Finding Area by Decomposing and Rearranging

Let's create shapes and find their areas.

2.1 Notice and Wonder: Squares in Shapes

What do you notice? What do you wonder?

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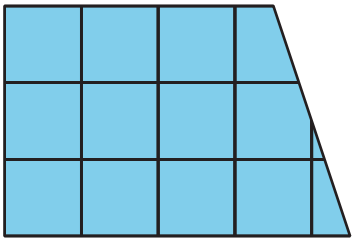

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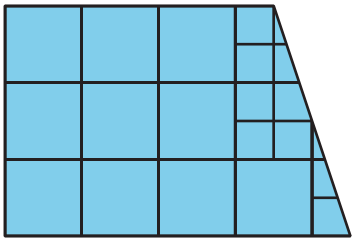

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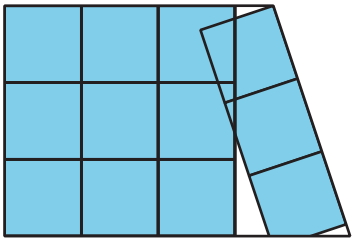

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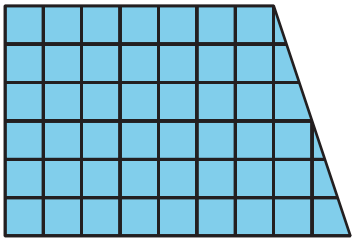
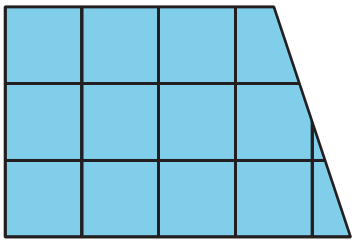


2.2 What Is Area?

You may recall that the term **area** tells us something about the number of squares inside a two-dimensional shape.

1. Here are four drawings that each show squares inside a shape. Select **all** drawings whose squares could be used to find the area of the shape. Be prepared to explain your reasoning.

A



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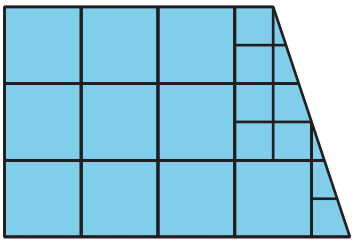

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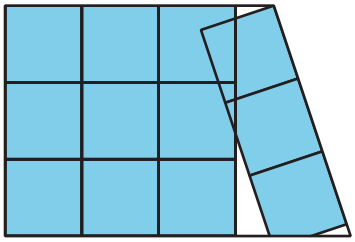

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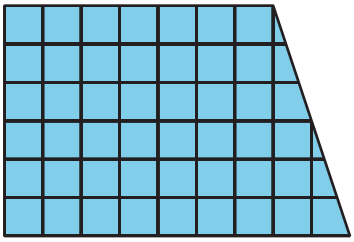


2. Write a definition of "area" that includes all the information that you think is important.

2.3 Composing Shapes

Your teacher will give you 1 square and some small, medium, and large right triangles. The area of the square is 1 square unit.

1. Notice that you can put together 2 small triangles to make a square. What is the area of the square composed of 2 small triangles? Be prepared to explain your reasoning.

2. Use your shapes to create a new shape with an area of 1 square unit that is *not* a square. Trace your shape.

3. Use your shapes to create a new shape with an area of 2 square units. Trace your shape.

4. Use your shapes to create a *different* shape with an area of 2 square units. Trace your shape.

5. Use your shapes to create a new shape with an area of 4 square units. Trace your shape.

Are you ready for more?

Find a way to use all of your pieces to compose a single large square. What is the area of this large square?

2.4 Tangram Triangles

Recall that the area of the square you saw earlier is 1 square unit. Complete each statement and explain your reasoning.

