

TOOTHPICK TRIANGLES FESTIVAL GUIDE

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Materials and Setup

Per table (assuming 5 students per table), you will need:

Per Table	Material Preparation	
100 colored 2" popsicle sticks		
3 copies of Instructions	1-page sheet	p. 6
5 copies of Challenges	2-page sheet <i>can be printed double-sided</i>	p. 7-8
1 copy of Table Sign	1-page sheet <i>print on cardstock for sturdiness</i>	p. 9

Per Table	Purchasing Materials		
Mini-colored popsicle sticks	pack of 150 for \$6.08		
8 plastic sheet protectors	pack of 100 for \$7.67	pack of 500 for \$26.99	These are recommended in order to protect the documents that students will be handling.

Objective

Remove toothpicks to make triangles.

Rules:

1. Place a toothpick on each line segment.
2. Remove toothpicks to complete each challenge.
3. Every toothpick must be a part of at least one triangle.
4. Triangles do not need to be the same size.

Materials

Each Toothpick Triangles table should be prepped for 5 stations.

Each station needs:

1. About 20 colored 2” popsicle sticks.
2. Toothpick Triangles instructions.
3. Toothpick Triangles challenges.

How to Play

Introduce the activity without overexplaining it and without telling what strategies students might want to use. As much as possible, avoid giving away answers. Students should be encouraged to explore, experiment, and learn from their mistakes.

1. Have ready a triangular array (like on the instruction page).
2. Demonstrate the rules by removing toothpicks.
3. Have the student help you solve the first challenge.
4. Have the student explore the next challenges.

For younger students, you may want to first involve them in recognizing and counting triangles. Create some triangles with the toothpicks and ask them to describe what they notice about a triangle. Next create triangular arrays and have them count the triangles they see. Challenge them to remove any number of toothpicks, leaving any number of triangles.

Standards

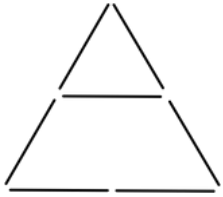
1. Make sense of problems and persevere in solving them. CCSS.MP1
2. Model with mathematics. CCSS.MP4
3. Attend to precision. CCSS.MP6

Asking Good Questions

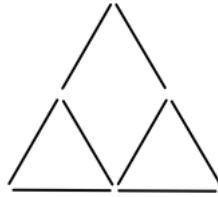
1. Ask questions about confidence.
 - a. When a student asks you “Is this right?”, instead of saying “yes” or “no” right away, ask them how confident they are in their answer. Here are some examples:
 - i. “Maybe. What do you think? How confident are you?”
 - ii. “On a scale of 1-5, how confident are you in your answer?”
 - b. If a student is not confident in their answer, follow up by asking “What would help you feel more confident in your answer?” or “Why do you not feel confident?” This helps you determine how best to help the student through their explorations.
2. Ask students about choices.
 - a. When a student is stuck or shows you a wrong answer, instead of jumping in and showing the student the correct answer, start by asking about the choices that the student made along the way. Here are some suggested steps to follow:
 - i. Start from the beginning.
 - ii. Ask students to show you what they’ve tried so far.
 - iii. When the student gets to a point where they have different choices, ask the student “What other choices can you make here?”
 - iv. Have the student make a different choice and try to solve the puzzle. This helps the student see that they have the power to make different choices during an activity, and they’ll start to do this on their own in the future.
 - v. If you’re familiar with the puzzle or a particular solution, stop the student only when a different choice will help them get to the solution. This will help them feel successful faster without you giving away too much of the answer.
3. Ask students about strategies.
 - a. If a student is getting into the activity and has been doing it for a while, ask the student if there are any strategies they’ve come up with to help them solve the puzzle or win the game.
 - b. Follow up by asking if they think their strategies will work for all puzzles and/or larger puzzles, more complex puzzles, etc. Have the student explore more complex puzzles to test out their strategies.
 - c. This is a great way to encourage a student to dive deeper into an activity and to start looking for patterns, structure, and proofs.

