

## Tiling Design Project

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### Lesson Overview

Students will work in pairs and small groups to create a design using pattern blocks. They will use what they know about how the different shapes are related to the square to find the area of the design.

### Standards Addressed

- 6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

### Disciplinary Literacy Best Practices

- Paired Verbal Fluency
- Making Thinking Visible
- Graphic Organizer
- Exit Slip

### Lesson Plan

Time Required: Two 60 minute class periods

Disciplinary Vocabulary: area, compose, decompose, rectangle, square, trapezoid, triangle, rhombus

Materials Needed:

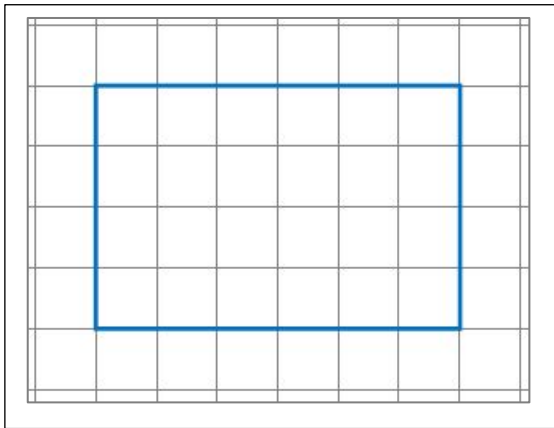
- Grid paper (one 8"x11" per student, one chart sized per group)
- Pattern Blocks (one set per group)
- PVF anchor chart
- Pictures of Tile Designs
- Pattern Blocks Graphic Organizer
- PVF Prompt Cards (one per student)
- Cue Cards (one set per group)
- Straight Edges

Assessment: Dialogue during PVF, MTV, and Tile Design; Exit Slips

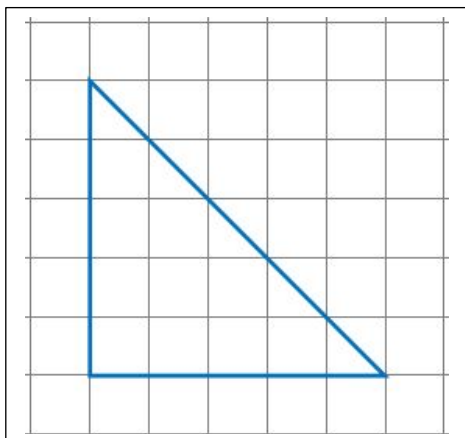
**Engage**

- Direct students' attention to the Paired Verbal Fluency anchor chart to review the steps in the process. In Paired Verbal Fluency, pairs of students are provided a prompt. Students take turns talking on the prompt without repeating any information for three timed rounds.
- Explain that there will be three different prompts. Each student will have a copy of the figures (rectangle, triangle, trapezoid).
- Time for the rounds: 15 seconds – 30 seconds – 45 seconds

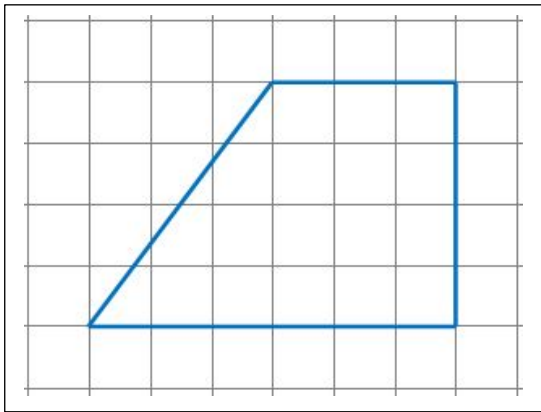
Prompt #1: Explain to your partner how you might find the area of this rectangle. Each square on the grid is 1 unit<sup>2</sup>. (A then B)



Prompt #2: Explain to your partner how you might find the area of this triangle. Each square on the grid is 1 unit<sup>2</sup>. (B then A)



Prompt #3: Explain how you might find the area of the trapezoid. Each square on the grid is 1 unit<sup>2</sup>. (A then B)



- **Debrief of Paired Verbal Fluency:**
  - Pairs to squares (grouping). Each pair of students joins another to form “squares.”
  - The groups will make an MTV (Making Thinking Visible) poster. On a piece of grid chart paper, the students will draw their strategies for finding the area of each of the “prompt” figures. Charts will be posted, examined, and discussed.
  - During the debrief, be sure to use the math vocabulary to help students:
    - remember that area is counted in square units
    - each of the figures could be composed and decomposed in various combinations of squares, rectangles, and triangles

## Explore

### Tiling Design Task

Students will work in their square groups (from PVF debrief) to create a design using pattern blocks. They will draw the design on grid paper and estimate the area of the design by composing and decomposing the shapes into combinations of squares and triangles.

Note: use the hexagons (yellow), regular trapezoids (red), rhombi (blue), equilateral triangles (green), and squares (orange).

Part 1: How is each shape related to the square?

Designate the square as one unit<sup>2</sup>.

Students need to find out how many square units are in each of the other shapes. Use the Workspace & Recording Handout and Cue Cards for this part of the lesson.

The Cue Cards are “leveled” from least to most structured.

#### Level 1

1. Explain how your group figured out how many square units are in each shape.

- Be sure to describe all of the relationships you can find.
- Words that will help

square

triangle

trapezoid

hexagon

rhombus

## Level 2:

1. Explain how your group figured out how many square units are in each shape.

- The green triangle = \_\_\_\_\_ of the orange square
- The blue rhombus = \_\_\_\_\_ of the orange square

Do the same for each of the other shapes.

## Level 3:

1. Explain how your group figured out how many square units are in each shape.

- The green triangle = \_\_\_\_\_ of the orange square
- The blue rhombus = \_\_\_\_\_ of the orange square
- The yellow hexagon = \_\_\_\_\_ of the orange square
- The red trapezoid = \_\_\_\_\_ of the orange square

Check in with each group as they work to be sure they are finding the relationships they need to figure the area of their designs.

## Part 2: Create a design

Students work with their groups to create a design using the pattern blocks. One way to keep it from getting out of hand is to give each group an 8 x 8 piece of paper and tell them to keep their design roughly that size.

Once the group has decided on a design, take a picture with the group number and student names. This picture will be used when the group shares how it found the area of the design.

### Part 3: Find the area

Students work together to find the area of their design. They should record their work in such a way that they will be able to explain what they did. If possible, make a copy of the picture available to them. If not, have one of the students copy the design onto an 8½ x 11 piece of grid paper.

### Explain

Each group will have the opportunity to present their tile design to their peers and explain how they found the area. Pictures of the designs should be available for projection via overhead or white board.

Exit slip (Students complete individually):

Explain how your group found the area of your design.

- Words that might help

first

next

square

triangle

second

then

trapezoid

rhombus

third

finally

hexagon

### Teacher Reflections and Biographical Information

This lesson gave students the opportunity to explore how to find the area of a tiled design by understanding how the shapes in the design were related to each other. Critical thinking and communication were emphasized as students worked together to create their design, make a plan for finding the area of the design, implementing the plan, and explaining the process. It's possible that some of the students will find figuring out that the green triangle is  $\frac{1}{2}$  of the orange square a bit challenging. One possible way to address this is to make purple right triangles available for figuring out that the green can be made with 2 purples and the orange square can be made with 4 purples. Then they can figure out that the green is  $\frac{1}{2}$  of the orange. Don't let students use the purple triangles for their tiling because the design may become too intricate.

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