



American Computer Science League

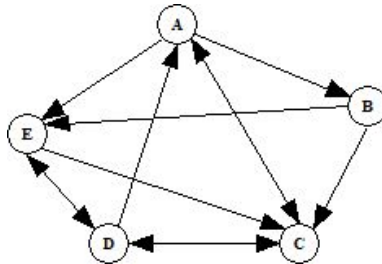
2019-2020

Contest #4

JUNIOR DIVISION

1. Graph Theory

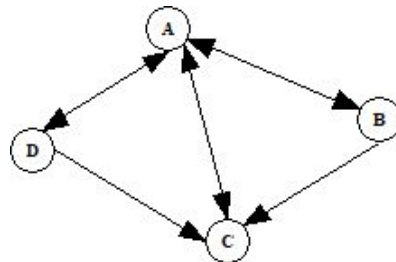
How many 1's are in the adjacency matrix for this directed graph?



1.

2. Graph Theory

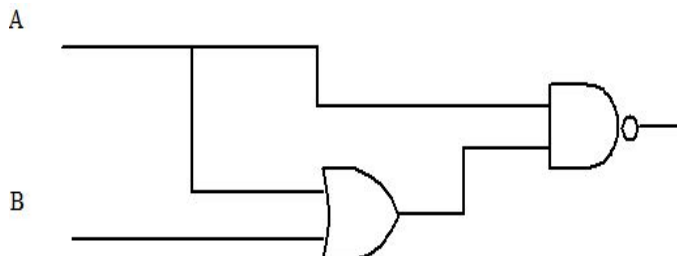
How many cycles are there from vertex A in the directed graph?



2.

3. Digital Electronics

Simplify the Boolean expression represented by the following digital circuit.

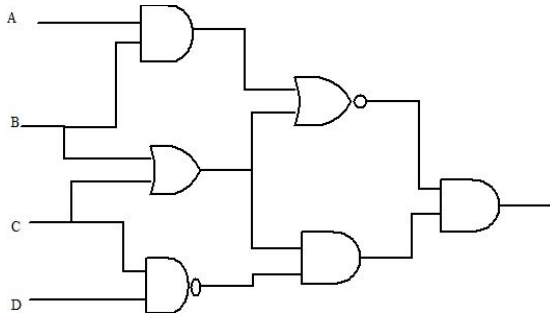


3.

4. Digital Electronics

4.

How many ordered quadruples make the following digital circuit TRUE?



5. What Does This Program Do? - Strings

5.

How many unique letters are in the output of the following program?

```
A = "HARTFORDISTHEINSURANCECAPITALOFTHEWORLD"
```

```
for i = 0 to len(A) - 1
```

```
    if A[i] <= "H" then
```

```
        B = B + A[i]
```

```
    end if
```

```
    if A[i] >= "P" then
```

```
        C = C + A[i]
```

```
    end if
```

```
next i
```

```
for i = 0 to len(B) - 1
```

```
    if B[i] != "A" && B[i] != "E" then
```

```
        D = D + B[i]
```

```
    end if
```

```
next i
```

```
for i = 0 to len(C) - 1
```

```
    if C[i] != "R" && C[i] != "T" then
```

```
        E = E + C[i]
```

```
    end if
```

```
next i
```

```
if len(D) <= len(E) then
```

```
    for i = 0 to len(D) - 1
```

```
        F = F + D[i] + E[i]
```

```
    next i
```

```
else
```

```
    for i = 0 to len(E) - 1
```

```
        F = F + D[i] + E[i]
```

```
    next i
```

```
end if
```

```
print F
```

```
end
```