

K: Keeping Cows

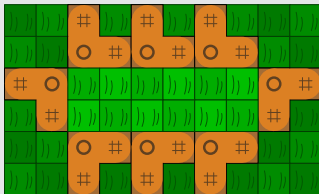
Problem author: Yidi Zang

Problem

- Place corner-fences into a 100×100 grid.
- Create a connected fenced area of exactly $1 \leq a \leq 5000$ cells.

Solution

- There are many different constructions of varying implementation difficulty.
- Determine minimum h with $(h - 1) \cdot 80 \geq a$ (one extra row).
- Fence a $h \times 80$ rectangle area.

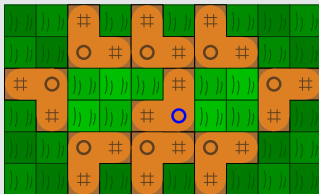


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Case $h = 2$

- If $h = 2$, then $a \leq 80$, and place a (blue) block as shown below.
- Notice that left component is odd, right is even.
- Move middle block left or right to increase the relevant component by 2.
- All $a \leq 80$ are achievable this way.



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Case $h > 2$

- By construction, our rectangle has $80 \leq x \leq 160$ cells too much.
- Place the right piece (blue) to reduce field by 3.
- Place the left piece (red) to reduce field by 4.
- Use up to 3 blue pieces, and then as many red pieces as necessary.
- One can (easily) show that $80 \leq x \leq 160$ reduction is always possible.

