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Unit Preview Sampler

GRADE 6

UNIT 1

Area and Surface Area

Student Workbook

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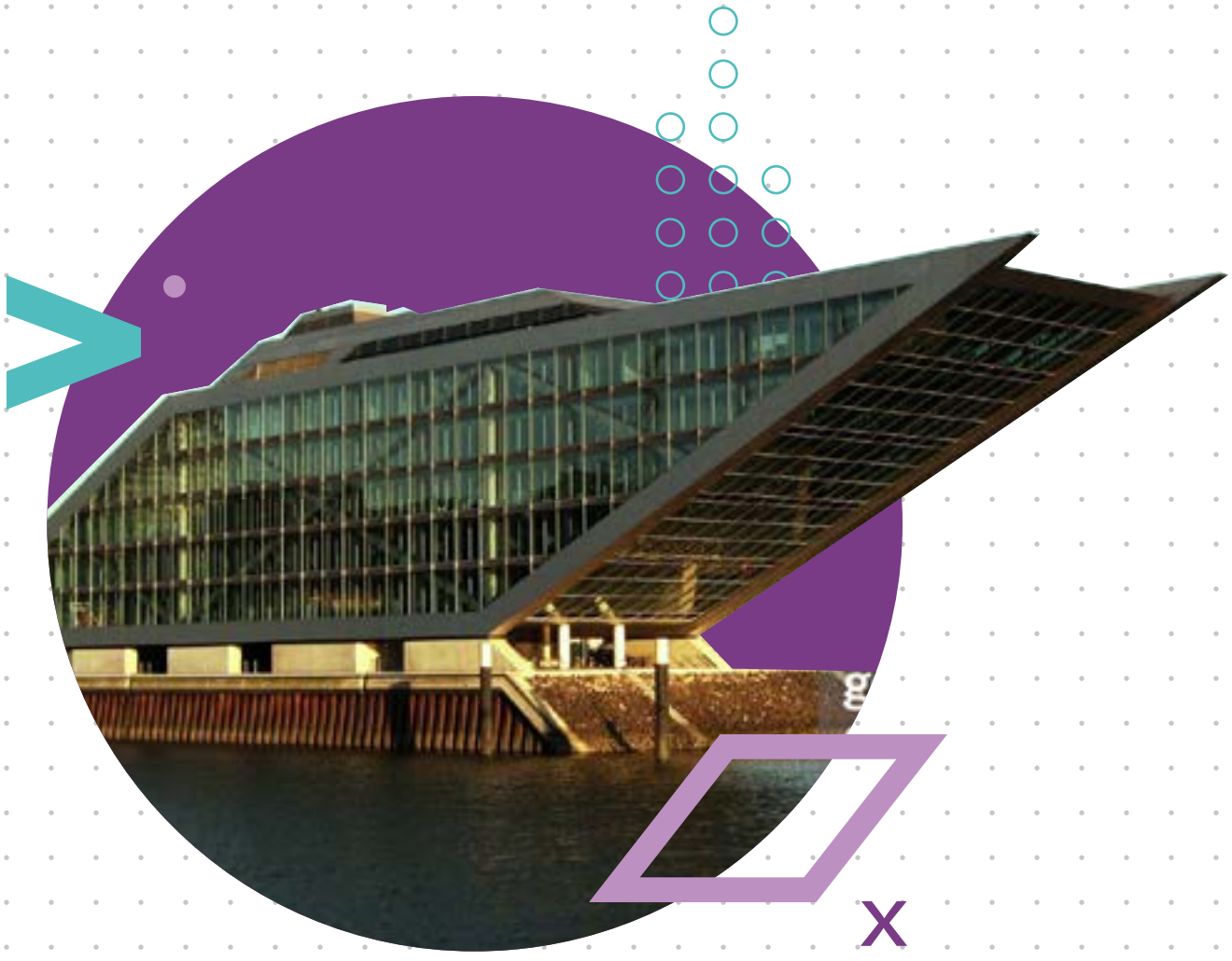
UNIT 1

Area and Surface Area



Go online to find the videos for this unit.

Replace with unit QR Code

Family support

Unit 1 Family Support video

Inspire Math

Math title video

SECTION A

Reasoning to Find Area

I will find and explain area by composing and decomposing parts of shapes.

Alignments

Building On
3.G.A, 3.MD.C.5.b, 3.MD.C.7.d

Addressing
6.G.A.1

Building Towards
6.G.A, 6.G.A.1

Mathematical Practice
MP1, MP3, MP5, MP6, MP7

LESSON 1

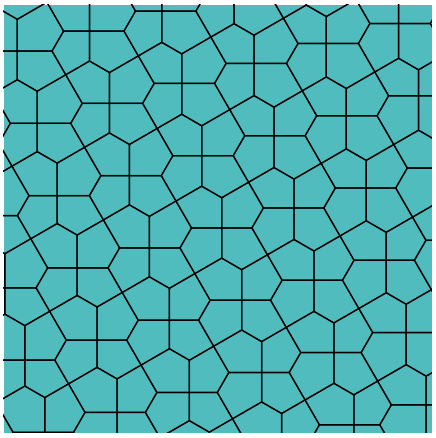
Tiling the Plane

Let's look at tiling patterns and think about area.

