

# American Computer Science League

2018-2019

Contest #3

## INTERMEDIATE DIVISION

考号/Exam Code: \_\_\_\_\_ 姓名/Name: \_\_\_\_\_ 学校/School: \_\_\_\_\_

### 1. Boolean Algebra

Simplify the following Boolean expression:

$$AB + \overline{A}(B + A) + A$$

1.

### 2. Boolean Algebra

Which ordered triple(s) make the following Boolean expression TRUE?

$$A\overline{B}(A + C) + B(\overline{A}C + \overline{B}C)$$

2.

### 3. Data Structures

How many nodes have only one child in the binary search tree for:

**WAYNENEWJERSEY**

3.

### 4. Data Structures

Define the operation REV as follows: reverse the items in the list.  
Begin with an initially empty stack, perform the operations listed.  
What is the next item to be popped?

PUSH(S), PUSH(U), PUSH(N), POP(X), REV, POP(X), PUSH(R),  
PUSH(A), PUSH(I), PUSH(N), REV, POP(X), POP(X), REV, POP(X),  
PUSH(W), PUSH(I), PUSH(N), PUSH(D), POP(X), REV, POP(X),  
PUSH(C), PUSH(L), PUSH(O), PUSH(U), PUSH(D), PUSH(S), REV,  
POP(X), POP(X), REV, POP(X), REV, POP(X), POP(X), REV

4.

### 5. FSA/Regular Expressions

What is the length of the smallest string that can be produced by the following regular expression?

$ab^*ba(ab \cup aa^*b)a(b \cup ab^*a)a(ab \cup (a \cup b))$

5.

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### 1. Boolean Algebra

简化下述布尔表达式:

$$AB + \bar{A}(B + A) + A$$

1.

### 2. Boolean Algebra

哪个有序三元组使得下述布尔表达式为真?

$$A\bar{B}(A+C) + B(\bar{A}\bar{C} + \bar{B}C)$$

2.

### 3. Data Structures

在下述二叉搜索树中, 有多少个节点只有一个子节点?

WAYNENEWJERSEY

3.

### 4. Data Structures

按照以下方式定义操作 REV: 反转列表中的项。从最初的空堆栈开始, 执行下面列出的操作。下一个要弹出的项是什么?

PUSH(S), PUSH(U), PUSH(N), POP(X), REV, POP(X), PUSH(R),  
PUSH(A), PUSH(I), PUSH(N), REV, POP(X), POP(X), REV, POP(X),  
PUSH(W), PUSH(I), PUSH(N), PUSH(D), POP(X), REV, POP(X),  
PUSH(C), PUSH(L), PUSH(O), PUSH(U), PUSH(D), PUSH(S), REV,  
POP(X), POP(X), REV, POP(X), REV, POP(X), POP(X), REV

4.

### 5. FSA/Regular Expressions

以下正则表达式能产生的最小字符串的长度是多少?

$$ab * ba(ab \cup aa * b)a(b \cup ab * a)a(ab \cup (a \cup b))$$

5.