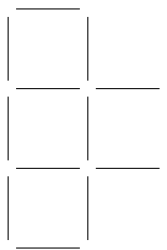


# Toothpick Geometry

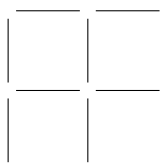
Hye Jung Kim and John Rader  
University of Hawai'i at Mānoa

The goal of this activity is to develop geometric visualization skills and proof techniques. You will be given a toothpick configuration and will have to remove or rearrange a specified number of toothpicks to create a new configuration with certain attributes. As you master each problem, you will see how solving it can be useful for solving the harder problems. It should be noted that several of these problems have multiple solutions. Pay attention to the instructions carefully. Good luck!

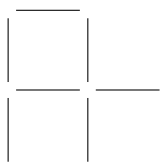
1. Remove one toothpick to leave only three squares.



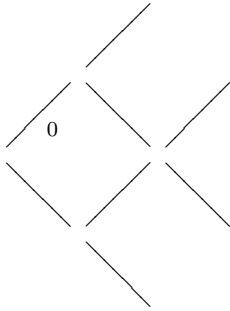
2. Remove two toothpicks to leave only two squares.



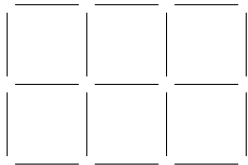
3. Remove two toothpicks to leave only two squares.



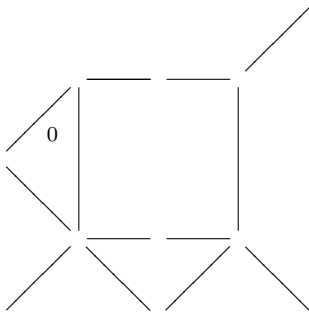
4. Make the fish swim the opposite way by moving three toothpicks.



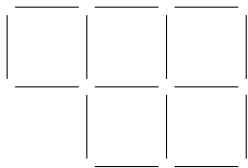
5. Remove six toothpicks to leave only two squares.



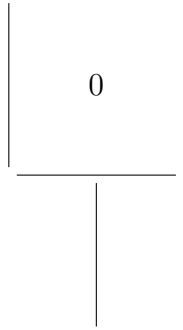
6. Move two toothpicks to make the pig go the opposite way (he will be running scared!).



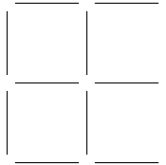
7. Remove three toothpicks to leave only three squares.



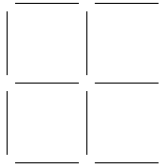
8. Move two toothpicks to get the ball out from between the goalposts.



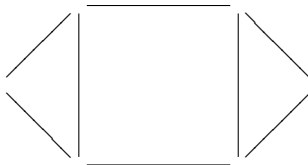
9. Move four toothpicks to make only three squares.



10. Move four toothpicks to make only four triangles and only two squares.

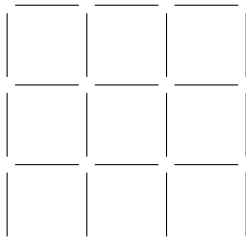


11. Move two toothpicks to make only five triangles and only one square.

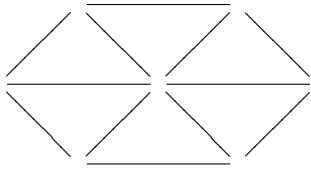


**From here on, they get harder!!!**

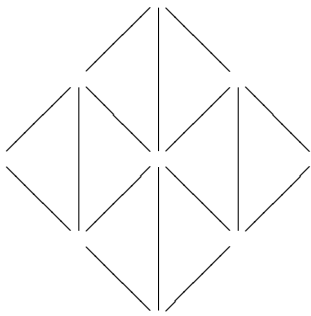
12. Remove eight toothpicks to leave only three squares.



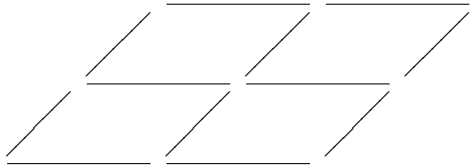
13. Move four toothpicks to leave only three equilateral triangles (the diagram is not drawn to scale).



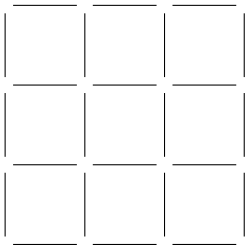
14. Remove six toothpicks to leave only four triangles.



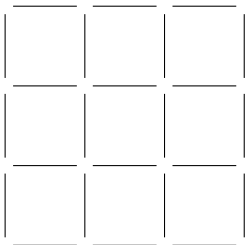
15. Move two toothpicks to make only four triangles.