Warm-up Which Three Go Together: Tilings

Which three go together? Why do they go together?

A



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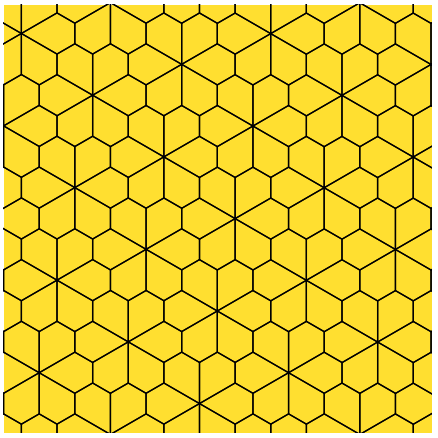

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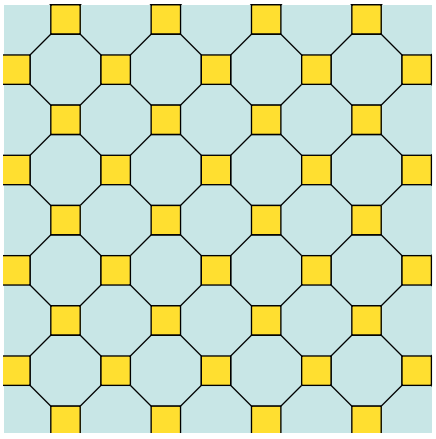

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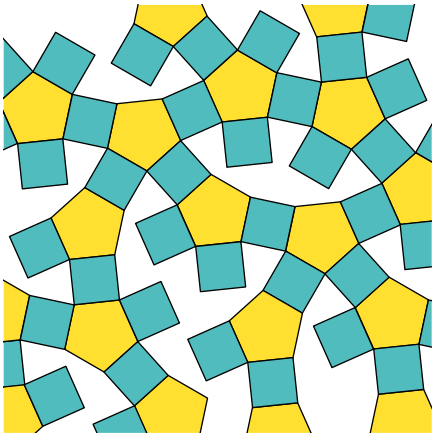
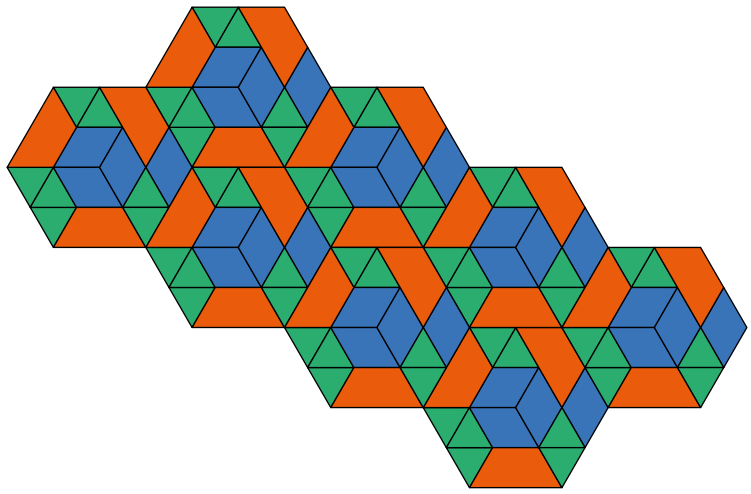


1 More Red, Green, or Blue?

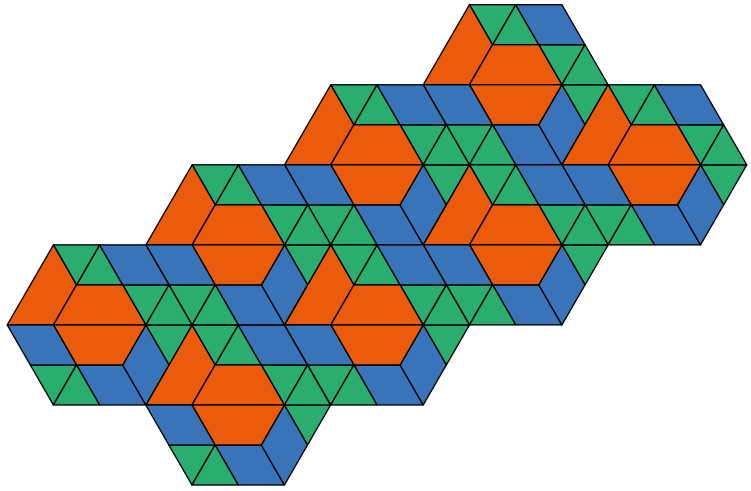
Your teacher will assign you to look at Pattern A or Pattern B.

