Lesson Overview

LESSON 28

Recognize and Draw Shapes

Lesson Objectives

Content Objectives

- Identify triangles, quadrilaterals, pentagons, and hexagons based on the number of sides and angles they have.
- Identify cubes based on the number and shape of faces that are the same.
- Distinguish among triangles, quadrilaterals, pentagons, and hexagons based on their attributes.
- Draw a shape based on specific attributes.

Language Objectives

- Write the names of shapes based on the number of sides and angles.
- Draw shapes that have a given number of sides or angles.
- Draw cubes.

Prerequisite Skills

- Identify the sides and angles of a polygon.
- Sort objects based on attributes.
- Identify and name triangles, circles, squares, and rectangles.

Standards for Mathematical Practice (SMP)

SMPs 1, 2, 3, 4, 5, and 6 are integrated in every lesson through the *Try-Discuss-Connect* routine.*

In addition, this lesson particularly emphasizes the following SMPs:

5 Use appropriate tools strategically.

6 Attend to precision.

7 Look for and make use of structure.

*See page 303k to see how every lesson includes these SMPs.

Lesson Vocabulary

- **angle** one of the corners of a shape where two sides meet.
- **cube** a three-dimensional shape with 6 square faces and all edges of equal length.
- **edge** a line segment where two faces meet in a three-dimensional shape.
- **hexagon** a two-dimensional closed shape with 6 straight sides and 6 angles.
- **pentagon** a two-dimensional closed shape with exactly 5 sides and 5 angles.
- **quadrilateral** a two-dimensional closed shape with exactly 4 sides and 4 angles.
- **rectangle** a quadrilateral with four square corners. Opposite sides of a rectangle have the same length.
- **rhombus** a quadrilateral with all sides the same length.
- **side** a line segment that forms part of a two-dimensional shape.
- **square** a quadrilateral with 4 square corners and 4 sides of equal length.
- **triangle** a two-dimensional closed shape with exactly 3 sides and 3 angles.
- **vertex** the point where two rays, lines, or line segments meet to form an angle.

Review the following key terms.

- **face** a flat surface of a solid shape.

Learning Progression

In Grade 1 students examine attributes that distinguish one shape from another and compose polygons from another set of polygons.

In Grade 2 students become more sophisticated in distinguishing among shapes and in their use of attributes.

In this lesson students use the number of sides and angles to identify, name, and classify polygons. Students reason logically when they generalize attributes to sets of shapes and in determining when an attribute can be applied to all of one kind of polygon, some of them, or none of them.

In Grade 3 students expand their understanding of polygons by categorizing sets within sets. They recognize that quadrilaterals all have four sides yet possess other distinguishing features that set them apart from other four-sided figures.

Lesson Pacing Guide

Whole Class Instruction

SESSION 1 Explore *45–60 min*	**Recognizing and Drawing Shapes** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Connect It *15 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 685–686
SESSION 2 Develop *45–60 min*	**Recognizing and Drawing Shapes** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Picture It & Draw It *5 min* • Connect It *10 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 691–692 **Fluency** Recognizing and Drawing Shapes
SESSION 3 Develop *45–60 min*	**Recognizing and Describing Cubes** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Picture Its *5 min* • Connect It *10 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 697–698 **Fluency** Recognizing and Describing Cubes
SESSION 4 Refine *45–60 min*	**Recognizing and Drawing Shapes** • Start *5 min* • Example & Apply It *35 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 701–702
SESSION 5 Refine *45–60 min*	**Recognizing and Drawing Shapes** • Start *5 min* • Apply It & Small Group Differentiation *35 min* • Close: Exit Ticket *5 min*	**Lesson Quiz** or **Digital Comprehension Check**

Lesson Materials

Lesson *(Required)*	*Per student:* geoboard, a block that is a cube *Activity Sheet:* Dot Paper
Activities	*Per student:* geoboard, 3–5 rubber bands, 2-foot lengths of string, 8–10 straws cut in various sizes *Per pair:* scissors, tape *For display:* various objects that are rectangular prisms, including some that are cubes *Activity Sheets:* Nets for Cubes, Tangram Shapes, both copied on cardstock if possible
Math Toolkit	1-centimeter grid paper, centimeter ruler, inch ruler, counters, sticky notes, color tiles, geoboards, dot paper, whiteboards, straws, index cards

*We continually update the Interactive Tutorials. Check the Teacher Toolbox for the most up-to-date offerings for this lesson.

Teacher Toolbox

Small Group Differentiation

PREPARE

Ready Prerequisite Lesson

Grade 1
- Lesson 33 Shapes

RETEACH

Tools for Instruction

Grade 1
- Lesson 33 Defining Attributes of Shapes

Grade 2
- Lesson 28 Draw and Describe Shapes

REINFORCE

Math Center Activities

Grade 2
- Lesson 28 Geometry Vocabulary Match
- Lesson 28 Attributes of Shapes

EXTEND

Enrichment Activity

Grade 2
- Lesson 28 Shape Search

i-Ready

Independent Learning

PERSONALIZE

i-Ready Lessons*

Grade 2
- Recognize and Draw Shapes
- Practice: Identify Two, Three, or Four Equal Parts

LESSON 28

Connect to Family, Community, and Language Development

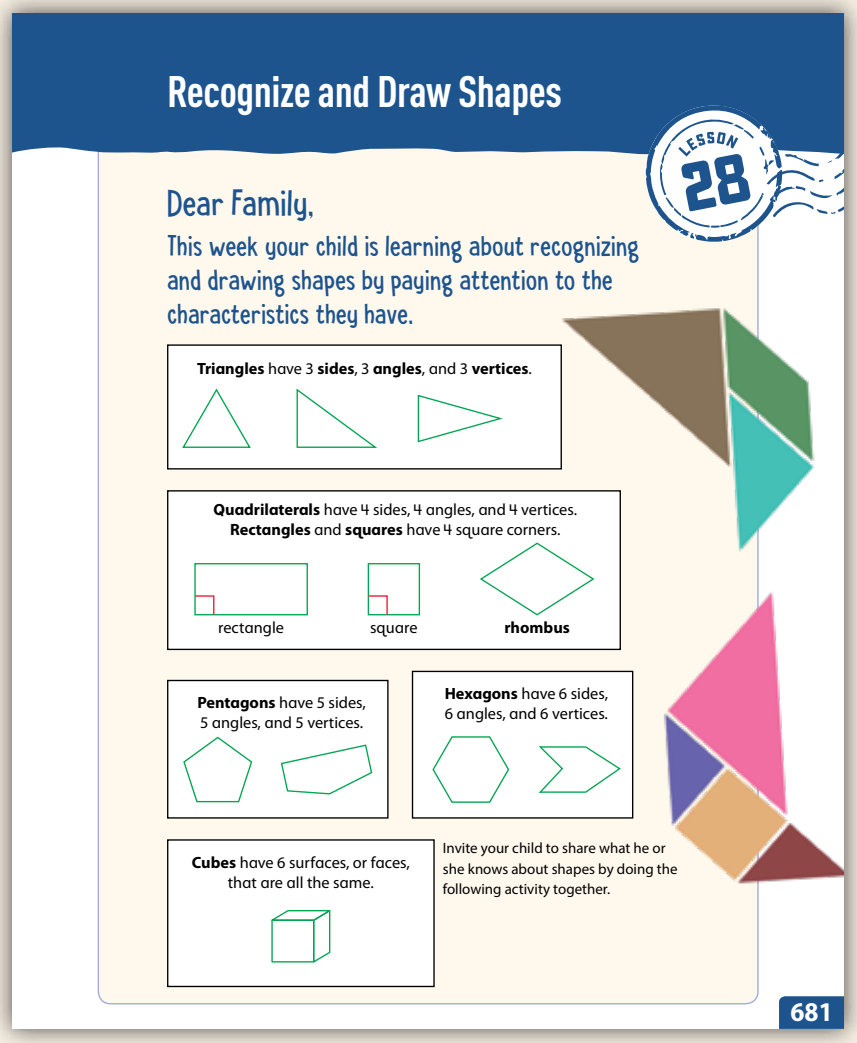
The following activities and instructional supports provide opportunities to foster school, family, and community involvement and partnerships.

Connect to Family

Use the **Family Letter**—which provides background information, math vocabulary, and an activity—to keep families apprised of what their child is learning and to encourage family involvement.

Available in Spanish

Teacher Toolbox



Recognize and Draw Shapes

LESSON 28

Dear Family,

This week your child is learning about recognizing and drawing shapes by paying attention to the characteristics they have.

Triangles have 3 **sides**, 3 **angles**, and 3 **vertices**.

Quadrilaterals have 4 sides, 4 angles, and 4 vertices.
Rectangles and **squares** have 4 square corners.

rectangle square **rhombus**

Pentagons have 5 sides, 5 angles, and 5 vertices.

Hexagons have 6 sides, 6 angles, and 6 vertices.

Cubes have 6 surfaces, or faces, that are all the same.

Invite your child to share what he or she knows about shapes by doing the following activity together.

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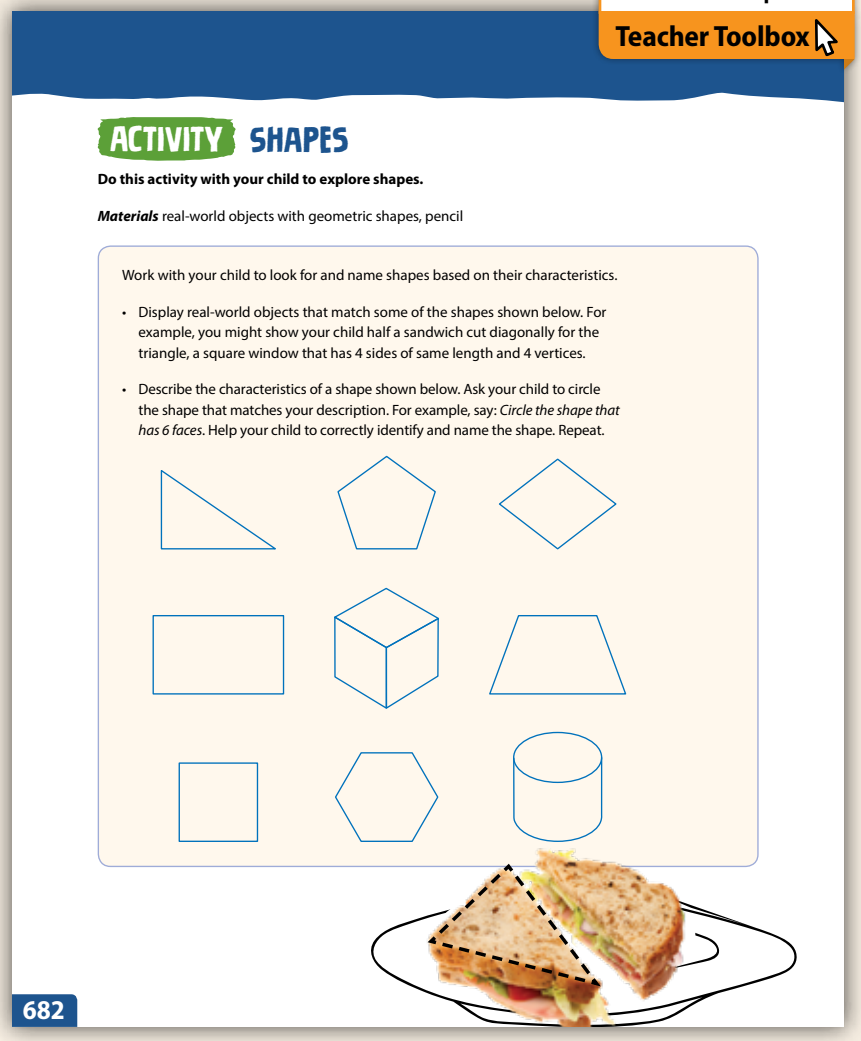

ACTIVITY SHAPES

Do this activity with your child to explore shapes.

Materials real-world objects with geometric shapes, pencil

Work with your child to look for and name shapes based on their characteristics.

- Display real-world objects that match some of the shapes shown below. For example, you might show your child half a sandwich cut diagonally for the triangle, a square window that has 4 sides of same length and 4 vertices.
- Describe the characteristics of a shape shown below. Ask your child to circle the shape that matches your description. For example, say: *Circle the shape that has 6 faces*. Help your child to correctly identify and name the shape. Repeat.

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Goal

The goal of the Family Letter is to help students recognize and draw shapes by paying attention to the attributes they have.

Activity

Understanding that shapes have certain attributes will help students build foundational skills for classifying shapes and calculating formulas in future years. Look at the *Shapes* activity and adjust it if necessary to connect with your students.

