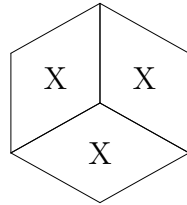


Turn in your solution to at least two of the problems. **Explain your solution in full sentences. Give detailed reasonings.** Include diagrams and figures if appropriate.

Problem 1. In a polyomino achievement game two players alternately mark the cells of a grid using their own colors. The player that can mark a given goal polyomino is the winner. In a weak achievement game the second player (the breaker) does not try to mark the goal polyomino, she only tries to prevent the first player (the maker) achieving his goal. Play this game on the tumbling block grid (see <http://incompetech.com/graphpaper/>) using the following goal polyomino:



Can the maker win in the weak achievement game? Who can win in the regular game?

Problem 2. Prove that $5^{2008} + 4$ is a composite number.

Problem 3. Let a , b and c be three not necessarily consecutive terms of an arithmetic progression of positive numbers. Find the common difference of the arithmetic progression if $\frac{c-b}{a} + \frac{a-c}{b} + \frac{b-a}{c} = 0$.