In your pattern, which shape covers more of the plane: blue rhombuses, red trapezoids, or green triangles? Explain how you know.

Pattern A



Pattern B



Are you ready for more?

On graph paper, create a tiling pattern so that:

- The pattern has at least two different shapes.
- The same amount of the plane is covered by each type of shape.

1 Lesson Summary

In this lesson, we learned about *tiling* the plane, which means "covering a two-dimensional **region** with copies of the same shape or shapes such that there are no gaps or overlaps."

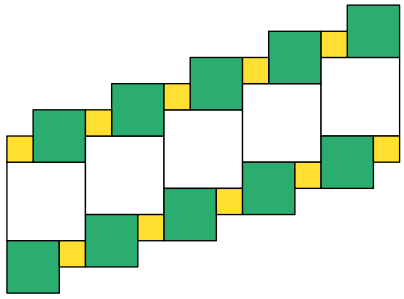
Then we compared tiling patterns and the shapes in them. In thinking about which patterns and shapes cover more of the plane, we have started to reason about **area**.

In future lessons, we will continue with this reasoning, and we will continue learning how to use mathematical tools strategically to help us do mathematics.

LESSON 1

PRACTICE PROBLEMS

1. Which square—large, medium, or small—covers more of the plane? Explain your reasoning.

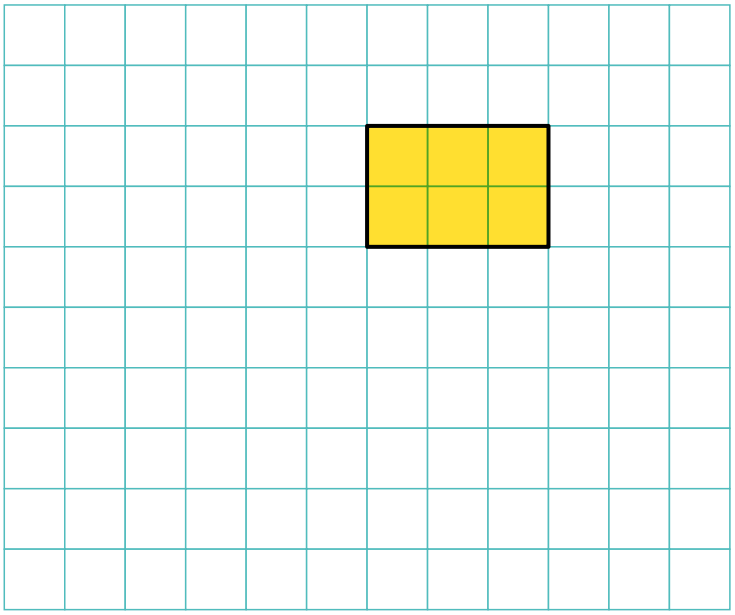


2. Draw three different quadrilaterals, each with an area of 12 square units.

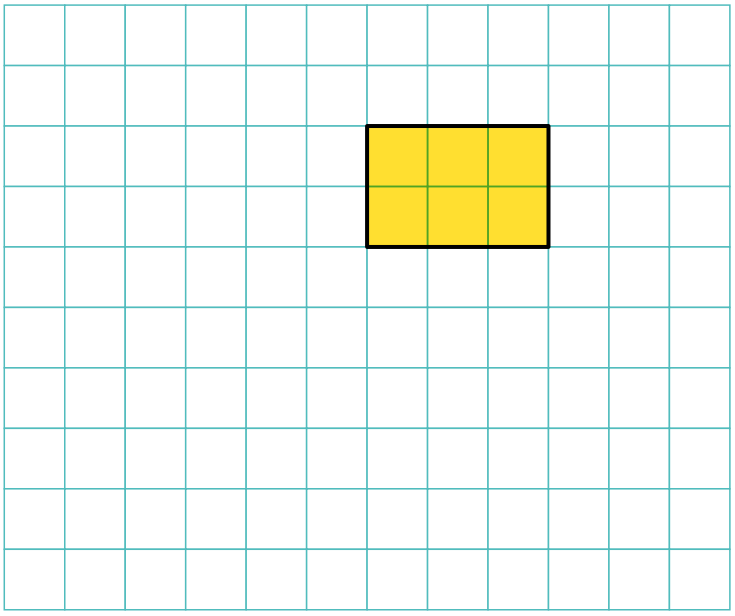
1 Practice Problems

3 Use copies of the rectangle to show how a rectangle could:

a. Tile the plane.

