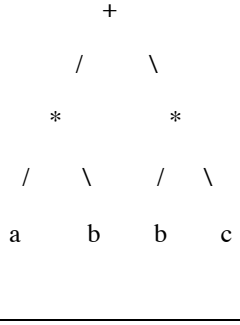
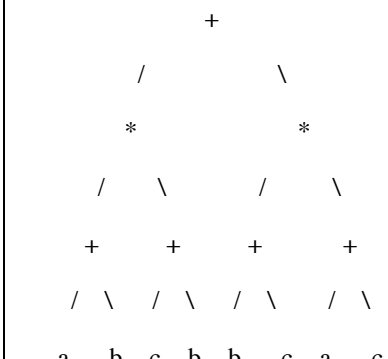
HOMEWORK 10

Question 1:

a. Expression that cannot be evaluated using just two registers, but can be evaluated with three registers.

Expression	AST	Pseudo code
$a = a * b + b * c$		load a into T0 load b into T1 T0 = T0 * T1 load c into T2 T1 = T1 * T2 T0 = T0 + T1

b. Expression that cannot be evaluated using just three registers, but can be evaluated with four registers.

Expression	AST	Pseudo code
$a = (a + b) * (c + b) +$ $(b + c) * (a + c)$		load a into T0 load b into T1 T0 = T0 + T1 load c into T2 T1 = T1 + T2 T0 = T0 * T1 load b in T1 T1 = T1 + T2 load a in T3 T2 = T3 + T2 T1 = T1 * T2 T0 = T0 + T1

Question 2

```
int numRegisters(ASTNode node) {
// add code to calculate and return the number of
// registers required to generate code for the whole
// expression (whose root is node)
        // leaf node
        if(node == null) {
                return 0;
        }
        // not leaf node
        int left = numRegisters(node.left);
        int right = numRegisters(node.right);
        // left node and right node with same register number requirements
        if(left == right) {
                return (left + 1);
        }
        else {
                return Math.max(left, right);
        }
}
```