Template Week 2 – Logic

Student number: 573512

Assignment 2.1: Parking lot

Which gates do you need?

You need the gate: AND
If parking lot 1 is occupied AND parking lot 2 is occupied AND parking lot 3 is occupied, show the 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
1	0	0	0
1	1	0	0
0	1	1	0
1	0	1	0
1	1	1	1

Assignment 2.2: Android/iPhone

Which gates do you need?

You need the gate: XOR (Exclusive OR)

Complete this table

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

Assignment 2.3: Four NAND gates

Complete this table

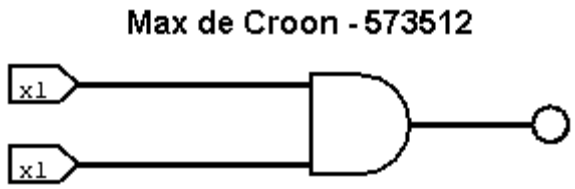
A	B	Q
0	0	0
1	0	1
0	1	1
1	1	0

How can the design be simplified?

You can also use an XOR (Exclusive OR) gate instead of 4 NAND gates.

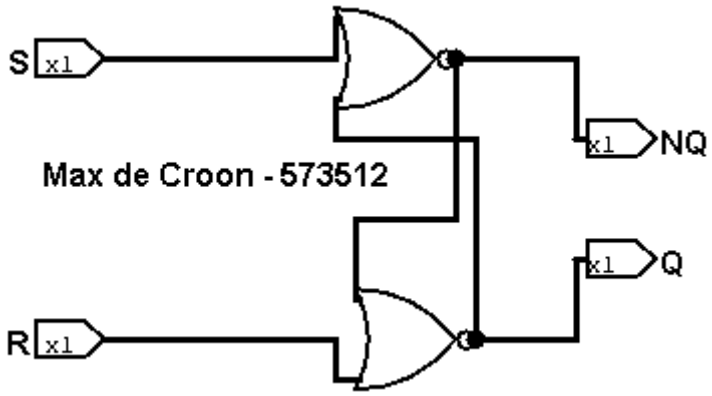
Assignment 2.4: Getting to know Logisim evolution

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



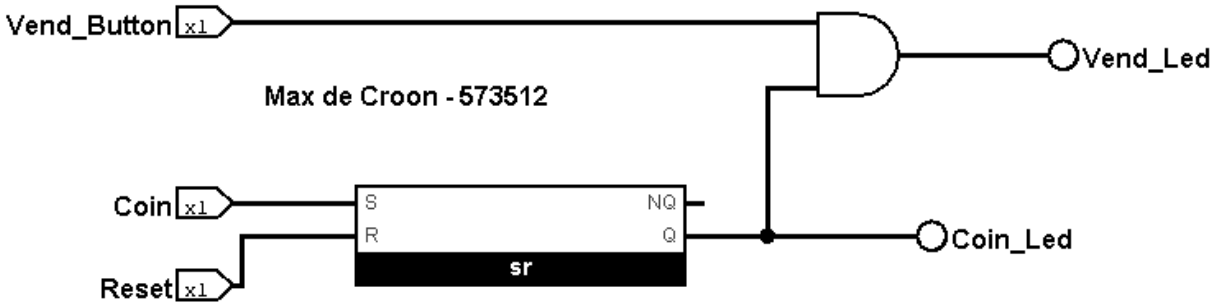
Assignment 2.5: SR Latch

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 programming assignment

In the course introduction to programming in quartile 1.1 you learned how to program in java. In this course we're going to expand your knowledge a bit by working with bitwise operators.

#1 even or odd Examine the table on the right.

When does a binary number become odd?

A binary number becomes odd if the last number in the series is a "1"

Could you write java code to check if a integer number is odd, without using the modulo % operator? That is possible with the bitwise operators. But why would we use them? Bitwise operators are more efficient than the modulo operator because they operate directly on the binary representation of numbers, allowing for faster calculations without the overhead of division.

```
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");
 }
}
```

#2 Power of 2

Examine the table on the right. When does a binary number become a power of 2?

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

#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 | WRITE;

