

Question 1

a.

Expression	AST	pseudo code
$a*b+c*d$	<pre> graph TD Plus["+"] --> Star1["*"] Plus --> Star2["*"] Star1 --> a["a"] Star1 --> b["b"] Star2 --> c["c"] Star2 --> d["d"] </pre>	load a into T0 load b into T1 $T0 = T0 * T1$ load c into T1 load d into T2 $T1 = T1 * T2$ $T0 = T0 + T1$

b.

Expression	AST	pseudo code
$a1*b1+c1*d1 < a2*b2+c2*d2$	<pre> graph TD LT["<"] --> Plus1["+"] LT --> Plus2["+"] Plus1 --> Star11["*"] Plus1 --> Star12["*"] Star11 --> a1["a1"] Star11 --> b1["b1"] Star12 --> c1["c1"] Star12 --> d1["d1"] Plus2 --> Star21["*"] Plus2 --> Star22["*"] Star21 --> a2["a2"] Star21 --> b2["b2"] Star22 --> c2["c2"] Star22 --> d2["d2"] </pre>	load a1 into T0 load b1 into T1 $T0 = T0 * T1$ load c1 into T1 load d1 into T2 $T1 = T1 * T2$ $T0 = T0 + T1$ load a2 into T1 load b2 into T2 $T1 = T1 * T2$ load c2 into T2 load d2 into T3 $T2 = T2 * T3$ $T1 = T1 * T2$ $T0 = T0 < T1$

Question 2

Assume left child is evaluated before right child.

```

int numRegisters(ASTNode node) {
    if(node.isLeaf()) return 1;
    int leftNum = numRegisters(node.leftChild);
    int rightNum = numRegisters(node.rightChild);
    if(leftNum > rightNum) return leftNum;
    return rightNum + 1;
}

```