



American Computer Science League

2019-2020

Contest #4

INTERMEDIATE DIVISION

1. Graph Theory

After drawing the following directed graph, how many pairs of different vertices have no edge in either direction between them?

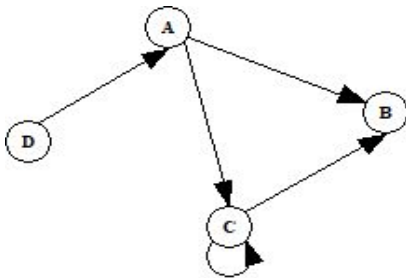
Vertices: {A, B, C, D, E, F} and

Edges: {AB, FD, CC, EA, FE, AC, DB, FA, CB, EE, BD}

1.

2. Graph Theory

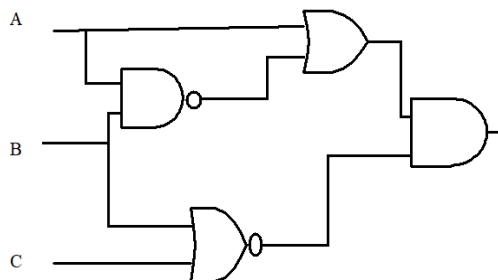
How many more paths of length 3 are there than of length 2 in this directed graph?



2.

3. Digital Electronics

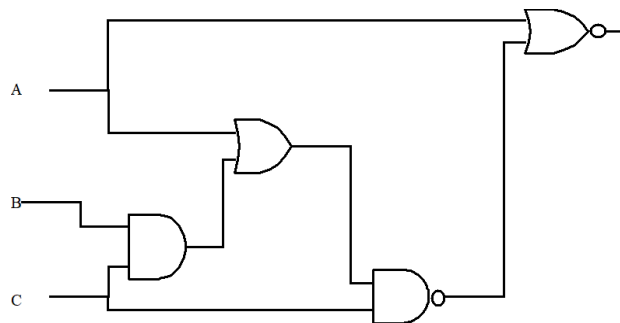
Simplify the Boolean expression represented by the following digital circuit. Perform all indicated operations.



3.

4. Digital Electronics

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



4.

5. Assembly Language

What is output when this program is executed?

```
X DC 8
Y DC 15
TOP LOAD X
MULT X
SUB Y
BL L
LOAD X
SUB =1
STORE X
LOAD Y
SUB =1
STORE Y
BU TOP
L PRINT X
END
```

5.



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1. Graph Theory

根据下面给出的信息，画出有向图后，请问有多少不同的顶点对，在它们之间不存在任何方向上的边？

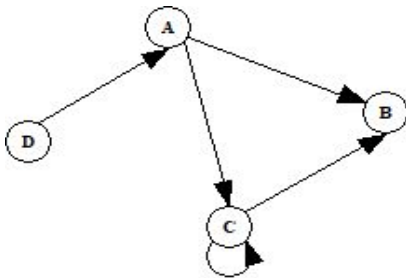
顶点: {A, B, C, D, E, F}

边: {AB, FD, CC, EA, FE, AC, DB, FA, CB, EE, BD}

1.

2. Graph Theory

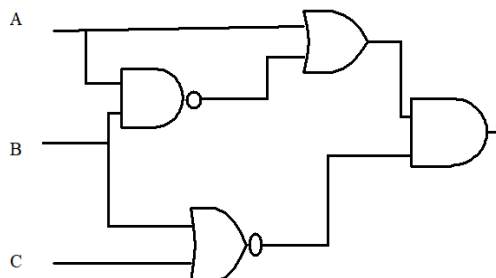
在下面这个有向图中，长度为3的路径比长度为2的路径多几条？



2.

3. Digital Electronics

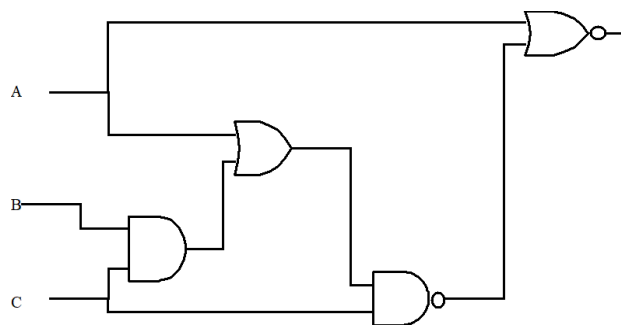
化简下述数字电路表示的布尔表达式。执行所有指示操作。



3.

4. Digital Electronics

有多少个有序三元组能够使得下述数字电路表示的布尔表达式为真?



4.

5. Assembly Language

执行此程序后，输出是什么？

```
      X DC 8
      Y DC 15
TOP   LOAD X
      MULT X
      SUB Y
      BL L
      LOAD X
      SUB =1
      STORE X
      LOAD Y
      SUB =1
      STORE Y
      BU TOP
L     PRINT X
      END
```

5.