 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);
 }
}
```

#7 Display binary, octal and hexadecimal values

Bonus point assignment – week 2

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.

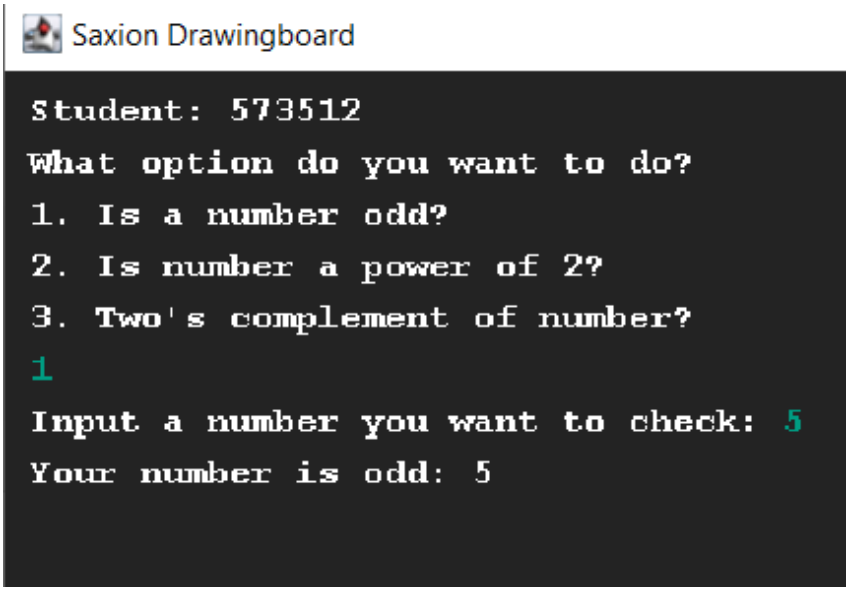
Organize your source code in a readable manner with the use of control flow and methods.

Paste source code here, with a screenshot of a working application.

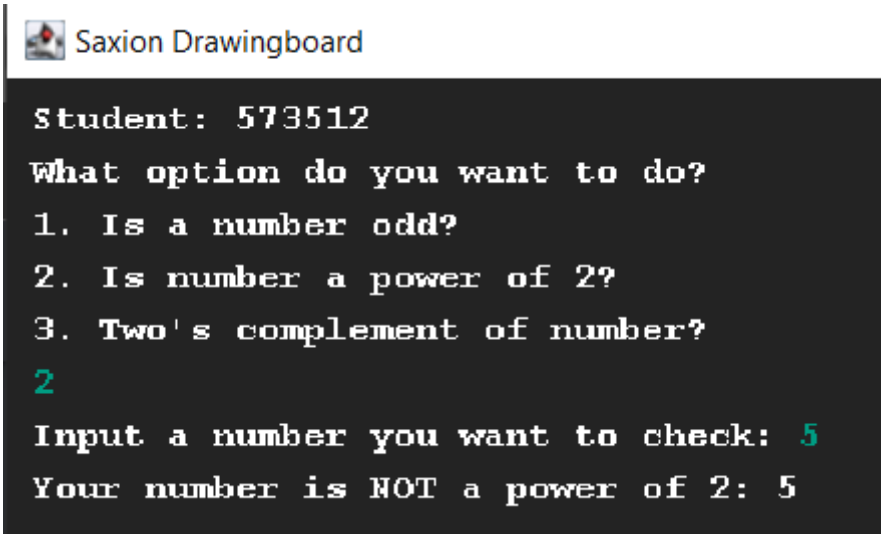
```
import nl.saxion.app.SaxionApp;

public class Application implements Runnable {

   public static void main(String[] args) {
      SaxionApp.start(new Application(), 1024, 768);
   }

   public void run() {

      boolean continueLoop = true;

      while (continueLoop) {
         SaxionApp.printLine("Student: 573512");

         SaxionApp.printLine("What option do you want to do?");
         SaxionApp.printLine("1. Is a number odd?");
         SaxionApp.printLine("2. Is number a power of 2?");
         SaxionApp.printLine("3. Two's complement of number?");

         int option = SaxionApp.readInt();

         if (option == 0) {
            continueLoop = false;
         } else if (option == 1) {
            isOdd();
         } else if (option == 2) {
            isPowerOf2();
         } else if (option == 3) {
            showTwosComplement();
         }
         else {
            SaxionApp.printLine("Not a valid option");
            SaxionApp.pause();
```

```
            SaxionApp.clear();
        }
    }
}

public void isOdd() {
    SaxionApp.print("Input a number you want to check: ");
    int number = SaxionApp.readInt();

    if ((number & 1) == 1) {
        SaxionApp.printLine("Your number is odd: " + number);
    } else {
        SaxionApp.printLine("Your number is even: " + number);
    }
    SaxionApp.pause();
    SaxionApp.clear();
}

public void isPowerOf2() {
    SaxionApp.print("Input a number you want to check: ");
    int number = SaxionApp.readInt();

    if ((number & number - 1) == 0) {
        SaxionApp.printLine("Your number is a power of 2: " + number);
    } else {
        SaxionApp.printLine("Your number is NOT a power of 2: " + number);
    }
    SaxionApp.pause();
    SaxionApp.clear();

}

public void showTwosComplement() {
    SaxionApp.print("Input a number you want to check: ");
    int number = SaxionApp.readInt();

    number = ~number + 1;
    SaxionApp.printLine("Number: " + number);

    SaxionApp.pause();
    SaxionApp.clear();
}

}
```

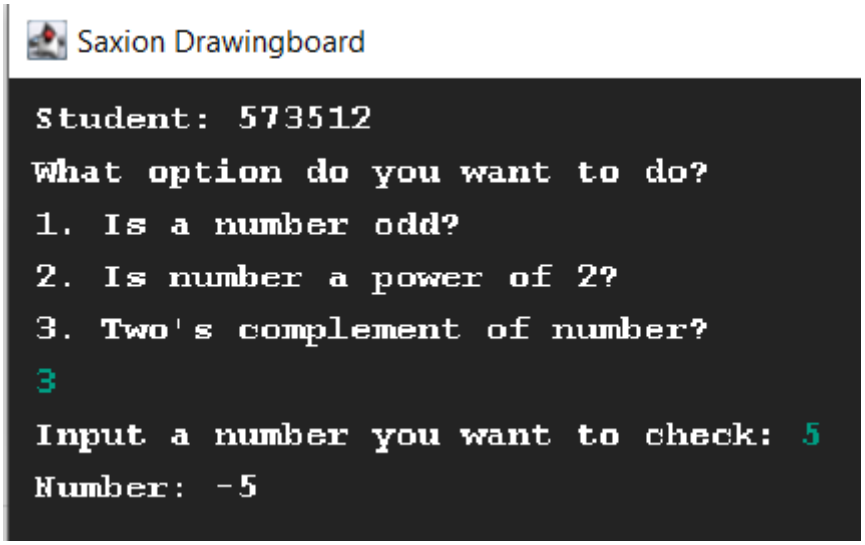
Screenshot odd number:



Screenshot power of 2 number:



Screenshot two's complement number:



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