Template Week 2 – Logic

Student number:568261

Assignment 2.1: Parking lot

Which gates do you need?

And gate

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?

Or gate

Complete this table

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

Assignment 2.3: Four NAND gates

Complete this table

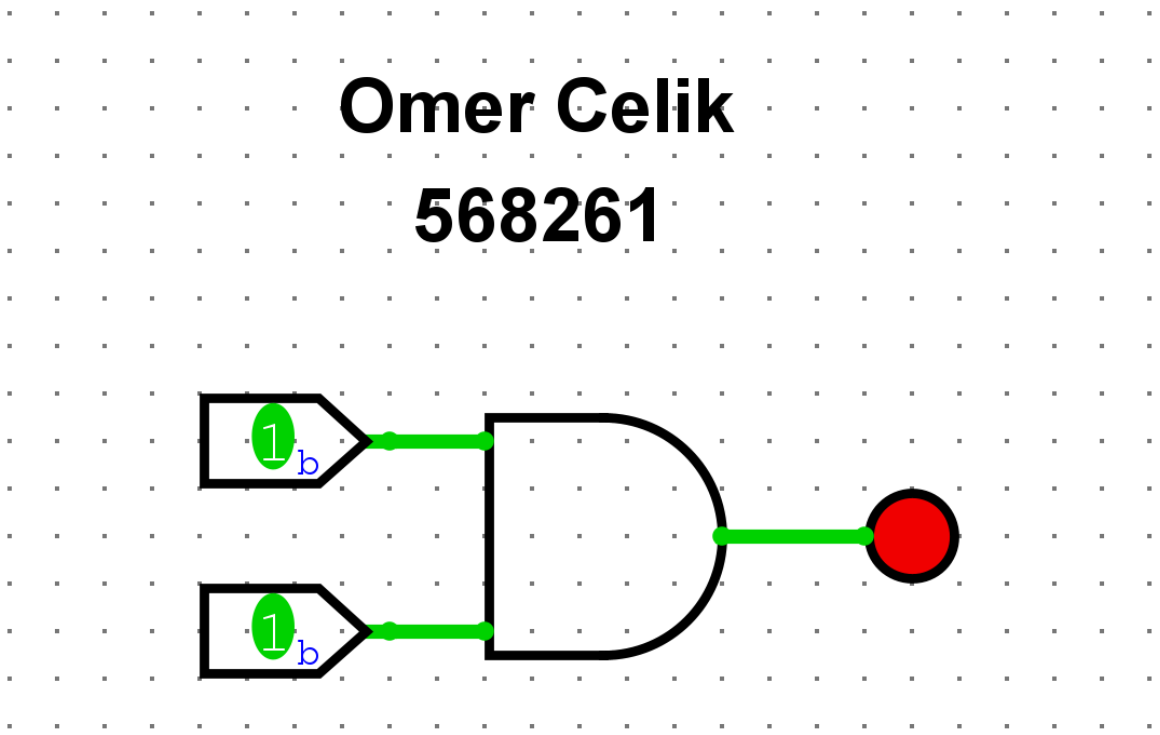
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

How can the design be simplified?

Het hele ontwerp van vier NAND-gates kan worden vervangen door **één enkele XOR-gate**. Dit bespaart ruimte op de chip en is technisch efficiënter.

