בניית עץ

נתונה סדרת מספרים שלמים חיוביים $\{d_1, d_2, \ldots\ldots\ldots, d_n\}$ $(d_i >= 1)$

d_i - דרגה של קודקוד.

תנאי הכרחי לקיום עץ :

$$\boxed{\sum_{i=1}^{n} d_i = 2*(n-1)}$$

דוגמה 1 :

deg1[] = { 1, 1, 2, 1, 4, 1, 1, 3 }

n = deg1.length = 8

$\sum d_i = 4 + 3 + 2 + 1 + 1 + 1 + 1 + 1 = 2 * (8 - 1) = 14$.

שלב 1:

בדיקת תנאי הכרחי לקיום עץ.

אם לא – יציאה מתכנה

שלב 2:

קלט : **deg1[] = { 1, 1, 2, 1, 4, 1, 1, 3 }**

מיון מערך בסדר יורד.

פלט : **deg1sort[] = { 4, 3, 2, 1, 1, 1, 1, 1 }**

שלב 3:

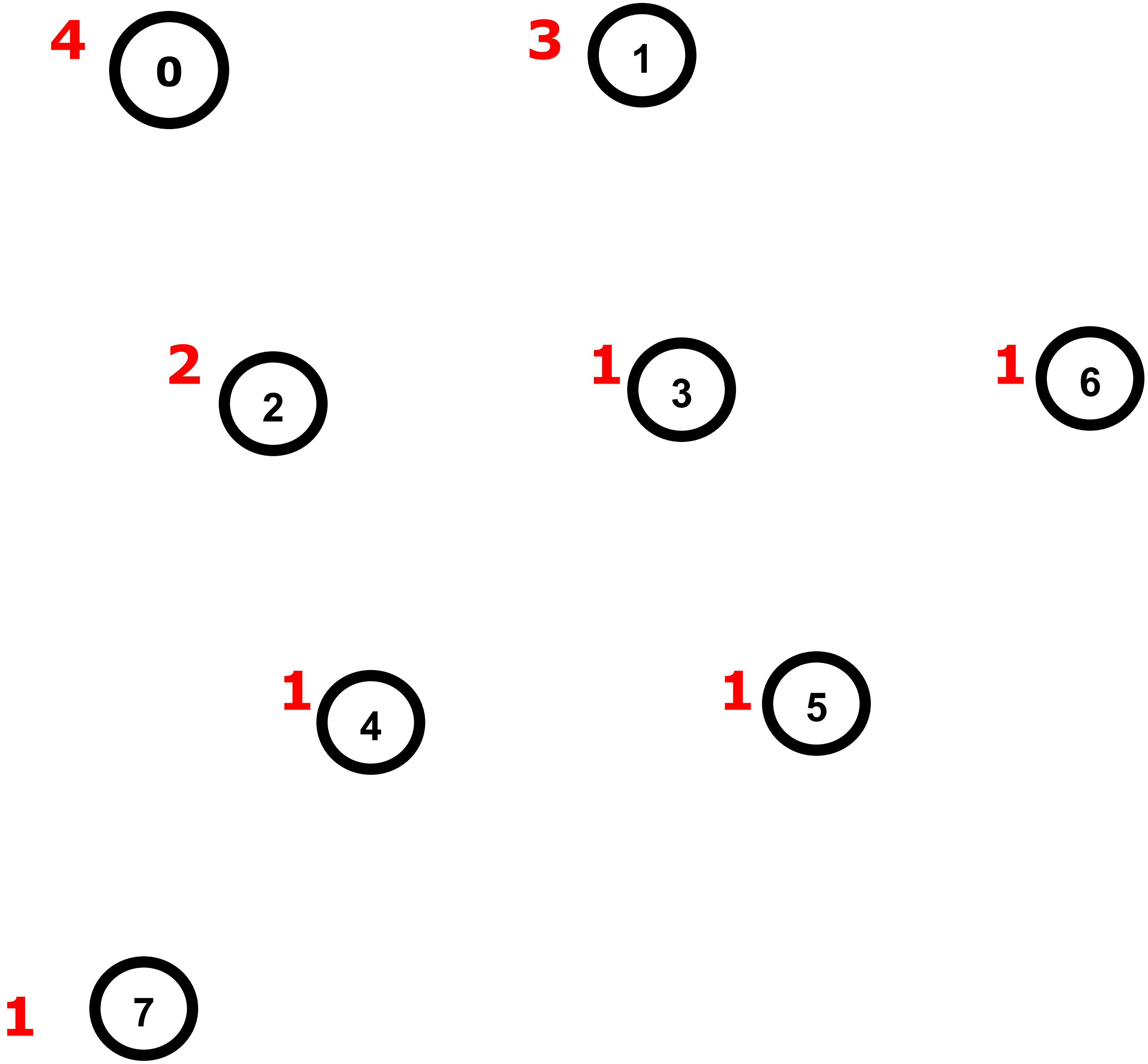
בניית עץ ריק

ArrayList<Integer>[] tree

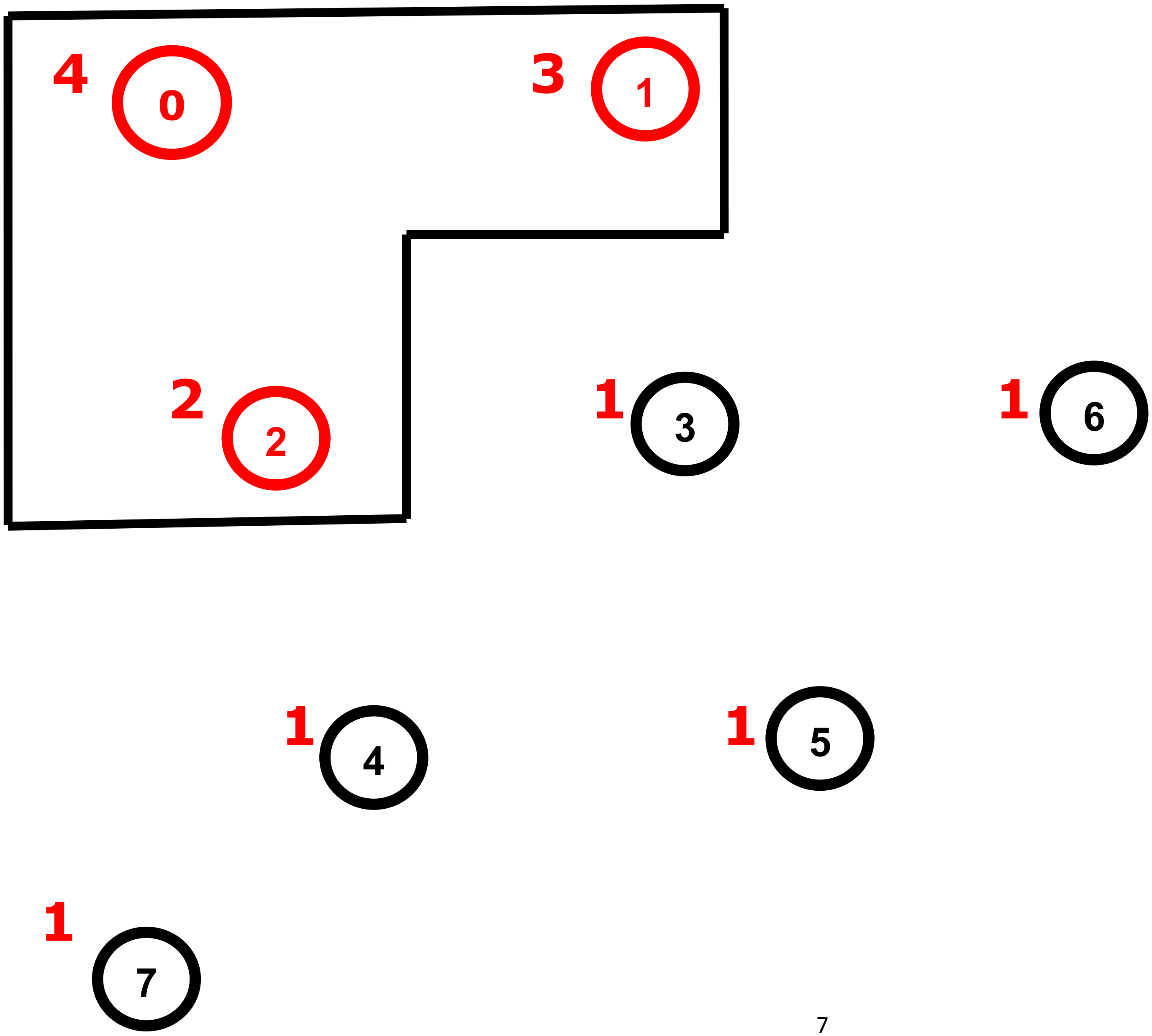
tree

0: []
1: []
2: []
3: []
4: []
5: []
6: []
7: []

