

# *Polytiles*

## Teacher Notes

Heather Swanson  
Bering Straits School District  
Koyuk Malemute School  
Koyuk, AK

*Heather works at Koyuk Malemute School in Koyuk Alaska. This is the beginning of her 8th year of teaching. All 8 have been in Koyuk. Her favorite aspect of math is problem solving and watching students solve the same problem in so many different ways.*

### **Heather's description of how she created Polytiles:**

I came up with the Polytile idea after watching Susan cut tangram pieces out of a perfect square with different folds. For our weekly math consortium assignment I wanted to see if I could come up with something like tangrams, but using a different regular polygon. I chose to use an equilateral triangle and folded it in different ways until I got pieces that I was happy with.

**Grade Level:** 4<sup>th</sup> – 5<sup>th</sup> grade (can be used for higher or lower grades)

**Prerequisites:** Knowledge of the properties of an equilateral triangle. Experience with Tangrams would help, too.

**Standards:**

- Identifies, describes, draws, and models fractions
- Estimates and determines areas of shapes

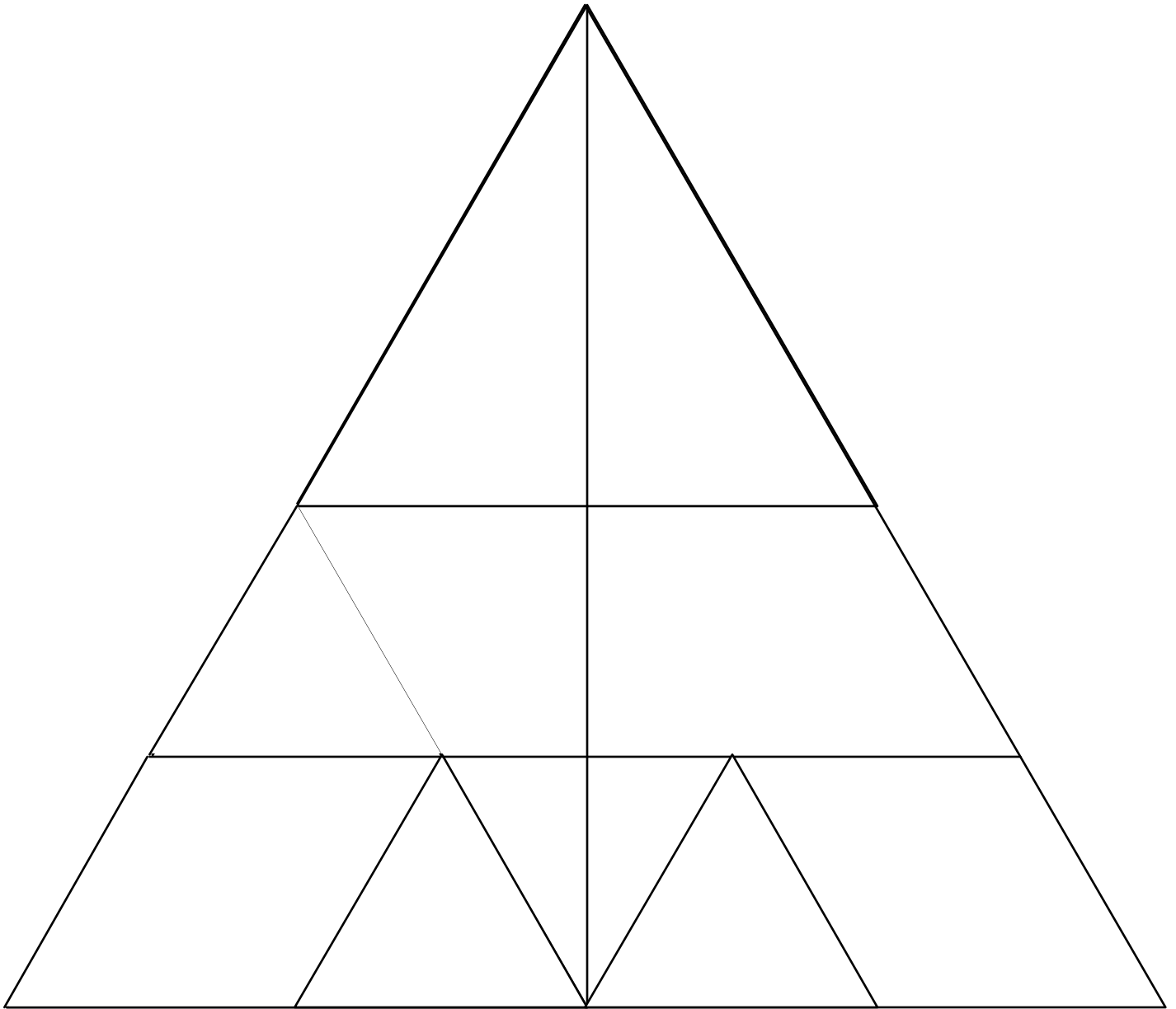
**Purpose:** To increase spatial acuity, practice fractions, find unknowns, and determine area and perimeter of shapes.

