

# American Computer Science League

2021-2022 • Contest 3: Short Problems • Intermediate Division

## 1. Boolean Algebra

Simplify the following Boolean expression:

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

- A. 0
- B. 1
- C.  $\overline{B}$
- D.  $\overline{A} + \overline{B} + \overline{C}$
- E.  $\overline{A} + \overline{B} + \overline{C}$

## 2. Boolean Algebra

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

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

- A. 0
- B. 3
- C. 5
- D. 7
- E. 8

## 3. Data Structures

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

SUMMEROLYMPICS

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

## 4. Data Structures

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

PUSH("C"), PUSH("A"), PUSH("N"), X=POP(),  
X=POP(), PUSH("T"), X=POP(), PUSH("S"),  
PUSH("M"), X=POP(), X=POP(), PUSH("A"),  
PUSH("J"), X=POP(), PUSH("O"), X=POP(),  
PUSH("R"), X=POP()

- A. S
- B. M
- C. I
- D. C
- E. A

---

## 5. FSAs and Regular Expressions

A new company is allowing its employees to select their own phone number and extension if it satisfies this regular expression:

$1-321-[^05][0-9][^5]-[12][3-6][^7-9]8-[^0][2-6]$

Which of the following are acceptable phone numbers and extensions?

- a. 1-321-123-2348-11
- b. 1-321-155-2368-96
- c. 1-321-444-2448-44
- d. 1-321-927-2408-84
- e. 1-321-559-2328-13
- f. 1-321-306-1366-62

- A. a, f
  - B. b, c
  - C. e, f
  - D. c, d
  - E. a, e
-