

# IOL Blagoevgrad 2015 P5 Somali Explanation

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## Problem

<https://ioling.org/problems/2015/i5/>

## Walkthrough

### Part (a)

We start by noting that this problem is a versification problem, which suggests that heavy/light syllable distinction may be vital to this problem's solution. Taking a look at the given data, we see syllables of the type (C)V, (C)VC, (C)VV, and (C)VVC (note that the onset/initial consonant is usually not so important); heavy/light distinctions can hinge on vowel length, whether a syllable has a coda, or both.

Let's try vowel length only first. L represents light while H represents heavy syllables, which have short and long vowels respectively. The lines become:

- |             |            |              |               |              |
|-------------|------------|--------------|---------------|--------------|
| 1. LHHLHLL  | 6. LHHLHH  | 11. LLHLLLLL | 16. LHLLLLLLL | 21. HLLLHH   |
| 2. HHLHH    | 7. LHLLLHH | 12. LHHLHH   | 17. LLLLHH    | 22. HLLLHLL  |
| 3. HHLHH    | 8. LHLLHLL | 13. HLLHLL   | 18. HHLHLL    | 23. LLHLHLL  |
| 4. LLHLLLLL | 9. LLLLHLL | 14. LHHLHLL  | 19. HHLHLL    | 24. LLHLLLLL |
| 5. LLLLHH   | 10. LLHLHH | 15. LHHLHLL  | 20. LLLLHH    | 25. LLLHLHLL |

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This may not look promising at first, but note that we can denote a light by a single dot  $\circ$  and a heavy by two consecutive dots,  $\circ\circ$ . Here are the 25 lines:

$\circ \mid \circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ$   
 $\circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ \mid \circ \quad \circ$   
 $\circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ$   
 $\circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \quad \circ$   
 $\circ \mid \circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ$   
 $\circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \quad \circ$   
 $\circ \mid \circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ$   
 $\circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ$   
 $\circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \quad \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ$   
 $\circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ$   
 $\circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ$   
 $\circ \mid \circ \mid \circ \mid \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ \quad \circ \mid \circ \mid \circ$

There is actually a LOT of nice alignment that we see here (matched-up vertical lines), but there is still no clear pattern. So let's try right-aligning the whole thing instead of left-

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aligning. Also, we can notice that every (half-)line is either 9 or 10 dots long, which is neat - this suggests that we might be on the right track with vowel length!

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o | o   o | o   o | o | o   o | o | o
      o   o | o   o | o | o   o | o   o
      o   o | o   o | o | o   o | o   o
      o | o | o   o | o | o | o | o | o | o
      o | o | o | o | o | o | o   o | o   o
o | o   o | o   o | o | o | o   o | o   o
o | o   o | o | o | o | o | o   o | o   o
o | o   o | o | o | o | o | o   o | o | o
      o | o | o | o | o | o | o   o | o | o
      o | o | o   o | o | o | o   o | o   o
      o | o | o   o | o | o | o | o | o | o
o | o   o | o   o | o | o | o   o | o   o
      o   o | o | o | o | o | o   o | o | o
o | o   o | o   o | o | o | o   o | o | o
o | o   o | o | o | o | o | o   o | o | o
o | o   o | o | o | o | o | o | o | o | o
      o | o | o | o | o | o | o   o | o   o
      o   o | o   o | o | o | o   o | o | o
      o   o | o   o | o | o | o   o | o | o
      o | o | o | o | o | o | o   o | o   o
      o   o | o | o | o | o | o   o | o | o
      o   o | o | o | o | o | o   o | o | o
      o | o | o   o | o | o | o   o | o | o
      o | o | o   o | o | o | o | o | o | o
o | o | o | o   o | o | o   o | o | o
```

(In reality, writing out all 25 lines would be a huge pain, so writing out just the first 10 [or even fewer!] lines or so should be good enough to see the following pattern.)

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What's incredibly striking about this representation is the one perfect column near the middle. What's more, the dot at the first column (which is not present for every line) is always single; if we remove it, we notice something even more interesting: to either side of the perfect column, the pattern is always  $\circ\circ|\circ\circ$ ,  $\circ|\circ|\circ\circ$ ,  $\circ\circ|\circ|\circ$ , or  $\circ|\circ|\circ|\circ$ . We are basically done at this point - the structure of a masafu half-line can be visualized in the following:

$$(\circ | ) + \left\{ \begin{array}{c} \circ \ \circ \ | \ \circ \ \circ \\ \circ \ | \ \circ \ | \ \circ \ \circ \\ \circ \ \circ \ | \ \circ \ | \ \circ \\ \circ \ | \ \circ \ | \ \circ \ | \ \circ \end{array} \right\} + | \ \circ \ | + \left\{ \begin{array}{c} \circ \ \circ \ | \ \circ \ \circ \\ \circ \ | \ \circ \ | \ \circ \ \circ \\ \circ \ \circ \ | \ \circ \ | \ \circ \\ \circ \ | \ \circ \ | \ \circ \ | \ \circ \end{array} \right\}$$

Note that, as specified, almost all of the lines 26 to 35 fail to pass this pattern, so it is reassuring that our pattern works.

**Part (b)**

- 36)  $\circ \ | \ \circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ \ \ \ \color{red}\circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ \ \ \ \circ$
- 37)  $\ \ \ \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ \ | \ \color{green}\circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ \ \ \ \circ$
- 38)  $\ \ \ \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ \ | \ \color{green}\circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ | \ \circ$
- 39)  $\ \ \ \ \circ \ | \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \color{red}\circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ | \ \circ$
- 40)  $\ \ \ \ \circ \ | \ \circ \ | \ \circ \ | \ \circ \ | \ \color{green}\circ \ | \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ$
- 41)  $\ \ \ \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ \ | \ \color{green}\circ \ | \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ$
- 42)  $\circ \ \ \ \ \circ \ | \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \color{red}\circ \ | \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ$
- 43)  $\ \ \ \ \circ \ \ \ \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \color{red}\circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ | \ \circ$
- 44)  $\circ \ | \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ \ | \ \color{red}\circ \ \ \ \ \circ \ | \ \circ \ | \ \circ \ \ \ \ \circ$
- 45)  $\circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ \ \ \ \circ \ | \ \color{green}\circ \ | \ \circ \ \ \ \ \circ \ | \ \circ \ \ \ \ \circ$

The colored dots are dots that we inspect; green marks lines that conform to our expected pattern of being a light syllable in this position, while red indicates a failure to comply with our pattern.