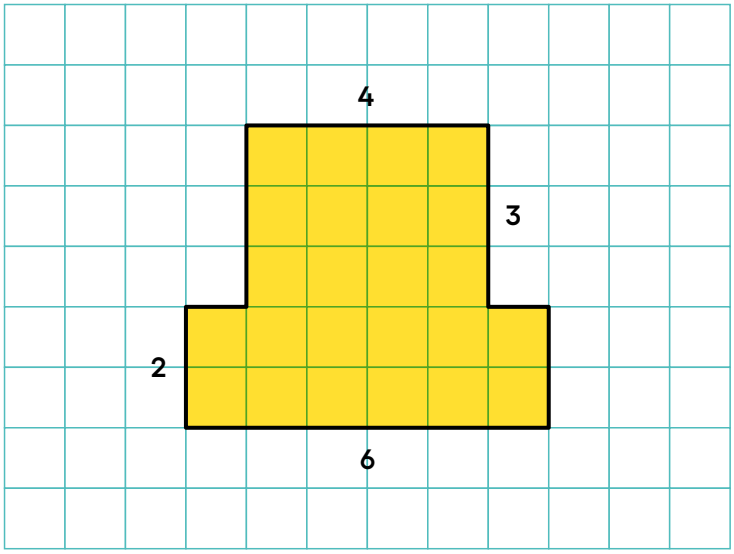


b. *Not* tile the plane.



1 Practice Problems

4 The area of this shape is 24 square units. Select **all** the statements that are true about the area.



A The area can be found by counting the number of squares that touch the edge of the shape.

B It takes 24 grid squares to cover the shape without gaps and overlaps.

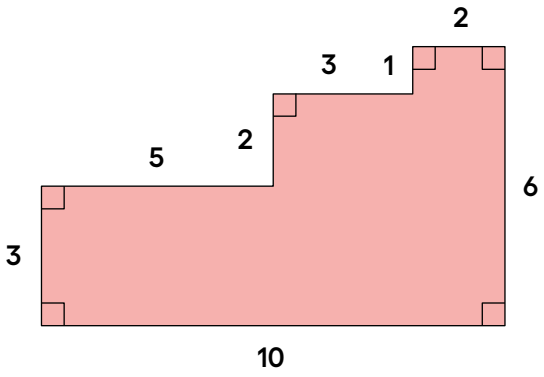
C The area can be found by multiplying the sides lengths that are 6 units and 4 units.

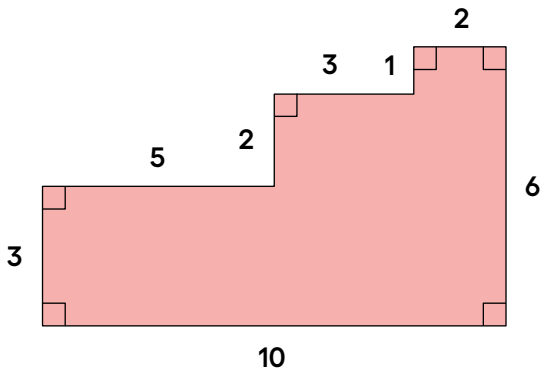
D The area can be found by counting the grid squares inside the shape.

E The area can be found by adding 4 × 3 and 6 × 2.

1 Practice Problems

5 Here are two copies of the same figure. All angles are right angles. Show two different ways for finding the area of the shaded region.





Learning Targets

+ I can explain the meaning of "area."

LESSON 2

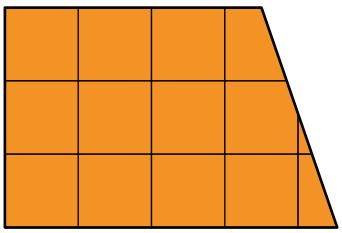
Finding Area by Decomposing and Rearranging

Let's create shapes and find their areas.

Warm-up Notice and Wonder: Squares in Shapes

What do you notice? What do you wonder?

A



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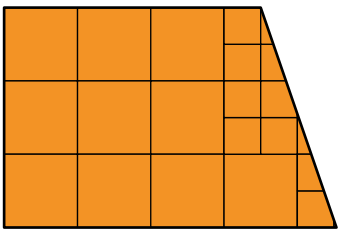

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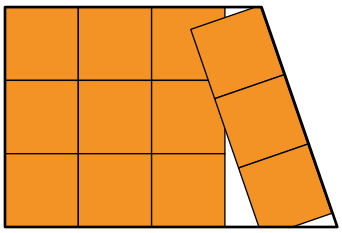

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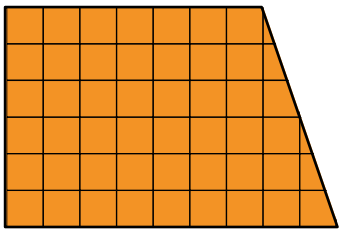
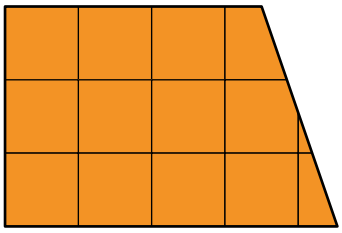


1 What is Area?

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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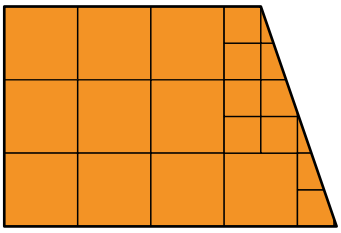