Math Talk at Home

Encourage students and their family members to search for objects in their home that have similar shapes to those in the lesson.

Conversation Starters Below are additional conversation starters students can write in their Family Letter or math journal to engage family members:

- *How is this object similar to one of the shapes in the* Shapes *activity?*
- *How many faces do both shapes have?*
- *How are the corners similar?*
- *What other attributes do both shapes have in common?*

Connect to Community and Cultural Responsiveness

Use these activities to connect with and leverage the diverse backgrounds and experiences of all students.

Session 1 **Use with *Try It*.**

- Encourage students to find objects around the classroom that have the shapes of a circle, a triangle, a square, or a rectangle. Have them sort those objects by common attributes. Extend the activity by having students think of objects they have at home that have a similar shape. Remind them that shapes are everywhere and that objects often have a certain shape for a certain purpose. For example, wheels are circular so that they can roll, and doors are rectangular so that people can walk through them.

Session 2 **Use with *Try It*.**

- Ask students to think of objects they could find outdoors that have similar shapes to objects in the classroom. Have them compare and discuss how the classroom objects and the outside objects are similar in shape. For example, a parking spot with lines shaped like a rectangle may be similar in shape to the top of their teacher's desk.

Session 3 **Use with *Try It*.**

- Have students work with a partner to identify three objects around the classroom that have 6 faces that are all the same. Ask students to explain to their partners why those shapes can be considered cubes. Then encourage students to think of three other objects they see at home or in places in the community that are shaped like cubes. Encourage them to think about and share why it is useful or necessary for the objects to be shaped like cubes. For example, a box in a store needs to be shaped like a cube so that an item for sale can be placed inside of it and be stacked on shelves.

Connect to Language Development

For ELLs, use the Differentiated Instruction chart to plan and prepare for specific activities in every session.

ELL English Language Learners: Differentiated Instruction

Prepare for Session 1
Use with *Try It*.

Levels 1–3

Speaking/Writing Have students chorally read the ***Try It*** problem. Ask the questions below for each shape:

Can you show me a (circle)? Look at the key. Which color should you use for the (circles)?
Then have students work with partners to color each shape and determine the number of each kind of shape.

Direct students to complete these sentence frames:

- *There are* ___3___ *red circles.*
- *There are* ___4___ *blue triangles.*
- *There are* ___4___ *yellow squares.*
- *There are* ___10___ *orange rectangles.*

Then have them read aloud their responses.

Levels 2–4

Speaking/Writing Have students chorally read the ***Try It*** problem. Have students work with partners to color each shape.

Then direct students to complete these sentence frames:

- *There are* ___3___ *red circles.*
- *There are* ___4___ *blue triangles.*
- *There are* ___10___ *orange rectangles.*
- *There are* ___4___ *yellow squares.*

Ask students to read aloud their responses.

Levels 3–5

Speaking/Writing Have students take turns reading the ***Try It*** problem with partners. Ask them to discuss how they could best show their findings. Encourage them to write their own statements describing how many shapes of the same type and color they see. For example: *There are 3 red circles.*

LESSON 28

SESSION 1 Explore

Purpose In this session, students draw on their knowledge of two-dimensional shapes to sort and count like shapes. They explore identifying shapes by name. They will look ahead to think about attributes of shapes, including the number of sides, vertices, and angles.

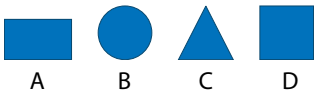
Start

Connect to Prior Knowledge

Why Support students' facility with identifying two-dimensional shapes.

How Have students name the four shapes.

What is the name of each shape?



Possible Solutions

A rectangle
B circle
C triangle
D square and rectangle

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, have them identify that there are different shapes in the collage.

DISCUSS IT

Support Partner Discussion

To reinforce students' understanding of geometric shapes, have them use the terms *circle*, *triangle*, *rectangle*, and *square* as they talk to each other.

Look for, and prompt as necessary, understanding of:

- the similarities of the shapes
- the differences of the shapes
- the idea that some shapes can have more than one name

LESSON 28 SESSION 1 ● ○ ○ ○ ○

Explore Recognizing and Drawing Shapes

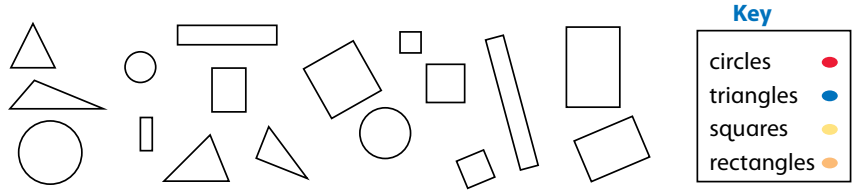
Learning Target

- Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

SMP 1, 2, 3, 4, 5, 6, 7

You have worked with flat and solid shapes in different ways. Use what you know to try to solve the problem below.

Macy makes this collage. Use the key to color each shape.



How many of each shape does she use?

TRY IT

Possible student work:

Sample A

red circles	|||
blue triangles	||||
yellow squares	||||
orange rectangles	𝍸 𝍸

Sample B

3 red circles
4 blue triangles
4 yellow squares
10 orange rectangles

Math Toolkit

- 1-centimeter grid paper
- ruler
- counters
- sticky notes
- color tiles

DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I agree with you about . . . because . . .

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Common Misconception **If** students do not see how a square can also be called a rectangle, **then** review the definition of a rectangle while looking at a square and ask if the description matches the square.

Select and Sequence Student Solutions

One possible order for whole class discussion:

- make an organized list of the number of each colored shape
- make a tally chart of the colored shapes
- make a number table of the colored shapes
- make a colored bar graph of the shapes

Support Whole Class Discussion

Prompt students to note the relationship between the numbers in each model and the numbers in the problem.

Ask *How do [student name]'s and [student name]'s models show the number of each kind of shape?*

Listen for There are 3 red circles, 4 blue triangles, 4 yellow squares, and 10 orange rectangles. They can be shown in a list, chart, table, or graph.

CONNECT IT

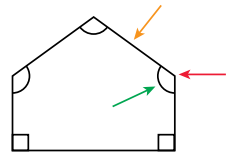
1 LOOK BACK

How many of each shape (circles, **triangles, squares, rectangles**) are in Macy's collage?

3 circles, 4 triangles, 4 squares, and 10 rectangles.

2 LOOK AHEAD

The number of **sides, vertices** (corners), and **angles** tells what group a shape belongs to.



a. Which color arrow is pointing to:

a side? orange

a vertex? red

an angle? green

b. The shape formed by two sides at an angle is a vertex. How many vertices does this shape have?

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c. A **quadrilateral** is a shape with 4 sides, 4 vertices, and 4 angles. Name a quadrilateral shape:

Possible answers: rectangle or square or rhombus

3 REFLECT

A **pentagon** has 5 sides, 5 vertices, and 5 angles. Is the shape above a pentagon? Explain.

Yes; Possible answer: I can count 5 sides, 5 vertices, and 5 angles, so I know the shape is a pentagon.

CONNECT IT

1 LOOK BACK

Look for understanding that there are 3 red circles, 4 blue triangles, 4 yellow squares, and 10 orange rectangles

Hands-On Activity

Making shapes on a geoboard.

If . . . *students are unsure about connecting shapes and shape names,*

Then . . . *use this activity to practice making shapes on a geoboard and naming the shapes.*

Materials For each student: geoboard, 3–5 rubber bands

- Have students make a triangle on the geoboard. Then have students show their triangles and discuss how the triangles are the same and different.
- Check that all shapes are triangles. For now set aside the examples that are not triangles. Then ask: *How do you know these are all triangles?*
- Students should be able to see that each triangle has 3 sides. Some students might also identify 3 vertices or 3 angles for each triangle. Have students touch each vertex and trace each side with a finger as they count.
- Ask students to describe how the triangles are different. Differences might include overall size, side length, and angle size.
- Ask students why the set-aside shapes are not triangles. Students should be able to voice that the shapes are not triangles if they do not have 3 sides.
- Repeat for rectangles and squares.

2 LOOK AHEAD

Point out that shapes are identified by their number of sides, vertices, and angles. Some shapes also have square corners that help to identify them.

Students should be able to define the words *side*, *vertex/vertices*, and *angle* and use a model to show each word. In the Additional Practice, students will use these terms to describe familiar shapes.

Close: Exit Ticket

3 REFLECT

Look for understanding that a pentagon can be identified by counting the number of sides, vertices, and angles.

Common Misconception **If** students do not confirm that the shape is a pentagon, **then** have them make a pentagon on their geoboard. Have them copy the shape onto paper and use an orange crayon to number each side 1 to 5. Use a red crayon to draw arrows at each vertex and number the arrows 1 to 5. Use a green crayon to label each angle 1 to 5. Write *pentagon* at the top of the page.

Real-World Connection

Encourage students to think about everyday places or situations where they see specific geometric shapes. Have volunteers share their ideas. Students may suggest examples such as road signs, product logos, or cell phones.

Solutions

Support Vocabulary Development

1 Ask students to discuss with their partners the four shapes they worked with in the *Try It* problem. Ask: *What are the four shapes? What does each shape look like?* Write a list of attributes to encourage students to associate those attributes with the shapes. Attributes could include:

- *round*
- *flat*
- *sides*
- *corners*

If needed, provide students with a visual example of each shape and each of the terms associated with them using real objects from the classroom.

2 Help students describe the attributes. Ask: *Is the shape flat? Is it solid? Is it round? How many sides/ corners does the shape have?*

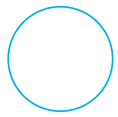
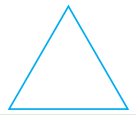
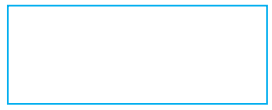
Supplemental Math Vocabulary

- *angles*
- *vertices*

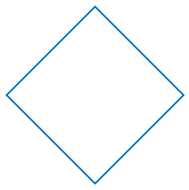
Name: _____ LESSON 28 SESSION 1

Prepare for Recognizing and Drawing Shapes

1 Think about what you know about shapes. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can. **Possible answers:**

Word	In My Own Words	Example
circle	A flat, round shape	
triangle	A flat shape with 3 sides and 3 corners	
rectangle	A flat shape with 4 sides and 4 square corners	
square	A flat shape with 4 sides and 4 square corners and all sides are the same length	

2 Is the shape below a rectangle? Explain.



Yes; Possible answer: It is a flat shape and has 4 sides and 4 square corners. It can also be called a square because all of its sides are the same length.

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3 Assign problem 3 to provide another look at recognizing shapes.

This problem is very similar to the problem about Macy making a collage of shapes. In both problems, students are asked to color the shapes in a collage and say how many of each shape are used in the collage. The question asks how many of each shape Percy uses in his collage.

Students may want to use pattern blocks.

Suggest that students read the problem three times, asking themselves one of the following questions each time:

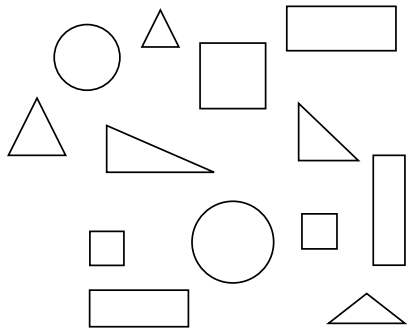
- *What is this problem about?*
- *What is the question I am trying to answer?*
- *What information is important?*

Solution: Percy used 2 circles, 5 triangles, 3 squares, and 3 rectangles. This can also be classified as 2 circles, 5 triangles, and 6 rectangles.
Medium

4 Have students solve the problem a different way to check their answer.

3 Solve the problem.

Percy makes this collage. Use the key to color each shape.



Key

- circles
- triangles
- squares
- rectangles

How many of each shape does he use?

Possible student work using words:

I colored 2 circles red.

I colored 5 triangles blue.

I colored 3 squares yellow.

I colored 3 rectangles orange.

Solution **Percy uses 2 circles, 5 triangles, 3 squares, and 3 rectangles.**

4 Check your answer. Show your work.

Possible student work:

I colored 6 rectangles orange. 3 of them could also be called squares.

I colored 5 triangles blue.

I colored 2 circles red.

Percy uses 6 rectangles, 5 triangles, and 2 circles.

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ELL English Language Learners: Differentiated Instruction

Prepare for Session 2
Use with *Try It*.

Levels 1–3

Speaking/Writing Have students chorally read the ***Try It*** problem. Ask them to draw a two-column table with the headings *Object* and *Shape*. Use a textbook to show the shape of a rectangle. Fill out the table to model for students how they will complete the table. Model writing *book* in the *Object* column, and *rectangle* in the *Shape* column. Also model drawing a sketch of a rectangle in the *Shape* column. Encourage students to work with partners to find three more objects and to fill out the table with those objects and their shapes.