tree

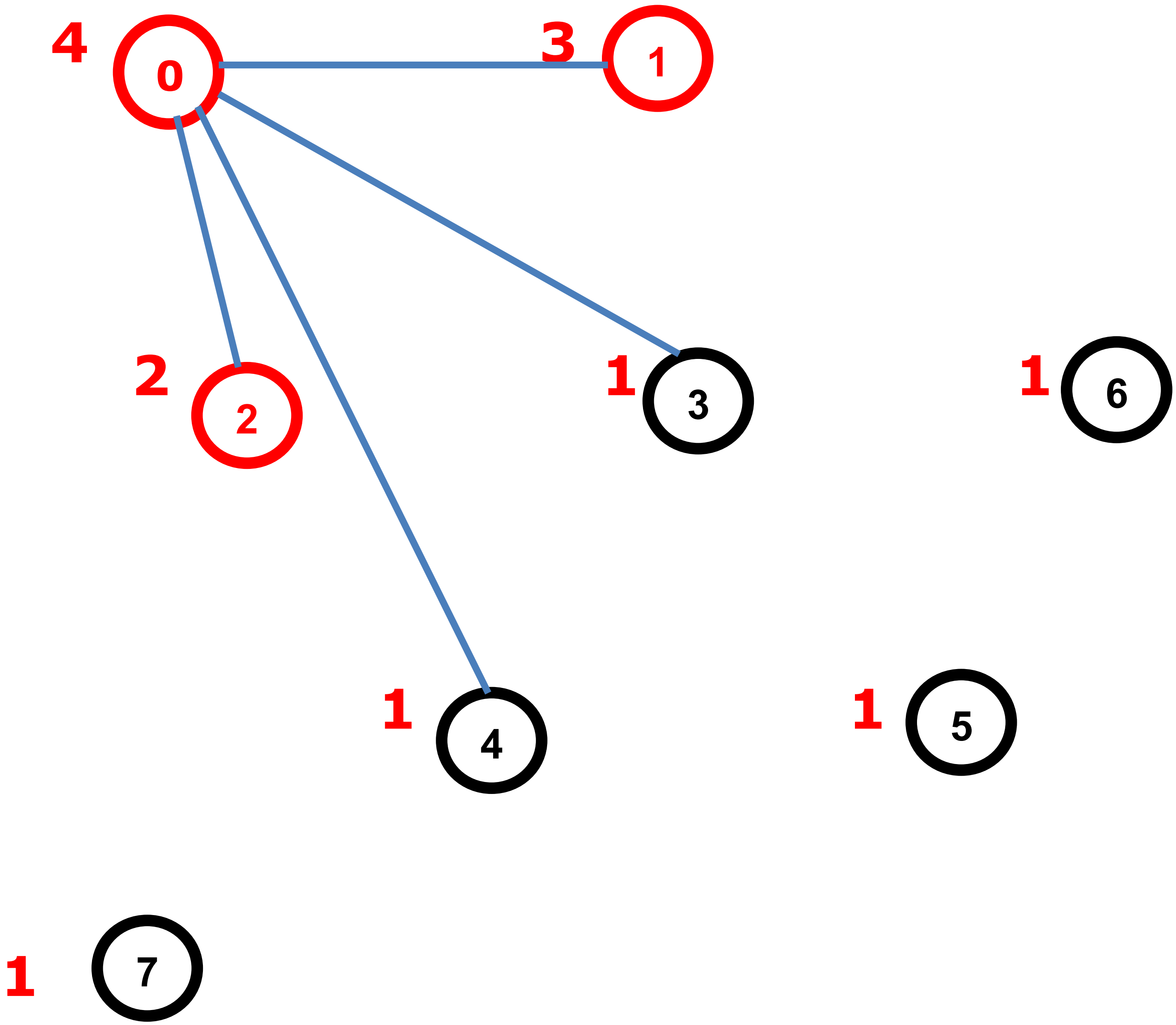


שלב 4:
למצוא מספר קודקודים עם דרגה גדולה מ-1



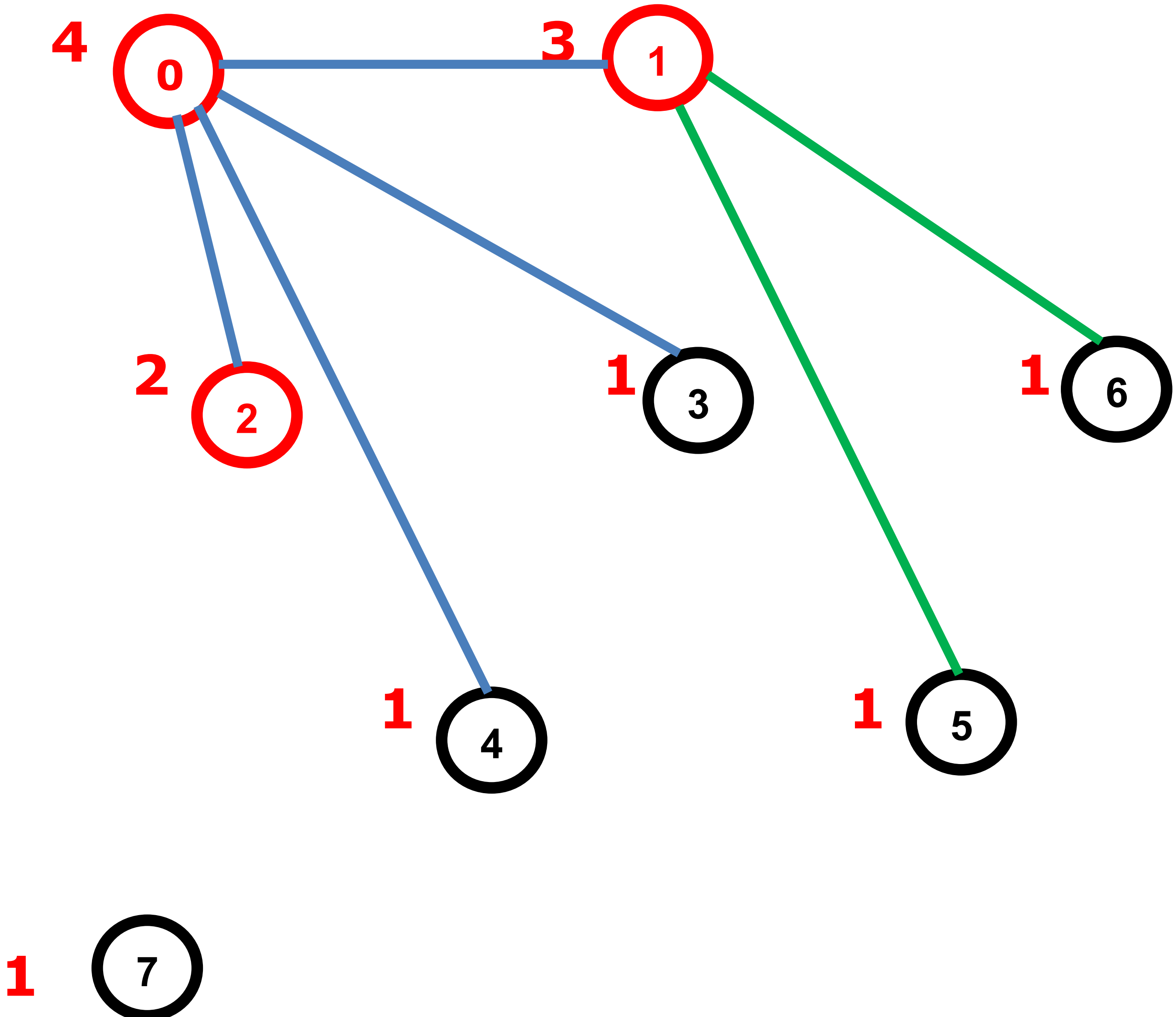
{ 4, 3, 2, 1, 1, 1, 1, 1 }

שלב 5: קודקוד 0