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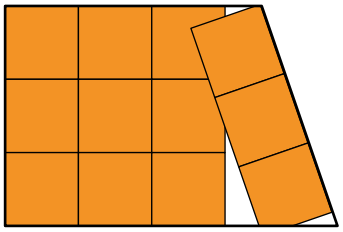

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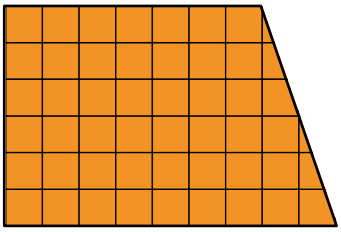


2. Write a definition of "area" that includes all the information that you think is important.

2 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.

2 Composing Shapes

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?

3 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 Tangram Triangles

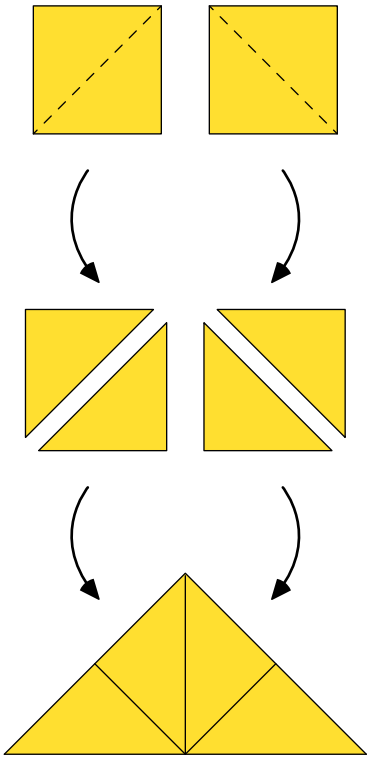
3 The area of the large triangle is _____ square units. I know this because . . .

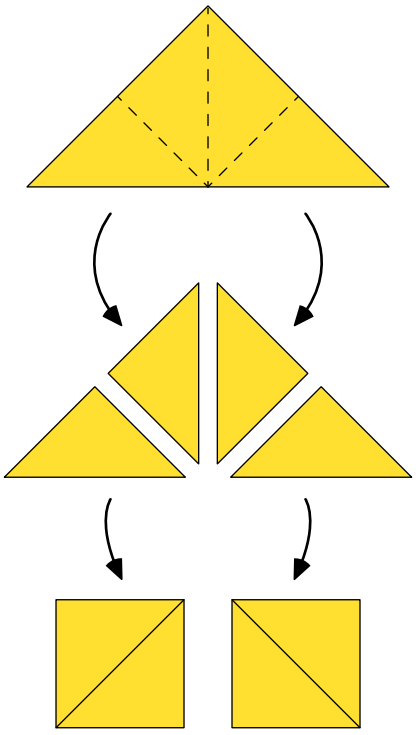
2 Lesson Summary

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.



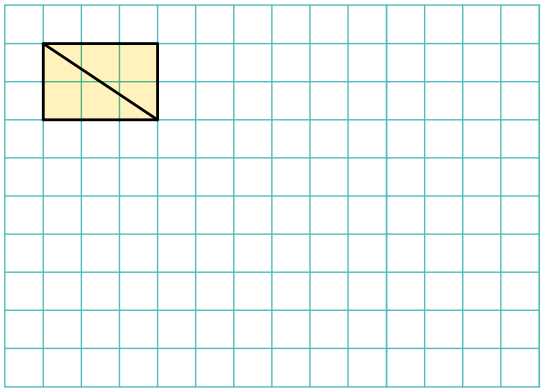


- Each square on the left can be decomposed into 2 triangles. These triangles can be rearranged into a large triangle. So, the large triangle has the *same area* as the 2 squares.
- Similarly, the large triangle on the right can be decomposed into 4 equal triangles. The triangles can be rearranged to 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.

LESSON 2

PRACTICE PROBLEMS

1. The diagonal of a rectangle is shown.

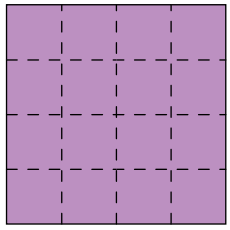


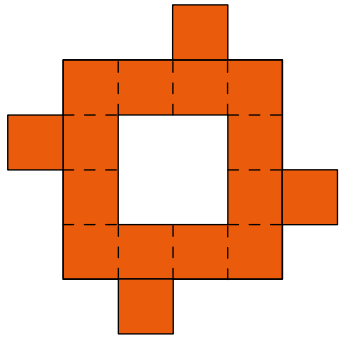
a. Decompose the rectangle along the diagonal, and recompose the two pieces to make a *different* shape.

b. How does the area of this new shape compare to the area of the original rectangle? Explain how you know.

