Problem 5: Stacking Cylinders

Cylinders (for example, oil drums) with a radius of one foot are stacked in a rectangular bin so that in a side view (as shown below) they look like a set of stacked circles. The cylinders in the bottom row (row 0) rest on the floor of the bin. Each cylinder in row k (for k > 0) rests on two cylinders in row k-1, which is the row below row k. Each row has one fewer cylinders than the row below it.

Given the position of the centers (show as "+" in the preceding illustration) of each cylinder on the bottom row, you are to find the position of the center of the cylinder on the top row.

Input
The input will contain multiple cases. The input for each case will begin with a positive non-zero integer N that indicates the number of cylinders on the bottom row. This will be followed by N real numbers giving the X coordinates of the centers of the cylinders on the bottom row. The Y coordinates of these cylinders are all 1.0 since the cylinders are resting on the floor of the bin, at which point Y is 0.0. The cylinders cannot overlap, and no cylinder in row k touches a cylinder in row k - 2. The last input case is followed by a single integer 0.

Output
For each case display the case number (starting with 1 and increasing sequentially), and the X and Y coordinates of the topmost cylinder. Display each coordinate with four fractional digits.

<table>
<thead>
<tr>
<th>Sample Input</th>
<th>Output for the Sample Input</th>
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<tbody>
<tr>
<td>4 1.0 4.4 7.8 11.2 1 1.0 6 1.0 3.0 5.0 7.0 9.0 11.0 10 1.0 3.0 5.0 7.0 9.0 11.0 13.0 15.0 17.0 20.4 5 1.0 4.4 7.8 11.2 14.6 0</td>
<td>Case 1: 6.1000 4.1607 Case 2: 1.0000 1.0000 Case 3: 6.0000 9.6603 Case 4: 10.7000 15.9100 Case 5: 7.8000 5.2143</td>
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