Week 2 – Logic

Student number: 577029

Assignment 2.1: Parking lot

Which gates do you need?

3input 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?

XOR gate

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
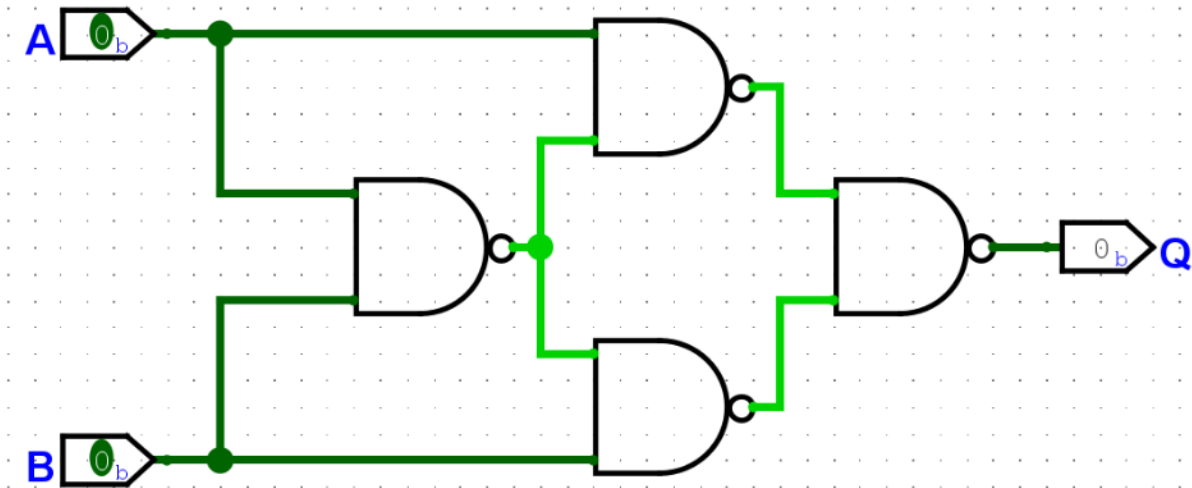
Complete this table
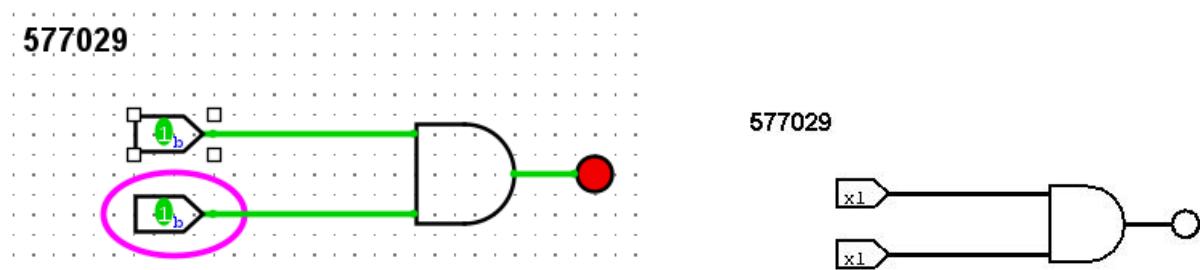
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

How can the design be simplified?

