and execute

Main.java

Share Run

```java
public class Main {
    public static void main(String[] args) {
        final int READ = 4;
        final int WRITE = 2;
        final int EXECUTE = 1;

        int userPermissions = 6; // done by Mohammed 590173


        userPermissions = userPermissions ^ WRITE;

        System.out.println("User permissions: " + userPermissions);
    }
}
```

User has read with no write permission

Main.java

Share Run

```java
public class Main {
    public static void main(String[] args) {
        int number = 5;

        number = ~number + 1;
        System.out.println("Negative Number: " + number); // Output: -5

        // done by Mohammed 590173
        number = ~number + 1;
        System.out.println("Positive Number (Back): " + number); // Output: 5
    }
}
```

Two's complement

```java
public class Main {
    public static void main(String[] args) {
        int number = 10;
        System.out.println("Decimal integer: " + number);

        String binary = Integer.toBinaryString(number);
        String octal = Integer.toOctalString(number);
        String hexadecimal = Integer.toHexString(number);

        // Mohammed 590173

        System.out.println("Binary representation: " + binary);
        System.out.println("Octal representation: " + octal);
        System.out.println("Hexadecimal representation: " + hexadecimal);
    }
}
```

Display binary, octal and hexadecimal values

Assignment 2.8: Java Application Bit Calculations

Create a java program that accepts user input and presents a menu with options.

1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?

Implement the methods by using the bitwise operators you have just learned.

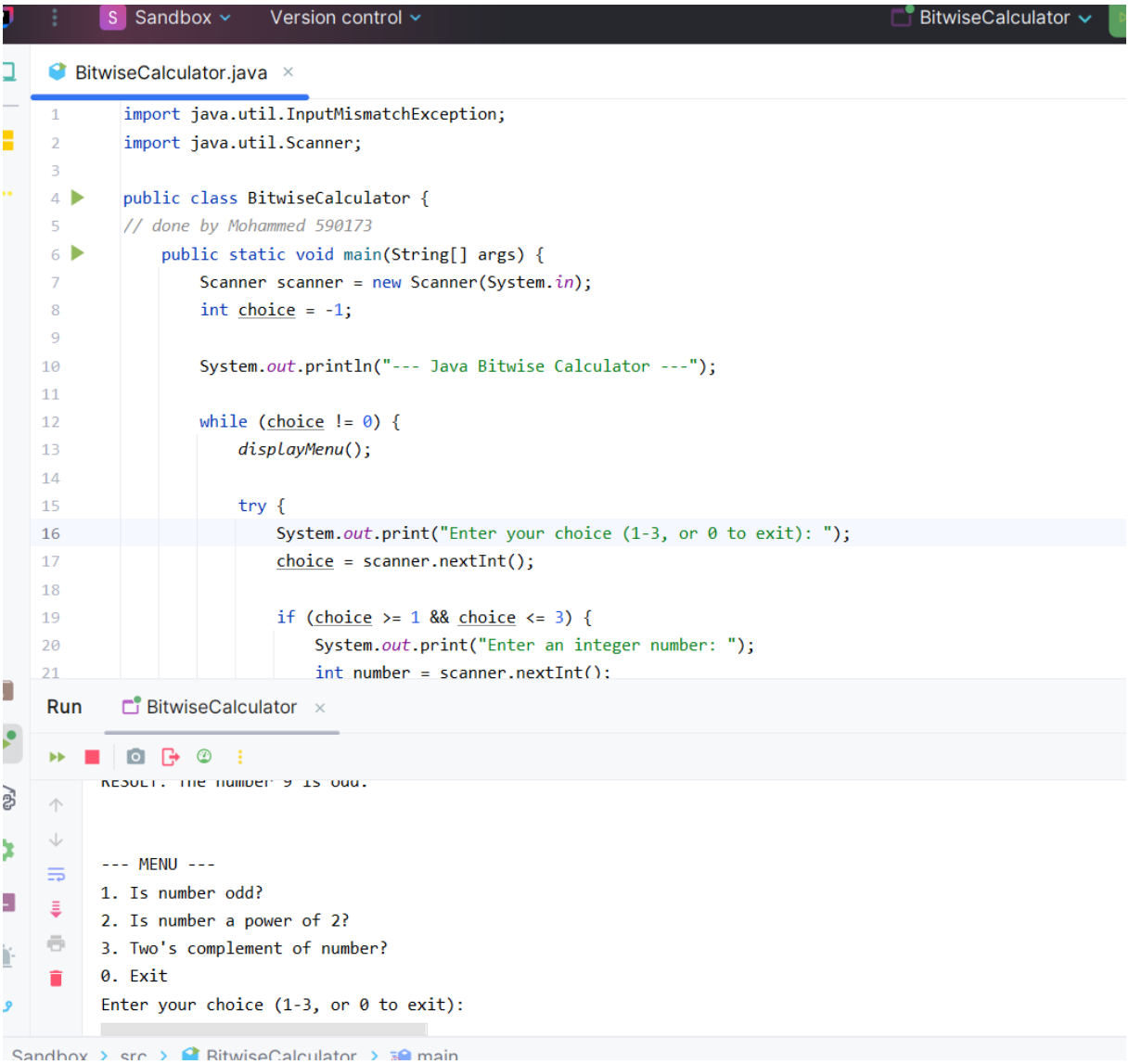
Organize your source code in a readable manner with the use of control flow and methods.