Answers

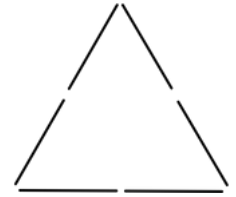
Some challenges have more than one solution:



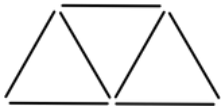
Challenge 1A



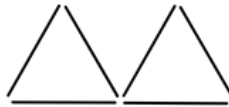
Challenge 1B



Challenge 1C



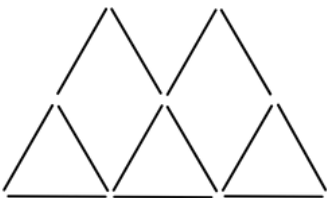
Challenge 1D



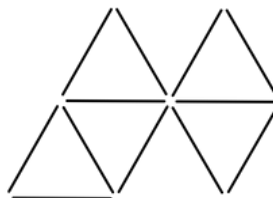
Challenge 1E



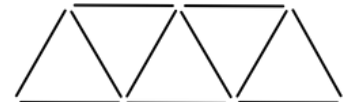
Challenge 1F



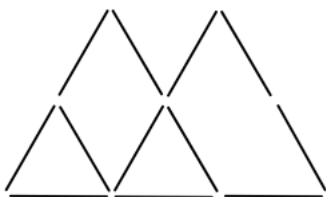
Challenge 2A



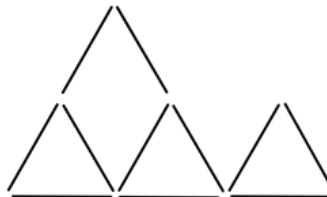
Challenge 2B



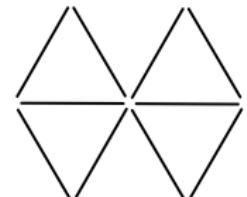
Challenge 2C



Challenge 2D



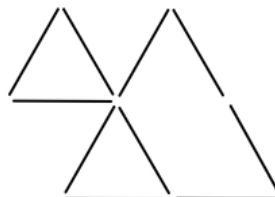
Challenge 2E



Challenge 2F



Challenge 2G



Challenge 2H



Challenge 2I



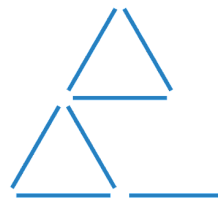
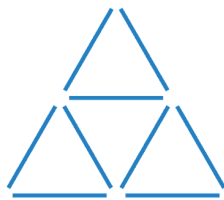
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Toothpick Triangles Instructions

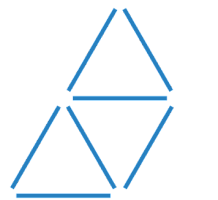
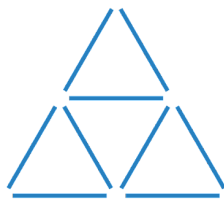
Rules:

1. Place a toothpick on each line segment.
2. Remove toothpicks to complete each challenge.
3. Every toothpick must be a part of at least one triangle.
4. Triangles do not need to be the same size.

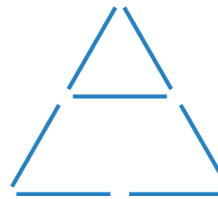
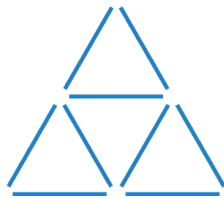
Challenge: Remove **2 toothpicks** to make **2 triangles**.



Some toothpicks aren't part of a triangle.