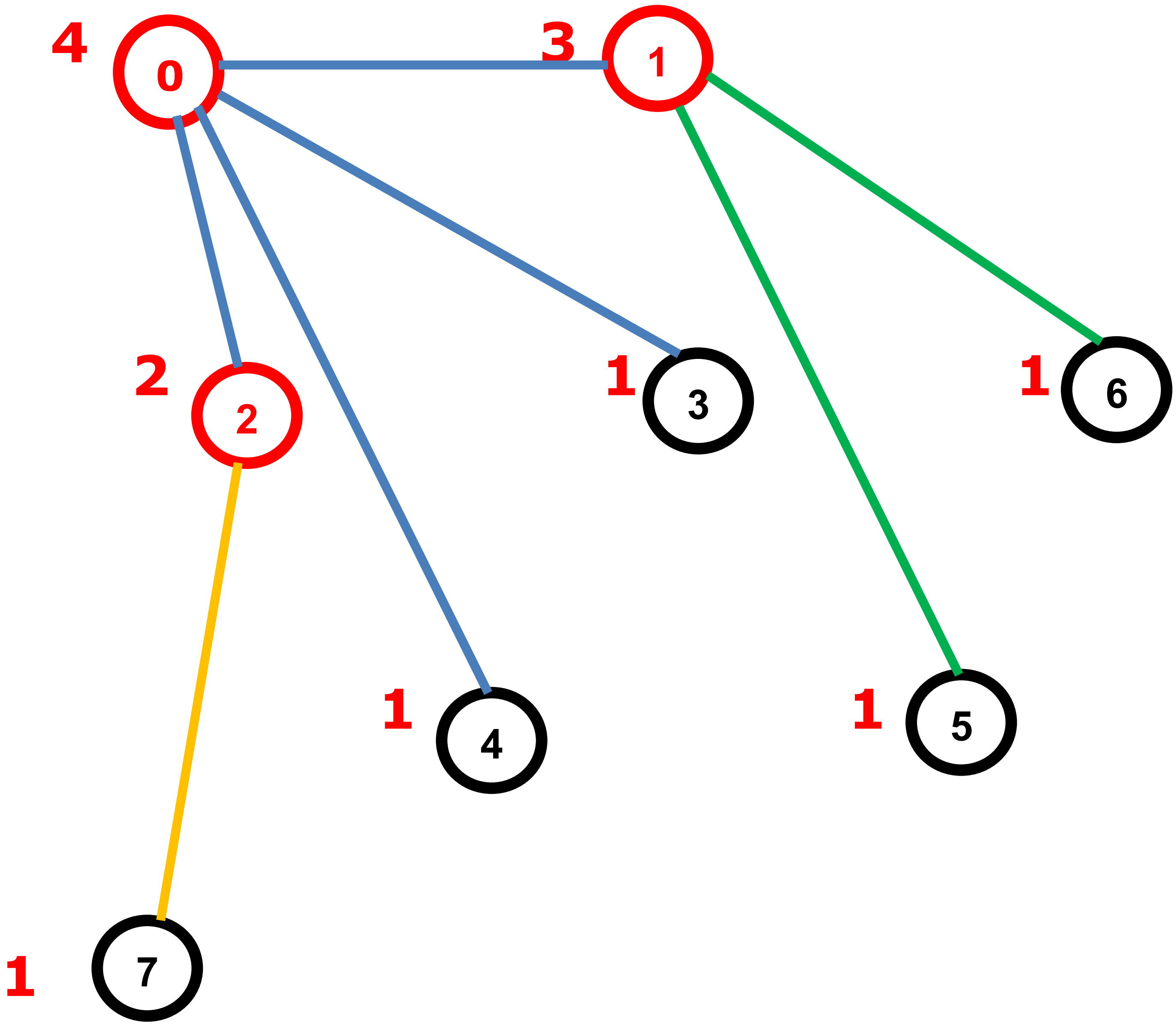
tree - 0: [1, 2, 3, 4]
1: [0]
2: [0]
3: [0]
4: [0]
5: []
6: []
7: []

שלב 6: קודקוד 1



tree - 0: [1, 2, 3, 4]
1: [0, 5, 6]
2: [0]
3: [0]
4: [0]
5: [1]
6: [1]
7: []

שלב 7: קודקוד 2



```
tree  -   0: [1, 2, 3, 4]
          1: [0, 5, 6]
          2: [0, 7]
          3: [0]
          4: [0]
          5: [1]
          6: [1]
          7: [2]
```

