Problem 1

Using only pen and paper, calculate what the following program will print

download *BitOp.java*

```
int a = 37, b = 98;
System.out.println("a & b                " + (a & b));
System.out.println("a | b                " + (a | b));
System.out.println("a ^ b                " + (a ^ b));
System.out.println("a << 2               " + (a << 2));
System.out.println("(a >> 1) & b         " + ((a >> 1) & b));
System.out.println("(a << 2) ^ (b >> 2)  " + ((a << 2) ^ (b >> 2)));
System.out.println("a & ~(b >> 3)        " + (a & ~(b >> 3)));
```

and then check the results by running the program.

Problem 2

Write a program which can be used as a (very) simple calculator. The program reads, using a **Scanner** or **JOptionPane**, two numbers (of type **double**) and, as a **String**, the symbol of an arithmetic operation ($+$, $-$, $*$ or $/$). Then it displays the result (sum, difference, product or ratio of the two numbers). In order to compare strings, say `s1` and `s2`, use function **equals** (`s1.equals(s2)` returns **true** or **false**).

Problem 3

Write a program which reads three natural numbers, `a`, `b` and `c`, and then prints `"OK"` if any two of them are equal, but the third is different, and `"NOT OK"` otherwise.

Problem 4

Write a program which reads three natural numbers, `a`, `b` and `c`, and then prints `"OK"` if for any two of them their sum is strictly larger than the third (in other words, if a triangle with side lengths equal those numbers exists), and `"NOT OK"` otherwise.

Problem 5

Write a program reading (using a **Scanner**) three values of type **boolean** and storing them in three variables (e.g., `a`, `b` and `c`). Then define five additional logical variables and set their values according to the following interpretation (abbreviation *iff* stands for *if, and only if*):

- allThree: **true** *iff* all three values are **true**;
- exactlyOne: **true** *iff* exactly one of them is **true**;
- exactlyTwo: **true** *iff* exactly two are **true**;
- atLeastOne: **true** *iff* at least one of them is **true**;
- atLeastTwo: **true** *iff* at least two of them are **true**;

NOTE: entering a logical value from the keyboard, type the word *true* or *false*.

The following program

download *Bools.java*

```
import java.util.Scanner;

public class Bools {
    public static void main(String[] args) {
        Scanner sca = new Scanner(System.in);
        System.out.print("Enter three boolean " +
                         "values (true or false) ");
        boolean a = sca.nextBoolean();
        boolean b = sca.nextBoolean();
        boolean c = sca.nextBoolean();

        boolean allThree   = ...
        boolean exactlyOne = ...
        boolean exactlyTwo = ...
        boolean atLeastOne = ...
        boolean atLeastTwo = ...

        System.out.println("a, b, c = " + a + ", " + b +
                ", " + c + "\nallThree:   " + allThree +
                "\nexactlyOne: " + exactlyOne +
                "\nexactlyTwo: " + exactlyTwo +
                "\natLeastOne: " + atLeastOne +
                "\natLeastTwo: " + atLeastTwo);
    }
}
```

should, for some combinations of input values, print

```
a, b, c = false, true, false
allThree:   false
exactlyOne: true
exactlyTwo: false
atLeastOne: true
atLeastTwo: false

a, b, c = true, true, false
allThree:   false
exactlyOne: false
exactlyTwo: true
atLeastOne: true
atLeastTwo: true

a, b, c = true, true, true
```

```
allThree:   true
exactlyOne: false
exactlyTwo: false
atLeastOne: true
atLeastTwo: true
```

Do not use **if** statements.

Problem 6

Suppose that one number of type **int** determines the family, style, weight and size of a font according to the following scheme:

- the value of two least significant bits determines the family
  - 0: Courier
  - 1: Times
  - 2: Arial
  - 3: Helvetica
- next two bits determine the style
  - 0: plain
  - 1: italic
  - 2: slanted
  - 3: undefined (illegal)
- next single bit determines the weight
  - 0: normal
  - 1: bold
- and the next three — size
  - 0: x-small
  - 1: small
  - 2: medium
  - 3: large
  - 4: x-large
  - other values: undefined (illegal)

Write a program defining one number of type **int** and then displaying information on the font represented by this number. If the value is illegal, the program should display an appropriate message and stop.
Notes:

- To stop a program, one can use in the **main** function the instruction **return**;
- To construct the final message, concatenation of **String**s may be useful.

For example, for numbers 102, 166, 46, 137, the results should be, respectively

```
n=102: Arial, italic, normal, large
n=166: illegal size
n=46: illegal style
n=137: Times, slanted, normal, x-large
```