2. Priya decomposed a square into 16 smaller, equal-size squares and then cut out 4 of the small squares and attached them around the outside to make the new figure shown.

How does the area of the new figure compare with that of the original square?





A. The area of the new figure is greater.

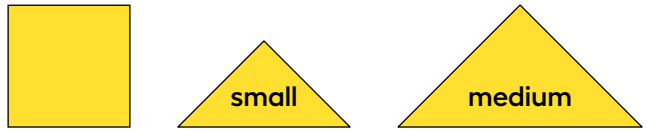
B. The two figures have the same area.

C. The area of the original square is greater.

D. We don't know because neither the side length nor the area of the original square is known.

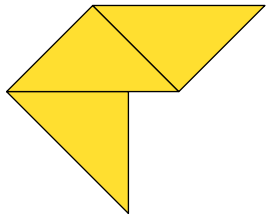
2 Practice Problems

3 The area of the square is 1 square unit. Two small triangles can be put together to make a square or to make a medium triangle.

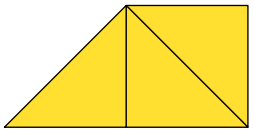


Which figure also has an area of $1\frac{1}{2}$ square units? Select **all** that apply.

A



B



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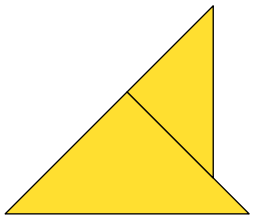

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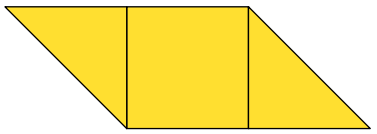


(A) Figure A (B) Figure B (C) Figure C (D) Figure D

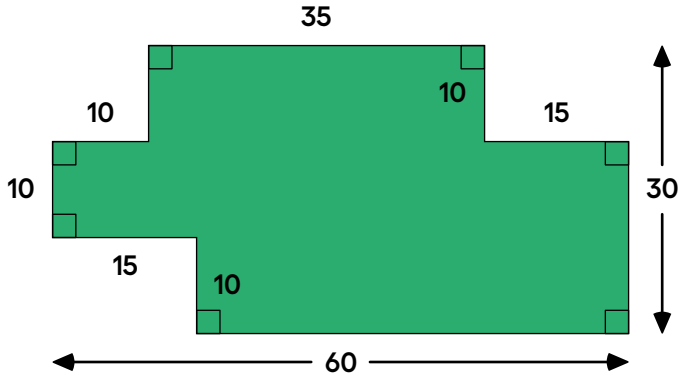
4 Unit 1, Lesson 1

The area of a rectangular playground is 78 square meters. If the length of the playground is 13 meters, what is its width? _____

2 Practice Problems

4 from Unit 1, Lesson 1

A student said, "We can't find the area of this shaded region because the shape has many different measurements, instead of just a length and a width that we could multiply."



Explain why the student's statement about area is incorrect.

Learning Targets

- I can explain how to find the area of a figure that is composed of other shapes.
- I know how to find the area of a figure by decomposing it and rearranging the parts.
- I know what it means for two figures to have the same area.

LESSON 3

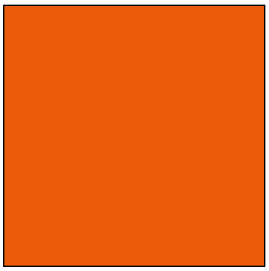
Reasoning to Find Area

Let's decompose and rearrange shapes to find their areas.

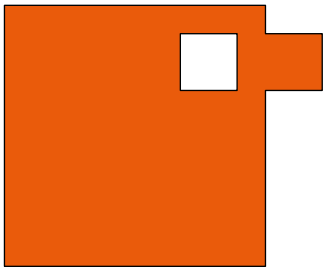
Warm-up Comparing Regions

Is the area of Figure A greater than, less than, or equal to the area of the shaded region in Figure B? Be prepared to explain your reasoning.

A



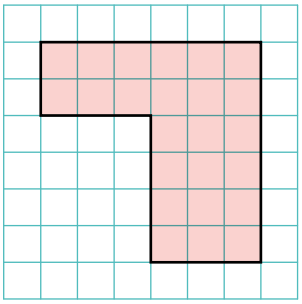
B



1 On the Grid

Each grid square is 1 square unit. Find the area, in square units, of each shaded region without counting every square. Be prepared to explain your reasoning.