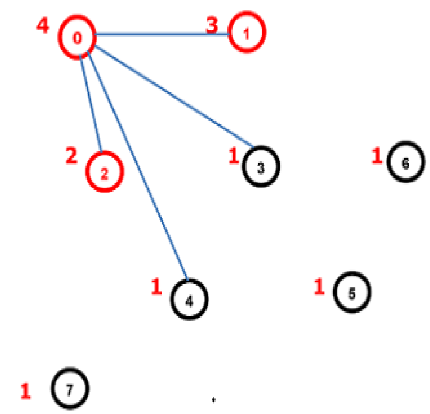
שלב 4

קלט

0: []
1: []
2: []
3: []
4: []
5: []
6: []
7: []

פלט

0: [1, 2, 3, 4]
1: [0]
2: [0]
3: [0]
4: [0]
5: []
6: []
7: []



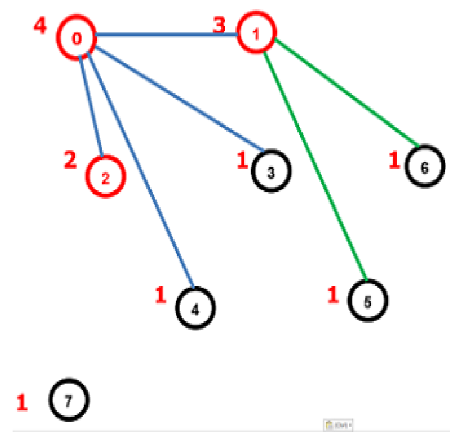
שלב 5

קלט

0: [1, 2, 3, 4]
1: [0]
2: [0]
3: [0]
4: [0]
5: []
6: []
7: []

פלט

0: [1, 2, 3, 4]
1: [0, 5, 6]
2: [0]
3: [0]
4: [0]
5: [1]
6: [1]
7: []



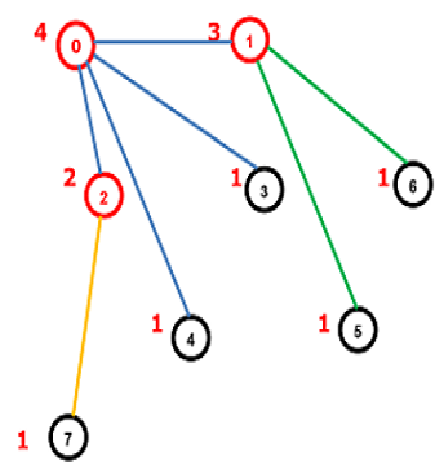
שלב 6

קלט

0: [1, 2, 3, 4]
1: [0, 5, 6]
2: [0]
3: [0]
4: [0]
5: [1]
6: [1]
7: []

פלט

0: [1, 2, 3, 4]
1: [0, 5, 6]
2: [0, 7]
3: [0]
4: [0]
5: [1]
6: [1]
7: [2]

