X<<Y states convert X into binary and shift binary X, Y times towards left and leave zeros on empty places.
X>>Y states convert X into binary and shift binary X, Y times towards right and leave zeros on empty places.

Java - Introduction to Programming

Lecture 14

eg. X=5 and Y=2, X<<Y = (101)<<2 = 10100 = 20, X=7 and Y=1, X>>Y = (111)>>1 = 011 = 3

Bit Manipulation

Get Bit

```java
import java.util.*;

public class Bits {
   public static void main(String args[]) {
      int n = 5; //0101
      int pos = 3;
      int bitMask = 1<<pos;

      if((bitMask & n) == 0) {
          System.out.println("bit was zero");
      } else {
          System.out.println("bit was one");
      }
   }
}
```

Set Bit

```java
import java.util.*;

public class Bits {
   public static void main(String args[]) {
      int n = 5; //0101
      int pos = 1;
      int bitMask = 1<<pos;

      int newNumber = bitMask | n;
      System.out.println(newNumber);
   }
}
```

Clear Bit

```java
import java.util.*;
public class Bits {
  public static void main(String args[]) {
     int n = 5; //0101
     int pos = 2;
     int bitMask = 1<<pos;
     int newBitMask = ~(bitMask);
     int newNumber = newBitMask & n;
     System.out.println(newNumber);
  }
}
```

Update Bit

```java
import java.util.*;

public class Bits {
   public static void main(String args[]) {
       Scanner sc = new Scanner(System.in);
       int oper = sc.nextInt();
       // oper=1 -> set; oper=0 -> clear
      int n = 5;
      int pos = 1;

      int bitMask = 1<<pos;
      if(oper == 1) {
          //set
          int newNumber = bitMask | n;
          System.out.println(newNumber);
      } else {
       //clear
       int newBitMask = ~(bitMask);
       int newNumber = newBitMask & n;
       System.out.println(newNumber);
      }

   }
}
```

Homework Problems

1. Write a program to find if a number is a power of 2 or not.
2. Write a program to toggle a bit a position = “pos” in a number “n”.
3. Write a program to count the number of 1’s in a binary representation of the number.
4. Write 2 functions => decimalToBinary() & binaryToDecimal() to convert a number from one number system to another. [BONUS]