

American Computer Science League

2021-2022 • Contest 4: Short Problems • Junior Division

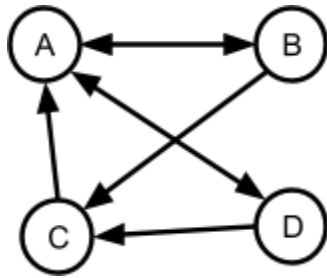
1. Graph Theory

Given vertices $\{A, B, C, D, E\}$ and edges $\{AE, AB, BD, BA, CD, DC, BE, EC, CA\}$, how many paths of length 2 are there?

- A. 12
- B. 13
- C. 14
- D. 15
- E. 16

2. Graph Theory

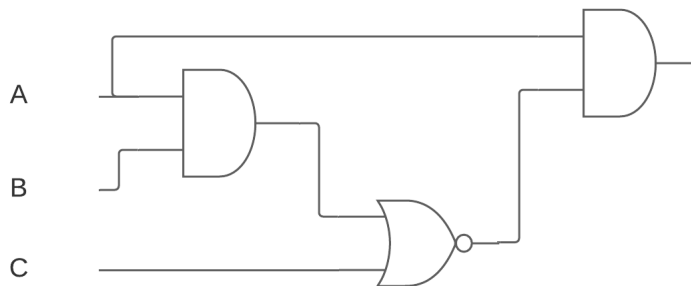
How many cycles are there from A in the directed graph below?



- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

3. Digital Electronics

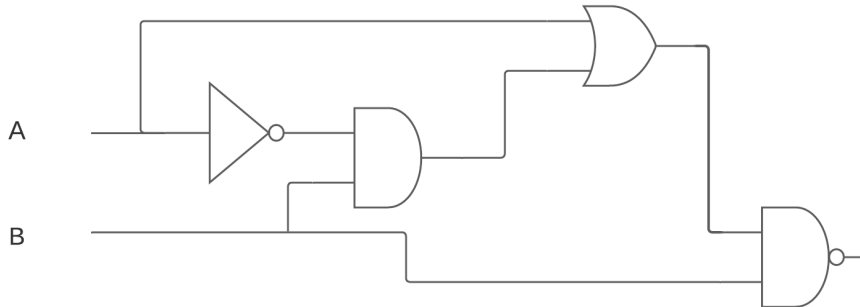
How many ordered triples make the Boolean expression represented by the following digital circuit TRUE?



- A. 0
- B. 1
- C. 4
- D. 5
- E. 7

4. Digital Electronics

Simplify the Boolean expression represented by the following digital circuit.



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

5. What Does This Program Do? (Strings)

What is the final length of the string *c* when this program is executed?

```
a = "HURRICANES HENRI AND IDA CAUSED HAVOC FOR MANY"
c = ""
for x = 0 to len(a) - 1
    b = 0
    for y = 0 to len(a) - 1
        if a[x] == a[y] && x != y then
            b = b + 1
        end if
    next y
    if b == 0 then
        c = c + a[x]
    end if
next x
```

- A. 1
- B. 3
- C. 4
- D. 8
- E. 10