16.1 Measure Area

Essential Question How can you find the area of a plane figure?

the 5 Es ENGAGE

GO DIGITAL Lesson Opener

Making Connections

Invite students to tell you what they know about squares.

If one side of a square measures 1 cm, what does each other side measure? (1 cm) **If two squares are set side by side, what shape is formed?** (A rectangle) **If the two squares that are set side by side have side lengths that are 1, what are the dimensions of the rectangle formed?** (1 cm, 2 cm, 1 cm, 2 cm)

Using the Digital Lesson

You may wish to use colored tiles to show the pattern of the basket. The students can count the number of squares.

Learning Task

What is the problem the students are trying to solve? Connect the story to the problem.

- **What figures are in the pattern of the basket?** (Squares)
- **How many squares are on one side of the basket?** (24)
- **How many sides of the basket are there?** (4)
- **What is the problem asking for?** (The total area of the sides of the basket)

Literacy and Mathematics

Choose one or more of the following activities.

- Have students draw the balloon basket, then color in the pattern.
- Have students restate the problem in their own words.

Texas Essential Knowledge and Skills

TEKS Geometry and Measurement—3.6.D
Decompose composite figures formed by rectangles into non-overlapping rectangles to determine the area of the original figure using the additive property of area

MATHEMATICAL PROCESSES
3.1.C Select tools, technology, and techniques
3.1.E Create and use representations

Are You Ready?

Access Prior Knowledge

Use the *Are You Ready?* 16.1 in the *Assessment Guide* to assess students' understanding of the prerequisite skills for this lesson.

Vocabulary

area, **unit square**, **square unit**

GO DIGITAL Multimedia eGlossary at *thinkcentral.com*

Materials

1-inch grid paper, scissors

GO DIGITAL Resources

For the student

- iSE **Interactive Student Edition** *provides students with an interactive learning environment!*
- Math on the Spot Video Tutor
- iTools Virtual Manipulatives
- Soar to Success Math Online Intervention

For the teacher

- **Digital Management Center** *organizes program resources by TEKS!*
- eTE eTeacher Edition
- Online Assessment System

Investigate

Read through the definitions of *area, unit square*, and *square unit*. Point out the unit square. Be sure students understand that the size of the unit square depends on the unit. A square foot is larger than a square inch, for example. Tell students that the area of a region is measured by the number of unit squares that will cover the region.

Make sure students use paper square tiles when completing the activity because square plastic tiles will not work when demonstrating overlaps.

For Part A, ask:

- **Why is it important that there are no gaps when you measure area using tiles?** If there are gaps between tiles when I measure area, then that means there is space in the shape that I haven't measured.

For Part B, have students use the grid to place the tiles so they are overlapping. They should place tiles so that the right side of the tiles line up against the dashed lines. The right side of the last tile should line up with the right side of the rectangle.

- **Did you measure the space where there are overlaps more than once?** Yes
- **Why is it important that no tiles overlap when you measure area using tiles?** If the tiles are overlapping when I am measuring area, then that means I have measured some of the area twice.

Name _____

16.1 Measure Area

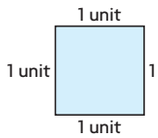
TEKS Geometry and Measurement—3.6.D
MATHEMATICAL PROCESSES 3.1.C, 3.1.E

Essential Question How can you find the area of a plane figure?

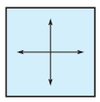
Investigate

Area is the measure of the number of unit squares needed to cover a flat surface. A **unit square** is a square with a side length of 1 unit. It has an area of 1 **square unit**.

Unit Square



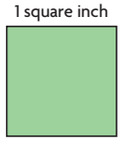
Area



1 square unit

Math Idea
You can count the number of unit squares inside a figure to find its area in square units.

1 square inch

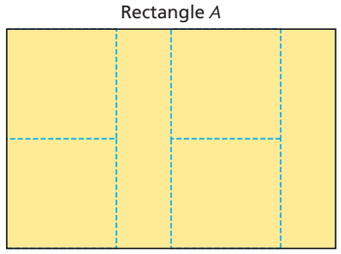


Activity **Materials** ■ 1-inch grid paper ■ scissors

You can measure the area of the rectangles with 1-inch square tiles.

Cut out eight 1-inch squares. Use the dashed lines as guides to place tiles for *A*–*C*.