Levels 2–4

Speaking/Writing Have students chorally read the ***Try It*** problem. Ask them to draw a two-column table with the headings *Object* and *Shape*. Use a textbook to show the shape of a rectangle. Fill out the table to model for students how they will complete the table. Encourage students to work with partners to find three more objects and to fill out the table with those objects and their shapes. Have students tell about the objects they found and the shape of the objects. For example: *The textbook is shaped like a rectangle.*

Levels 3–5

Reading/Writing Have students take turns reading the ***Try It*** problem with partners. Have partners work together to identify objects. Then ask them to write a statement about each object using the following sentence frame:

- *The _____ is shaped like a _____ because _____.*

Example: *The floor tile is shaped like a square because all sides are the same length.*

Once complete, direct students to read aloud their sentences to each other.

LESSON 28

SESSION 2 Develop

Purpose In this session, students solve a problem that requires them to find and draw shapes from objects in the classroom. Students model the shapes either on paper or with manipulatives. The purpose of this problem is to have students identify and be able to draw two-dimensional shapes.

Start

Connect to Prior Knowledge

Materials For each student: geoboard

Why Support students' facility with creating two-dimensional shapes.

How Have students use the geoboard to make a rectangle and a square.

Make a rectangle and a square.

Use your geoboard.

Possible Solutions

Check students' geoboards for a rectangle and a square.

Develop Language

Why Support understanding of the word *vertices* in the *Try It* problem.

How Have students underline the word *vertices* in the *Try It* problem. Explain that *vertices* is the plural of *vertex* and means more than one *vertex*. Then clarify that a *vertex* is a point where two lines meet to form an angle. Encourage students to use the following sentence frame to describe each shape:

- *The* _(shape)_ *has* _(number)_ *vertices.*

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, have them identify that the problem is asking them to find different shapes in the classroom, draw the shapes, and name them.

Ask *What are some objects with different shapes in the classroom? What are some characteristics of these shapes?*

Develop Recognizing and Drawing Shapes

Read and try to solve the problem below.

Hunt around your classroom for three objects that have different shapes. Look for sides, vertices, and angles. Draw each shape, and label it with its shape name.

TRY IT

Possible student work:

Sample A

pentagon - poster 

rectangle - rug 

triangle - block 

Sample B

hexagon - table top 

triangle - art project 

square - floor tile 

Math Toolkit

- geoboards
- dot paper
- whiteboards
- straws
- index cards

DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: I knew . . . so I . . .

DISCUSS IT

Support Partner Discussion

Encourage students to use the terms *sides*, *angles*, and *vertices* as they talk with each other.

Support as needed with questions such as:

- *How did you decide what shape each object was?*
- *How might counting the number of vertices help you name a shape?*

Common Misconception Look for students who may draw a circle rather than a shape with sides, vertices, and angles.

Select and Sequence Student Solutions

One possible order for whole class discussion:

- tracing different shapes from photographs and then naming them
- tracing different shapes from blocks and then naming them
- making different shapes on a geoboard and then naming them
- drawing different shapes freehand on paper and then naming them

Support Whole Class Discussion

Compare and connect the actual classroom shapes with the student representations of the shapes and the shape names.

Ask *How does each representation show shapes from the classroom? Why might different students draw the same shape for different objects?*

Listen for A drawing of a closed shape with straight sides can represent shapes such as triangles, squares, rectangles, quadrilaterals, pentagons, and hexagons. There might be different kinds or sizes of triangles, rectangles, or other shapes in the classroom. So, different students could both draw triangles or rectangles for different objects.

PICTURE IT & DRAW IT

If no student presented these models, connect them to the student models by pointing out the ways they each represent:

- shapes found in the classroom
- specific two-dimensional geometric shapes

Ask *How do you look for shapes in the classroom?*

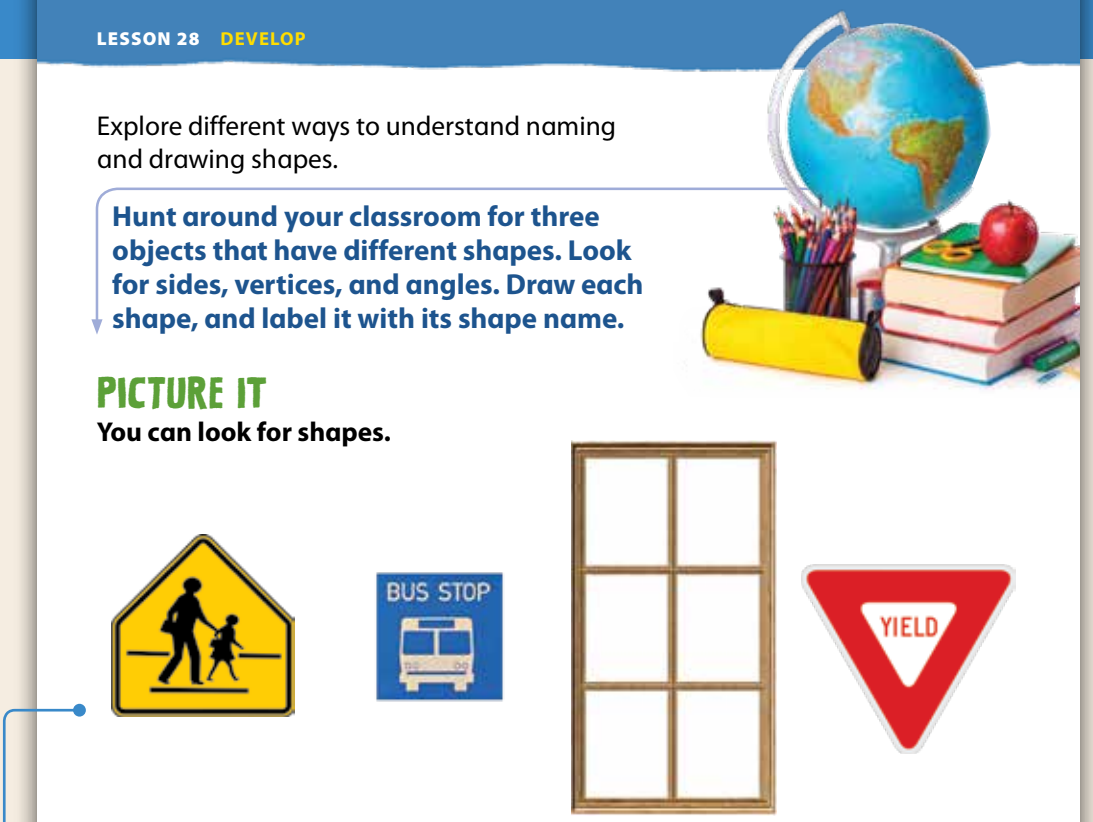
Listen for Look at the outside edges of objects in the classroom. If the objects make closed shapes, you can draw them and then count the number of sides to determine the name of the shape.

For looking for shapes, prompt students to describe their process for finding shapes.

- *How did you picture shapes when you looked around the classroom?*
- *What is the easiest part about finding shapes in the classroom? What is the most difficult part?*

For drawing shapes, prompt students to describe how they drew each shape.

- *Which shape was easiest to draw? Which shape was the most difficult to draw? Explain.*
- *Which shape names do you already know? How can you identify those shapes?*



Deepen Understanding

Quadrilaterals

SMP 6 Attend to precision.

Display a square and rectangle.

Ask *A square can also be called a rectangle. Why?*

Listen for A rectangle has 4 sides, 4 angles, and 4 square corners. Opposite sides have the same length. A square has 4 sides, 4 angles, and 4 square corners. It is a special rectangle because it has 4 sides that are the same length.

Ask *Why are squares and rectangles also called* quadrilaterals*?*

Listen for A quadrilateral is a shape with 4 sides and 4 angles. A square has 4 sides and 4 angles. A rectangle has 4 sides and 4 angles.

Display a square, trapezoid, and rectangle.

Ask *What is one name that you can use for all these shapes? Explain.*

Listen for All the shapes have 4 sides and 4 angles, so they can be called quadrilaterals.

CONNECT IT

- Remind students that one thing that is alike about all the representations is that they all show closed shapes with sides, angles, and vertices.
- Explain that on this page, students will try to find a pattern in the number of sides, angles, and vertices for a shape.

Monitor and Confirm

1 Check for understanding that:

- a triangle has 3 sides, 3 angles, and 3 vertices
- a rectangle has 4 sides, 4 angles, and 4 vertices
- a pentagon has 5 sides, 5 angles, and 5 vertices
- a hexagon has 6 sides, 6 angles, and 6 vertices

Support Whole Class Discussion

2 Look for the idea that each shape has the same number of sides, angles, and vertices.

Ask *If you know the number of sides a shape has, how can you find the number of angles and the number of vertices?*

Listen for The number of sides, angles, and vertices is the same for a shape, so if you know the number of sides, it would be the same number of angles and vertices.

3 REFLECT Have all students focus on the strategies used to solve this problem. If time allows, have students share their preferences with a partner.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to name and draw shapes.

1 Look at **Draw It** to complete the chart below.

Shape	Shape Name	Number of Sides	Number of Angles	Number of Vertices
A	triangle	3	3	3
B	rectangle	4	4	4
C	pentagon	5	5	5
D	hexagon	6	6	6

2 What do you notice about the number of sides, angles, and vertices in each shape?

Possible answer: Each shape has the same number of sides, angles, and vertices.

3 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Draw It**. Which models or strategies do you like best for naming and drawing shapes you see? Explain.

Possible answer: I like counting the number of sides, angles, and vertices a shape has. That tells me which group a shape belongs to and that helps me name and draw the shape.

Hands-On Activity

Make string-and-straw shapes.

If . . . *students are unsure about the attributes of two-dimensional shapes,*

Then . . . *use this activity to have them build shapes.*

Materials For each student: 2-foot lengths of string, 8 to 10 straws cut in various sizes

- Have students string 3 straws together and tie the ends of the string. Identify the sides as the straight pieces of straw and angles as the place where the sides meet.
- Ask: *What shape did you make?* [a triangle] Have students compare their triangles. Discuss that the shapes may look different, but they are all triangles. Repeat for a quadrilateral, a pentagon, and a hexagon.
- Ask: *Do you think it is possible for a shape to have 4 angles but not 4 sides?* Encourage students to justify their reasoning and question the reasoning of classmates. Challenge them to try to make a figure with 4 angles but not 4 sides. If the shape is closed, they will find it is impossible.

APPLY IT

For all problems, encourage students to use or draw a model to support their thinking.

4 See Student Worktext page.

5 **C**; All quadrilaterals have 4 sides and 4 angles.

Close: Exit Ticket

6 Possible explanation: A triangle has 3 sides and 3 angles, while a rectangle has 4 sides and 4 angles. Also, a rectangle has 4 square corners. A triangle can have only 1 square corner or no square corners.

Students' solutions should indicate understanding that:

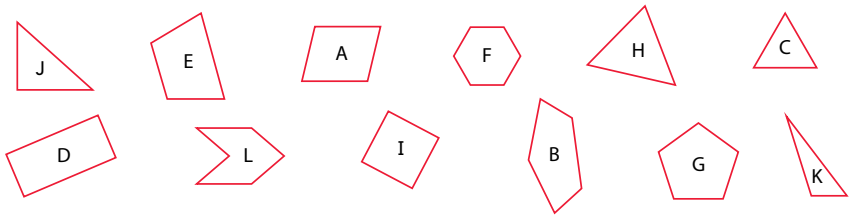
- a triangle has 3 sides, 3 angles, 3 vertices, and 0 or 1 square corner(s)
- a rectangle has 4 sides, 4 angles, 4 vertices, and 4 square corners

Error Alert **If** students confuse or incorrectly identify the attributes of a rectangle, **then** have students use the geoboard to make 3 or 4 different rectangles and describe what makes them all rectangles. Make a class poster of the attributes of a rectangle with examples of rectangles with different dimensions.

APPLY IT

Use what you just learned to solve these problems.

4 Look at the number of sides, angles, and vertices of each shape below.



Sort the shapes. Write each shape's letter in the correct column.

Triangles	Quadrilaterals	Pentagons	Hexagons
C	A	B	F
H	D	G	L
J	E		
K	I		

5 Which describes all quadrilaterals?

Ⓐ all sides the same length
Ⓑ 5 sides and 5 vertices
Ⓒ 4 sides and 4 angles
Ⓓ 4 sides and 4 square corners

6 Explain two ways in which a triangle and a rectangle are different.

Possible answer: A triangle has 3 sides and 3 angles and a rectangle has 4 sides and 4 angles. A rectangle has all right angles, but a triangle cannot have all right angles.

