

The Five-Triangle Puzzle

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This month's activity is a geometric dissection puzzle. In this type of puzzle, pieces are put together to form a geometric shape. *The Five Triangle Puzzle* has five pieces—three larger 30-60-90 degree right triangles and two smaller, similar triangles. There is a special relationship between the larger and smaller pieces—the hypotenuses of the smaller triangles are congruent to one of the legs of the larger triangles. The challenge in this puzzle is to put all five pieces together to form a large triangle. There are two unique solutions—each a different type of triangle.

This *Puzzle Corner* activity has two student pages. The first page introduces the puzzle and provides space for students to sketch their solutions. The second page contains the puzzle pieces. This page should be run on card stock or some similar weight paper. To save paper, it contains the pieces for two puzzles.

This puzzle will likely require patience and persistence to solve for most students. Students who have well-developed spatial-relationship skills will find it easier than those who don't have these skills. Often, these students are not the top students and their ability to solve puzzles like this one faster than their peers is a great esteem builder. Conversely, this type of puzzle often frustrates those students who usually do well at traditional school tasks and provides them with a real challenge. This role reversal has the potential to be beneficial for both sets of students.

This puzzle can be used at a variety of different grade levels. While the puzzle is somewhat difficult, it can be solved by younger students using trial and error—if they persist. Older students familiar with the language of geometry can be guided by the geometric relationships between the pieces mentioned above, and by using the following hint, which requires knowledge of geometric terms.

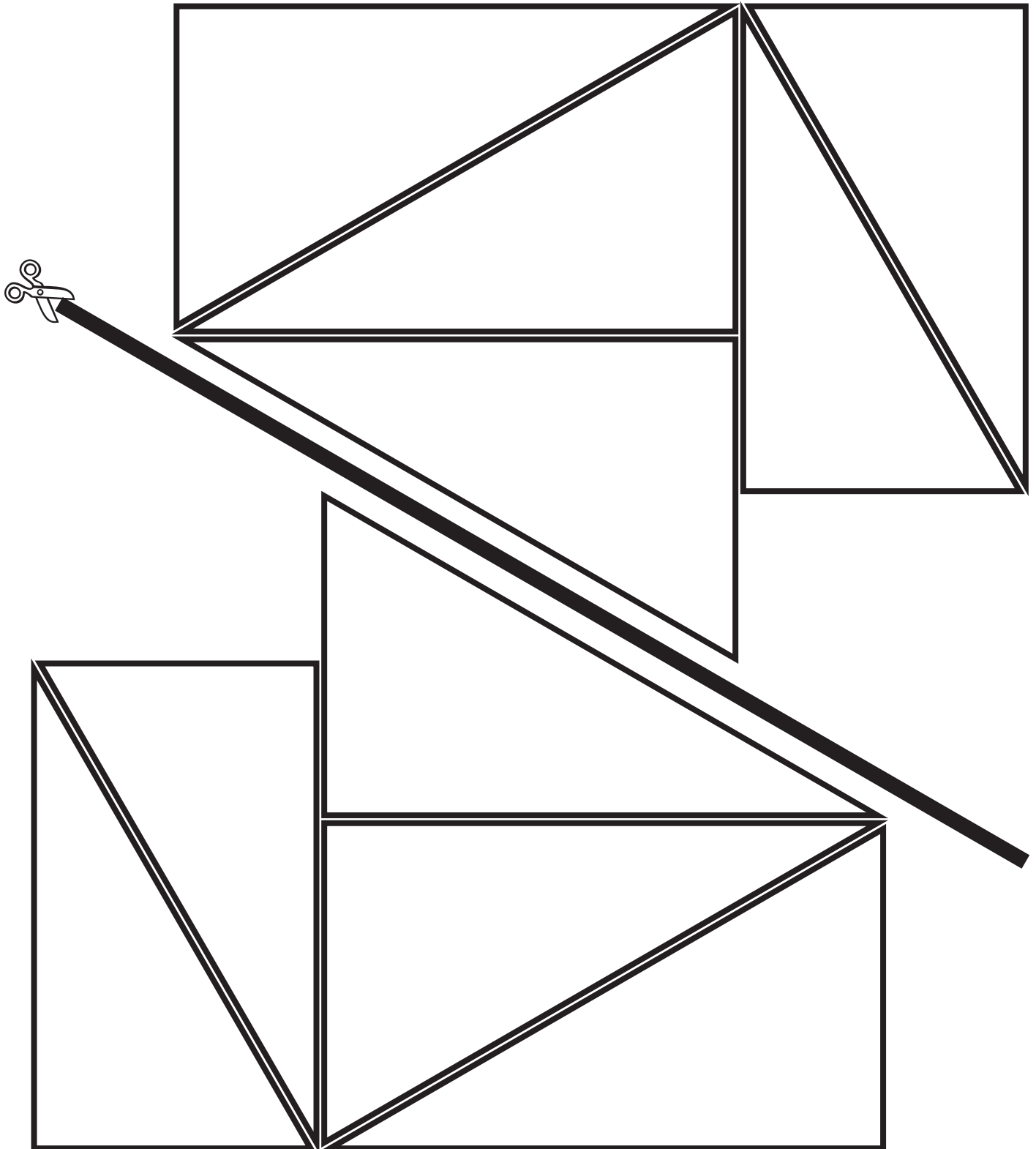
Hint: One of the solutions forms an equilateral triangle; the other an obtuse isosceles triangle. With this knowledge, the puzzle becomes more of a problem-solving activity. For example, equilateral triangles have 60 degree angles—knowing this gives you insight into how the pieces must be arranged in any possible solution (the 90-degree corners of the pieces cannot be the corners of the triangle).

For advanced students, you can also extend this activity by having them think about the possible angles and triangles given the pieces. Since all of the pieces are 30-60-90 degree triangles, the smallest possible angle is 30 degrees. The other possibilities are 60, 90, and 120 degrees. (You can make a 150-degree angle with the pieces, but this leaves only 30 degrees for the remaining two corners. Since 30 degrees is the smallest angle, this is not possible.) From this, students can determine the possible angle combinations that could be made with the pieces. These are 60-60-60 (an equilateral triangle), 120, 30, 30 (an obtuse isosceles triangle), and 30-60-90 (a right triangle). Working with the pieces will confirm that the last of these is not actually possible.

I hope that you and your class find this *Puzzle Corner* activity challenging, but enjoyable. The solutions will appear in the next issue. If you need the solutions before then, or have any other questions or comments, please contact me at dyoungs@fresno.edu or at the AIMS address or phone number found on the back cover of this magazine.

The FIVE-TRIANGLE PUZZLE

Cut out one set of five triangles below. Use them to make a large triangle. There are two unique solutions.



The FIVE-TRIANGLE PUZZLE

The challenge in this puzzle is to use all five puzzle pieces to make a large triangle. Two different triangles are possible.

Sketch your solutions in the space below.

