Week 2 – Logic

Student number: 573534

Assignment 2.1: Parking lot

Which gates do you need?
The 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
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?
The XOR gate

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
0	1	1
1	0	1
1	1	0

How can the design be simplified?
Changing this to a XOR gate can get rid of all the 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:

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 java.util.Scanner;

public class Main {

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

      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?");
      int choice = scanner.nextInt();

      System.out.println("\nChoose a number");
      int number = scanner.nextInt();

      if (choice == 1) {
         if ((number & 1) == 1) System.out.println("number is odd");
         else System.out.println("number is even");
      } else if (choice == 2) {
         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");
      } else if (choice == 3) {
         number = ~number + 1;
         System.out.println("Number: " + number);
      }
   }
}
```

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

Choose a number
1
number is odd
```

1 & 1 == 1 this compares the first bit and checks if it is equal to 1 if it is the number is odd.
3 & 1 == 1 is equal to (11 & 1) == 1 so it is odd.
4 & 1 == 1 is equal (100 & 1) != 0 so it is even.

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

Choose a number
4
number is a power of 2
```

(2 & (2 – 1)) == 0) this compares the number's first bit to 1 and if it is 0 it is a power of 2 and if it isn't then it isn't a power of 2.

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

Choose a number

4
Number: -4
```

This ~ bitwise operator flips each individual bit and inverts it.
so it becomes inverted. 4 (0100) becomes (1011) = -5 + 1 = -4