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Solutions

1 See student page.
Medium

Name: _____ LESSON 28 SESSION 2

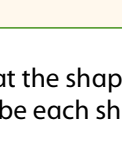
Practice Recognizing and Drawing Shapes

Study the Example showing how to name shapes and describe shapes. Then solve problems 1–5.

EXAMPLE

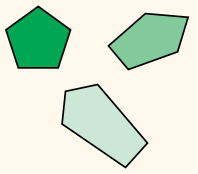
Quadrilaterals have 4 sides, 4 angles, and 4 vertices.

square rectangle

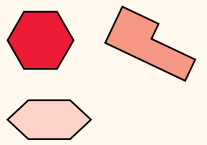


rhombus

Pentagons have 5 sides, 5 angles, and 5 vertices.



Hexagons have 6 sides, 6 angles, and 6 vertices.



1 Look at the shapes below. Fill in the chart to name and describe each shape.

Shape A 

Shape B 

Shape C 

Shape	Shape Name	Sides	Angles	Vertices
A	hexagon	6	6	6
B	rhombus	4	4	4
C	pentagon	5	5	5

Vocabulary

angle one of the corners of a shape where two sides meet.

vertex the point where two rays, lines, or line segments meet to form an angle.

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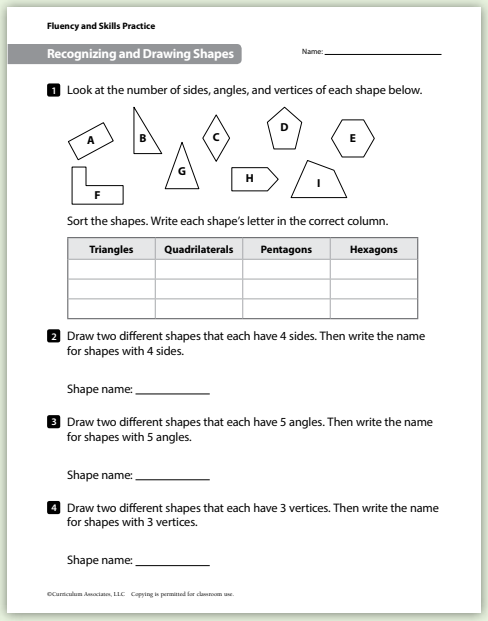
Fluency & Skills Practice

Teacher Toolbox

Assign *Recognizing and Drawing Shapes*

In this activity students practice sorting and naming polygons. They also draw shapes based on given attributes. These skills are useful in many real-world situations, such as identifying the shapes in a quilt pattern.



Fluency and Skills Practice

Recognizing and Drawing Shapes

Name: _____

1 Look at the number of sides, angles, and vertices of each shape below.

A B C D E F G H I

Sort the shapes. Write each shape's letter in the correct column.

Triangles	Quadrilaterals	Pentagons	Hexagons

2 Draw two different shapes that each have 4 sides. Then write the name for shapes with 4 sides.

Shape name: _____

3 Draw two different shapes that each have 5 angles. Then write the name for shapes with 5 angles.

Shape name: _____

4 Draw two different shapes that each have 3 vertices. Then write the name for shapes with 3 vertices.

Shape name: _____

2 Triangle; Student drawings may vary but should show 2 different triangles.
Medium

3 Hexagon; Student drawings may vary but should show 2 different hexagons.
Medium

4 Pentagon; Student drawings may vary but should show 2 different pentagons.
Medium

5 **a.** All

b. No

c. Some
Medium

2 Draw two different shapes that each have 3 sides. Then write the name for shapes with 3 sides.

Shapes will vary but should have 3 sides and 3 angles.

Shape name: triangle

3 Draw two different shapes that each have 6 angles. Then write the name for shapes with 6 angles.

Shapes will vary but should have 6 sides and 6 angles.

Shape name: hexagon

4 Draw two different shapes that each have 5 vertices. Then write the name for shapes with 5 vertices.

Shapes will vary but should have 5 vertices and 5 angles.

Shape name: pentagon

5 Fill in the blanks. Use the words in the box.

a. All quadrilaterals have 4 vertices.

b. No quadrilaterals have 5 angles.

c. Some quadrilaterals have sides the same length.

Some
No
All

ELL English Language Learners: Differentiated Instruction

Prepare for Session 3
Use with *Try It*.

Levels 1–3

Listening/Speaking Have students chorally read the ***Try It*** problem. Explain and show examples of real objects that have shapes similar to those pictured.

Have students work with partners. Ask: *Which shapes could be cubes? Can you show me? Which shapes are definitely not cubes? What is the name of that shape?*

Levels 2–4

Listening/Speaking Have students chorally read the ***Try It*** problem. Explain and show examples of real objects that have shapes similar to those pictured.

Have students work with partners. Ask: *Which shapes could be cubes? Can you show me? Which shapes are definitely not cubes? What is the name of that shape? What are some objects that are shaped like a cube?*

Levels 3–5

Speaking/Writing Have students take turns reading the ***Try It*** problem with partners. Explain and show examples of real objects that have shapes similar to those pictured. Ask students to work with their partners to write two sentences describing the characteristics of their answer choice.

Once complete, have students share their work with another set of partners. Encourage them to defend their answer and have them discuss whether another answer is possible and explain why or why not.

LESSON 28

SESSION 3 Develop

Purpose In this session, students solve a problem that requires them to identify a cube as a shape with 6 faces that are all the same. They describe the cube faces as squares. The purpose of this problem is to have students identify cubes by their attributes.

Start

Connect to Prior Knowledge

Materials For each student: a block that is a cube

Why Support students' facility with identifying cubes

How Have students identify a drawing of a cube and name it.

Which shape matches your block? What is the name of the shape?

Solution
C; cube

Develop Language

Why Support understanding of the multiple meaning term *face*.

How Explain that the term *face* has multiple meanings. Ask students to tell you the common meaning of the word *face*. Confirm that the word is often used to refer to the front part of the head that has the eyes, nose, and mouth on it. Then explain that in math, it refers to a flat part of a shape. Have students identify objects around the classroom that could be used as examples of shapes with faces. Have students use the word to describe the shapes.

TRY IT

Make Sense of the Problem

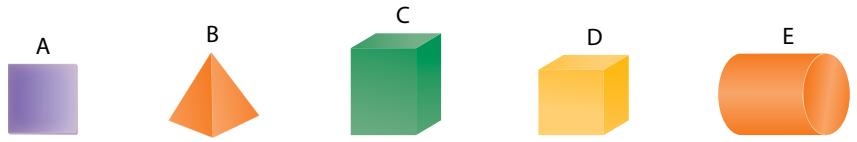
To support students in making sense of the problem, have them identify that one of the solid shapes shown is called a cube but the others are not. They need to support their selection choice using what they know about cubes.

LESSON 28 SESSION 3 ● ● ● ○ ○

Develop Recognizing and Describing Cubes

Read and try to solve the problem below.

Which shape is a cube? Tell how you know.



TRY IT

Possible student work:

Sample A

Shape D, because cubes have 6 faces that are all the same.

Sample B

Shape D, because all the faces are squares that are the same size.

Math Toolkit
- 1-centimeter grid paper
- centimeter ruler
- sticky notes
- counters
- whiteboard

DISCUSS IT

Ask your partner:
Do you agree with me? Why or why not?

Tell your partner:
At first, I thought . . .

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DISCUSS IT

Support Partner Discussion

Encourage students to use the term *face(s)* as they discuss their solutions.

Support as needed with questions such as:

- *How would you describe a cube?*
- *Which shape(s) look similar to a cube but are not cubes? Why are they not cubes?*

Common Misconception Look for students who identify C as a cube because all of the faces are 4-sided. Discuss with students that a cube has faces that are all squares and that the sides of each face are all equal in length.

Select and Sequence Student Solutions

One possible order for whole class discussion:

- identifying the cube as having 6 faces that are the same shape and size
- identifying the cube by recognizing that all of its faces are squares
- distinguishing the cube from the other shapes by naming attributes of the shapes

Support Whole Class Discussion

Compare and connect the different explanations and have students identify why Shape D is the only solution.

Ask *How do you know that the 6 faces on Shape D are all the same?*

Listen for The faces are squares. The faces are connected exactly along the sides of the square. None of the faces are larger than the others.

PICTURE ITS

If no student presented these models, connect them to the student models by pointing out the ways they each represent:

- 6 faces that are identical
- faces that are squares

Ask *In models and drawings, the side and top faces of a cube do not always look like squares. Why? How do you know it is still a cube?*

Listen for Because of the way cubes are drawn, the sides and tops might look more like diamonds, or they may be invisible. This happens when the cube is turned or tilted. When I hold a cube, all the faces are 6 equal squares. I know that the drawing is a cube even though I do not always see all 6 faces. If I took a cube apart and laid all 6 faces flat on a table, they would all be squares.

For counting the square faces, prompt students to count each numbered face.

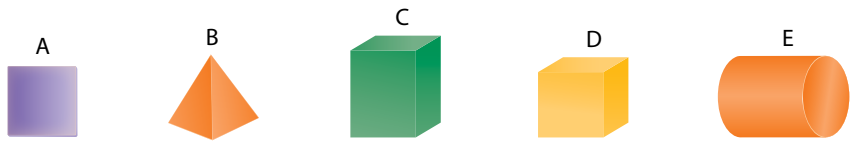
- *How can you keep track of the faces as you count them?*
- *Why don't some of the faces in the picture look like squares?*

For the edges, vertices, and faces, prompt students to identify that the picture is showing the names of parts of a cube.

- *How would you describe an edge of a solid figure?*
- *How is the vertex of a cube similar to, and different from, the vertex of a flat shape, such as a square?*

Explore different ways of recognizing cubes.

Which shape is a cube? Tell how you know.

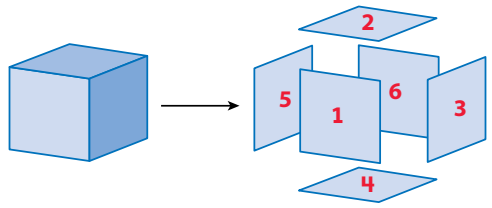


PICTURE IT

A **cube** has six faces.

Each face is a square.

You can count the number of square faces.



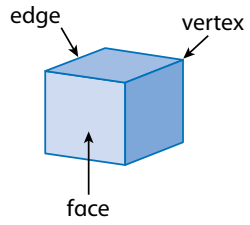
PICTURE IT

Cubes have edges, vertices, and faces.

Each face is a square, and all of the squares are the same size.

An **edge** is formed where two faces come together.

A vertex is formed where three edges come together.



Deepen Understanding

Learn about cubes

SMP 7 Use structure.

For all . . . *students to explore the structure of a cube,*

Use . . . *the activity below to investigate a cube concretely.*

Materials For each pair: a cube-shaped block with faces numbered 1–6 or number cube with square corners

- Point to one face of a cube-shaped block and tell students that the flat part of a solid figure is called a *face*.
- Have one student in each pair hold the cube firmly on a sheet of paper with the face labeled "1" facing down while the other partner carefully traces around the block with a pencil. Have the pair rotate the cube and place each of the other faces labeled 2–6 onto the outlined square to verify that they all fit within the same border.

Ask *How many faces does the cube have? What shapes is each face? How do you know? Are the faces the same size?*

Listen for The cube has 6 faces. Each face is a square with 4 equal sides and 4 square corners. All of the faces are the same size because they all fit inside the square that we traced, which is an outline of one of the faces.

CONNECT IT

- Remind students that one thing that is alike about all the representations is the number of equal square faces in a cube, even if we do not see them all.
- Explain that on this page, students will identify the number of edges and vertices in a cube.

Monitor and Confirm

1 – 3 Check for understanding that:

- a cube has 6 faces
- each face of a cube is a square
- Shape D, the yellow shape, is a cube

Support Whole Class Discussion

4 Be sure students understand that the problem is asking them to explain why a shape that has some faces that are not squares cannot be a cube.

Ask *What shape are the faces on Shape C?*

Listen for All of the faces have 4 sides like the faces of a cube. However, Shape C has some square faces but it also has some faces that are rectangles that are not squares.

Ask *Why is Shape C not a cube?*

Listen for All of the faces are not the same. All of the faces are not squares that are the same size.

5 Look for the idea that a cube has 12 edges and 8 vertices. Allow students to hold a cube and trace the edges and touch the vertices as they count them. Model how to keep track so they do not double count or omit any edges or vertices.

6 REFLECT Have all students focus on the strategies used to solve this problem. If time allows, have students share their preferences with a partner.

CONNECT IT

Now you will use the problem from the previous page to help you understand naming and describing cubes.