Keep this application because you need to expand it in week 6 for calculating network segments.

Paste source code here, with a screenshot of a working application.

```
import java.util.InputMismatchException;
import java.util.Scanner;

public class BitwiseCalculator {
// done by Mohammed 590173
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      int choice = -1;

      System.out.println("--- Java Bitwise Calculator ---");

      while (choice != 0) {
         displayMenu();

         try {
            System.out.print("Enter your choice (1-3, or 0 to exit): ");
            choice = scanner.nextInt();

            if (choice >= 1 && choice <= 3) {
               System.out.print("Enter an integer number: ");
               int number = scanner.nextInt();

               switch (choice) {
                  case 1:
                     // 1. Is number odd?
                     String oddStatus = isOdd(number) ? "odd" : "even";
                     System.out.println("\nRESULT: The number " + number + " is " + oddStatus + ".\n");
                     break;

                  case 2:
                     // 2. Is number a power of 2?
                     String powerStatus = isPowerOfTwo(number) ? "a power of 2" : "NOT a power of 2";
                     System.out.println("\nRESULT: The number " + number + " is " + powerStatus + ".\n");
                     break;

                  case 3:
                     // 3. Two's complement of number?
                     int complement = twoSComplement(number);
                     System.out.println("\nRESULT: The two's complement of " + number + " is " +
complement + ".\n");
```

```
                    break;
                }
            } else if (choice == 0) {
                System.out.println("\nExiting the calculator. Goodbye!");
            } else {
                System.out.println("Invalid choice. Please enter a number between 1 and 3.");
            }

        } catch (InputMismatchException e) {
            System.out.println("\nError: Invalid input. Please enter an integer.");
            scanner.next(); // Clear the invalid input from the scanner
            choice = -1; // Reset choice to keep the loop going
        }
    }
    scanner.close();
}

public static void displayMenu() {
    System.out.println("\n--- MENU ---");
    System.out.println("1. Is number odd?");
    System.out.println("2. Is number a power of 2?");
    System.out.println("3. Two's complement of number?");
    System.out.println("0. Exit");
}




public static boolean isOdd(int n) {

    return (n & 1) == 1;
}


public static boolean isPowerOfTwo(int n) {

    return n > 0 && (n & (n - 1)) == 0;
}

public static int twoSComplement(int n) {
    return (~n) + 1;
}
}
```



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