1. The area of the small triangle is _____ square units. I know this because . . .

2. The area of the medium triangle is _____ square units. I know this because . . .

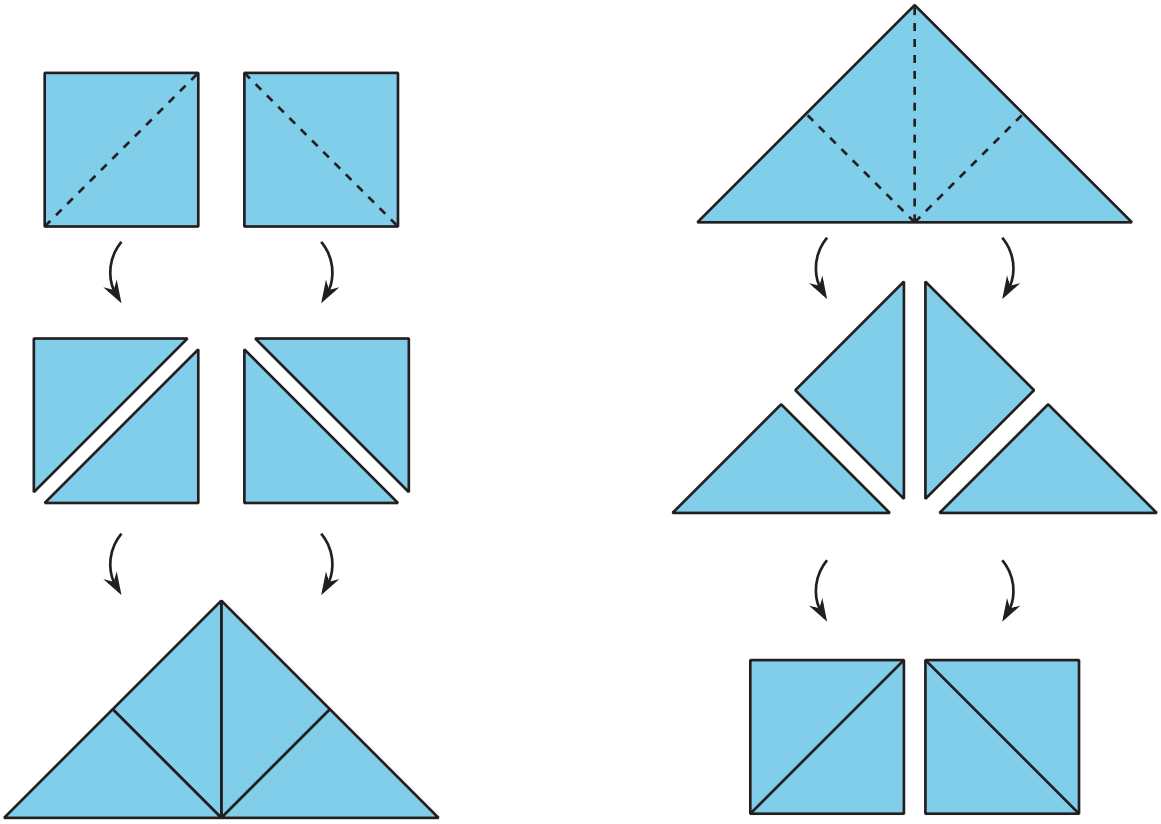
3. The area of the large triangle is _____ square units. I know this because . . .

Lesson 2 Summary

Here are two important principles for finding **area**:

1. If two figures can be placed one on top of the other so that they match up exactly, then they have the *same area*.
2. We can *decompose* a figure (break a figure into pieces) and *rearrange* the pieces (move the pieces around) to find its area.

Here are illustrations of the two principles.



- Each square on the left can be decomposed into 2 triangles. These triangles can be rearranged into a large triangle. So, the large triangle has the *same area* as the 2 squares.
- Similarly, the large triangle on the right can be decomposed into 4 equal triangles. The triangles can be rearranged to form 2 squares. If each square has an area of 1 square unit, then the area of the large triangle is 2 square units. We also can say that each small triangle has an area of $\frac{1}{2}$ square unit.