1 Look at the first **Picture It**. How many faces does a cube have? 6

2 Draw any face of a cube.

3 Which shape on the previous page is a cube? Shape D

4 Why is Shape C on the previous page not a cube?
Possible answer: Some of its faces are not squares.

5 Pick up a cube. How many edges does a cube have? How many vertices?

A cube has 12 edges and 8 vertices.

6 REFLECT

Look back at your **Try It**, strategies by classmates, and the **Picture Its**. Which models or strategies do you like best for identifying cubes? Explain.

Possible answer: I like to check the faces of the shape. If a shape does not have 6 square faces, I know it is not a cube.

Hands-On Activity

Analyze rectangular prisms and identify cubes.

For all . . . *students to recognize when a rectangular prism is a cube,*
Use . . . *the activity below to analyze rectangular prisms and describe their attributes.*
Materials For display: 4–6 everyday objects that are rectangular prisms, including a few that are cubes

- Display several common objects in the shape of rectangular prisms, such as blocks, tissue boxes, number cubes, or erasers. At least two of the items should be cubes.
- Have students take turns handling each object. Prompt them to analyze it and describe it using vocabulary such as faces, edges, and vertices. Allow students to trace different faces and name the shape they have drawn.
- Designate two locations for sorting items into groups of "cubes" and those that are "not cubes."
- Ask: *How many faces does a cube have?* [6] *What shape is each face?* [a square] *How many vertices does a cube have?* [8] *How many edges does a cube have?* [12] Conclude the examination of each object with the question: *Is this a cube?* Place it in the correct location depending on whether it is a cube or not a cube. Encourage students to add other shapes to the categories as they find them at home or in the classroom.

APPLY IT

For all problems, encourage students to use or draw a model to support their thinking.

7 Marty is correct.; Possible explanation: The figure is a solid figure, and a square is flat. The figure shows 3 square faces, and 3 more square faces are hidden. A cube has 6 square faces.

8 **A**; All cubes have 6 square faces, 8 vertices, and 12 edges.

Close: Exit Ticket

9 Tam is not correct; Possible explanation: When the two cubes are placed together, the sides of 4 of the faces are twice as long and are no longer squares, so the new shape is not a cube.

Students' solutions should indicate understanding of:

- the attributes of a cube, including 6 square faces that are the same
- the difference between a square and a rectangle that is not a square
- the idea that the sides of the new figure are twice as long as the side of each cube, so they are not squares.

Error Alert **If** students agree with Tam that the resulting shape is a cube, **then** have them use tape to put two cubes together and outline the resulting shape by tracing a long rectangular face on paper. Ask students to identify the shape they traced. Give students an opportunity to discover that 8 identical cubes of any size can be used to form a larger cube.

APPLY IT

Use what you just learned to solve these problems.

7 Bonnie says this figure is a square. Marty says it is a cube. Who is correct? Explain.

Solution Marty is correct. Possible explanation: The figure has 6 square faces that are all the same and is a solid shape, so it is a cube. A square would be a flat figure.

8 Which description is true for all cubes?

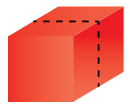
Ⓐ 6 square faces that are all the same

Ⓑ 6 sides and 6 vertices

Ⓒ 4 square faces that are all the same

Ⓓ 4 sides and 4 vertices

9 Tam puts together two cubes that are the same size and says his new solid shape is also a cube. Is Tam correct? How do you know? Use two cubes to model the problem.



No, Tam is not correct. The new shape will not be a cube because only the two end faces are still squares. The other four faces are now twice as long and are not squares. The faces are not all the same now, so the shape cannot be a cube.

Solutions

1 Possible answer: Faces that are the same have the same shape and size.
Basic

Name: _____ LESSON 28 SESSION 3

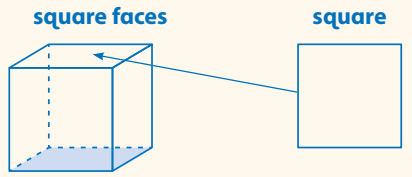
Practice Recognizing and Describing Cubes

Study the Example showing flat shapes and solid shapes. Then solve problems 1–3.

EXAMPLE

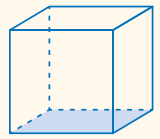
How can you use flat shapes to make a cube?

Look at the solid shape below. Each of the 6 faces is a square.



Edges are where two faces come together.

Vertices are where three edges come together.



6 faces

12 edges

8 vertices

APPLY IT

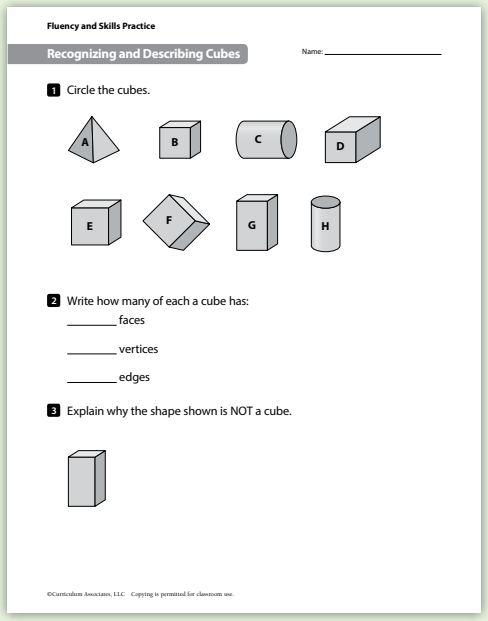
1 What does it mean for faces to be the same?

Possible answer: The faces have the same shape and size.

Fluency & Skills Practice Teacher Toolbox

Assign *Recognizing and Describing Cubes*

In this activity students practice identifying and describing cubes. This skill is useful for helping prepare students to identify and describe other three-dimensional shapes. The last problem gives students practice in articulating how a shape that has many traits of a cube is not a cube.



Fluency and Skills Practice

Recognizing and Describing Cubes

Name: _____

1 Circle the cubes.

A B C D E F G H

2 Write how many of each a cube has:

_____ faces

_____ vertices

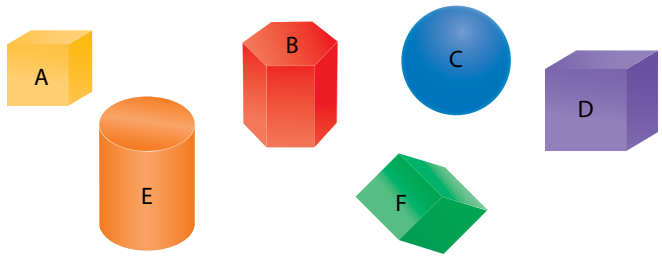
_____ edges

3 Explain why the shape shown is NOT a cube.

2 A, D, and F; Possible explanation: They are all solid shapes with 6 faces that are the same. Each face is a square.
Medium

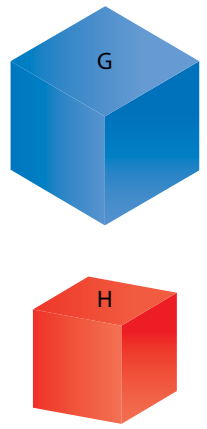
3 Students should note that the shapes are different sizes, which is the one difference. They may mention any of the following characteristics they have in common: they are both cubes, they both have 6 faces, they both have faces that are all squares that are the same size, and they both have 12 edges and 8 vertices.
Challenge

2 Which of these shapes are cubes? Write the letter of each shape that is a cube. Explain how you know.



A, D, and F; Possible explanation: They are solid shapes that have 6 square faces that are the same.

3 Look at Shapes G and H. Name one way they are different. Name two ways they are the same.



Possible answer:

Different:

1. **different sizes**

The same:

1. **both have 6 faces**
2. **all the faces are squares**

ELL English Language Learners: Differentiated Instruction

Prepare for Session 4
Use with *Apply It*.

Levels 1–3	Levels 2–4	Levels 3–5
Listening/Speaking Have students chorally read ***Apply It*** problem 2. Ask them to draw a pentagon next to the word *pentagon* in the first sentence of the problem and circle the word *fewer*. It may be helpful to refer back to *Apply It* problem 1 for a prompt. With partners, have students discuss the number of sides the shape could have based on the first sentence. (Since a pentagon has 5 sides, the shape could have 3 or 4 sides.) Read aloud the second sentence of the problem. Have students circle the term *quadrilateral*. Ask: *How many sides does it have? Can you show me with your fingers?* Have them discuss options. Then ask them to draw their answers.	**Listening/Speaking** Have students chorally read ***Apply It*** problem 2. Ask them to circle words in the problem describing important characteristics that are clues for finding the answer, such as *fewer*, *pentagon*, and *quadrilateral*. Encourage students to discuss with partners options based on those clues. Then ask them to draw their answers. Once complete, direct students to write a reflection to answer the questions: *Which clues helped you solve the problem? Why did these clues help?*	**Reading/Writing** Have students take turns reading ***Apply It*** problem 2 with their partners. Ask them to circle words in the problem that are important clues for finding the answer, such as *fewer*, *pentagon*, and *quadrilateral*. Instruct students to write sentences explaining which words they identified as important clues and why they chose them. Once complete, ask partners to take turns reading their sentences to each other.

LESSON 28

SESSION 4 Refine

Purpose In this session, students use different strategies to solve problems involving naming and drawing shapes, sharing their thinking with a partner.

Start

Connect to Prior Knowledge

Materials For each student: Activity Sheet
Dot Paper

Why Support students' facility with drawing shapes on dot paper.

How Have students draw a triangle and a rectangle on dot paper.

Draw a triangle and a rectangle.

Use dot paper.

Solutions

Check that students have correctly drawn a triangle and a rectangle.

EXAMPLE

See Student Worktext page for possible student drawing.

Look for A polygon with 6 sides is called a hexagon.

APPLY IT

1. The shape is a pentagon. See Student Worktext page for possible student drawing. Students could solve the problem by drawing any polygon with 5 sides.
DOK 1

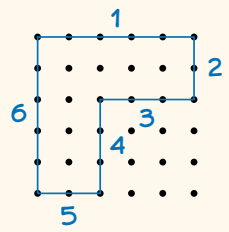
   Look for A shape with 5 sides also has 5 angles and 5 vertices, or corners.

Refine Recognizing and Drawing Shapes

Complete the Example below. Then solve problems 1–3.

EXAMPLE

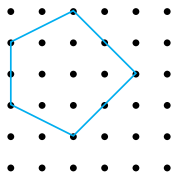
Lin draws a shape with 6 sides. Draw a shape that could be Lin's on the dot grid below. Number the sides and tell the name of the shape.



Solution This shape is a hexagon.

APPLY IT

1. Draw a shape that has 5 sides. Write the name of the shape. Show your work. **Possible answer:**



Solution The shape is a pentagon.

You can use the dots as the corners of your shape.

2. The shape is a triangle. Students could solve the problem by eliminating possible shapes. A pentagon has 5 sides, so the mystery shape has fewer than 5 sides. A quadrilateral has 4 sides and a triangle has 3 sides. There are no 2-sided shapes. The riddle says it is not a quadrilateral, so it must be a triangle.
DOK 2

   Look for A pentagon has 5 sides, so the shape must have 3 or 4 sides.

3 **C**; A cube is a solid figure with 6 square faces that are the same.

Explain why the other two answer choices are not correct:

A is not correct because cubes are solid shapes.

B is not correct because cubes have 6 square faces, not 4 square faces.
DOK 3

Close: Exit Ticket

Check for Understanding

Materials For remediation: several different quadrilaterals

Show students a rectangle, square, trapezoid, and rhombus. Ask students what name can be used for all of the shapes and have students tell why. [They are all quadrilaterals. They have 4 sides and 4 angles.]

For students who are still struggling, use the table below to guide remediation.

After providing remediation, check students' understanding using the following problem:
Show students a variety of triangles, quadrilaterals, pentagons, and hexagons and ask them to name them and organize them into groups. [Check for accurate labels.]

2 Solve the riddle.

I have fewer sides than a pentagon.

I am not a quadrilateral.

What am I? Show your work.

Possible work: A pentagon has 5 sides. A shape with 3 or 4 sides has fewer sides than a pentagon. It's not a quadrilateral, so it has to have 3 sides.

What shapes have fewer sides than a pentagon?

Solution **The shape is a triangle.**

3 Which statement is true?

Ⓐ Cubes are not solid shapes.

Ⓑ Cubes have exactly 4 faces that are the same.

Ⓒ Cubes have exactly 6 faces that are the same.

Ⓓ Cubes have exactly 6 vertices.

Alma chose Ⓓ as the answer. How did Alma get her answer?

Possible answer: Cubes have 6 faces that are the same. A cube has 8 vertices. Alma might have confused the number of faces with the number of vertices.

Draw a cube. Draw an arrow that points to each corner. Label the arrows to show the number of corners.

