

9.C SuperTangrams, Midpoints

SUPERTANGRAMS

You will need:

graph paper



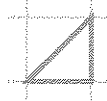
geoboards



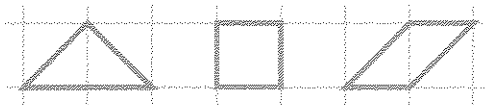
dot paper



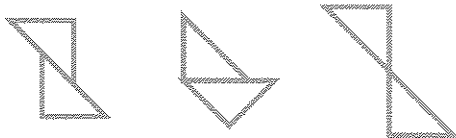
In the world of geometric puzzles, half a unit square (cut along the diagonal), is called a *tan*.



Figures created by combining tans are called *polytans*. Here are the ditans.

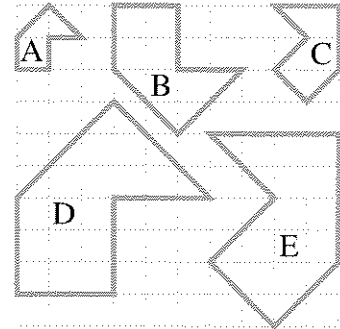


The tans must be combined side-to-side. The following arrangements are not acceptable.




- Find all four tritans.
- 💡 Find all fourteen tetratans.
- Tetratans are usually called *SuperTangrams*. Find the perimeter and area of each SuperTangram, using radical expressions when appropriate. Rank the perimeters from shortest to longest.

This figure shows one of the SuperTangrams and four blown-up versions of it.



- Find the perimeter and the area for the SuperTangram and each blowup.
 - Compare shape A with shape C.
 - What is the ratio of similarity?
 - Verify your answer to part (a) by showing that multiplying the perimeter of A by the ratio of similarity yields the perimeter of C.
 - Repeat problem 5 for each other pair of shapes in the figure. (You should find nine more ratios of similarity.)
- Report** Write a report summarizing your work in problems 3-6. Include a discussion of:
- using the Pythagorean theorem;
 - perimeter and area of similar figures;
 - operations with radical expressions.

MIDPOINTS

8. Draw five geoboard segments whose midpoints are on a peg.
9. Make a triangle such that all of its sides have their midpoints on a peg. Connect the midpoints, making a smaller triangle. Study the figure, looking for parallel lines, equal segments, and similar figures.
10. Find the slopes of lines you believe are parallel. Find the lengths of the segments you believe are equal. Find the ratio of similarity for figures you believe are similar.
11. Make a quadrilateral such that all of its sides have their midpoints on a peg. Make the quadrilateral as irregular as you can, avoiding equal or parallel sides. Connect the midpoints, making a smaller quadrilateral. Study the figure, looking for parallel sides and equal segments.
12. Find the slopes of lines you believe are parallel. Find the lengths of the segments you believe are equal.
13. **Report** Write a report on midpoints of triangles and quadrilaterals. Do you think what you found in the case you investigated will always be true? Explain.
14.  Try to make a triangle such that exactly two of its sides have their midpoints on pegs. If you find such a triangle, draw it on dot paper. If you believe such a triangle does not exist, explain why.