

Challenge 255: Dishing out Doing the Dishes

Five children are deciding who should do the washing up. They stand in a circle and then number themselves in order, from 1 to 5. Then counting round the circle, every other child is allowed to leave the circle, so the last child left has to do the washing up. Here's how it works for these five children:

Child 1 must stay in the circle (for now) but child 2 is allowed to leave the circle, which closes up. Then child 3 must stay in the circle (for now) but child 4 is allowed to leave the circle, which closes up. Then child 5 must stay in the circle (for now) but child 1 (the one after child 5 in the circle) is allowed to leave the circle.

Then child 3 (the next left in the circle after child 1) must stay in the circle, but child 5 is allowed to leave the circle.

But now only child 3 is left in the circle, and he has to do the washing up.

If there are different numbers of children in the circle, the same rules apply: at the start, child 1 must stay in the circle and child 2 is allowed to leave. After that, whenever a child leaves the circle, the next child in the circle stays in the circle (temporarily) but the child after that can leave the circle. The last child left in the circle has to do the washing up.

(a) Suppose the initial number of children is a power of two. What will happen?

(b) What if the initial number of children is one less than a power of two?

Do you have advice for any of these children about where they should choose to stand?