

# American Computer Science League

2018-2019

Contest #3

## JUNIOR DIVISION

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

### 1. Boolean Algebra

1.

Which ordered pairs make the following Boolean expression TRUE?

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

### 2. Boolean Algebra

2.

Simplify the following Boolean expression:

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

### 3. Data Structures

3.

What is the depth of the binary search tree for:

**WAYNEHILLSHS**

### 4. Data Structures

4.

Given an initially empty stack and the following commands on the stack, what will the next popped item be?

PUSH(H), PUSH(U), PUSH(R), PUSH(R), POP(X), PUSH(I), PUSH(C),  
PUSH(A), PUSH(N), POP(X), POP(X), PUSH(E), PUSH(S), PUSH(A),  
PUSH(N), POP(X), POP(X), POP(X), PUSH(D), PUSH(V), PUSH(O),  
PUSH(L), POP(X), POP(X), POP(X), POP(X), PUSH(C), PUSH(A),  
PUSH(N), POP(X), POP(X), POP(X), PUSH(O), PUSH(E), PUSH(S),  
POP(X), POP(X)

**JUNIOR DIVISION****5. What Does This Program Do? - Arrays**

What is outputted when this program is executed?

The data inputted is: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233,  
377, 610, 987

```
d = 0
for i = 0 to 3
  for j = 0 to 3
    input a(i, j)
  next j
next i
for i = 1 to 3
  for j = 1 to 3
    if a(i,j) / (i*j) == int(a(i,j) / (i*j)) then
      a(i,j) = 1
    else
      a(i,j) = int(a(i,j)/(i*j))
    end if
  next j
next i
for i = 0 to 3
  for j = 0 to 3
    if a(i, j) > 99 then
      a(i, j) = a(i, j) - 100
    end if
    a(i, j) = a(i, j) % 3
  next j
next i
for i = 0 to 3
  d = d + a(i, i) + a(i, 3-i)
next i
output d
end
```

**5.**

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### 1. Boolean Algebra

哪些有序对使得下述布尔表达式为真?

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

1.

### 2. Boolean Algebra

简化下述布尔表达式:

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

2.

### 3. Data Structures

下述二叉搜索树的深度为?

WAYNEHILLSHS

3.

### 4. Data Structures

给定一个最初为空的堆栈和堆栈上的以下命令, 下一个弹出的项是什么?

PUSH(H), PUSH(U), PUSH(R), PUSH(R), POP(X), PUSH(I), PUSH(C),  
PUSH(A), PUSH(N), POP(X), POP(X), PUSH(E), PUSH(S), PUSH(A),  
PUSH(N), POP(X), POP(X), POP(X), PUSH(D), PUSH(V), PUSH(O),  
PUSH(L), POP(X), POP(X), POP(X), POP(X), PUSH(C), PUSH(A),  
PUSH(N), POP(X), POP(X), POP(X), PUSH(O), PUSH(E), PUSH(S),  
POP(X), POP(X)

4.

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### 5. What Does This Program Do? - Arrays

执行此程序时，输出什么？  
输入的数据是：1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233,  
377, 610, 987

```
d = 0
for i = 0 to 3
  for j = 0 to 3
    input a(i, j)
  next j
next i
for i = 1 to 3
  for j = 1 to 3
    if a(i,j) / (i*j) == int(a(i,j) / (i*j)) then
      a(i,j) = 1
    else
      a(i,j) = int(a(i,j)/(i*j))
    end if
  next j
next i
for i = 0 to 3
  for j = 0 to 3
    if a(i, j) > 99 then
      a(i, j) = a(i, j) - 100
    end if
    a(i, j) = a(i, j) % 3
  next j
next i
for i = 0 to 3
  d = d + a(i, i) + a(i, 3-i)
next i
output d
end
```

5.