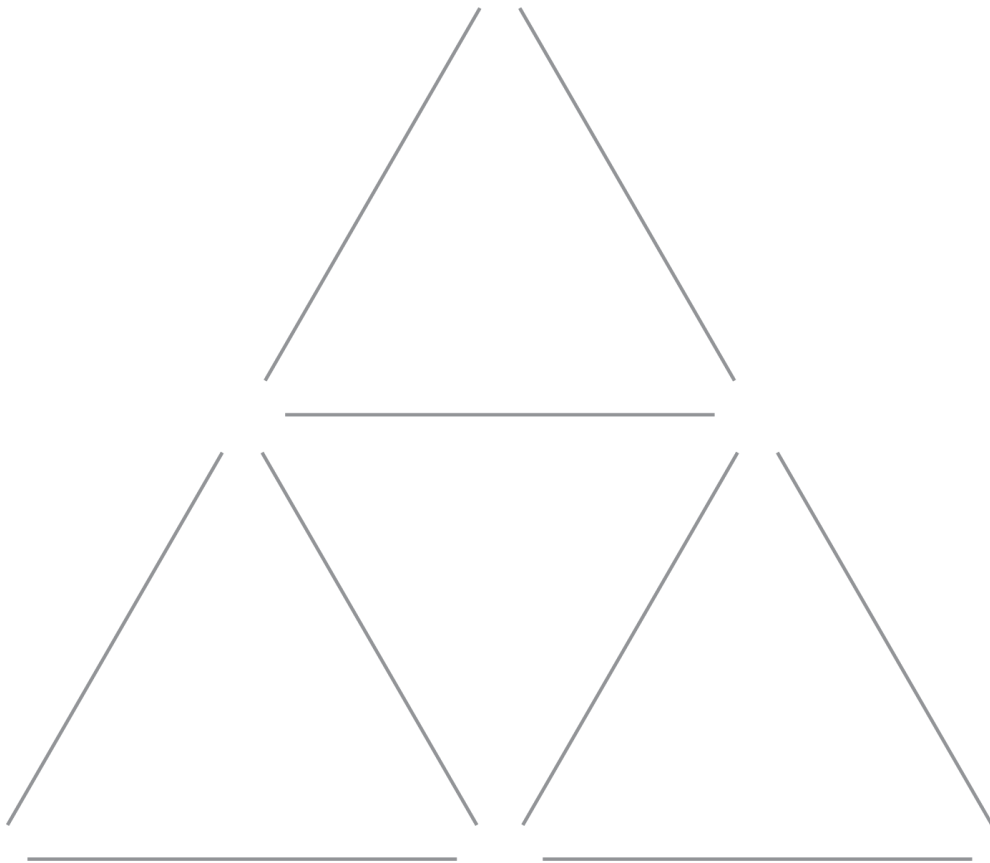


There are 3 triangles.