A



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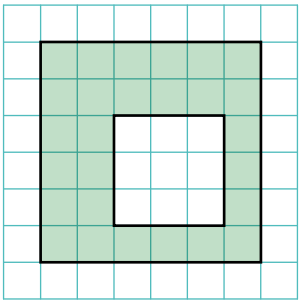

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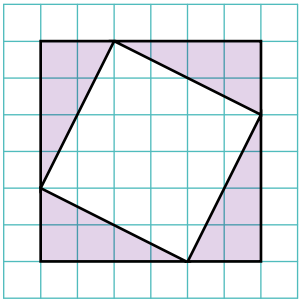

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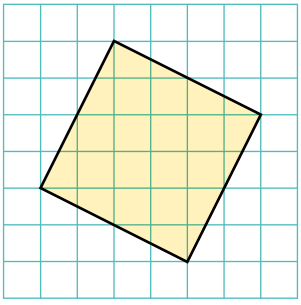


1 On the Grid

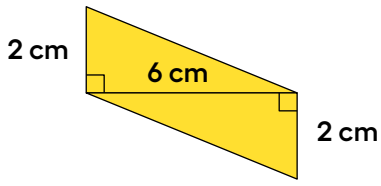
Are you ready for more?

Rearrange the shaded triangles from Figure C so they fit inside Figure D.
Draw and color a diagram of your work.

2 Off the Grid

Find the area of the shaded region(s) of each figure. Explain or show your reasoning.

E



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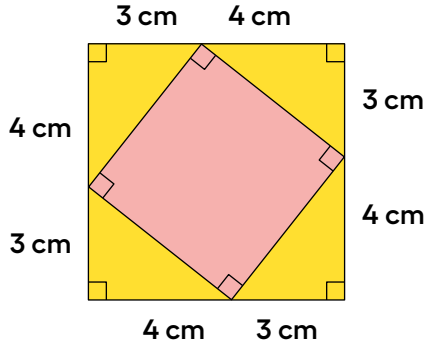
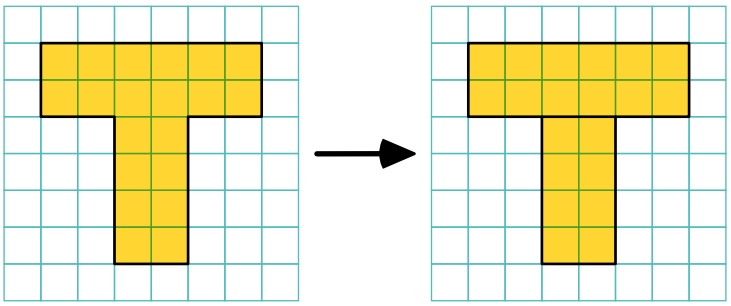


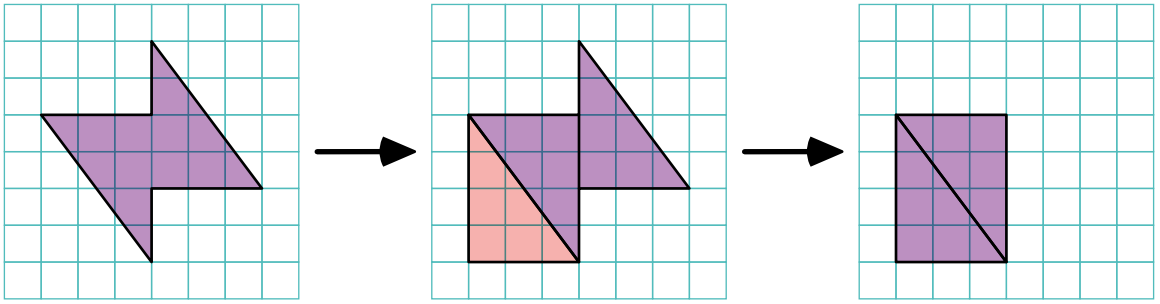
3 Lesson Summary

There are different strategies we can use to find the area of a region. We can:

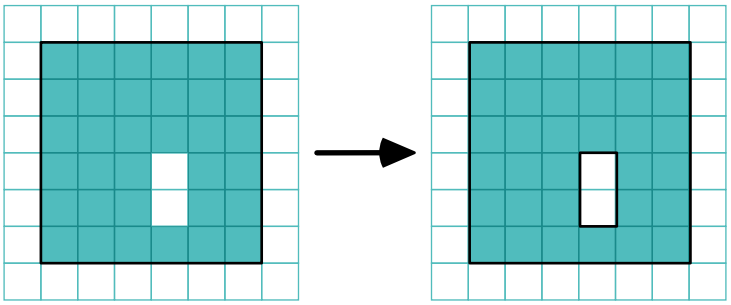
- Decompose it into shapes whose areas we know how to calculate. We find the area of each of those shapes, and then add the areas.



- Decompose it and rearrange the pieces into shapes whose areas we know how to calculate. We find the area of each of those shapes, and then add the areas.

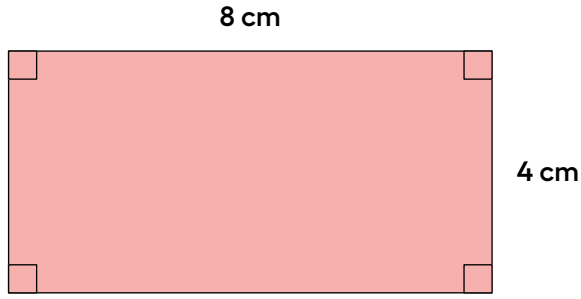


- Consider it as a shape with a missing piece. We calculate the area of the shape and the missing piece, and then subtract the area of the piece from the area of the shape.



