

2014-CA-02-EN Shout Your Name Shout Your Name

0 ----		I: ----		II: ----		III: hard		IV: medium			
<input checked="" type="checkbox"/> ALG		<input type="checkbox"/> INF		<input checked="" type="checkbox"/> STRUC		<input type="checkbox"/> PUZ		<input type="checkbox"/> SOC		<input type="checkbox"/> USE	

Answer Type: Multiple Choice Mandatory for: none

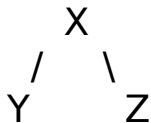
Body

Seven kids named Ana, Beate, Cezar, Diana, Elena, Ieva and Greg get together. Some of the kids point to each other as shown below.



Cezar is pointing to Diana with his right hand and to Elena with his left hand.

More generally, anything in the form below means that kid X is pointing to kid Y with his right hand and kid X is pointing to kid Z with his left hand.



As soon as a kid is tapped on the head, he shouts his name if he is not pointing at any other kids. Otherwise, assume X is pointing to Y and Z with his right and left hands respectively. Then, in order:

1. Kid X taps the head of kid Y.
2. Kid X waits for kid Y to shout Y's name.
3. Kid X taps the head of kid Z.
4. Kid X waits for kid Z to shout Z's name.
5. Kid X shouts her name (X's name).

To begin, Ana is tapped on the head.

Question

In what order do the seven kids shout out their names ?

- A) Beate, Ieva, Diana, Greg, Cezar, Elena, Ana
- B) Beate, Ana, Cezar, Diana, Ieva, Greg, Elena
- C) Beate, Ieva, Greg, Diana, Elena, Cezar, Ana
- D) Beate, Ana, Cezar, Ieva, Greg, Diana, Elena

Answer

C

Explanation

When the given algorithm is followed, a kid will only shout her name some time after any kids she is pointing to shout their names. So Ana will shout her name last and Cezar will shout his name after Diana and Elena. This rules out A, B and D as possible answers.

It's informatics

This task involves at least two fundamental computer science concepts. First, the picture is a binary tree which can be used to represent some data that is “nested” or arranged in a hierarchy. Large binary trees consist of smaller binary trees in the same way we can find many instances of “X,Y,Z” in the picture of seven kids. This allows the process in the task to be *recursive*. That is, the process (or *algorithm*) is described in terms of itself. When used with care, recursion and binary trees can be used to solve a wide ranging set of problems in natural and efficient ways.

Keywords

binary tree, recursion, traversal, postorder

Websites

http://en.wikipedia.org/wiki/Tree_traversal

<http://en.wikipedia.org/wiki/Recursion>

http://en.wikipedia.org/wiki/Binary_tree

<http://csunplugged.org/divideAndConquer>

Internal Use

Wording

kid, point, tap, shout

Comments

J.P. Pretti, jpretti@uwaterloo.ca, (2014-04-28)

- The wording could be supplemented/replaced with an image of kids pointing (or something for an alternative story).
- Second alternative: replace the picture with a chart with columns “kid”, “left kid”, “right kid”.
- All the kids are female to avoid awkward use of his/her & he/she in wording.
- Answers A, B and D correspond to non-postorder traversals.

Valentina, valentina.dagiene@mii.vu.lt We will draw artictic picture with kids pointed to each other to be clear right and left hands. For age groups IV and III pictures can be as suggested, for group II we suggest easier picture with flipped picture (easy understand left and right).

Graphics

Two pictures.

Files

All additional files for this task (graphics, scripts, etc.)

2014-CA-02-EN Shout Your Name.odt (this file)

Authorship

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