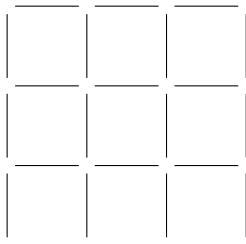
16. Move six toothpicks to make only twelve triangles and only seven squares.



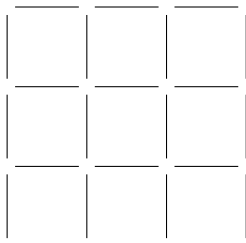
17. Move six toothpicks to make only seventeen triangles and only seven squares.



18. Move four toothpicks to make only eight triangles and only seven squares.

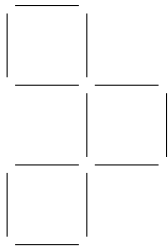


19. Move four toothpicks to make only nine triangles and only seven squares.

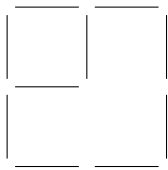


# Solutions

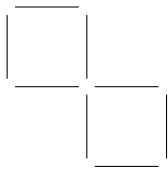
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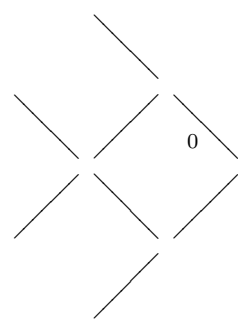
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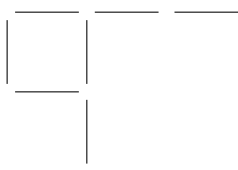
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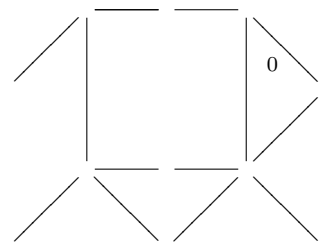
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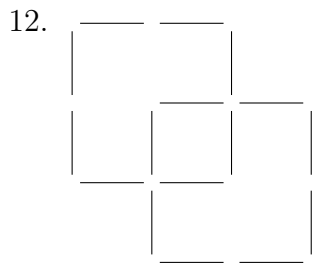
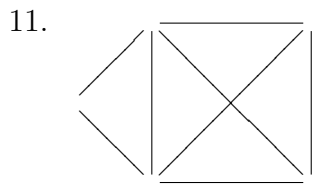
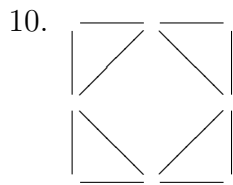
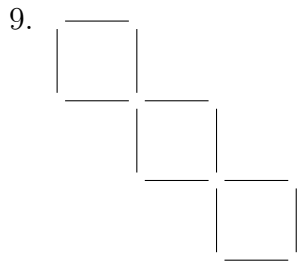
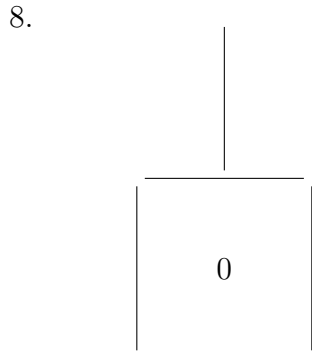
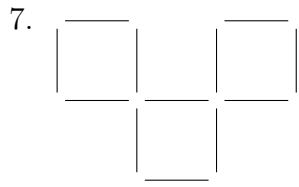


5.

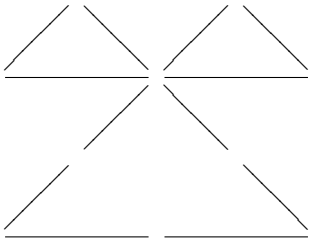


6.

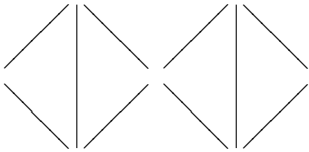




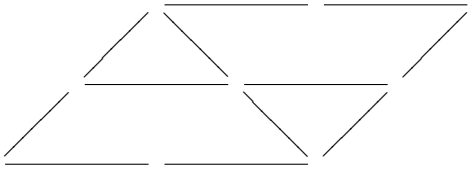
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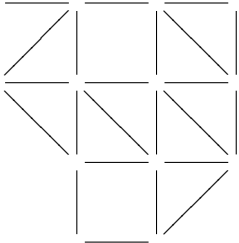
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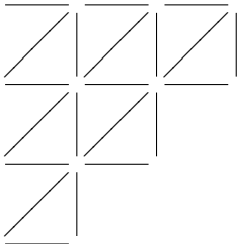
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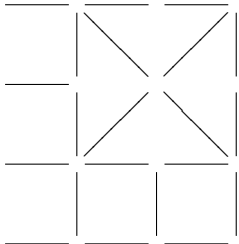
16.



17.



18.





19.

