

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

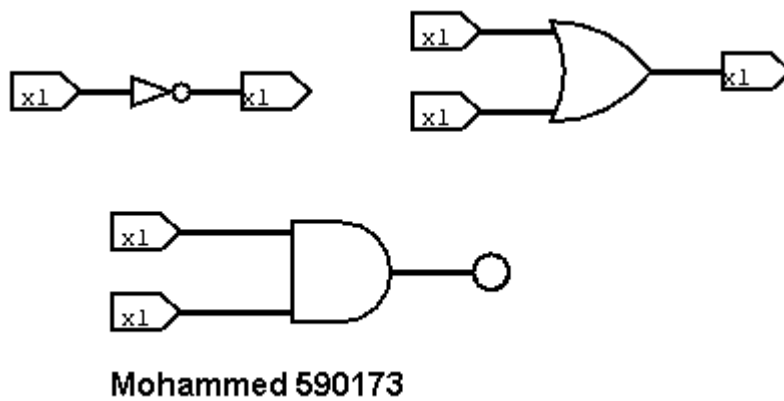
A	B	Q
0	0	1
1	1	0
1	0	1
0	1	1

How can the design be simplified?

Most simplified would be an XOR gate.

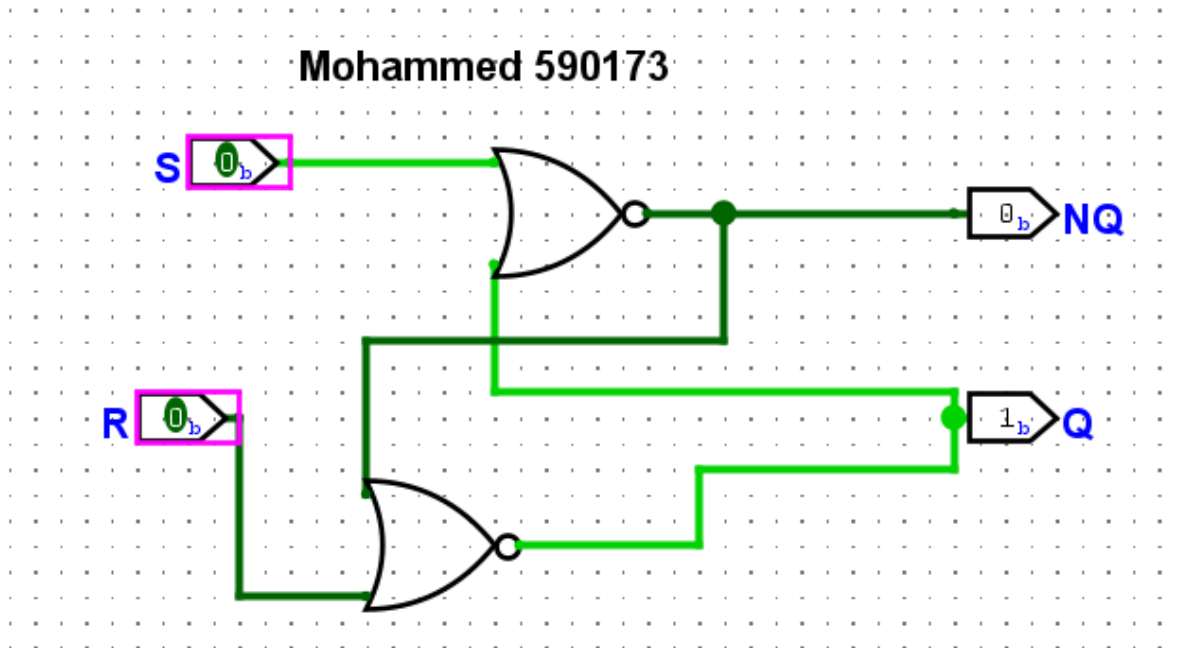
Assignment 2.4: Getting to know Logisim evolution

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



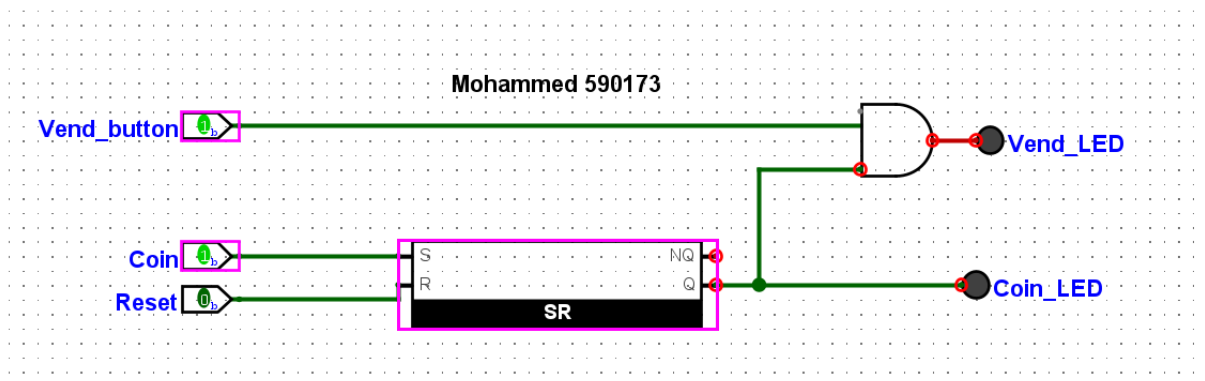
Assignment 2.5: SR Latch

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.