3 Summary

The area of a figure is always measured in square units. When both side lengths of a rectangle are given in centimeters, then the area is given in square centimeters. For example, the area of this rectangle is 32 square centimeters.

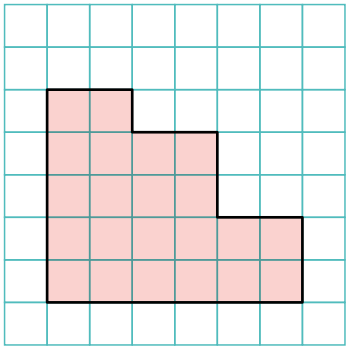


LESSON 3

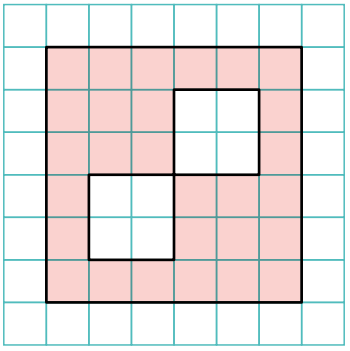
PRACTICE PROBLEMS

1 Find the area of each shaded region. Show your reasoning.

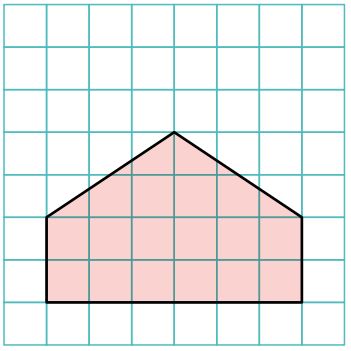
A



B

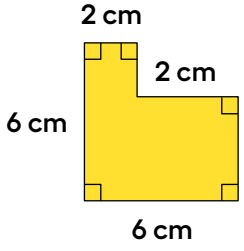


C

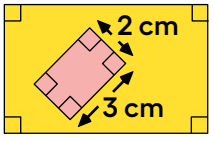


2 Find the area of each shaded region. Show or explain your reasoning.

A

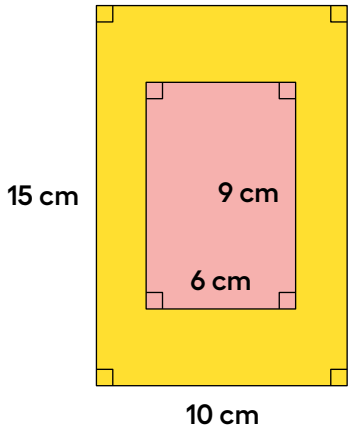


B

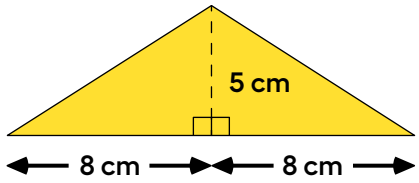


3 Practice Problems

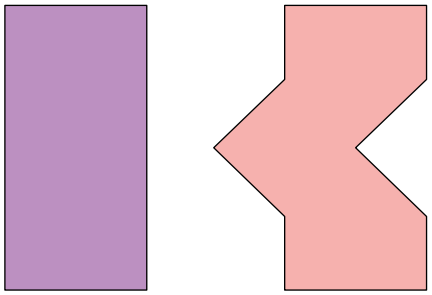
C



D



3 Two plots of land have very different shapes. Noah said that both plots of land have the same area.



Do you agree with Noah? Explain your reasoning.

3 Practice Problems

4 from Unit 1, Lesson 2

A homeowner is deciding on one size of tiles to use to fully tile a rectangular wall in her bathroom that is 80 inches by 40 inches. The tiles are squares and come in three side lengths: 8 inches, 4 inches, and 2 inches. Tell whether or not you agree with each statement about the tiles. Explain your reasoning.

a. Regardless of the size she chooses, she will need the same number of tiles.

b. Regardless of the size she chooses, the area of the wall that is being tiled is the same.

c. She will need two 2-inch tiles to cover the same area as one 4-inch tile.

d. She will need four 4-inch tiles to cover the same area as one 8-inch tile.

e. If she chooses the 8-inch tiles, she will need a quarter as many tiles as she would with 2-inch tiles.

5 from an earlier course

Find the area of the rectangle with each set of side lengths.

a. 5 in and $\frac{1}{3}$ in _____

b. 5 in and $\frac{4}{3}$ in _____

c. $\frac{5}{2}$ in and $\frac{4}{3}$ in _____

d. $\frac{7}{6}$ in and $\frac{6}{7}$ in _____

Learning Targets

+ I can use different reasoning strategies to find the area of shapes.

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