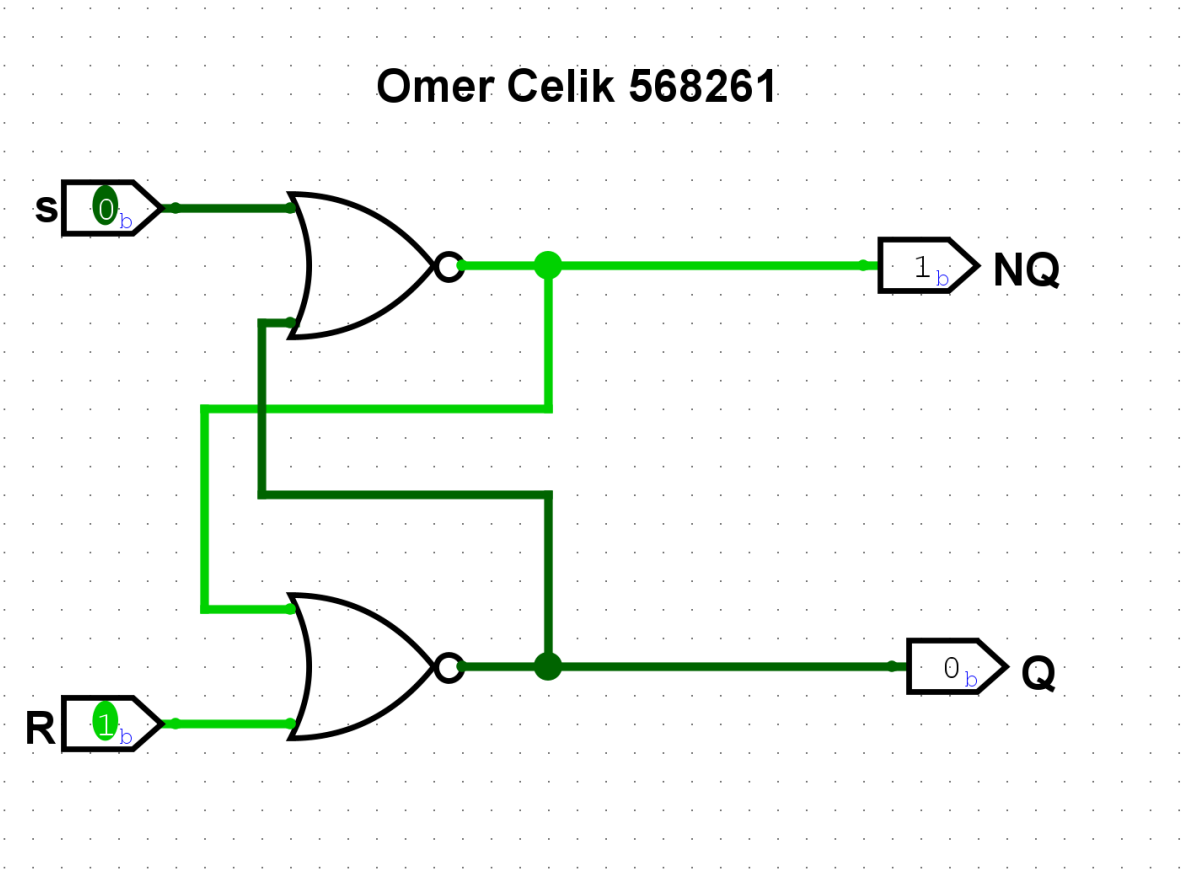
Assignment 2.4: Getting to know Logisim evolution

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



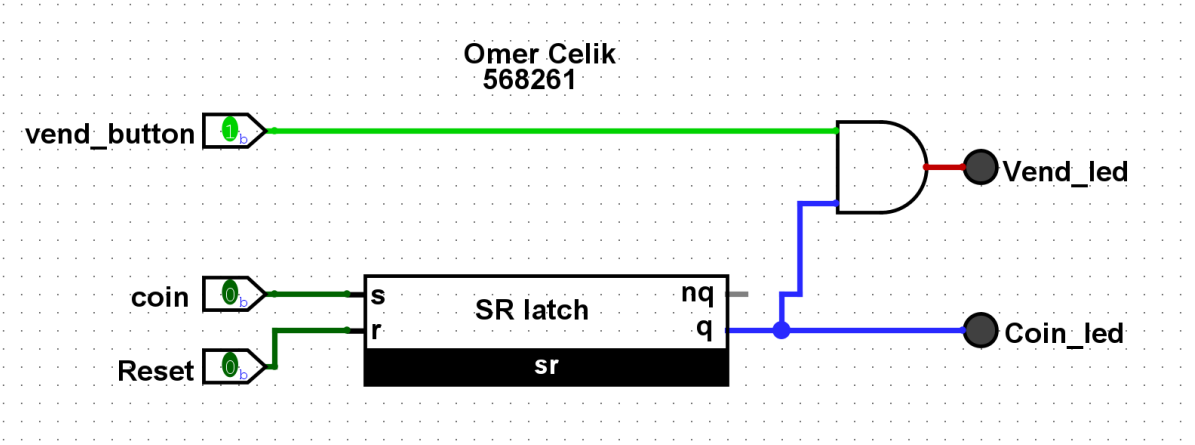
Assignment 2.5: SR Latch

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");
        }
    }
}
```

```
number is odd
```

#2 Power of 2

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

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

