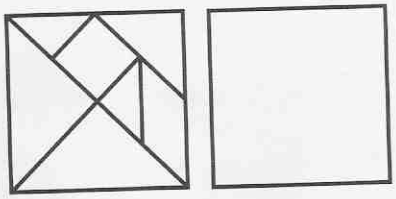
About Tangrams

The tangram is an ancient Chinese puzzle consisting of seven pieces in three different shapes: two large triangles, one medium triangle, two small triangles, a square, and a parallelogram. The large triangle is twice the area of the medium triangle. The medium triangle, the square, and the parallelogram are each twice the area of a small triangle. Each angle of the square measures 90°. Since each triangle contains a 90° angle and two 45° angles, they are all isosceles right triangles, and the two sides opposite the 45° angles are congruent. The parallelogram contains 45° and 135° angles. The relationships among the pieces enables them to fit together to form many figures and arrangements.

Constructing a Tangram

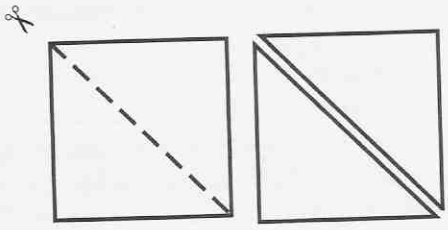
Students can gain valuable experience learning and reviewing various geometric concepts and vocabulary terms by constructing the tangram puzzle through paper folding. The materials needed are a model of the tangram square (page 8), a 4-inch square piece of paper, and a pair of scissors. To emphasize geometric concepts, ask the questions below during the construction process.

1. Show students the square pattern with internal shape lines, and the 4-inch square piece of paper.



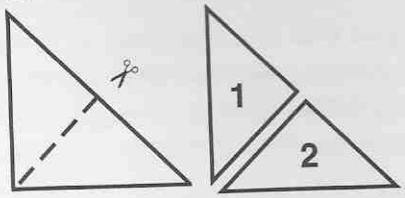
- How would you begin to fold and cut the square piece of paper to form the seven pieces of the tangram? What would be your first fold? [A diagonal of the square.]

2. Fold the square piece of paper in half along the diagonal. Cut along the diagonal fold to make two triangles.



- Which side of the diagonal in the pattern is easier to work with in order to form some of the tangram pieces? [The part showing two triangles.]

3. Fold one of the triangles in half. Cut along the fold line to make two smaller triangles. Label them "1" and "2."



- Are the two triangles alike? [Yes.]
- Can you fit one triangle on top of the other? [Yes.]
- Are they *congruent*? [Yes.]
- How do you know? [Each triangle is the same size and shape.]
- What do you notice about the angles of these triangles? [A right angle and two smaller angles of the same size.]
- Can you name this triangle more accurately? [A *right triangle*.]
- What is longside of each triangle called? [The *hypotenuse*.]
- Are the shorter sides of each triangle the same size? [Yes.]

A triangle having at least two congruent sides is *isosceles.*

- Can you name this triangle even more accurately? [An *isosceles right triangle*.]

Ask older students:

- How could you figure out the size of the smaller angles of the triangle? [Place the two triangles together so that the smaller (45°) angles form a right angle. Half of a right angle (90°) is 45°. Triangles 1 and 2 will form the two large triangles of the tangram.]

4. Now work with the remaining half piece of paper to form the other five pieces of the tangram. Fold the triangle in half and then open it up to show a fold line.

- Where is the hypotenuse of this triangle? [The long side opposite the right angle.]
- What is the relationship between the fold line and the hypotenuse? [They are *perpendicular*; they form right angles.]