### **Directions:**

1. Cut out the large equilateral triangle on the next page. Cut on all of the dark lines. You should have 10 pieces when the Polytiles are completely cut out. Use the set to complete the activities on the succeeding pages.

2. To increase stability of the shapes, the triangle can be glued onto tag board and then cut apart. Polytile sets can be stored in Ziplocs so they won't get mixed up.

# Polytile Set



Name: \_\_\_\_\_

### **Polytile Activity #1 - Spatial Acuity**

1. Find at least 2 different ways to create an equilateral triangle using your 10 shapes. Sketch your solutions in the space below.

2. Create at least one solution in which the trapezoids are not touching each other. Sketch your solution below.

3. 2 small right triangles + 1 small equilateral triangle = what shapes?

**4. Is it possible to create an equilateral triangle in which the two largest triangles are not touching side by side? Explain why or why not.**

**5. Is it possible to create an equilateral triangle in which the two large right triangles are in a position other than the tip of one of the vertices?**

**6. Use any combination of the Polytile shapes to create rectangles. How many different rectangles can you make out of the Polytile shapes? Sketch your solutions below.**

Name: \_\_\_\_\_

**Polytile Activity #2 - Fraction Sense**

1. If the completed equilateral equals one whole, what is the value of each of the following shapes?

- small right triangle
- large right triangle
- rhombus
- trapezoid
- small equilateral triangle

2. If the small equilateral triangle equals one whole, what is the value of each of the following shapes?

- small right triangle
- large right triangle
- rhombus
- trapezoid
- large (completed) equilateral triangle

**3. If the large equilateral triangle equals one whole, find the answers to the following equations using fractions or shapes as your answer. Use sketches to prove your answers.**

$$1 \text{ rhombus} + 1 \text{ rhombus} =$$

$$1 \text{ rhombus} + 1 \text{ small equilateral triangle} =$$

$$1 \text{ trapezoid} + 1 \text{ small equilateral triangle} =$$

$$1 \text{ large triangle} + 1 \text{ rhombus} + 1 \text{ small right triangle} =$$

$$2 \text{ trapezoids} + 1 \text{ large right triangle} =$$

Name: \_\_\_\_\_

**Polytile Activity #3 - Area and Perimeter**

1. If one small triangle equals 1 unit, what is the area of the large equilateral triangle? Manipulate the shapes, and then sketch your solution below to prove your answer.

2. If one small triangle equals 1 unit, what is the perimeter of the large equilateral triangle? Manipulate the shape, and then sketch your solution below to prove your answer.

3. If one rhombus equals 1 unit, what is the area of the large equilateral triangle? Manipulate the shapes, and then sketch your solution below to prove your answer.

4. If one rhombus equals 1 unit, what is the perimeter of the large equilateral triangle? Manipulate the shape, and then sketch your solution below to prove your answer.

Name: \_\_\_\_\_

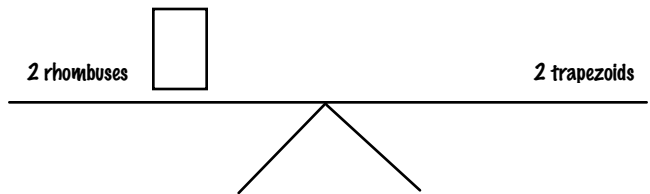
### Polytile Activity #4 - Finding the Unknown Shape

1. 1 small equilateral triangle +  = 1 rhombus

2.  + 1 small right triangle = 1 trapezoid

3. 1 large right triangle - 1 small equilateral triangle =

4. What shape(s) go in the box to balance the scale?



5. What shape(s) go in the box to balance the scale?