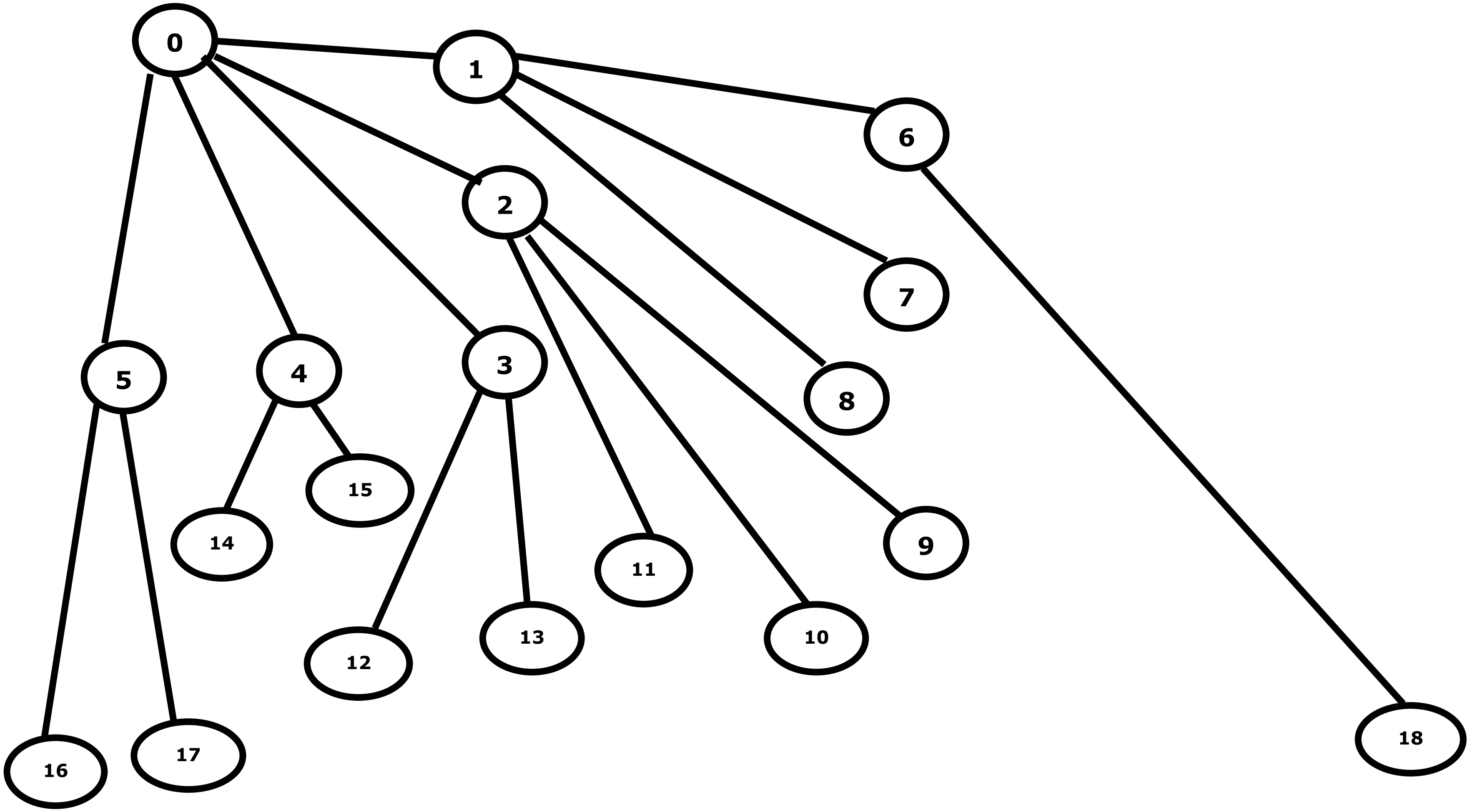


דוגמה 2 :

$$\sum_{i=1}^{n} d_i = 2*(n-1)$$

$N = 14$ $\qquad \sum d_i = 13*2 = 26$

$\{1,4,1,1,1,3,1,1,4,1,1,1,5,1\}$


0
1
6
2
7
5
4
3
8
15
14
9
11
13
10
12
18
17
16

{5,4,4,3,3,3,2,1,1,1,1,1,1,1,1,1,1,1,1} sort array

Tree

0: [1, 2, 3, 4, 5]
1: [0, 6, 7, 8]
2: [0, 9, 10, 11]
3: [0, 12, 13]
4: [0, 14, 15]
5: [0, 16, 17]
6: [1, 18]

7: [1]
8: [1]
9: [2]
10: [2]
11: [2]
12: [3]
13: [3]
14: [4]
15: [4]
16: [5]
17: [5]
18: [6]

The **Erdős–Gallai theorem** is a result in graph theory, a branch of combinatorial mathematics. It provides one of two known approaches solving the graph realization problem, i.e. it gives a necessary and sufficient condition for a finite sequence of natural numbers to be the degree sequence of a simple graph. A sequence obeying these conditions is called "graphic". The theorem was published in 1960 by Paul Erdős and Tibor Gallai, after whom it is named.

A sequence of non-negative integers $d_1 \geq \cdots \geq d_n$ can be represented as the degree sequence of a finite simple graph on *n* vertices if and only if

$d_1 + \cdots + d_n$ is even and

$$\sum_{i=1}^{k} d_i \leq k(k-1) + \sum_{i=k+1}^{n} \min(d_i, k)$$

holds for every k in $1 \leq k \leq n$.