

- 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 the XOR operator (\oplus).

P	Q	$P \oplus Q$
T	T	
T	F	
F	T	
F	F	

(b) Write a boolean expression that will satisfy the output of $P \oplus Q$ 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`.