Error Alert

If the error is . . .	*Students may . . .*	*To support understanding . . .*
pentagons or hexagons	not have learned the vocabulary word *quadrilateral* yet.	Ask students to tell you what all the shapes have in common. Guide them to recognize that all the shapes have 4 sides and 4 angles. Remind them that the name for that group of shapes is *quadrilaterals*.
rectangles	have misinterpreted the term *rectangle* to mean any 4-sided figure.	Show students several quadrilaterals. Have them identify similarities and differences. Help them to recognize that only some of the shapes share the attributes of a rectangle.

Solutions

1 **B** (False);
C (True);
F (False);
G (True)
Medium

2 **C**; A quadrilateral has 4 sides, and a triangle has 3 sides, which is fewer than 4.

Explain why the other two answer choices are not correct:

A is not correct because a pentagon has 5 sides, which is more sides than a quadrilateral.

B is not correct because a hexagon has 6 sides, which is more sides than a quadrilateral.
Challenge

Name: _____ LESSON 28 SESSION 4

Practice Recognizing and Drawing Shapes

1 Choose *True* or *False* for each sentence.

	True	False
All hexagons have 5 angles.	Ⓐ	Ⓑ
All squares have 4 vertices.	Ⓒ	Ⓓ
All triangles have 3 equal sides.	Ⓔ	Ⓕ
All hexagons have more sides than triangles have.	Ⓖ	Ⓗ

You can draw a picture of each shape to help you.

2 Which shape has fewer sides than a quadrilateral? Circle the correct answer.

Ⓐ pentagon
Ⓑ hexagon
Ⓒ triangle
Ⓓ square

How many sides does a quadrilateral have?

Nina chose Ⓓ. How did Nina get her answer?

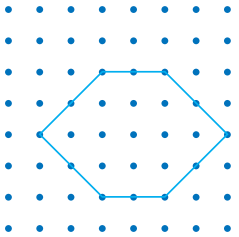
Possible answer: Nina may not have seen the word "fewer" and quadrilaterals and squares both have 4 sides.

3 Hexagon; See student page for possible student drawing.
Basic

4 Pentagon; See student page for possible student drawing.
Basic

5 **C, D, E**
Medium

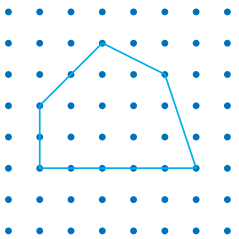
3 Draw a flat shape that has 6 sides. Write the name of the shape. You may use the dots to help you. Show your work. **Possible answer:**



Solution hexagon

You can use the dots as the corners of your shape.

4 Draw a flat shape that has 5 vertices. Write the name of the shape. You may use the dots to help you. Show your work. **Possible answer:**



Solution pentagon

How many sides are made when you connect 5 vertices?

5 Which of the following are true?

Ⓐ A triangle never has equal sides.

Ⓑ A quadrilateral has 6 angles.

Ⓒ A pentagon has 5 vertices.

Ⓓ A hexagon has 6 sides.

Ⓔ A cube always has faces that are the same.

What do you know about each of these shapes?

LESSON 28

SESSION 5 Refine

Purpose In this session, students further refine their skills for identifying and drawing shapes.

Start

Develop Fluency

Materials For each student: geoboard

Why Support students' facility with identifying, drawing, and listing the attributes of shapes.

How Have students make a shape with 5 sides and 5 angles on their geoboard and then name the shape.

Make a shape with 5 sides and 5 angles.

What is the name of the shape?

Use your geoboard.

Solutions

Check that students have made and named a pentagon.

APPLY IT

1 **a.** All

b. Some

c. No

DOK 1

2 **B**; a shape with 6 angles also has 6 sides.

D; a shape with 6 angles is a hexagon.

E; a quadrilateral has exactly 4 angles, so it cannot have 6 angles.

DOK 2

3 **A**; A pentagon has 5 angles and 5 sides.

C; A pentagon has 5 vertices.

DOK 2

Refine Recognizing and Drawing Shapes

APPLY IT

Solve the problems.

1 Fill in the blanks. Use the words in the box.

a. All triangles have 3 sides.

b. Some triangles have sides the same length.

c. No triangles have 4 angles.

Some

No

All

2 Ross draws a shape with exactly 6 angles. Which are true about his shape?

Ⓐ It is a pentagon.

Ⓑ It has exactly 6 sides.

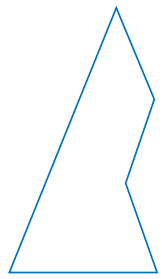
Ⓒ It has exactly 5 vertices.

Ⓓ It is a hexagon.

Ⓔ It cannot be a quadrilateral.

Ⓕ It could be a triangle.

3 Which are true about this shape?



Ⓐ It is a pentagon.

Ⓑ It is a quadrilateral.

Ⓒ It has 5 vertices.

Ⓓ It has exactly 3 angles.

Ⓔ It is a hexagon.

Differentiated Instruction

RETEACH

Hands-On Activity

Fold a cube.

Students struggling with the structure and attributes of a cube

Will benefit from additional work folding a cube from a flat representation.

Materials For each pair: scissors, tape, Activity Sheet *Nets for Cubes* copied on cardstock

- Have students carefully cut out each figure along the solid lines.
- Hold up each figure and tell students that they are going to fold along the dotted lines to make a solid shape. Ask: *What shape do you think it will make? Why do you think so?* List different shape ideas and explore students' reasoning.
- Then have students test their ideas by folding the shapes along the lines. Direct students to tape adjacent faces together. Have volunteers list the attributes of each shape they have made and suggest what solid shape fits those attributes. Discuss initial guesses and why they are correct or incorrect.

4 See Student Worktext page.
DOK 1

5 No; Possible explanation: The faces of a shoe box are not usually all squares, so it is not a cube.
DOK 3

Close: Exit Ticket

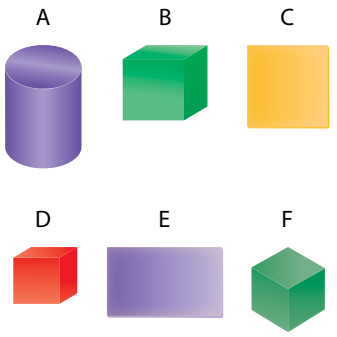
6 MATH JOURNAL

Student responses should indicate understanding of how to draw a specific shape and describe the attributes such as the number of angles and sides that define that shape.

Error Alert **If** students confuse or incorrectly identify the attributes or name of the shape, **then** have students create shapes on the geoboard according to specific attributes that you give.

☑ SELF CHECK Have students consider whether they feel they are ready to check off any new skills on the Unit 5 Opener.

4 Sort the shapes. Write the letter in the correct column.



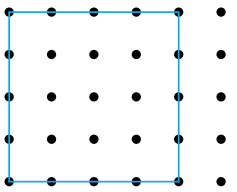
Cube	Not a Cube
B	A
D	C
F	E

5 Marisol stores blocks in a shoe box. Is a shoe box usually a cube? Explain why or why not.

No. Possible explanation: The faces of a shoe box are not all squares, so it cannot be a cube.

6 MATH JOURNAL

Draw a shape that has between 3 and 6 sides. Use the dots below. What is the name of your shape? Explain how you know.



Answers will vary. Possible answer: The shape I drew has 4 sides. So it is a quadrilateral.

☑ SELF CHECK Go back to the Unit 5 Opener and see what you can check off.

EXTEND

Challenge Activity

Make shapes using tangram pieces.

Students who have achieved proficiency with the names and attributes of shapes

Will benefit from deepening understanding of the attributes of shapes.

Materials For each pair: Activity Sheet *Tangram Shapes* copied on cardstock and cut apart

- Draw a chart on the board with the headings *Triangle*, *Square*, *Rectangle*, and *Trapezoid*. Have students copy the chart.
- Tell students that they are to put some or all their shapes together to make each of the shapes listed in the chart. Tell them that there is more than one way to make most of the shapes.
- After students build a shape, they should draw it on their chart, showing the pieces they used. Emphasize that an exact picture is not necessary.
- When everyone is finished, share solutions.

PERSONALIZE

i-Ready

Provide students with opportunities to work on their personalized instruction path with *i-Ready* Online Instruction to:

- fill prerequisite gaps
- build up grade-level skills

Lesson Overview

LESSON 30

Partition Rectangles

Lesson Objectives

Content Objectives

- Analyze an array of squares with no gaps or overlaps.
- Determine the number of squares used to partition a rectangle.
- Create an array of squares to fit a rectangular shape.

Language Objectives

- Draw lines in a rectangle to make rows of same-sized squares.
- Tell how many same-sized squares of a certain size will fill a rectangle.

Prerequisite Skills

- Know that an array is organized in equal-sized rows and columns.
- Compose a shape from a different shape.
- Know the attributes of a square and a rectangle.

Standards for Mathematical Practice (SMP)

SMPs 1, 2, 3, 4, 5, and 6 are integrated in every lesson through the *Try-Discuss-Connect* routine.*

In addition, this lesson particularly emphasizes the following SMPs:

4 Model with mathematics.

5 Use appropriate tools strategically.

7 Look for and make use of structure.

8 Look for and express regularity in repeated reasoning.

*See page 303k to see how every lesson includes these SMPs.

Lesson Vocabulary

- **column** a top-to-bottom (vertical) line of objects or numbers, such as in an array or table.
- **row** a side-by-side (horizontal) line of objects or numbers, such as in an array or table.

Learning Progression

In Grade 1 students identify and explore attributes of triangles and squares. They compose two-dimensional shapes to create a composite shape.

In Grade 2 students extend their understanding of shapes and attributes by grouping them into broad categories of triangle, quadrilateral, pentagon, and hexagon. They explore the concept of an array as a rectangular shape.

In this lesson students build on the concept of an array and the attributes of a rectangle as they fill a rectangular shape using congruent squares.

In Grade 3 students utilize the concept of an array as rows and columns of equal-sized squares as a tool for understanding multiplication and division as well as in exploring concepts of area.

Lesson Pacing Guide

Whole Class Instruction

SESSION 1 **Explore** *45–60 min*	**Interactive Tutorial*** *(Optional)* *Prerequisite Review:* Divide Shapes into Three Equal Parts **Partitioning Rectangles** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Connect It *15 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 721–722
SESSION 2 **Develop** *45–60 min*	**Partitioning a Rectangle into Squares** • Start *5 min* • Try It *10 min* • Discuss It *10 min* • Model Its *5 min* • Connect It *10 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 727–728 **Fluency** Partitioning a Rectangle into Squares
SESSION 3 **Refine** *45–60 min*	**Partitioning Rectangles** • Start *5 min* • Example & Apply It *35 min* • Close: Exit Ticket *5 min*	**Additional Practice** Lesson pages 731–732
SESSION 4 **Refine** *45–60 min*	**Partitioning Rectangles** • Start *5 min* • Apply It & Small Group Differentiation *35 min* • Close: Exit Ticket *5 min*	**Lesson Quiz** or **Digital Comprehension Check**

Small Group Differentiation

Teacher Toolbox

PREPARE

Ready Prerequisite Lessons

Grade 1
- Lesson 34 Putting Shapes Together
- Lesson 35 Understand Breaking Shapes into Equal Parts

RETEACH

Tools for Instruction

Grade 1
- Lesson 34 Making New Shapes
- Lesson 35 Making Equal Shares

Grade 2
- Lesson 30 Fill a Rectangle with Squares

REINFORCE

Math Center Activities

Grade 2
- Lesson 30 Tile Rectangles
- Lesson 30 Fill Rectangles with Squares

EXTEND

Enrichment Activity

Grade 2
- Lesson 30 Rectangle Tangle

Lesson Materials

Lesson *(Required)*	none
Activities	*Per student:* 12 in. × 18 in. sheet of construction paper, inch ruler, glue *Activity Sheets:* 1-Inch Grid Paper, 2-Inch Grid Paper
Math Toolkit	1-inch tiles, 1-centimeter tiles, 1-inch grid paper, 1-centimeter grid paper, $\frac{1}{2}$-inch grid paper

*We continually update the Interactive Tutorials. Check the Teacher Toolbox for the most up-to-date offerings for this lesson.

