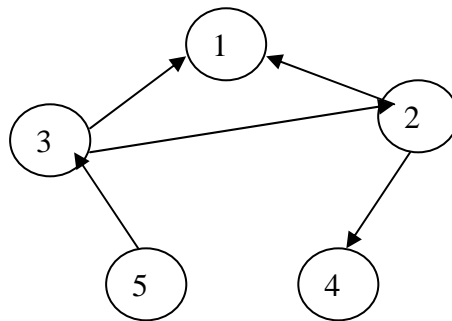


**HKOI 2004 Final**  
**Senior Q2 Teacher's Problem**

Using the sample input 1 as an example, it can be represented by the following figure:



An arrow means one student teases another student

**Solution:**

*Method 1:*

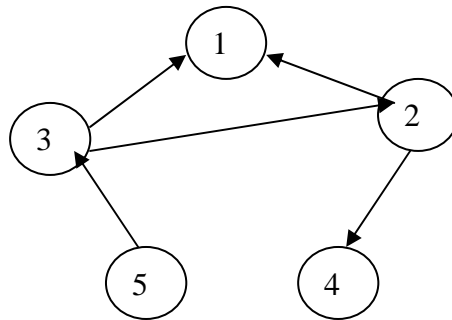
for loop 1: find n times

    for loop 2: find student A who does not tease students that have not received candies

        for loop 3: find if student have not received candies and teased by student A

Complexity:  $O(N^3)$

Method 2:



**outdegree**

student 1: 0  
student 2: 2  
student 3: 2  
student 4: 0  
student 5: 1

for loop 1:

for loop 2: find student A who does not tease students that have not received candies

⇔ find A such that  $\text{outdegree}(A)=0$

for loop 3: update outdegree

Complexity:  $O(N^2)$

Notice that when we program, we always consider 2 factors:

- time
- memory

If you want a program to be time efficient, it usually costs more memory.  
If you want a program to be memory efficient, it usually costs more time.