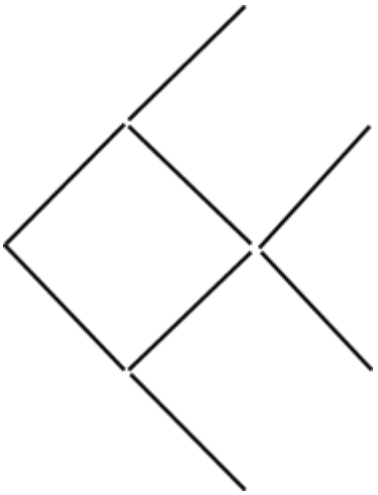
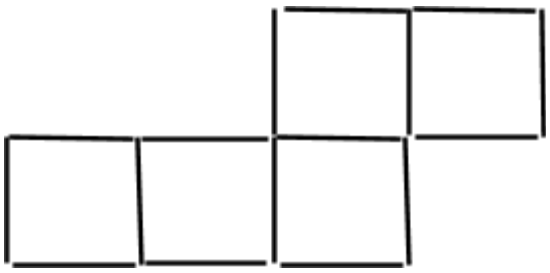
Take home problems:

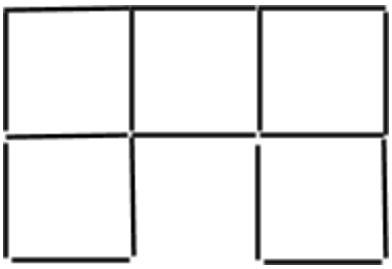
1. Turn the fish around by moving only 3 matches without overlapping:



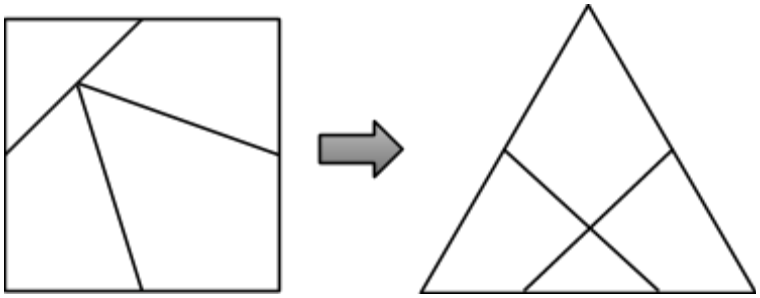
2. Move 2 matches to get only 4 squares:



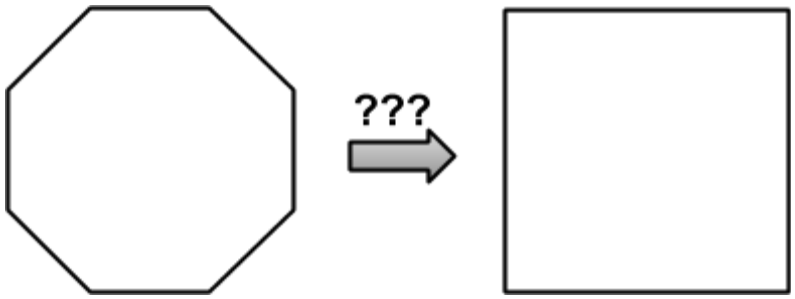
3. Remove a square by moving only 3 matches to be left with only 4 squares:



4. A square can be turned into an equilateral triangle by cutting into 4 pieces and rearranging as follows:



Find a way to cut up an octagon into pieces and rearrange them to get a square.
How few can you use?
Challenge: It can be done using only 5 pieces!



5. A grasshopper jumps on the road, left or right. He jumps 1 inch, then 2 inches, 3… and his last jump is 10 inches.
   Is it possible that he ends up exactly where he started?

6. (★★★)=**challenge**
   Let $S_n = 1^2 + 2^2 + ... + N^2$ be the sum of the first n squares. Show that $6S_n = N(N+1)(2N+1)$ by "stacking corners" in a rectangular solid of dimensions $N \times (N+1) \times (2N+1)$.

7. You have 2 fuses. Each burns in <u>exactly</u> one hour. <u>But</u>, the rate is uneven, and you don't know how long it takes to burn ½, ⅓, etc. of the fuse.
   Can you make a timer that burns <u>exactly</u> 45 minutes?