

# ACTIVITIES

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## TANGRAM GEOMETRY

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### Teacher's Guide

*Grade level:* 7-10

*Materials:* Student worksheets, scissors, rulers, and protractors. Transparencies of sheets 1-3 for classroom discussion.

*Objectives:* The students will use the tangram pieces to create common geometric shapes. In addition, they will use inductive reasoning to determine the properties of those shapes that are convex quadrilaterals.

*Directions:* Make copies of sheets 1-3 and distribute them to the students. Have the students cut the tangram shown on sheet 1 into the seven pieces indicated by the letters *A* through *G*, inclusive. Ask the students to identify the geometric shape formed by each of the seven pieces, and show them how the solutions are recorded on sheet 2. Then have them use pieces *A* and *B* to form each of the geometric shapes shown in the three sample solutions on sheet 1, and discuss the manner in which these solutions are recorded on sheet 2. When the students appear to understand the task, encourage them to work with the pieces in a systematic fashion to find additional solutions. That is, they should consider the different pieces two at a time (*AB*, *AC*, etc.), three at a time (*ABC*, *ABD*, etc.), four at a time (*ABCD*, *ABCE*, etc.), five at a

time (*ABCDE*, *ABCDF*, etc.), six at a time (*ABCDEF*, *ABCDEG*, etc.), and seven at a time (*ABCDEFG*). Point out that only pieces that form one of the geometric shapes indicated on sheet 2 are recorded as solutions. Thus, for example, the use of piece *A* in conjunction with either of the pieces *C*, *D*, *E*, or *F*, respectively, does not result in one of these shapes, and so *AC*, *AD*, *AE*, and *AF* are not recorded on sheet 2. On the other hand, since pieces *A* and *G* form a trapezoid, *AG* is the next two-piece solution that is recorded on sheet 2. The activities on sheet 3 introduce students to the properties of some special quadrilaterals. By measuring the sides and angles of the quadrilaterals formed by the tangram pieces, students should be able to complete the table.

*Comments:* This tangram activity is particularly appropriate for introducing students to some special quadrilaterals and the properties that they possess. Additional tangram activities can be found in the interesting article by Allen (1973).

### REFERENCE

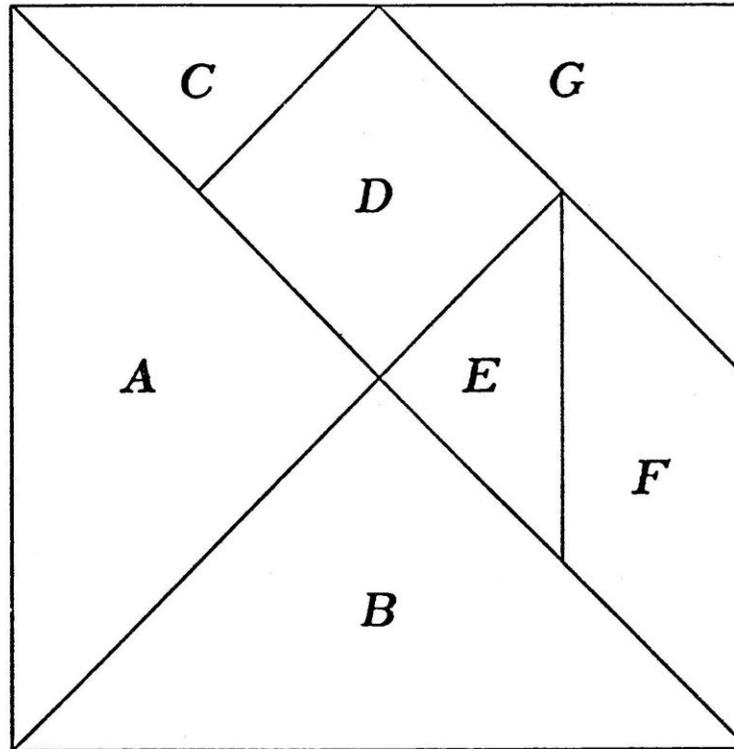
Allen, Charles E. "Mission—Tangrams." *Mathematics Teacher* 66 (February 1973): 143-46.

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This section is designed to provide mathematical activities suitable for reproduction in worksheet and transparency form for classroom use. Appropriate laboratory experiences, discovery activities, and model constructions of mathematical significance drawn from the topics of the seventh, eighth, and ninth grades are most welcome. Send your suggestions, in a four-page format similar to the "Activities" already published, to the managing editor for review.

## TANGRAM GEOMETRY

Carefully cut out the tangram below.



By using various combinations of the tangram pieces, we can form quadrilaterals and triangles. In this activity, fit the pieces together one at a time, two at a time, three at a time, and so on. If the pieces can be arranged to form a triangle or quadrilateral, it should be recorded in the solutions on sheet 2.

Pieces	Shape	Name of Shape
AB		Isosceles triangle
AB		Parallelogram
AB		square

SOLUTIONS

Piece(s)		Isosceles triangle	Parallelogram	Rectangle	Rhombus	Square	Trapezoid	Isosceles trapezoid
1 piece	A	X						
	B	X						
	C	X						
	D					X		
	E	X						
	F		X					
	G	X						
2 pieces	AB	X						
	AG							
	BG							
	CD							
	CE							
	CF							
	CG							
	DE							
	EF							
	EG							
3 pieces	FG							
	ACE							
	BEC							
	CDE							
	ABG							
	ABC							
	CEF							
4 pieces	EFG							
	CGE							
	A EFG							
	A CEG							
	A CEF							
5 pieces	B CDE							
	B GEC							
	C EFD							
6 pieces	ABCEG							
	ABCEF							
	ABCDE							
7 pieces	BCDEFG							
	ABCDEFG							

## PROPERTIES OF QUADRILATERALS

Use your tangram pieces and a ruler or protractor to complete this table.

Property	Parallelogram	Rectangle	Rhombus	Square	Trapezoid	Isosceles trapezoid
Both pairs of opposite sides are parallel						
Exactly one pair of opposite sides is parallel						
Both pairs of opposite sides are congruent						
Exactly one pair of opposite sides is congruent						
All sides are congruent						
Opposite angles are congruent						
All angles are right angles						
Diagonal forms two congruent triangles						
Diagonal forms two congruent isosceles triangles						
Diagonals are congruent						
Diagonals bisect the opposite angles						
Diagonals are perpendicular						
Diagonals bisect each other						