Teacher Guide for Tangrams

Special notes and timing
These lessons may look short, but figuring out the puzzles is pretty challenging. If hints are given (see the **mathematical notes** for hints), the first lesson takes about 25 minutes.

Learning Objectives

Students will:
- Draw a shape made of tangram pieces.
- Find the area of tangram pieces.
- Create new tangram shapes.

Materials
- Math journal or notebook
- Tangram pieces (either premade or use master to make them)

Mathematical Notes

Some students become frustrated if they can't figure out the puzzle right away. You can help ease that frustration by giving students hints when they need it. Some good hints for lesson 1 are:
- For the 3-piece square, do not use a large triangle.
- There are several correct answers for the 4-piece square, and they all use one large triangle.
- For the 5-piece square, don't use either large triangle.

Helping Questions

How might you begin?
What pattern do you see?
Why do you think that happens? (*Students may not know the answer to this question, but it helps them to think about it and try to explain it.*)
What did you try that didn't work? Can you learn something from that?
Is there any symmetry in the shape that might help you?
Where do you need right angles (or 45^{o} angles)?

Assessment Options
- Look at the students' math journals. Make sure that they are accurately representing their tangram shapes.
- Ask the students to explain why certain figures are convex and others are not.

Extensions
- Students may want to make their own pictures using the tangram pieces. They may enjoy trying to make letters of the alphabet from the pieces.
- Have the students research the history of the tangram. There are a lot of stories on the internet about how the shapes came about—this is a good lesson in the development of a myth or legend. What similarities are there in all of the stories?
- Students can try to make shapes with various symmetries (flip/reflection, rotation). Students may debate the following question: If I can rotate part of my solution and then I have your

solution, are they really different solutions? (In other words, if you have two solutions that are symmetric to each other, are they really different solutions?)

Teacher Reflection

- Which students were able to see the patterns quickly, and which students struggled to see the patterns?
- Were you surprised by which students could see the geometric relationships most quickly?
- Did some students get frustrated if they couldn't find a solution immediately? What can you do to ease that frustration?
- Did some students work better individually or in pairs/small groups? What support can you provide to the students to work outside their comfort zone?
- What were the greatest challenges for the students?

Standards Addressed

Common Core State Standards (and Colorado Academic Standards in Mathematics)

4. Shape, Dimension, and Geometric Relationship

NCTM (National Council of Teachers of Mathematics) Content Standards

Geometry
Measurement

NCTM Process Standards

Problem Solving
Reasoning and Proof
Communication
Representation

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