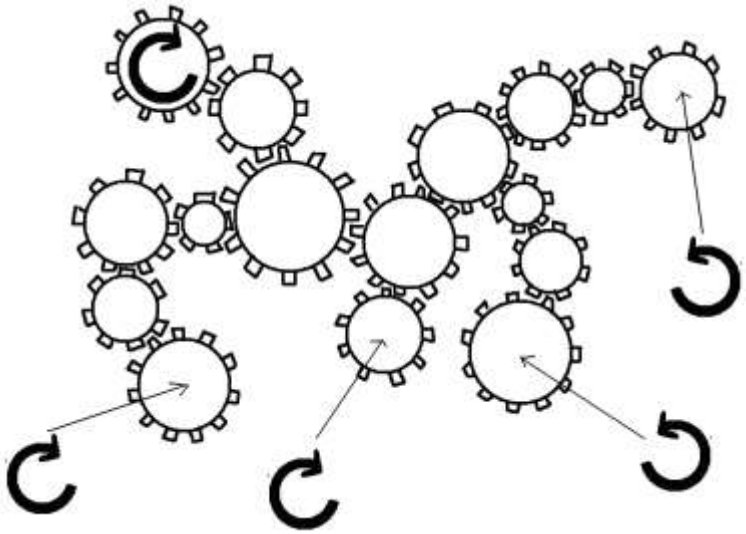
WITHOUT WORDS

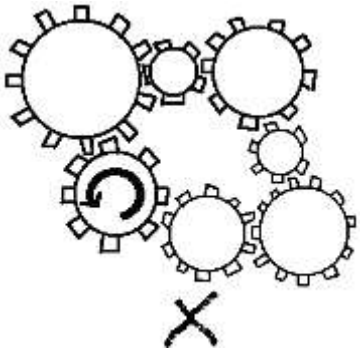
Mathematical Puzzles to Confound and Delight

WW 3: SOLUTION



We see that any two touching cogs must rotate in opposite directions, and so a string of cogs alternates back and forth between clockwise and counter-clockwise motions.

A loop of cogs involving an odd number of cogs cannot turn: the first cog must turn both clockwise and counterclockwise at the same time!



If there were instead eight cogs in this loop of cogs, then all the cogs in that diagram could turn.

Comment: Mathematicians use the word *parity* to describe systems or objects that can be in one of two states: up/down, clockwise/counter-clockwise, even/odd, black/white, on/off, for example. To learn more about the mathematics of parity, see Chapter 5 of *THINKING MATHEMATICS! Vol 1: Arithmetic = Gateway to All.* (http://www.lulu.com/shop/james-tanton/thinking-mathematics-1-arithmeticgateway-to-all/ebook/product-17511272.html)