Rectangle *A*

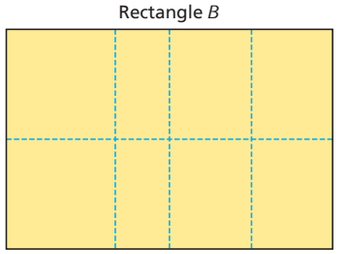


A Place 4 tiles on Rectangle *A*.

- Are there any gaps? Yes
- Are there any overlaps? No
- Jaime says that the area is 4 square inches. Is Jaime's measurement correct? No

When you measure area, there can be no space, or gaps, between the tiles.

Rectangle *B*



B Place 8 tiles on Rectangle *B*.

- Are there any gaps? No
- Are there any overlaps? Yes
- Jaime says that the area is 8 square inches. Is Jaime's measurement correct? No

When you measure the area, the tiles cannot overlap.

ELL English Language Learners

Leveled Activities	ELPS
Beginning: Activity 20	1.A.1, 3.G.2, 4.C.3
Intermediate: Activity 40	4.F.6, 4.G.2, 4.G.4
Advanced: Activity 41	4.F.3, 4.F.8
Advanced High: Activity 18	4.C.4, 4.E, 4.F.7

GO DIGITAL Go to *thinkcentral.com* for the **ELL Activity Guide** containing these leveled activities.

Differentiated Instruction

ELL Language Support

Interpersonal / Social
Small Group

ELPS 1.F, 2.C.4, 3.H.3

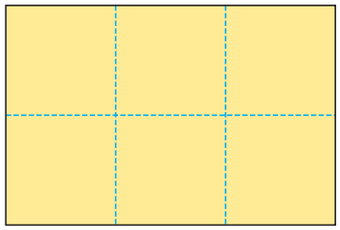
Strategy: Define

Materials paper (cut into 1 square inch and 1 square centimeter)

- Students can define words by using them in context with their definitions.
- Remind students that the *area* is the number of unit squares needed to cover a flat surface. Have students repeat the definition using their own words.
- Write *square inch* and *square centimeter* on the board, and allow students time to look at and name the squares. Have students use their own words to compare the two squares using these terms. Possible answer: the square centimeter is smaller than the square inch.

C Place 6 tiles on Rectangle C.

Rectangle C



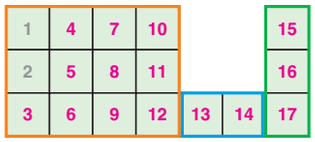
- Are there any gaps? No
- Are there any overlaps? No
- Jaime says that the area is 6 square inches. Is Jaime's measurement correct? Yes

So, the area of the rectangle is 6 square inches.

Share and Show

MATH BOARD

1. Count to find the area of the large figure. Each unit square is 1 square centimeter.



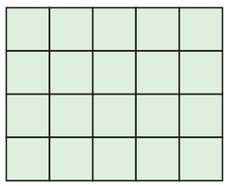
Think: I can put the small shapes together if there are no gaps and no overlaps.

There are 17 unit squares in the figure.

So, the area is 17 square centimeters.

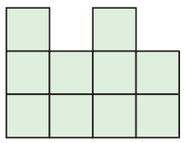
Count to find the area of the figure. Each unit square is 1 square centimeter.

2.



Area = 20 square centimeters

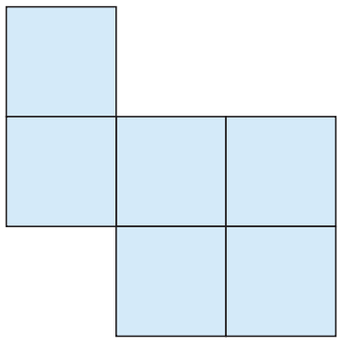
3.



Area = 10 square centimeters

Count to find the area of the figure. Each unit square is 1 square inch.

4.

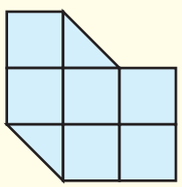


Area = 6 square inches

Enrich

Visual / Spacial
Individuals

- Draw a shape that involves half-unit squares like the one at the right.
- Tell students that the triangle is one half of a unit square and that two triangles form one unit square.
- Have students find the area. The area is 7 square units.
- Have students use grid paper to draw a shape that involves half-unit squares. Have students exchange drawings with a classmate in order to find the area.



