American Computer Science League

2020-2021 • Contest 4: Shorts • Intermediate Division

1. Graph Theory

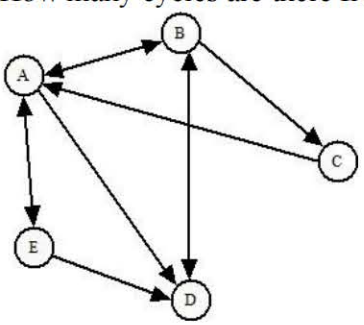
Given the following adjacency matrix, which vertices do not have a path of length 3 to vertex B?

	A	B	C	D
A	1	0	0	1
B	0	1	1	0
C	1	0	1	0
D	0	0	1	1

A. A, C, D
B. A, B, C
C. A, B, D
D. C, D
E. A, C

2. Graph Theory

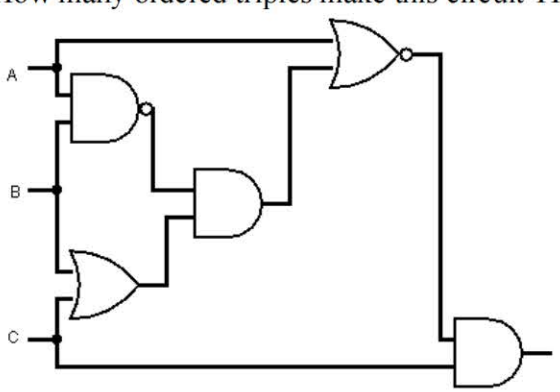
How many cycles are there from vertex B in this directed graph?



A. 5
B. 6
C. 7
D. 8
E. 9

3. Digital Electronics

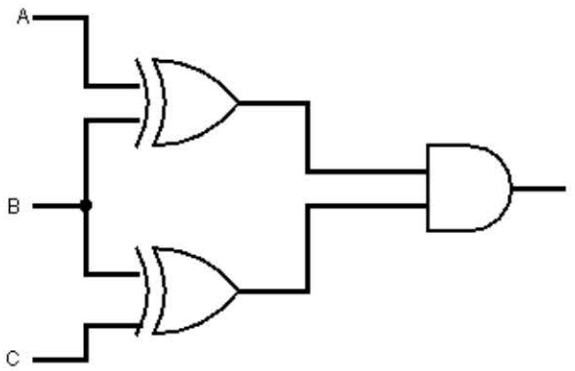
How many ordered triples make this circuit TRUE?



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

4. Digital Electronics

Identify the ordered triples that make this circuit TRUE:



A. (0,*,0)
B. (1,*,1)
C. (0,*,0), (1,0,1)
D. (1,*,1), (0,1,0)
E. (0,1,0), (1,0,1)

5. Assembly Language

What is printed when the following program is executed?

```
X     DC      21
Y     DC      49
      LOAD    Y
TOP   BE      STOP
      LOAD    X
      DIV     Y
      MULT    Y
      STORE   R
      LOAD    X
      SUB     R
      STORE   R
      LOAD    Y
      STORE   X
      LOAD    R
      STORE   Y
      BU      TOP
STOP  PRINT   X
      END
```

A. 1
B. 7
C. 14
D. 21
E. 49

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1. Graph Theory

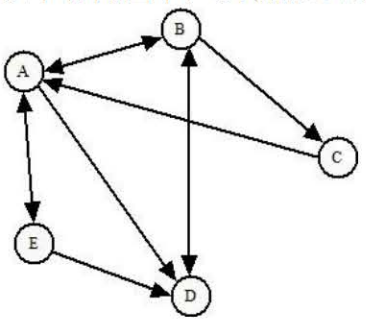
给定以下邻接矩阵， 哪个顶点到顶点 B 没有长度为 3 的路径？

	A	*B*	*C*	*D*
A	1	0	0	1
B	0	1	1	0
C	1	0	1	0
D	0	0	1	1

A. A, C, D
B. A, B, C
C. A, B, D
D. C, D
E. A, C

2. Graph Theory

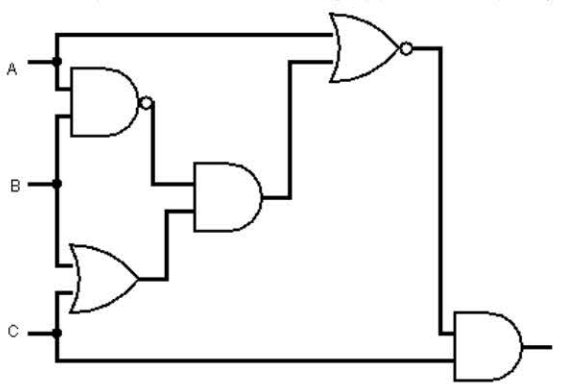
以下有向图中，从顶点 B 出发有多少个环？



A. 5
B. 6
C. 7
D. 8
E. 9

3. Digital Electronics

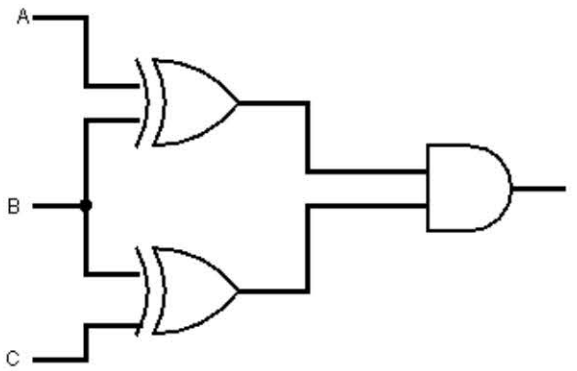
有多少个有序三元组能够使得下述电路为**真**？



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

4. Digital Electronics

请找出可以使下述电路为**真**的有序三元组：



A. (0,*,0)
B. (1,*,1)
C. (0,*,0), (1,0,1)
D. (1,*,1), (0,1,0)
E. (0,1,0), (1,0,1)

5. Assembly Language

执行以下程序会打印输出什么？

```
X     DC      21
Y     DC      49
      LOAD    Y
TOP   BE      STOP
      LOAD    X
      DIV     Y
      MULT    Y
      STORE   R
      LOAD    X
      SUB     R
      STORE   R
      LOAD    Y
      STORE   X
      LOAD    R
      STORE   Y
      BU      TOP
STOP  PRINT   X
      END
```

A. 1
B. 7
C. 14
D. 21
E. 49