```
number is 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.");
    }
}
```

```
User has read 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 = 0;
        System.out.println("User permissions: " +
userPermissions);

        userPermissions = userPermissions | READ;
        userPermissions = userPermissions | EXECUTE;

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

```
User permissions: 0
User permissions: 5
```

#5 Update permissions

```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;

        userPermissions = userPermissions ^ WRITE;

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

```
User permissions: 4
```

#6 Two's complement

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

        // Maak het getal negatief met two's complement
        number = ~number + 1;

        System.out.println("Number: " + number);

        // Terug naar positief
        number = ~number + 1;

        System.out.println("Back to positive: " + number);
    }
}
```

```
Number: -5
Back to positive: 5
```

#7 Display binary, octal and hexadecimal values

```java
public class Main {
    public static void main(String[] args) {

        // Decimaal getal
        int number = 10;

        // Print het decimale getal
        System.out.println("Decimal integer: " + number);

        // Omzetten naar andere talstelsels
        String binary = Integer.toBinaryString(number);
        String octal = Integer.toOctalString(number);
        String hexadecimal = Integer.toHexString(number);

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

```
Decimal integer: 10
Binary representation: 1010
Octal representation: 12
Hexadecimal representation: a
```

Assignment 2.8: Java Application Bit Calculations

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

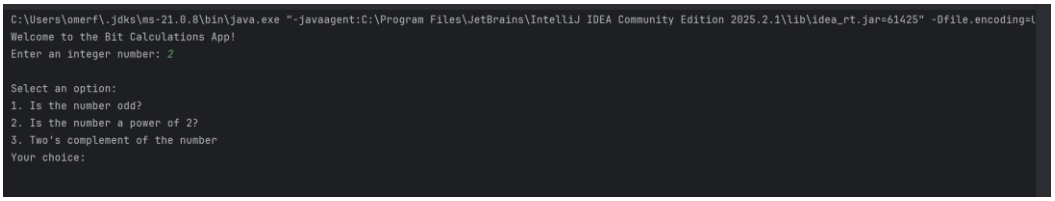
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?

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.




```java
import java.util.Scanner;

class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.println("Welcome to the Bit Calculations App!");

        int number = 0;
        System.out.print("Enter an integer number: ");
        if (scanner.hasNextInt()) {
            number = scanner.nextInt();
        } else {
            System.out.println("Invalid input! Please enter an integer.");
            scanner.close();
            return;
        }

        System.out.println("Select an option:");
        System.out.println("1. Is the number odd?");
        System.out.println("2. Is the number a power of 2?");
        System.out.println("3. Two's complement of the number");
        System.out.print("Your choice: ");

        int choice = 0;
        if (scanner.hasNextInt()) {
            choice = scanner.nextInt();
        } else {
            System.out.println("Invalid input! Please enter 1, 2, or 3.");
            scanner.close();
            return;
        }

        switch (choice) {
            case 1:
                System.out.println(number + (isOdd(number) ? " is odd." : " is even."));
                break;
            case 2:
                System.out.println(number + (isPowerOfTwo(number) ? " is a power of 2." : " is NOT a power of 2."));
                break;
            case 3:
                System.out.println("Two's complement of " + number + " is: " + twosComplement(number));
                break;
            default:
                System.out.println("Invalid option! Please choose 1, 2, or 3.");
        }

        scanner.close();
    }

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

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

    public static int twosComplement(int number) {
        return ~number + 1;
    }
}
```

Ready? Then save this file and export it as a pdf file with the name: **week2.pdf**