Main.java	Output
<pre>1 public class Main { 2 public static void main(String[] args) { 3 int number = 4; 4 if((number&1)==1) System.out.println("number is odd"); 5 else System.out.println("number is even"); 6 } 7 }</pre>	<pre>number is even === Code Execution Successful ===</pre>

If number is Odd or Even^^^

```
1 public class Main {
2 public static void main(String[] args) {
3 int number = 8;
4 if((number&(number-1))==0) {System.out.println("number is a power of 2");}
5 else {System.out.println("number isnt a power of 2");}
6 }
7 }
8 }
```

If number is power of 2

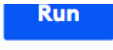
```
1 public class Main {
2 public static void main(String[] args) {
3 final int READ = 4;
4 final int WRITE = 2;
5 final int EXECUTE = 1;
6
7 int userPermissions = 3;
8
9 if((userPermissions & READ) != 0)
10 {System.out.println("User has read permissions");}
11 else
12 {System.out.println("User can't read. No permissions.");}
13 }
14 }
15 }
```

IF user has read permission

```
Main.java    Share  Run

1 public class Main {
2     public static void main(String[] args) {
3         final int READ = 4;
4         final int WRITE = 2;
5         final int EXECUTE = 1;
6
7         int userPermissions = 0;
8
9         // done by mohammed 590173
10        userPermissions = userPermissions | READ | EXECUTE;
11
12        System.out.println("User permissions: " + userPermissions);
13    }
14 }
15 }
```

User can read and execute

```
Main.java    Share  Run

1 public class Main {
2     public static void main(String[] args) {
3         final int READ = 4;
4         final int WRITE = 2;
5         final int EXECUTE = 1;
6
7         int userPermissions = 6; // done by Mohammed 590173
8
9
10        userPermissions = userPermissions ^ WRITE;
11
12
13        System.out.println("User permissions: " + userPermissions);
14    }
15 }
```

User has read with no write permission

```
Main.java
1 public class Main {
2     public static void main(String[] args) {
3         int number = 5;
4
5
6         number = ~number + 1;
7         System.out.println("Negative Number: " + number); // Output: -5
8
9         // done by Mohammed 590173
10        number = ~number + 1;
11        System.out.println("Positive Number (Back): " + number); // Output: 5
12    }
13 }
```

Two's complement

```
Main.java
1 public class Main {
2     public static void main(String[] args) {
3         int number = 10;
4         System.out.println("Decimal integer: " + number);
5
6         String binary = Integer.toBinaryString(number);
7         String octal = Integer.toOctalString(number);
8         String hexadecimal = Integer.toHexString(number);
9
10        // Mohammed 590173
11
12        System.out.println("Binary representation: " + binary);
13        System.out.println("Octal representation: " + octal);
14        System.out.println("Hexadecimal representation: " + hexadecimal);
15    }
16 }
```

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");
                    }
                }
            }
        }
    }

    private static void displayMenu() {
        System.out.println("Menu:");
        System.out.println("1. Check if a number is odd or even");
        System.out.println("2. Check if a number is a power of 2");
        System.out.println("3. Calculate the two's complement of a number");
        System.out.println("0. Exit");
    }

    private static boolean isOdd(int number) {
        return (number & 1) == 1;
    }

    private static boolean isPowerOfTwo(int number) {
        return (number & (number - 1)) == 0 && number > 0;
    }

    private static int twoSComplement(int number) {
        return ~number + 1;
    }
}
```

```

        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;
}
}

```



```
1 import java.util.InputMismatchException;
2 import java.util.Scanner;
3
4 public class BitwiseCalculator {
5     // done by Mohammed 590173
6     public static void main(String[] args) {
7         Scanner scanner = new Scanner(System.in);
8         int choice = -1;
9
10        System.out.println("--- Java Bitwise Calculator ---");
11
12        while (choice != 0) {
13            displayMenu();
14
15            try {
16                System.out.print("Enter your choice (1-3, or 0 to exit): ");
17                choice = scanner.nextInt();
18
19                if (choice >= 1 && choice <= 3) {
20                    System.out.print("Enter an integer number: ");
21                    int number = scanner.nextInt();
```

Run BitwiseCalculator

RESULT: The number 9 is odd.

--- MENU ---

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

Enter your choice (1-3, or 0 to exit):

Sandbox > src > BitwiseCalculator > main

Ready? Then save this file and export it as a pdf file with the name: [week2.pdf](#)