GO DIGITAL Go to *thinkcentral.com* for additional enrichment activities in the **Enrich Activity Guide**.

3 the 5 Es EXPLAIN

For Part C, make sure that students notice that the tiles line up exactly in the rectangle, with the edges just touching.

- **Can you have gaps or overlaps when you are measuring area with tiles? Why or why not?** No; if there are gaps, you don't measure all of the area. If there are overlaps, you measure some of the area twice.

Share and Show

It is important for students to understand the sizes of a square inch and a square centimeter, as these are units of measure that they will encounter frequently.

- **What does each unit square in Exercise 3 and Exercise 4 represent?** Exercise 3:1 square centimeter; Exercise 4:1 square inch

Provide students with a square inch tile and a square centimeter tile, and have them trace along the sides of each while stating the side length. Form rectangles from 2 square-inch tiles or 2 square-centimeter tiles. Then have students state the area of each. It may be helpful for students to find benchmarks in the classroom that are about the size of a square inch or a square centimeter.

Use the checked exercises for **Quick Check**.

RtI Quick Check

IF a student misses the checked exercises

THEN **Differentiate Instruction** with RtI Tier 1 Lesson 79

COMMON ERRORS

Error Students count the number of unit squares incorrectly.

Example Students may count the corner square units of a large rectangle twice.

Springboard to Learning Tell students that when they count the unit squares, it may be helpful to number the squares as they count them or to place a check in each square.

Problem Solving

Problems 5 and 6 require students to find area using square meters and square feet. You might want to discuss the relative sizes of these units to develop students' understanding of their sizes.

H.O.T. Problems

Problem 8 requires students to understand the concept of area in order to write a problem of their own. In Problem 9, students reason about the relationship between the size of the square unit and the area of a given region.

Go Deeper

Have students consider finding the area of the board using square-inch tiles. Ask students if they would use more or fewer unit squares if they were measuring in square feet. fewer; because feet are a greater unit of measurement than inches

Math on the Spot Video Tutor

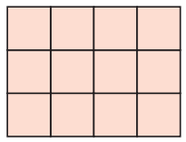
Through the ***Math on the Spot Video Tutor***, students will be guided through an interactive solving of this type of H.O.T. problem. Use this video to also help students solve the H.O.T. problem in the Interactive Student Edition. With these videos and the H.O.T. problems, students will build skills needed in the TEXAS assessment.

GO DIGITAL **Math on the Spot** videos are in the Interactive Student Edition and at *thinkcentral.com*.

Name _____

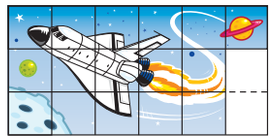
Problem Solving Real World

5. Danny is placing tiles on the floor of an office lobby. Each tile is 1 square meter. The diagram at the right shows the lobby. What is the area of the lobby?



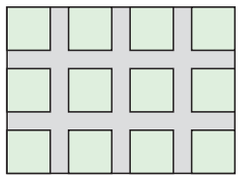
12 square meters

6. **Multi-Step** Angie is painting a space shuttle mural on a wall. Each section is one square foot. The diagram shows the unfinished mural. How many more square feet has Angie painted than NOT painted on her mural?



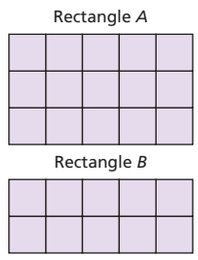
14 square feet

7. Write Math **Sense or Nonsense?** Tom places green square tiles on the figure at the right. He says that the figure has an area of 12 square units. Does his statement make sense? **Explain**.



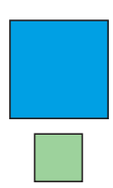
No; possible explanation: there are gaps, so the space between the tiles was not measured. The area is greater than 12 square units.

8. H.O.T. **Pose a Problem** Write an area problem that can be solved by using Rectangle *A* and Rectangle *B*. Then solve your problem.