With XOR table, since NAND is universal gate that could also make XOR. Based on the result of the output of above table has similarities with the result of XOR truth table
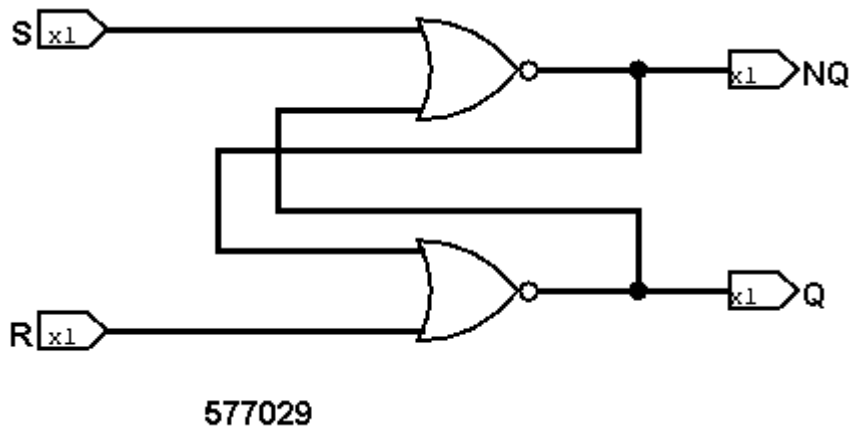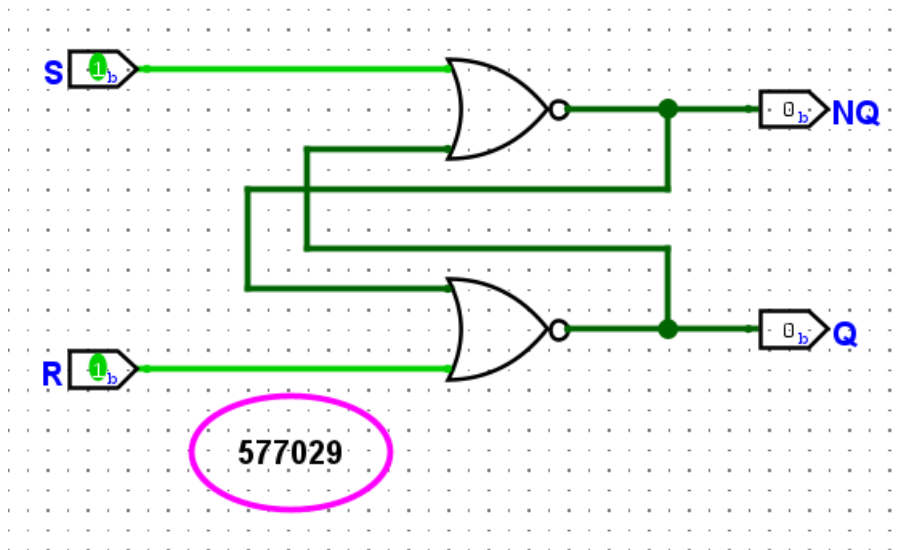
Assignment 2.4: Getting to know Logisim evolution

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:

S   **NQ**

R

577029

S   x1   x1   **NQ**

R   x1   x1   **Q**

577029

Assignment 2.6: Vending Machine

Screenshot Vending Machine in Logisim with your name and student number:

vend_button   **vend_LED**

coin   S   NQ

reset   R   SR Latch   Q   **coin_LED**

sr

577029

577029
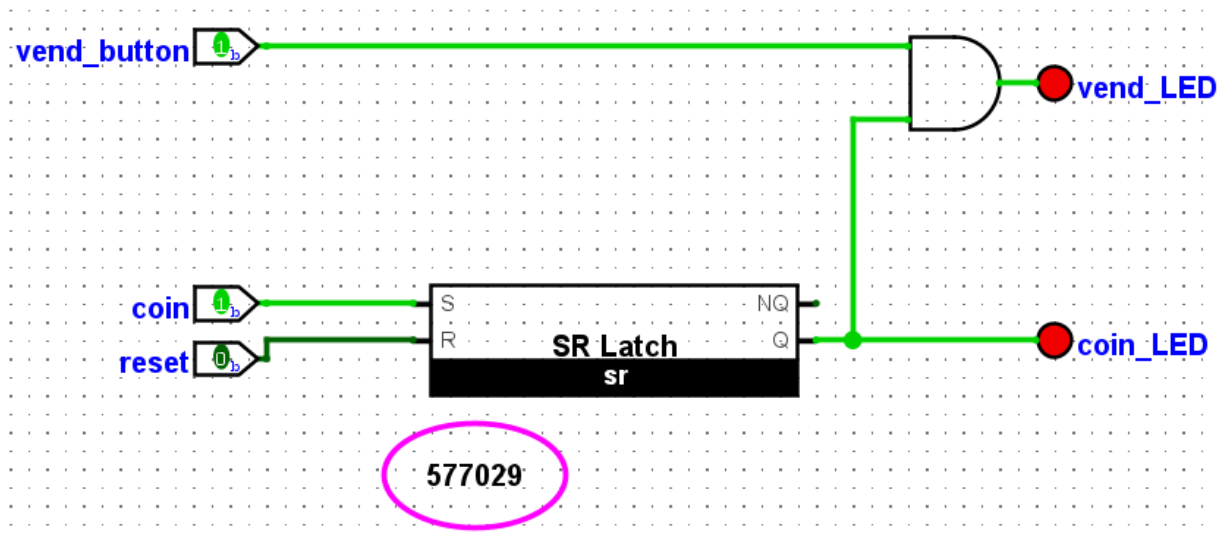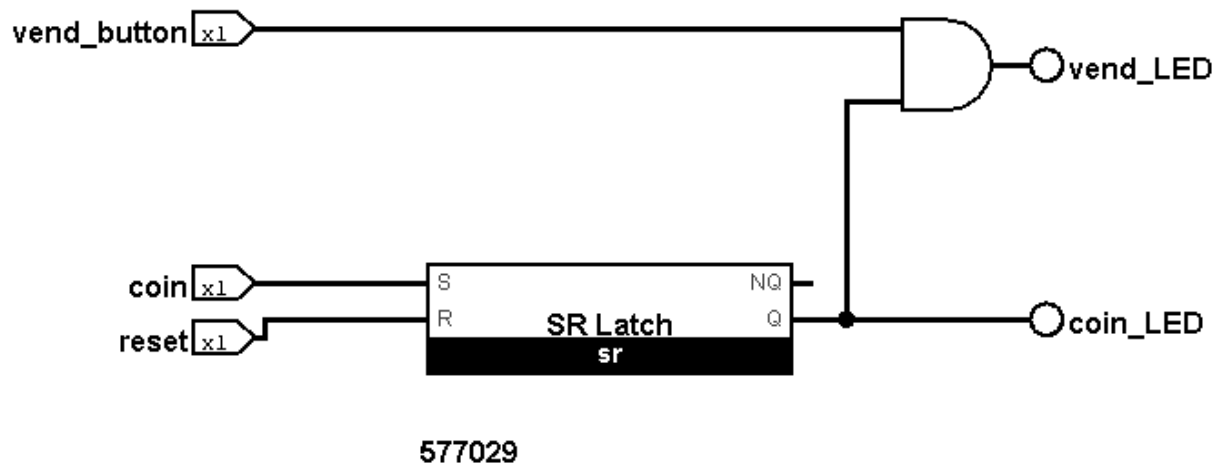
Assignment 2.7: Bitwise operators