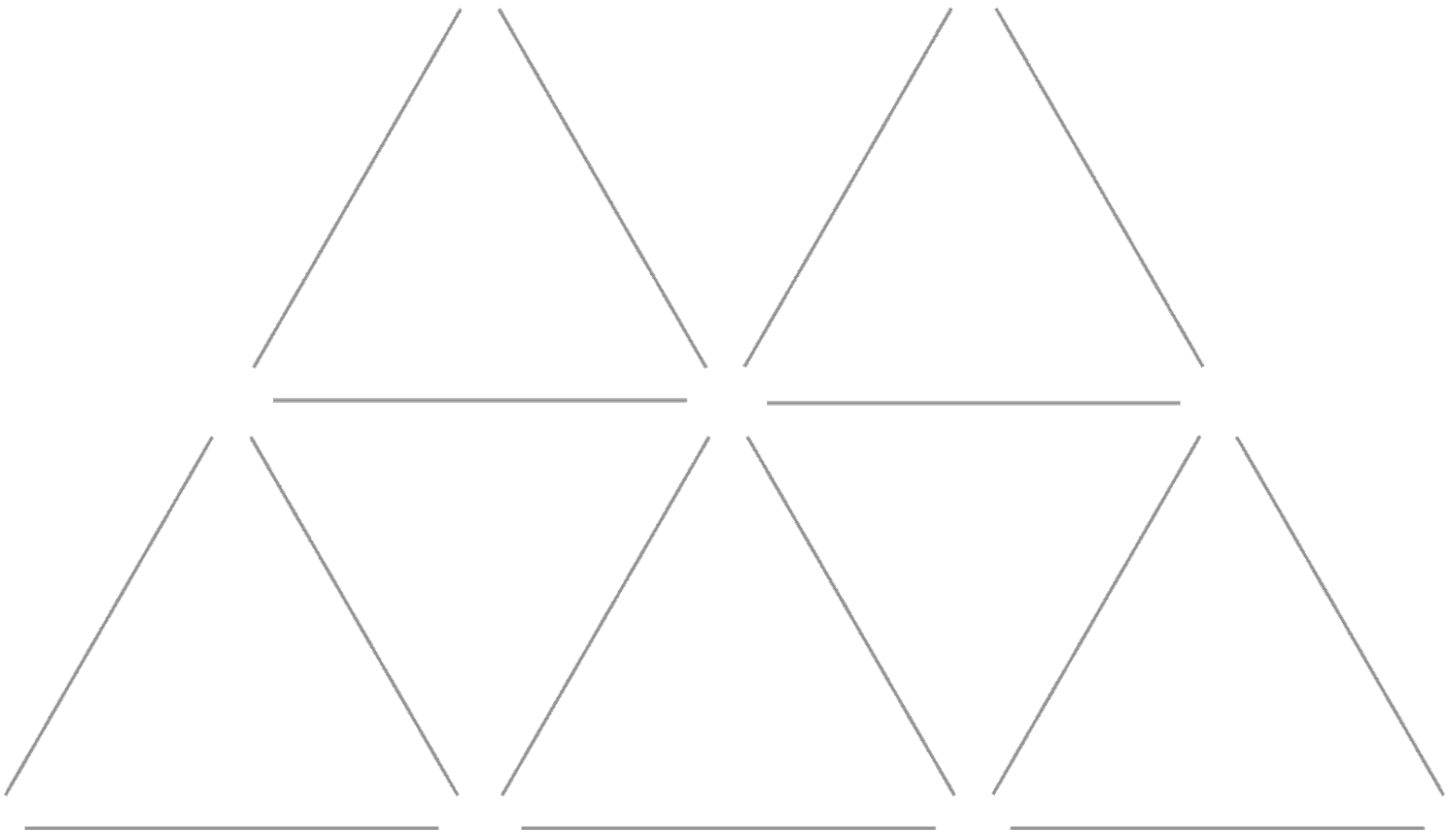
Toothpick Triangles Challenges

A. Remove 2 toothpicks to make 2 triangles .	B. Remove 1 toothpick to make 3 triangles .	C. Remove 3 toothpicks to make 1 triangle .
D. Remove 2 toothpicks to make 3 triangles .	E. Remove 3 toothpicks to make 2 triangles .	F. Remove 4 toothpicks to make 2 triangles .



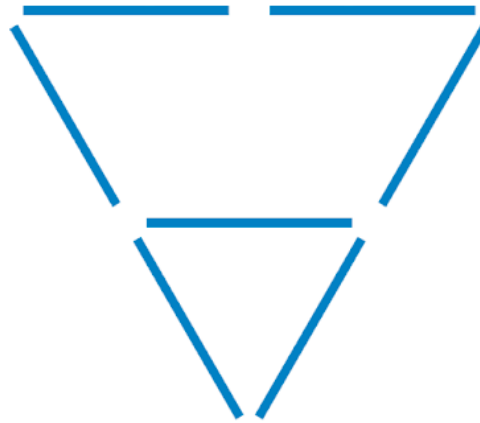
Toothpick Triangles Challenges

A. Remove 2 toothpicks to make 5 triangles .	B. Remove 3 toothpicks to make 5 triangles .	C. Remove 4 toothpicks to make 5 triangles .
D. Remove 3 toothpicks to make 4 triangles .	E. Remove 4 toothpicks to make 4 triangles .	F. Remove 5 toothpicks to make 4 triangles .
G. Remove 4 toothpicks to make 3 triangles .	H. Remove 5 toothpicks to make 3 triangles .	I. Remove 6 toothpicks to make 3 triangles .





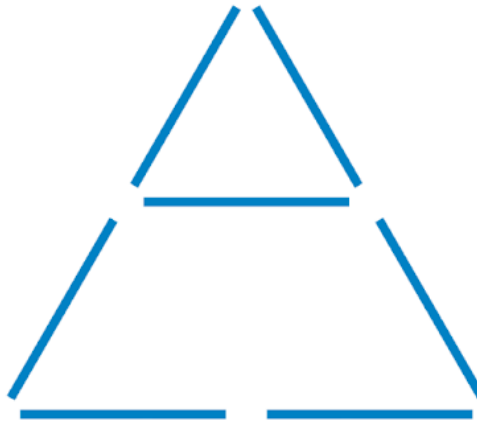
Play for free at
jrmf.org/puzzle/toothpick-triangles



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