American Computer Science League

2018-2019 **Contest #3**

JUNIOR DIVISION

1. Boolean Algebra Which ordered pairs make the following Boolean expression TRUE? $(A+B)\overline{B}$	**1.**
2. Boolean Algebra Simplify the following Boolean expression: $A(A\overline{B}+B)+B(\overline{A}+B)$	**2.**
3. Data Structures What is the depth of the binary search tree for: **WAYNEHILLSHS**	**3.**
4. Data Structures 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)	**4.**

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.