



Children's Museum of Houston

Pre/Post Classroom Activities

Tricky Toothpick Puzzles

Rationale

Think Tank encourages children to use higher level thinking skills by using an array of lively and interactive components and activities. Four child characters serve as the gallery guides, spreading the message that thinking and problem solving is fun, hip, and “the thing to do.” This lesson introduces children to higher level thinking skills and provides practice of processes and tools used in problem solving.

TEKS Objectives (Mathematics)

3.8: The student is expected to identify, classify and describe two and three-dimensional geometric figures by their attributes.

3.14C, 4.14C, 5.14C: Select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem

3.16B, 4.16B, 5.16B: Justify why an answer is reasonable and explain the solution process.

4.9B: Use translations, reflections, and rotations to verify that two shapes are congruent.

Background

In these puzzles, the children need to use what they know about the geometric shapes of triangles and squares in order to solve them. The problem cannot be solved, unless the child can recognize the shapes. It is even more helpful to be able to visualize the shapes when they plan which toothpicks to move. Some children may find it helpful to draw their solution attempts to keep track of what worked and what didn't. Students will be able to share strategies to solve puzzles using geometric figures. In the Think Tank Gallery at the Museum the children can look for the Perplexing Pyramid puzzle. It challenges them to make a triangular pyramid from three identical blocks.

Vocabulary

Strategy- a plan of action

Congruent- figures that have the same shape and size

Materials

- Flat toothpicks
- Copies of Tricky Toothpick Puzzles

Procedure

Set Up: Copy the toothpick puzzles for the students (Another option is to write on the board or prepare overhead transparency). It may also be helpful to divide the toothpicks into small packages for each student or group.

1. Make some triangles and squares with the toothpicks. Talk about what makes the shape a triangle or a square.
2. Build some figures with multiple triangles and squares. Talk about sharing sides and the hidden shapes they may be able to find.
3. Challenge the students with the “Tricky Toothpick Puzzles”.
4. Encourage the children to record how they solved the puzzles and then share with the class how they went about it.

Questions to ask

- How many triangles or squares are left each time you change or move a toothpick?
- How many of the shapes are exactly alike (congruent)? How do you know?
- Which shapes are similar (look alike but may be different sizes)?
- What is the smallest number of toothpicks you need to make 3 squares? 2 squares? 4 squares?

Extensions

Make up your own toothpick puzzle for someone else to solve.

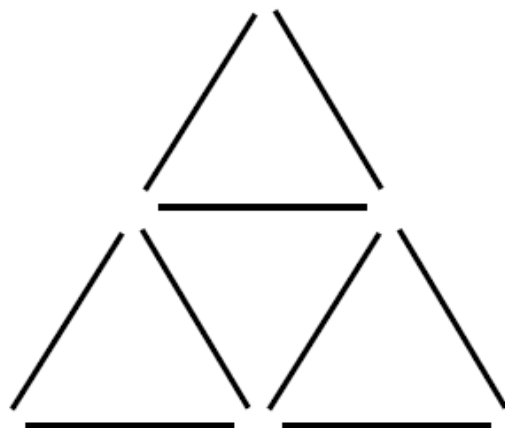
Resources

Check out these children’s picture books about shapes:

Burns, Marilyn. *The Greedy Triangle*. Scholastic, Inc., 1995.

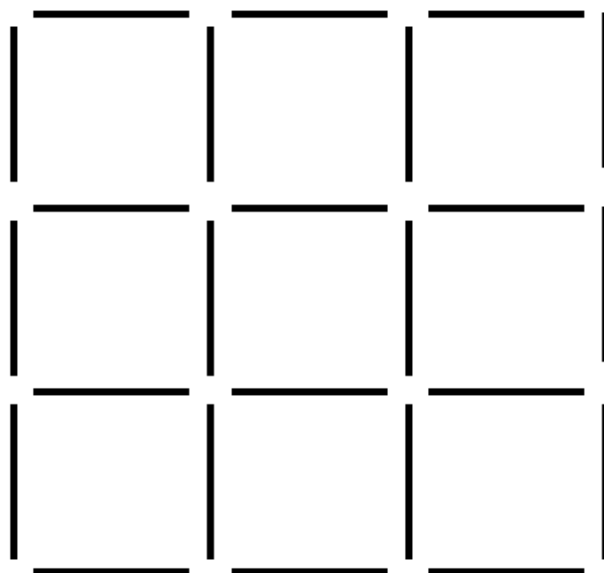
Lewis, J. Patrick. *Doodle Dandies: Poems That Take Shape*. Aladdin Paperbacks, 2002.

Tricky Toothpick Puzzles



Puzzle 1

- Make this design using nine toothpicks. How many triangles do you see?
- How many are exactly alike?
- Move just 4 of the toothpicks to make exactly 3 congruent triangles (exactly alike).



Puzzle 2

- Arrange 24 toothpicks in the design above.
- How many squares do you see? How many are exactly alike?
- Can you take away 8 of the toothpicks to make 2 squares?