Template Week 2 – Logic

Student number: 565228

Assignment 2.1: Parking lot

If all is full = True
If one is empty = False

Which gates do you need?
You need an OR gate because if one or more parking spaces are free, you can park. If they are all full, you can't park anymore.

Complete this table

Parking lot 1	Parking lot 2	Parking lot 3	Result (full)
0	0	0	False
0	0	1	False
0	1	0	False
1	0	0	False
1	1	0	False
1	1	1	True

Assignment 2.2: Android/iPhone

Exactly 1 true = True
More than 1 true = False
Both false = False

Which gates do you need?
You need an XOR (Exclusive OR) gate, because the result is only true if exactly 1 of the statements is true. So, an android = true, an iPhone = true, but an Android AND iPhone = false, and of course none = false

Complete this table

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

Assignment 2.3: Four NAND gates

A NAND (NOT AND) gate will only output false if both input values are true. Otherwise, the output will be true.

Complete this table

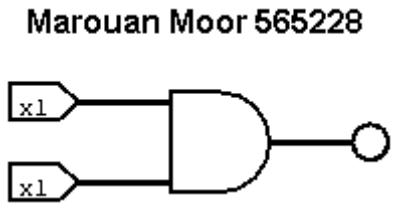
A	B	Q
1	1	False
1	0	True
0	1	True
0	0	True

How can the design be simplified?

By replacing the 4 NAND gates with a singular XOR gate.

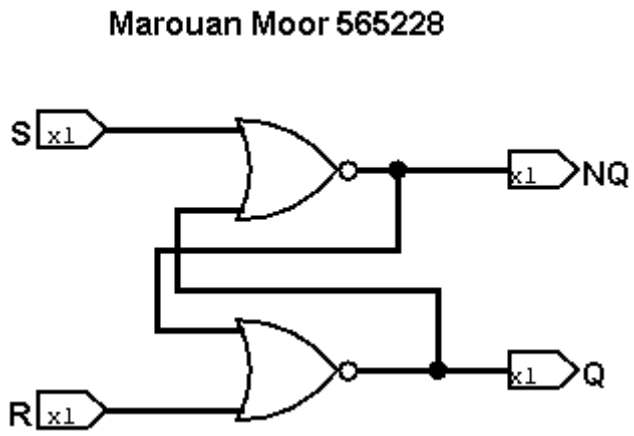
Assignment 2.4: Getting to know Logisim evolution

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



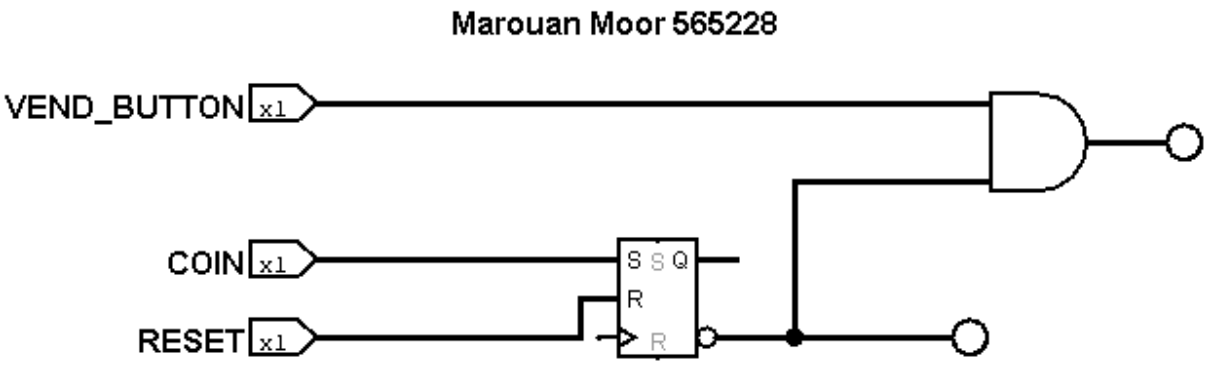
Assignment 2.5: SR Latch

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:



Bonus point assignment – week 2

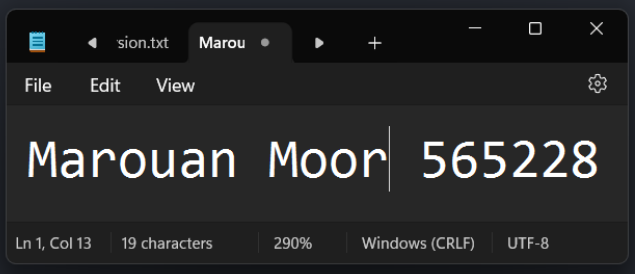
Create a java program that accepts user input and presents a menu with options.

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.

```
"C:\Program Files\Java\jdk-21.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2024.2.1\lib\idea_rt.jar=12
Please enter a number: 6

Menu
1. Check if the number is odd
2. Check if the number is a power of 2
3. Check what the two's complement of the number is
4. Exit
1
6 is even

Menu
1. Check if the number is odd
2. Check if the number is a power of 2
3. Check what the two's complement of the number is
4. Exit
2
6 is a multiple of 2

Menu
1. Check if the number is odd
2. Check if the number is a power of 2
3. Check what the two's complement of the number is
4. Exit
3
The two's complement of 6 is -6

Menu
1. Check if the number is odd
2. Check if the number is a power of 2
3. Check what the two's complement of the number is
4. Exit
4
Goodbye!

Process finished with exit code 0
```



```
import java.util.Scanner;
class Main {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Please enter a number: ");
      int number = scanner.nextInt();
      while (true) {
         System.out.println("\nMenu");
         System.out.println("1. Check if the number is odd");
         System.out.println("2. Check if the number is a power of 2");
         System.out.println("3. Check what the two's complement of the number is");
         System.out.println("4. Exit");
         int choice = scanner.nextInt();
         switch (choice) {
            case 1:
               if (isOdd(number))
                  System.out.println(number + " is odd");
               else
                  System.out.println(number + " is even");
               break;
            case 2:
               if (powerOfTwo(number))
                  System.out.println(number + " is a multiple of 2");
               else
                  System.out.println(number + " is not a multiple of 2");
               break;
            case 3:
               System.out.println("The two's complement of " + number + " is " +
                     twoCompNumber(number));
               break;
            case 4:
               System.out.println("Goodbye!");
               scanner.close();
               return;
         }
      }
   }
   public static boolean isOdd(int number) {
      return (number & 1) == 1;
   }
   public static boolean powerOfTwo(int number) {
      return number % 2 == 0;
   }
   public static int twoCompNumber(int number) {
      return ~number + 1;
   }
}
```