

# 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

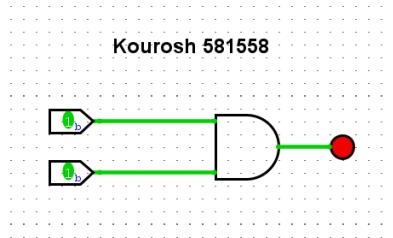
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

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.*

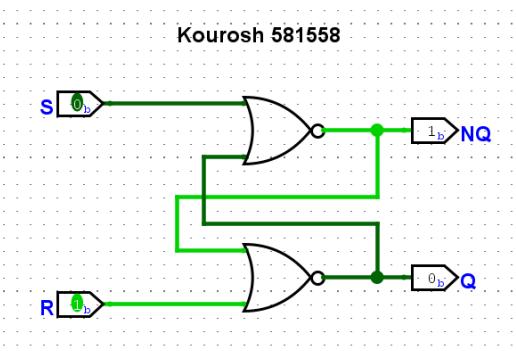
### Assignment 2.4: Getting to know Logisim evolution

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



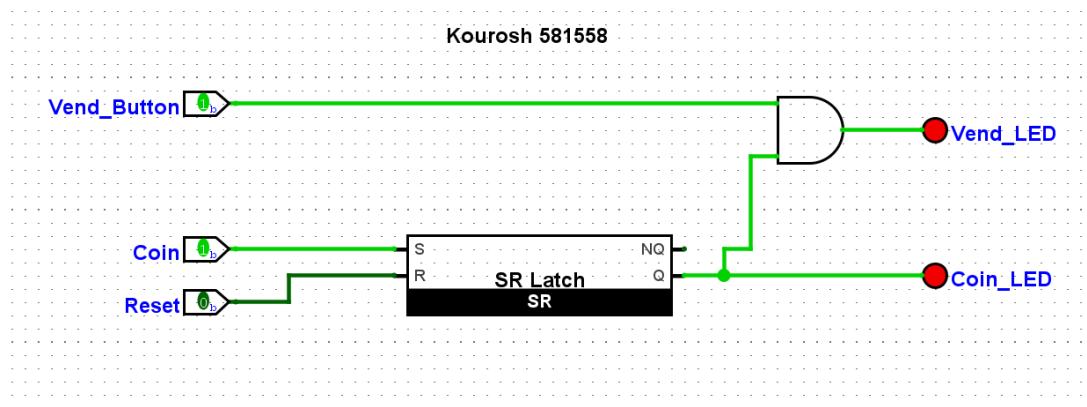
### Assignment 2.5: SR Latch

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");
```

}

1

## #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

1

#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("\nEnter 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](#)