

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

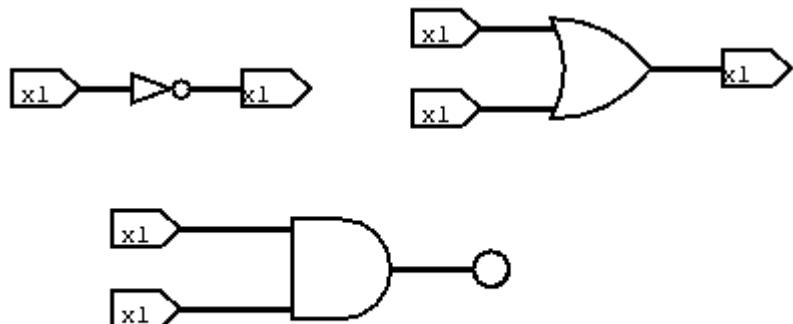
A	B	Q
0	0	1
1	1	0
1	0	1
0	1	1

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:

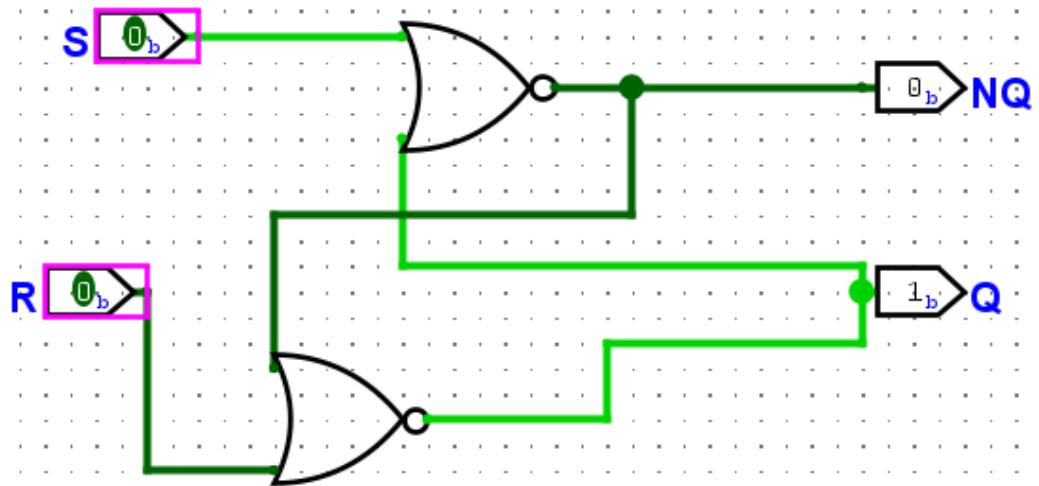


Mohammed 590173

Assignment 2.5: SR Latch

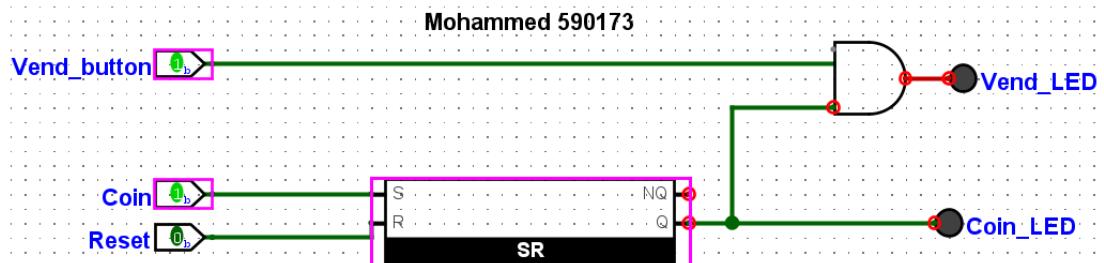
Screenshot SR Latch in Logisim with your name and student number:

Mohammed 590173



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

```
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 }
```

Run Output

```
number is even  
== Code Execution Successful ==
```

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 isn't a power of 2");}  
6     }  
7 }
```

If number is power of 2

```
1 package com.example;  
2  
3 public class Main {  
4     public static void main(String[] args) {  
5         final int READ = 4;  
6         final int WRITE = 2;  
7         final int EXECUTE = 1;  
8  
9         int userPermissions = 3;  
10  
11         if((userPermissions & READ) != 0)  
12             {System.out.println("User has read permissions");}  
13         else  
14             {System.out.println("User can't read. No permissions.");}  
15     }  
16 }
```

IF user has read permission

Main.java

```
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  
13        System.out.println("User permissions: " + userPermissions);  
14    }  
15 }
```

User can read and execute

Main.java

```
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-         number = ~number + 1;  
6-         System.out.println("Negative Number: " + number); // Output: -5  
7-  
8-         // done by Mohammed 590173  
9-         number = ~number + 1;  
10-        System.out.println("Positive Number (Back): " + number); // Output: 5  
11-    }  
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");
                    }
                }
            } catch (InputMismatchException e) {
                System.out.println("Invalid input. Please enter a valid integer choice (1-3 or 0).");
            }
        }
    }

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

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

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

    private 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;
}
}

```

The screenshot shows a Java development environment with the following details:

- Top Bar:** Shows "Sandbox" and "Version control" on the left, and "BitwiseCalculator" on the right.
- Code Editor:** Displays the `BitwiseCalculator.java` file. The code implements a simple menu-based calculator for bitwise operations. It uses `Scanner` to read user input and `System.out` to print results.
- Run Tab:** Shows the application running with the title "BitwiseCalculator". The terminal window displays:
 - "RESULT: The number 9 is odd."
 - "--- MENU ---"
 - A list of four options: 1. Is number odd?, 2. Is number a power of 2?, 3. Two's complement of number?, 0. Exit
 - An input prompt: "Enter your choice (1-3, or 0 to exit):"
- Bottom Navigation:** Shows the file path: "Sandbox > src > BitwiseCalculator > main".

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