Complete the java source code for bitwise operators. Put the source code here.

#1 even or odd

```java
public class Main {
    public static void main(String[]
args) {
        int number = 6;
        if((number & 1) == 1)

            System.out.println("number is
odd");
        else System.out.println("number is
even");
    }
}
```

```
number is even
```

```java
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

```java
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");
        }
    }
}
```

```
number is a power of 2
```

```java
public class Main {
    public static void main(String[] args) {
        int number = 7;

        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");
        }
    }
}
```

```
number isn't a power of 2
```

#3 check 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 = 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
```

```java
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) ==
WRITE) {
            System.out.println("User has read
permissions");
        } else {
            System.out.println("User can't
read. No permissions.");
        }
    }
}
```

```
User can't read. No permissions.
```

#4User 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 = READ | EXECUTE;

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

```
User permissions: 5
```

#5UpdatePermissions

```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);
    }
}
```
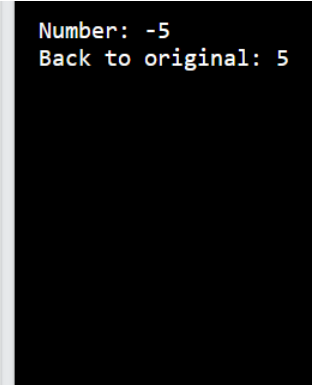
```
User permissions: 4
```

#6 Two's complement

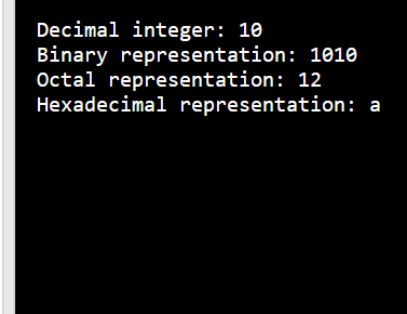**#6 Two's complement**

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

        number = ~number + 1;

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

        number = ~number + 1;
        System.out.println("Back to original: " + number);
    }
}
```

```
Number: -5
Back to original: 5
```

#7 Display binary, octal and hexadecimal values

```java
public class Main {
public static void main(String[] args) {
int number = 10;
System.out.println("Decimal integer: "+number);
String binary = Integer.toBinaryString(number);
String octal = Integer.toOctalString(number);
String hexadecimal = Integer.toHexString(number);
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;

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

        System.out.print("Enter an integer: ");
        int number = scanner.nextInt();

        System.out.println("\n--- Bitwise Operations 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.print("Choose an option (1-3): ");

        int choice = scanner.nextInt();

        switch (choice) {
            case 1:
                if (isOdd(number)) {
                    System.out.println(number + " is an ODD number.");
                } else {
                    System.out.println(number + " is an EVEN number.");
                }
                break;

            case 2:
                if (isPowerOfTwo(number)) {
                    System.out.println(number + " IS a power of 2.");
                } else {
                    System.out.println(number + " is NOT a power of 2.");
                }
                break;
```

```java
        case 3:
            int result = getTwosComplement(number);
            System.out.println("The Two's Complement of " + number + " is: " + result);
            break;

        default:
            System.out.println("Invalid option selected.");
    }
}

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

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

    public static int getTwosComplement(int n) {  1 usage
        return ~n + 1;
    }
}
```

Output:

```
Enter an integer: 8

--- Bitwise Operations Menu ---
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?
Choose an option (1-3): 2
8 IS a power of 2.

Process finished with exit code 0
```

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