

Template Week 2 – Logic

Student number: 581558

Assignment 2.1: Parking lot

Which gates do you need?

We need an AND gate. Because if spot 1 is occupied AND spot 2 is occupied AND spot 3 is occupied, the sign has to show FULL message.

Complete this table

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

Assignment 2.2: Android or iPhone

Which gates do you need?

We need XOR gate. Because we can choose Android and we can choose iPhone but we cannot choose both.

Complete this table

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

Assignment 2.3: Four NAND gates

Complete this table

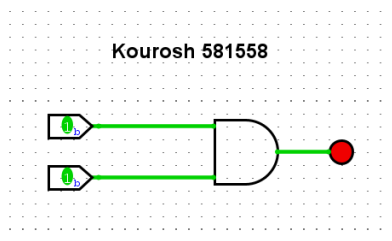
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

How can the design be simplified?

The diagram uses 4 NAND gates that gives the same output as a single XOR gate, so we simplify the chip to using only one XOR gate.

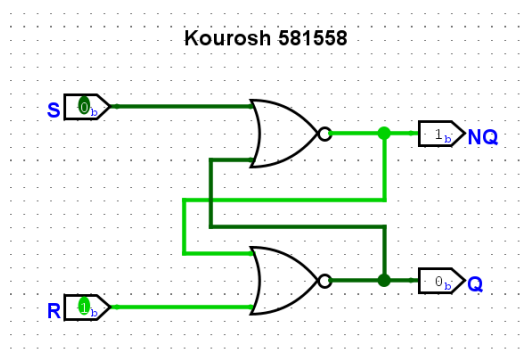
Assignment 2.4: Getting to know Logisim evolution

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



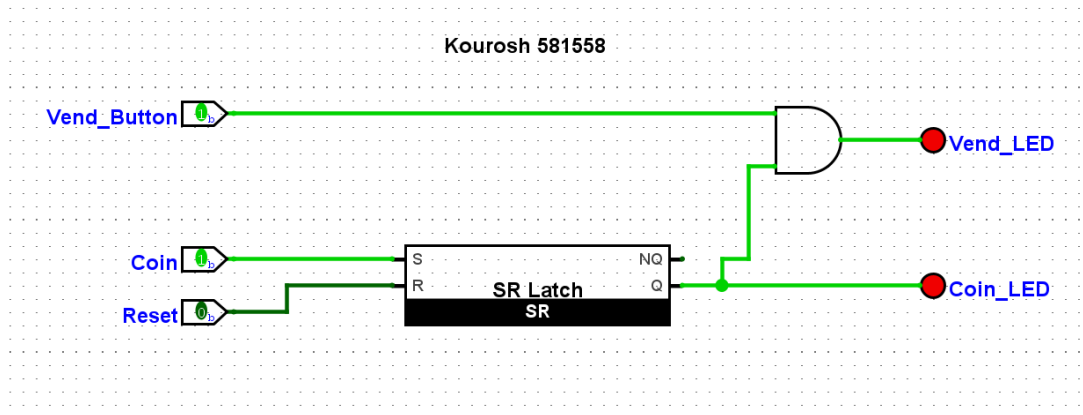
Assignment 2.5: SR Latch

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.

#1 Even or odd

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

        if ((number & 1) == 1) {
            System.out.println("number is odd");
        } else {
            System.out.println("number is even");
        }
    }
}
```

#2 Power of 2

```
public class Main {
    public static void main(String[] args) {
        int number = 4;

        if (number > 0 && (number & (number - 1)) == 0) {
            System.out.println("number is a power of 2");
        } else {
            System.out.println("number isn't a power of 2");
        }
    }
}
```

#3 Check permissions

```
public class Main {  
    public static void main(String[] args) {  
        final int READ = 4;  
        final int WRITE = 2;  
        final int EXECUTE = 1;  
  
        int userPermissions = 7;  
  
        if ((userPermissions & READ) == READ) {  
            System.out.println("User has read permissions");  
        } else {  
            System.out.println("User can't read. No permissions.");  
        }  
    }  
}
```

#4 Assign permissions

```
public class Main {  
    public static void main(String[] args) {  
        final int READ = 4;  
        final int WRITE = 2;  
        final int EXECUTE = 1;  
  
        int userPermissions = READ | EXECUTE;  
  
        System.out.println("User permissions: " + userPermissions);  
    }  
}
```

#5 Update permissions

```
public class Main {  
    public static void main(String[] args) {  
        final int READ = 4;  
        final int WRITE = 2;  
        final int EXECUTE = 1;  
  
        int userPermissions = 6;  
  
        userPermissions = userPermissions ^ WRITE;  
  
        System.out.println("User permissions: " + userPermissions);  
    }  
}
```

#6 Two's complement

```
public class Main {  
    public static void main(String[] args) {  
        int number = 5;  
  
        number = ~number + 1;  
  
        System.out.println("Number: " + number);  
    }  
}
```

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.Scanner;  
  
public class Main {  
  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        System.out.print("Enter an integer number: ");  
        int number = scanner.nextInt();  
  
        System.out.println("\nSelect an operation:");  
        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.print("Enter your choice (1-3): ");  
  
        int choice = scanner.nextInt();  
  
        switch (choice) {  
            case 1:  
                checkIfOdd(number);  
                break;
```

```

        case 2:
            checkIfPowerOfTwo(number);
            break;
        case 3:
            printTwosComplement(number);
            break;
        default:
            System.out.println("Invalid choice.");
    }

    scanner.close();
}

public static void checkIfOdd(int n) {
    if ((n & 1) == 1) {
        System.out.println("The number " + n + " is ODD.");
    } else {
        System.out.println("The number " + n + " is EVEN.");
    }
}

public static void checkIfPowerOfTwo(int n) {
    if (n > 0 && (n & (n - 1)) == 0) {
        System.out.println("Yes, " + n + " is a power of 2.");
    } else {
        System.out.println("No, " + n + " is NOT a power of 2.");
    }
}

public static void printTwosComplement(int n) {
    int result = ~n + 1;
    System.out.println("The two's complement of " + n + " is: " + result);
}
}

```

Output

```

Kourosh 581558
Enter an integer number: 23

Select an operation:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?
Enter your choice (1-3): 2
No, 23 is NOT a power of 2.

=== Code Execution Successful ===

```

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