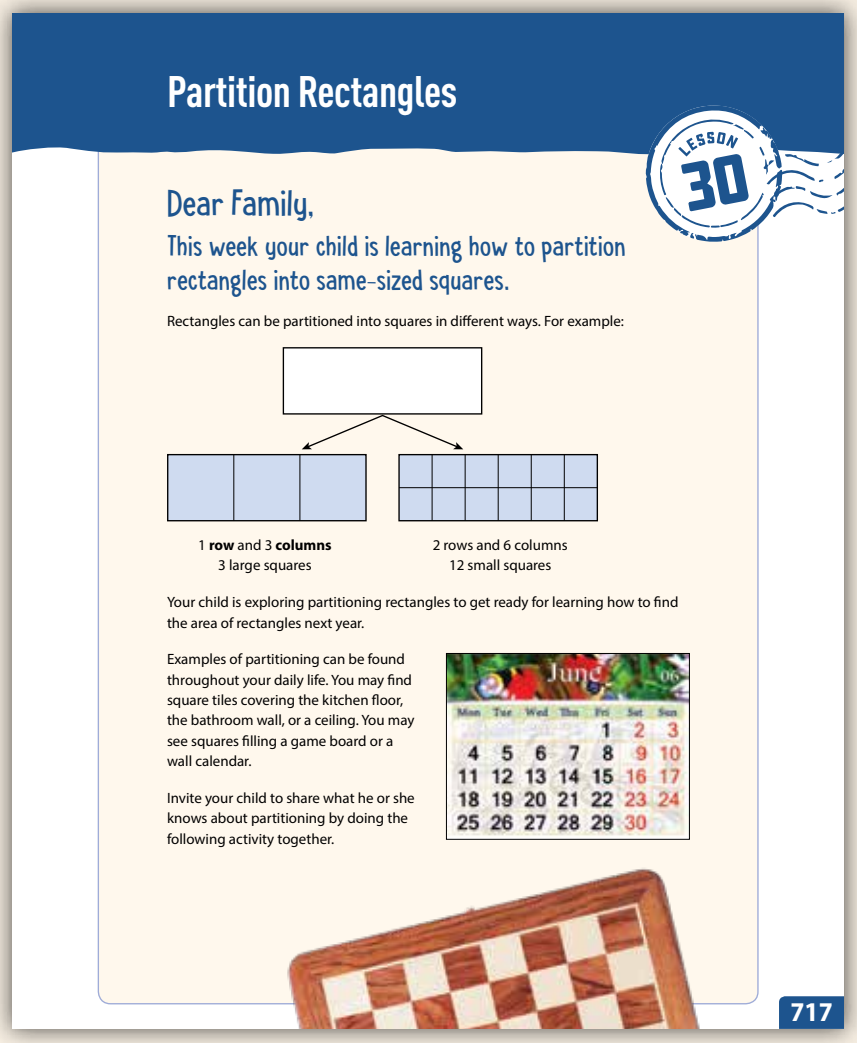
LESSON 30

Connect to Family, Community, and Language Development

The following activities and instructional supports provide opportunities to foster school, family, and community involvement and partnerships.

Connect to Family

Use the **Family Letter**—which provides background information, math vocabulary, and an activity—to keep families apprised of what their child is learning and to encourage family involvement.



Partition Rectangles

LESSON 30

Dear Family,

This week your child is learning how to partition rectangles into same-sized squares.

Rectangles can be partitioned into squares in different ways. For example:

1 **row** and 3 **columns**
3 large squares

2 rows and 6 columns
12 small squares

Your child is exploring partitioning rectangles to get ready for learning how to find the area of rectangles next year.

Examples of partitioning can be found throughout your daily life. You may find square tiles covering the kitchen floor, the bathroom wall, or a ceiling. You may see squares filling a game board or a wall calendar.

Invite your child to share what he or she knows about partitioning by doing the following activity together.

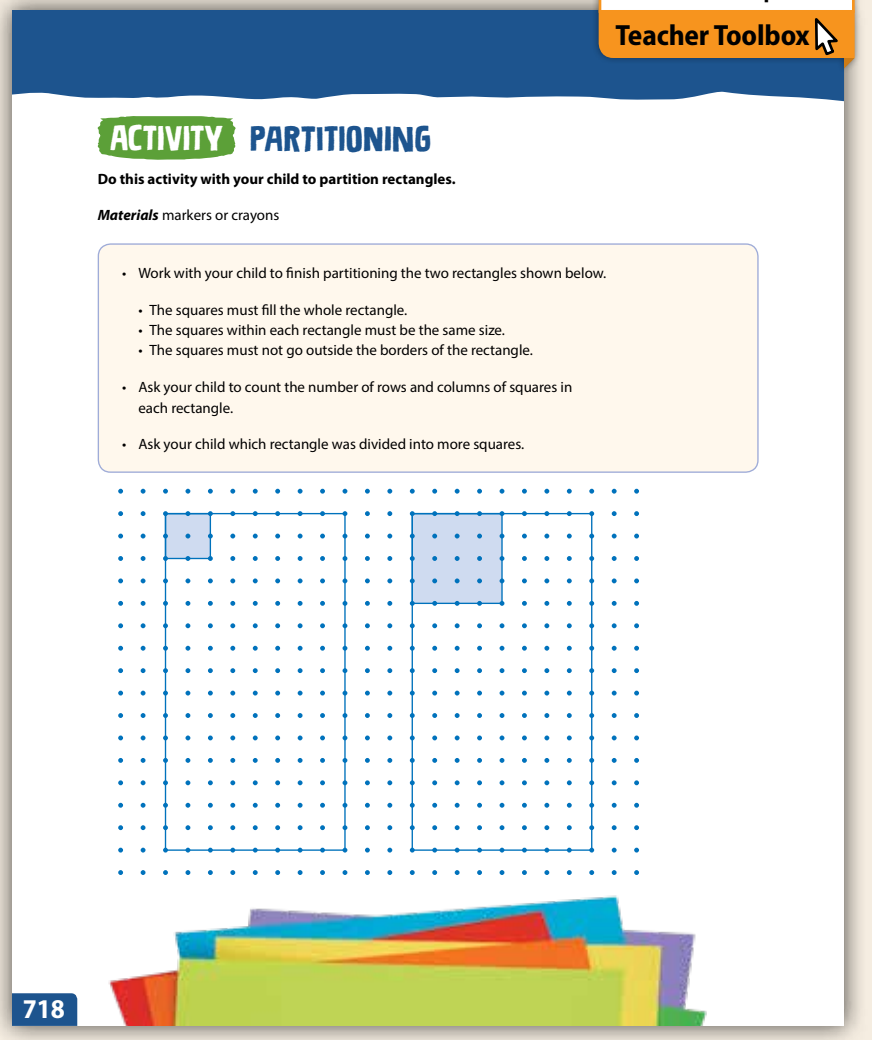
June 06

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

717

Available in Spanish

Teacher Toolbox



ACTIVITY PARTITIONING

Do this activity with your child to partition rectangles.

Materials markers or crayons

- Work with your child to finish partitioning the two rectangles shown below.
  - The squares must fill the whole rectangle.
  - The squares within each rectangle must be the same size.
  - The squares must not go outside the borders of the rectangle.
- Ask your child to count the number of rows and columns of squares in each rectangle.
- Ask your child which rectangle was divided into more squares.

718

Goal

The goal of the Family Letter is to help students explore partitioning rectangles into same-sized squares.

Activity

Understanding that square tiles can fit into rectangles will help prepare students to work with problems involving calculating area. Look at the *Partitioning* activity and adjust it if necessary to connect with your students.

Math Talk at Home

Encourage students to think of objects around the house that can be partitioned into square tiles.

Conversation Starters Below are additional conversation starters students can write in their Family Letter or math journal to engage family members.

- *Which objects are shaped like a rectangle?*
- *How many square tiles could fit into this rectangle?*
- *How many rows and columns fit?*

Connect to Community and Cultural Responsiveness

Use these activities to connect with and leverage the diverse backgrounds and experiences of all students.

Sessions 1–3 **Use anytime during the sessions.**

- Encourage students to think of objects around school or at home that have rectangles partitioned into squares. Ask: *Why do you think the squares are the same size?* Examples of rectangles partitioned into squares include floor tiles, ceiling tiles, window panels, graph paper, quilts, and squared storage shelves. Invite students to draw and discuss some of the examples they shared.

Connect to Language Development

For ELLs, use the Differentiated Instruction chart to plan and prepare for specific activities in every session.

ELL English Language Learners: Differentiated Instruction

Prepare for Session 1
Use with *Try It*.

Levels 1–3

Listening/Speaking Have students chorally read the ***Try It*** problem. Ask them to show you examples of squares they can find in the classroom. Tell them to work with a partner to arrange tiles to make a rectangle. Then have them work on the problem and describe Jen's rectangle. Point to the sides of the rectangles and ask: *How long is this side? And how long is this side? How many sides are (number) tiles long?*

Levels 2–4

Listening/Speaking Have students chorally read the ***Try It*** problem. With partners, have them compare the characteristics of a square and a rectangle. Encourage them to place two tiles together. Ask: *Do the two squares together make a square or a rectangle?* Have partners work on the problem and describe the rectangles. Provide the following sentence frame:

- *Jen's rectangle is _____ tiles long on two sides and _____ tiles long on two sides.*

Have partners compare their rectangles with those of other students.

Levels 3–5

Reading/Writing Have students take turns reading the ***Try It*** problem with a partner. Have them write one sentence describing rectangles and one sentence describing squares. Encourage students to place two tiles together. Ask them to write a response to these questions: *Do the two squares together make a square or a rectangle? Why?* Provide this sentence starter:

- *The two squares together _____.*

Have partners take turns reading their sentences to each other. Once complete, ask them to find two different ways to show what Jen's rectangle could look like.

LESSON 30

SESSION 1 Explore

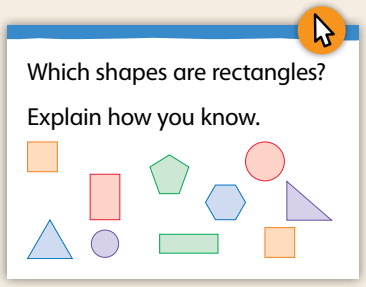
Purpose In this session, students connect their previous knowledge about rectangles to creating a rectangle using same-size squares. Students explore and share solution strategies for making a design in the shape of a rectangle with 12 square tiles. They look ahead to using square tiles to fill rectangles.

Start

Connect to Prior Knowledge

Why Support students' knowledge of the attributes of rectangles, foreshadowing using squares to fill a rectangle.

How Have students identify shapes that are rectangles and explain how they identified them.



Solution

Students should identify the 2 squares and 2 other rectangles as rectangles. Possible explanation: I know these shapes are rectangles because they have 4 sides and 4 square corners.

TRY IT

Make Sense of the Problem

To support students in making sense of the problem, help them understand that there are 12 tiles that can be arranged to form a rectangle.

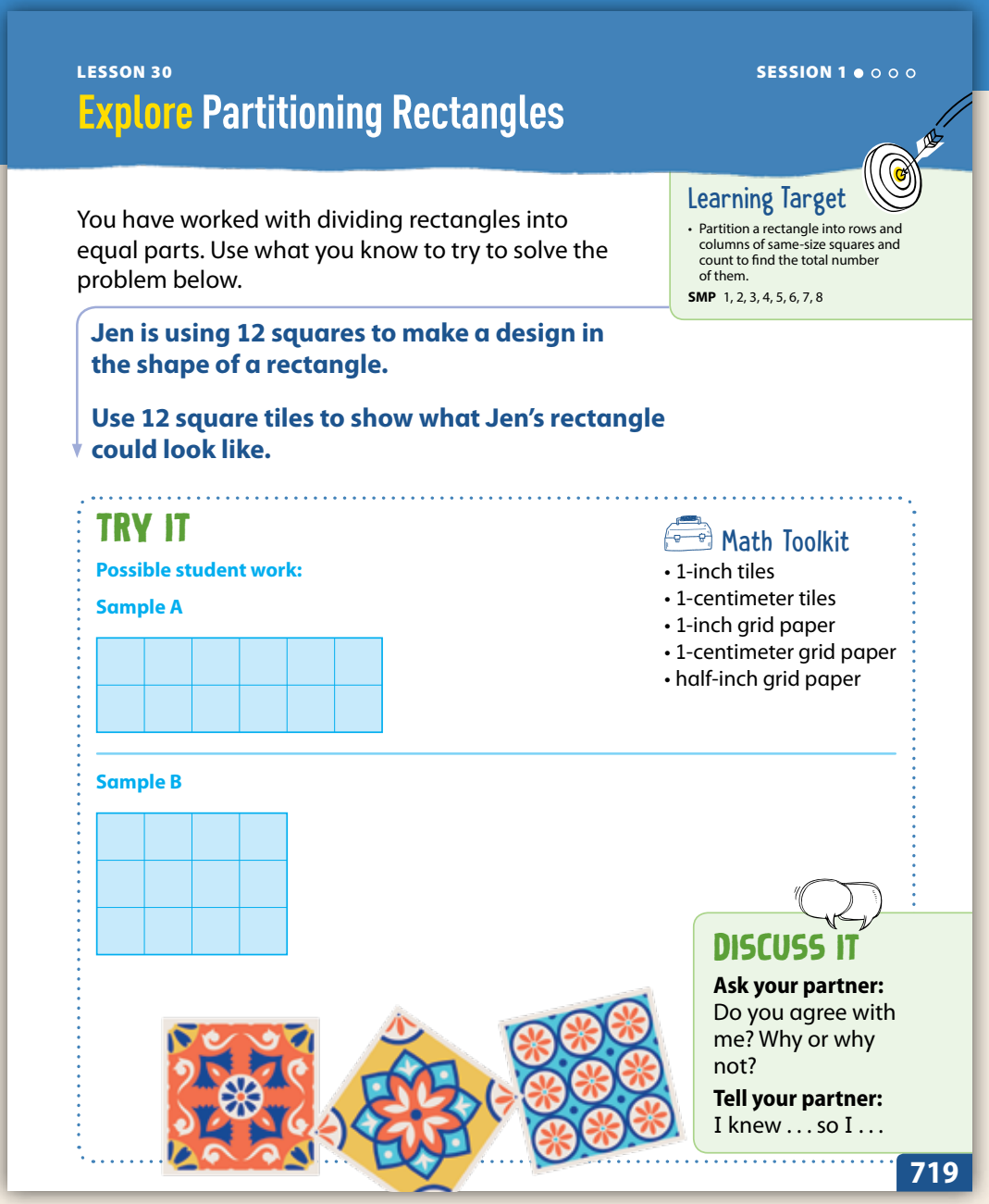
DISCUSS IT

Support Partner Discussion

Encourage students to use the terms *square* and *rectangle* as they discuss their solutions.