Possible problem: How many more square units is the area of Rectangle *A* than the area of Rectangle *B*? 5 more square units

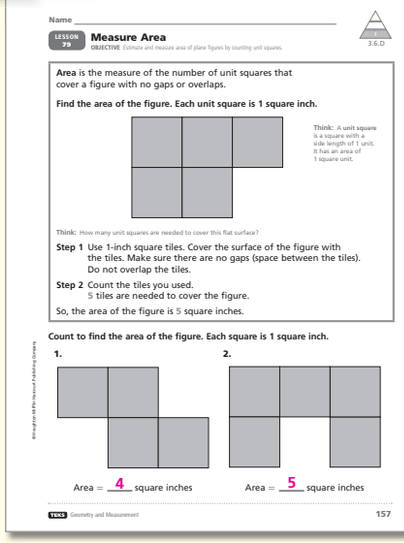
9. H.O.T. **Reasoning** You measure the area of a table top with blue unit squares and green unit squares. Which unit square will give you a greater number of square units for area? **Explain**.



Possible explanation: the blue square units are larger than the green square units, so it takes fewer blue square units than green square units to cover the shape.

Differentiated Instruction

RtI Tier I Lesson 79



Name _____

LESSON 79 **Measure Area** OBJECTIVE Estimate and measure area of plane figures by counting unit squares. 3.6.D

Area is the measure of the number of unit squares that cover a figure with no gaps or overlaps.

Find the area of the figure. Each unit square is 1 square inch.

Think: A unit square is a square with a side length of 1 unit. It has an area of 1 square unit.

Think: How many unit squares are needed to cover this flat surface?

Step 1 Use 1-inch square tiles. Cover the surface of the figure with the tiles. Make sure there are no gaps (space between the tiles). Do not overlap the tiles.

Step 2 Count the tiles you used. 5 tiles are needed to cover the figure.

So, the area of the figure is 5 square inches.

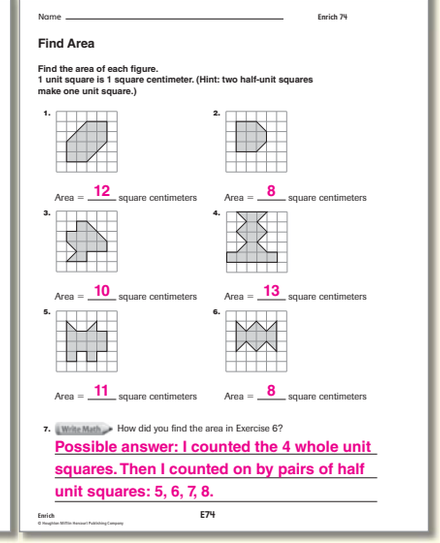
Count to find the area of the figure. Each square is 1 square inch.

1. Area = 4 square inches

2. Area = 5 square inches

TEKS Geometry and Measurement 157

Enrich 74



Name _____ Enrich 74

Find Area

Find the area of each figure.
1 unit square is 1 square centimeter. (Hint: two half-unit squares make one unit square.)

1. Area = 12 square centimeters
2. Area = 8 square centimeters
3. Area = 10 square centimeters
4. Area = 13 square centimeters
5. Area = 11 square centimeters
6. Area = 8 square centimeters

7. Write Math How did you find the area in Exercise 6?

Possible answer: I counted the 4 whole unit squares. Then I counted on by pairs of half unit squares: 5, 6, 7, 8.

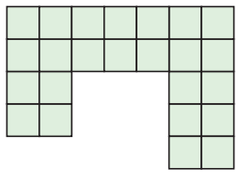
Enrich E74

Mathematical Processes
Model • Reason • Communicate

Daily Assessment Task

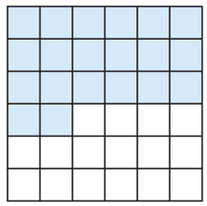
Fill in the bubble for the correct answer choice.

10. Farmer Paul plants peas. The diagram shows his field. Each unit square is 1 square meter. What is the area of Farmer Paul's field?



Ⓐ 28 square meters
● 24 square meters
Ⓒ 30 square meters
Ⓓ 11 square meters

11. Sheri is making the quilt shown in the diagram. Each unit square is 1 square foot. The blue squares are completed. What is the area of the quilt that Sheri has completed?



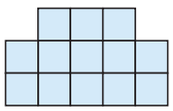
Ⓐ 36 square feet
Ⓑ 17 square feet
● 20 square feet
Ⓓ 16 square feet

12. **Multi-Step** Use the diagram from Exercise 11. How many more square feet has Sheri completed than NOT completed for her quilt?

