1 What (if anything) is wrong with each of the following statements? (3)

(a) `if (a > b) then c = 0;`

(b) `if a > b { c = 0; }`

(c) `if (a > b) c = 0;`

2 Write a program that will use `Math.random()` to simulate the flipping of a fair coin. Your program should print `Heads` or `Tails`. (3)

3 What values for boolean variables, `X` and `Y`, will result in the following statement being true? (5)

```
!(X && Y) || !(X || Y)
```

Explain your reasoning.

4 Write the program, `Craps`, that will roll two 6-sided dice and print the following: (5)

- `Snake Eyes` when two 1's are rolled,
- `Seven` when the dice values total 7,
- `Boxcars` when two 6's are rolled,
- `Hard Way` when any other pair is rolled.

5 The *exclusive*-or (*XOR*) boolean operator evaluates to `true` if exactly one of two boolean expressions is `true` and `false` otherwise. (10)

(a) Complete the following truth table for XOR operator ($\oplus$).

$\mathbf{P}$	$\mathbf{Q}$	$\mathbf{P} \oplus \mathbf{Q}$
T	T	
T	F	
F	T	
F	F	

(b) Write a boolean expression that will satisfy the output of $\mathbf{P} \oplus \mathbf{Q}$ above using any combination of AND (`&&`), OR (`||`) and NOT (`!`) logical operators.

6 *The Quadratic Formula.* Write the program, `Quadratic`, that, when given a, b, and c, the coefficients of a quadratic function in the form $y = ax^2 + bx + c$, correctly prints the roots of the function. Be sure to consider the following: (20)

- The quadratic formula returns the roots of a given quadratic function. It is as follows:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Note: The command `Math.sqrt(n)` will return the square root of the number, n.

- When a is 0, in order to avoid dividing by zero when using the quadratic formula, you should instead solve the equation:

$$bx + c = 0$$

- When the discriminant, $b^2 - 4ac$, is negative, there is no real solution. Your method should return `Double.NaN` and print: `No Real Solutions`.