

# American Computer Science League

2023-2024 • Contest 3: Short Problems • Junior Division

<b>1. Boolean Algebra</b>  How many ordered pairs make the following Boolean expression TRUE?  $A + B(\overline{A} + B)$	A. 0 B. 1 C. 2 D. 3 E. 4
<b>2. Boolean Algebra</b>  Simplify the following Boolean expression:  $A + \overline{B + C} + \overline{B} + \overline{\overline{A} + \overline{C}}$	A. $\overline{A} + \overline{B}$ B. $A + B$ C. $A + \overline{B}$ D. $\overline{A} B$ E. $A \overline{B}$
<b>3. Data Structures</b>  Find the depth of the binary search tree for:  <b>DODGECARAVAN</b>	A. 2 B. 3 C. 4 D. 5 E. 6
<b>4. Data Structures</b>  If the following operations are done on both a stack and a queue, what is the top of the stack and the front of the queue at the end of the entire process?  PUSH("A") PUSH("L") PUSH("P") PUSH("H") x = POP() x = POP() PUSH("A") PUSH("B") x = POP() PUSH("E") PUSH("T") x = POP()	A. stack top="E", queue front="H" B. stack top="T", queue front="A" C. stack top="T", queue front="H" D. stack top="A", queue front="T" E. stack top="E", queue front="A"

### 5. What Does This Program Do? (Arrays)

What is the output when the following program is run using the following values of array *val* given that  $\text{val}(0) = 3$ .

3	6	7	1	4	8	9	2	6	1
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m = 1
t = 1
for x = 1 to 9
  if val(x) < val(x-1) then
    if t > m then
      m = t
    end if
    t = 1
  else
    t = t + 1
  end if
next x
output m
```

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5