Ⓐ 16 square feet
● 4 square feet
Ⓒ 12 square feet
Ⓓ 14 square feet

TEXAS Test Prep

13. What is the area of the figure at the right? Each unit square is 1 square foot.



Ⓐ 3 square feet
Ⓑ 15 square feet
● 13 square feet
Ⓓ 10 square feet

Grab-and-Go!™ Ready-Made Independent Activities

Differentiated Centers Kit

Activities
Figure It Out
Students complete blue Activity Card 18 by identifying two-dimensional figures by their attributes.

Activities
Hurray for Arrays!
Students complete blue Activity Card 15 by using arrays to model multiplication facts.

5 the 5 Es EVALUATE

Daily Assessment Task RtI

Can students find the area of a plane figure?

IF	THEN
NO	• Soar to Success Math Warm-Up 48.31
YES	• Enrich 74 • Homework and Practice Lesson 16.1

TEXAS Test Prep Coach

Test Prep Coach helps teachers to identify common errors that students can make.

In the Test Prep exercise, if students selected:

A They only considered the top row of squares.

B They counted 3 rows of 5 unit squares.

D They only considered the bottom two rows.

Essential Question

How can you find the area of a plane figure?

Possible answer: I can find the area by using unit squares, making sure there are no gaps or overlaps, and counting the number of square units inside the figure.

Homework and Practice

TEKS Algebraic Reasoning—3.6.D
MATHEMATICAL PROCESSES 3.1.C, 3.1.E

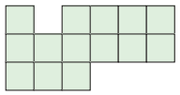
Name _____

16.1 Measure Area

Count to find the area of the figure.
Each unit square is 1 square centimeter.

1. 

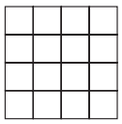
Area = 10 square centimeters

2. 

Area = 14 square centimeters

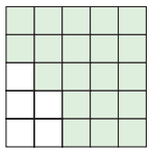
Problem Solving Real World

3. Kaylee is covering the top of a box with tiles. Each tile is 1 square centimeter. The diagram shows the top of the box. What is the area?



16 square centimeters

4. Miguel drew this puzzle. He divides the area into one-inch square sections. The diagram shows how much of the puzzle Miguel puts together. What is the area of the puzzle Miguel has completed so far?



20 square inches

5. Dawn draws a picture that is 12 square inches. She draws another picture that is 12 square centimeters. Which picture is larger? Use centimeter and inch square paper to solve the problem. **Explain** how you solved the problem.

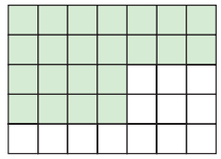
the picture that is 12 square inches. Possible explanation: 1-inch unit squares are larger than 1-centimeter unit squares, so 12 square inches > 12 square centimeters.

Lesson Check

TEXAS Test Prep

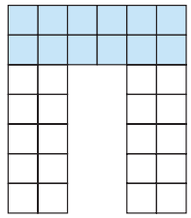
Fill in the bubble completely to show your answer.

6. Angelina is covering a closet floor with 1-foot square tiles. The green squares are completed. What area of the floor has Angelina covered?



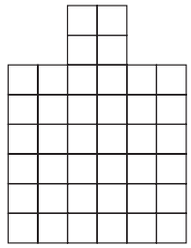
- ● 22 square feet
- Ⓑ 35 square feet
- Ⓒ 24 square feet
- Ⓓ 20 square feet

7. **Multi-Step** Dom is tiling a countertop. Each unit square is 1 square foot. The blue squares are completed. How many more square feet of countertop has Dom NOT completed, compared to what he has completed?



- Ⓐ 12 square feet
- Ⓑ 20 square feet
- Ⓒ 32 square feet
- ● 8 square feet

8. **Multi-Step** A craft company uses 1-inch square tiles for the floor and closet of a dollhouse as shown in the diagram. An additional 7 square inches of tile will be used for a hallway. How many square inches of tile does the craft company need for the dollhouse?



- ● 47 square inches
- Ⓑ 51 square inches
- Ⓒ 48 square inches
- Ⓓ 40 square inches

Homework and Practice

Use the Homework and Practice pages to provide students with more practice on the concepts and skills of this lesson.