Template Week 2 – Logic

Student number: 585303

Assignment 2.1: Parking lot

Which gates do you need?

AND gate with 3 inputs

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 full

Assignment 2.2: Android or iPhone

Which gates do you need?

XOR with 2 inputs

Complete this table

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

Assignment 2.3: Four NAND gates

Complete this table

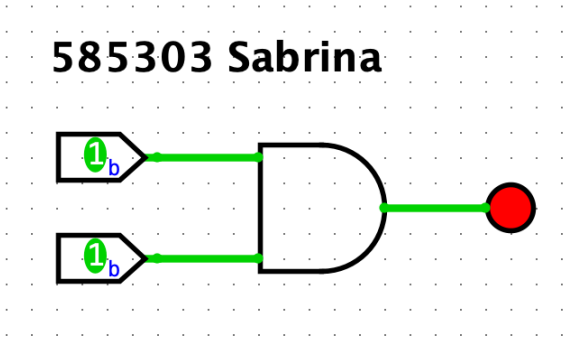
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

How can the design be simplified?

We can simplify a four NAND gate with a XOR gate in this specific example

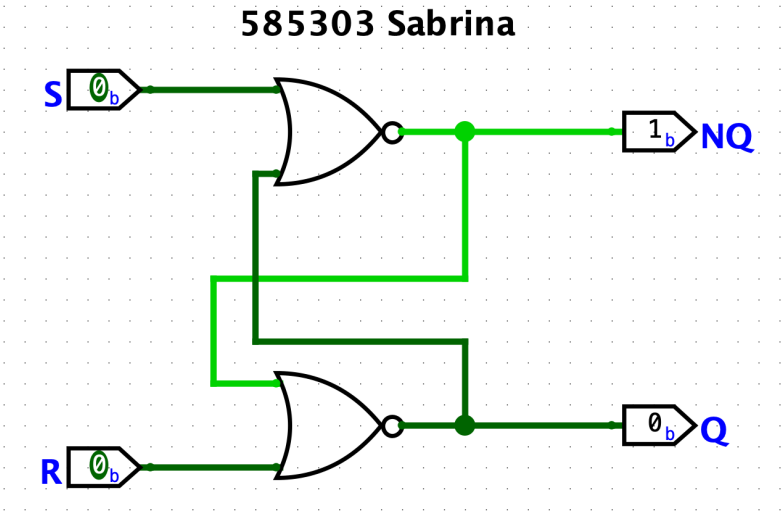
Assignment 2.4: Getting to know Logisim evolution

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



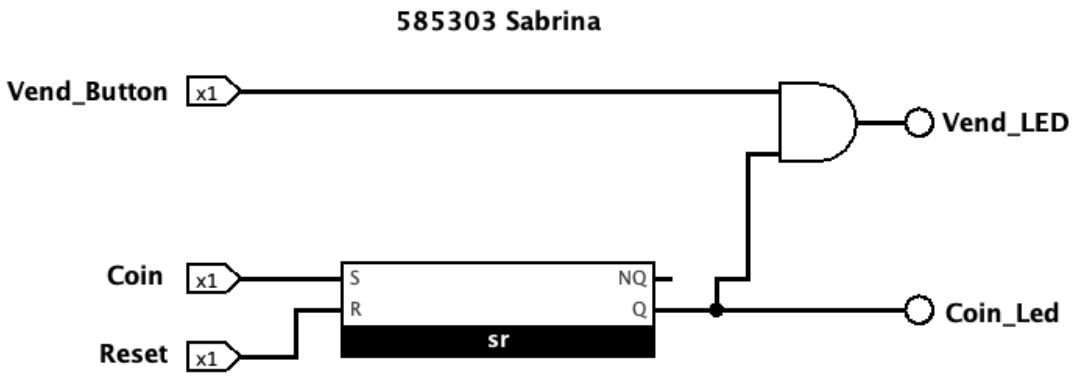
Assignment 2.5: SR Latch

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.

TASK 1

```
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");
	}
}
```

TASK 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");
}
```

TASK 3

```
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)== 4) System.out.println("User has read permissions");
		else System.out.println("User can't read. No permissions.");
	}
}
```

TASK 4

```
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);
	}
}
```

TASK 5

```
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);
	}
}
```

TASK 6

```
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.

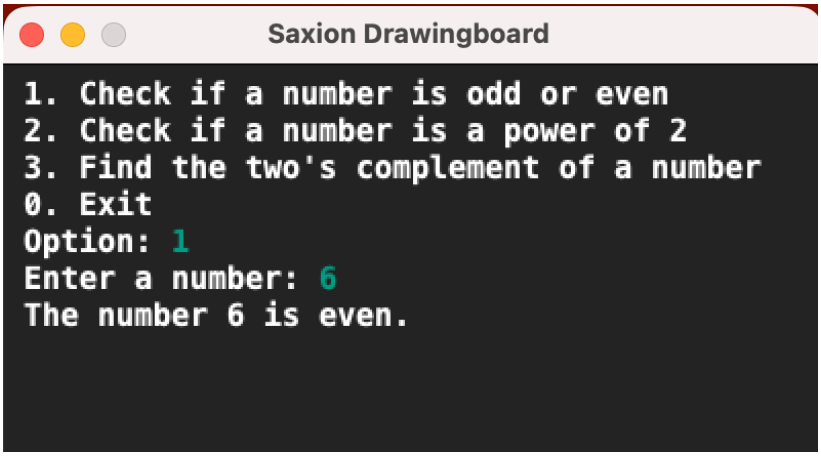
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?

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.

```
import nl.saxion.app.SaxionApp;

public class Application implements Runnable {

    public static void main(String[] args) {
        SaxionApp.start(new Application(), 400, 400);
    }

    public void run() {
        boolean run = true;

        while (run) {
            SaxionApp.printLine("1. Check if a number is odd or even");
            SaxionApp.printLine("2. Check if a number is a power of 2");
            SaxionApp.printLine("3. Find the two's complement of a number");
            SaxionApp.printLine("0. Exit");
            SaxionApp.print("Option: ");

            int option = SaxionApp.readInt();

            if (option == 1) {
                isOdd();
            } else if (option == 2) {
                isPower2();
            } else if (option == 3) {
                twosComp();
            } else if (option == 0) {
                run = false;
            } else {
                SaxionApp.printLine("Invalid option!");
            }

            if (run) {
                SaxionApp.pause();
                SaxionApp.clear();
            }
        }
    }

    private void isOdd() {
        SaxionApp.print("Enter a number: ");
        int number = SaxionApp.readInt();

        if ((number & 1) == 1) {
            SaxionApp.printLine("The number " + number + " is odd.");
        } else {
            SaxionApp.printLine("The number " + number + " is even.");
        }
    }

    private void isPower2() {
        SaxionApp.print("Enter a number: ");
        int number = SaxionApp.readInt();

        if (number > 0 && (number & (number - 1)) == 0) {
            SaxionApp.printLine("The number " + number + " is a power of 2.");
        } else {
            SaxionApp.printLine("The number " + number + " is not a power of 2.");
        }
    }

    private void twosComp() {
        SaxionApp.print("Enter a number: ");
        int n = SaxionApp.readInt();

        int result = (~n) + 1;
        SaxionApp.printLine("The two's complement of " + n + " is " + result + ".");
    }
}
```


Saxion Drawingboard
1. Check if a number is odd or even
2. Check if a number is a power of 2
3. Find the two's complement of a number
0. Exit
Option: 1
Enter a number: 6
The number 6 is even.