Look for, and prompt as necessary, understanding that:

- all 12 square tiles are to be used
- the design needs to be in the shape of a rectangle



LESSON 30 SESSION 1 ● ○ ○ ○

Explore Partitioning Rectangles

Learning Target

- Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

SMP 1, 2, 3, 4, 5, 6, 7, 8

You have worked with dividing rectangles into equal parts. Use what you know to try to solve the problem below.

Jen is using 12 squares to make a design in the shape of a rectangle.

Use 12 square tiles to show what Jen's rectangle could look like.

TRY IT

Possible student work:

Sample A

Sample B

Math Toolkit

- 1-inch tiles
- 1-centimeter tiles
- 1-inch grid paper
- 1-centimeter grid paper
- half-inch grid paper

DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I knew . . . so I . . .

719

Common Misconception Look for students who are unable to form rows and columns of squares that will result in the shape of a rectangle. As students present solutions, have them explain how they arranged their tiles in rows and columns to create a rectangle.

Select and Sequence Student Solutions

One possible order for whole class discussion:

- arranging the tiles in an array with 2 rows of 6 tiles
- arranging the tiles in an array with 3 rows of 4 tiles
- arranging the tiles in an array with 4 rows of 3 tiles
- arranging the tiles in an array with 1 row of 12 tiles

Support Whole Class Discussion

Prompt students to note the relationship between the numbers in each model and the numbers in the problem.

Ask *How are [student name]'s and [student name]'s rectangles the same? How are they different?*

Listen for One design shows 3 rows with 4 tiles in each row, and another design shows 2 rows with 6 tiles in each row. Each rectangle has 12 tiles in all.

CONNECT IT

1 LOOK BACK

Look for understanding that 12 tiles can be arranged in rows and columns to form a rectangle without gaps or overlaps.

Hands-On Activity

Use paper squares to form a rectangle.

If . . . *students are unsure about arranging 12 tiles to build a rectangle,*

Then . . . *use this activity to have them build different rectangles using 8 squares.*

Materials For each student: 1-inch squares cut from Activity Sheet *1-Inch Grid Paper*

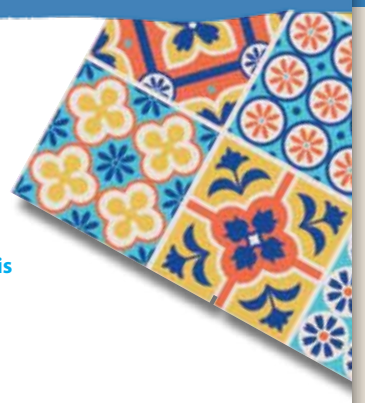
- Distribute 8 squares to each student.
- Guide students to build a rectangle with their 8 squares. Ask: *How many squares are in each row? In each column?*
- Ask: *Are there any other rectangles that you could build with these squares? Explain.* As students suggest different rectangles, have volunteers show the class how to build them.
- Show students a shape with 3 squares in the first row, 3 squares in the second row, and 2 squares in the third row. Say: *I used the 8 squares. Did I build another rectangle? Explain.*
- Repeat the activity for 6 squares.

2 LOOK AHEAD

Point out that the squares that are being used to fill the rectangle in this problem are different from those that students used for the previous problem, but the activity is the same.

Students should be able to recognize that they need to draw how the rectangle would be completely filled by squares with no gaps or overlaps between them.

CONNECT IT



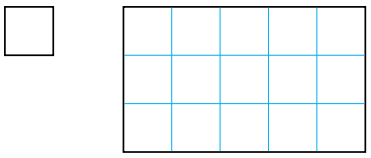
1 LOOK BACK

How many **rows** and **columns** could Jen's rectangle have?

Answers may vary; students may describe a rectangle that is 1 × 12, 2 × 6, 3 × 4, 12 × 1, 6 × 2, or 4 × 3.

2 LOOK AHEAD

Al is filling the large rectangle with 15 of the squares shown below.



Draw lines to show how to fill the rectangle with the squares.

3 REFLECT

How did you check your work to know that you used 15 squares to fill Al's rectangle?

Possible answer: There are 5 in each row and 3 rows, so I added 5 three times: 5 + 5 + 5 = 15.

Close: Exit Ticket

3 REFLECT

Look for understanding that 15 squares cannot be arranged into 2 rows that have the same number of squares. Each row of the rectangle must have the same number of squares, but 15 squares cannot be split up into two equal groups. The rows will not be the same, or there will be 1 square left over after making two equal rows.

Common Misconception **If** students are unable to explain why they could not use 15 squares to build a rectangle with two rows, **then** model using 15 squares to try to make a rectangle, starting with two rows of 7. Discuss that all of the squares have not been used if there is 1 square left over and that adding the last square to one of the rows gives a shape that is not a rectangle.

Real-World Connection

Encourage students to think about everyday places or situations where people might need to build a rectangle. Have volunteers share their ideas. Examples include covering the floor with carpet tiles, tiling a bathroom wall, and making a rectangular tray using mosaic tiles.

Solutions

Support Vocabulary Development

1 Ask students to circle *part* in the term *partitioning* and discuss its meaning with their partners. Have students share their responses with the class. Explain that *partitioning* means "breaking a shape into smaller parts or pieces." Ask students to think of examples of familiar objects that are usually partitioned, such as a tiled floor, pies, or pizza.

2 Have students underline the term *fill*. Explain that squares have to fit into the rectangle and cover it completely. The rectangle should not have empty spaces between squares, and squares should not go outside of the borders.

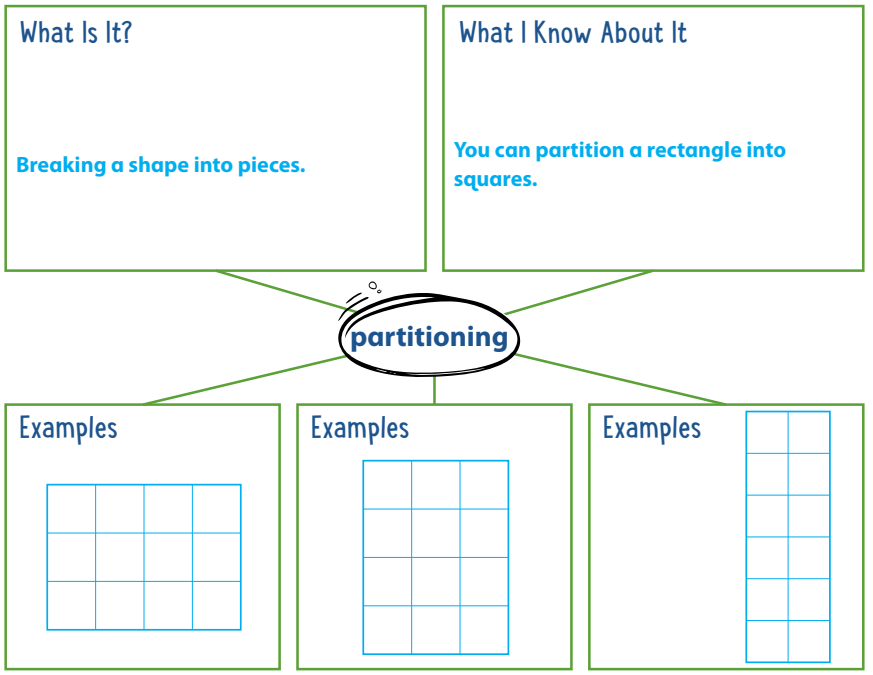
Supplemental Math Vocabulary

- *rows*
- *columns*

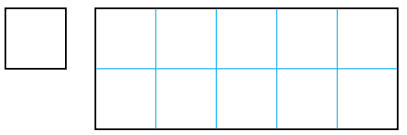
Name: _____ LESSON 30 SESSION 1

Prepare for Partitioning Rectangles

1 Think about what you know about filling rectangles with same-sized squares. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can. **Possible answers:**



2 Tanya is filling this rectangle with 10 of the square tiles shown. Draw lines to show how to fill the rectangle.



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3 Assign problem 3 to provide another look at filling rectangles with same-size squares in rows and columns.

This problem is very similar to the problem about Jen using 12 squares to make a design in the shape of a rectangle. In both problems, students are asked to make a rectangle with a certain number of squares. This question asks to show what Juan's rectangle of 18 squares could look like.

Students may want to use inch squares made out of paper or plastic.

Suggest that students read the problem three times, asking themselves one of the following questions each time:

- *What is this problem about?*
- *What is the question I am trying to answer?*
- *What information is important?*

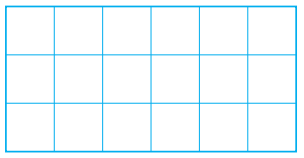
Solution: Answers will vary. Students may draw a rectangle made up of squares that is 1 by 18, 2 by 9, 3 by 6, 6 by 3, 9 by 2, or 18 by 1.
Medium

4 Have students solve the problem a different way to check their answer.

3 Solve the problem. Show your work.

Juan is using 18 squares to make a design in the shape of a rectangle. Show what Juan's rectangle could look like.

Possible student work:



Solution **Juan's rectangle could be 3 tiles by 6 tiles.**

4 Check your answer. Show your work.

Possible student work:

The tiles form a rectangle, and I use 18 tiles.

I can make a different rectangle with 18 tiles:

ELL English Language Learners: Differentiated Instruction

Prepare for Session 2
Use with *Try It*.

Levels 1–3

Speaking/Writing Have students chorally read the ***Try It*** problem. Ask: *How many squares can fit going up and down in a column? How many squares can fit left to right in a row?* Model the phrases going *up and down* and *left to right*, as needed.

Instruct students to complete the following sentence frame in writing:

- *__24__ square tiles fit into the rectangle.*

Levels 2–4

Speaking/Writing Have students chorally read the ***Try It*** problem. Ask: *How many squares can fit going up and down in a column? How many squares can fit left to right in a row?*

Have students draw lines to show the total number of rows and number of columns. Then have them solve the problem.

Instruct students to write a sentence to state their answers.

Levels 3–5

Listening/Speaking Have students read the ***Try It*** problem in pairs. Ask: *How many columns and how many rows do you think can fit into the rectangle?* Then have them discuss how they will solve the problem. Once complete, have partners discuss whether their answers match what they predicted.

LESSON 30

SESSION 2 Develop

Purpose In this session, students find how many squares are needed to completely fill a partially filled rectangle. Students solve the problem using different strategies to draw the missing squares and then write an equation to represent the total number of squares used. The purpose of this problem is to have students develop strategies for determining how to partition different rectangles.

Start

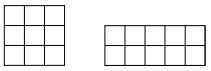
Connect to Prior Knowledge

Why Support students' knowledge of determining the number of squares used to compose different rectangles, foreshadowing using squares to partition a rectangle.

How Have students find the number of squares that make up different rectangles.

How many squares were used to build each rectangle?

Explain how you found your answer.



Solutions

9 tiles; 10 tiles; Possible explanation: I used skip-counting to find how many tiles are in each rectangle. I counted 3, 6, 9 for the first rectangle and 5, 10 for the second rectangle.

Develop Language

Why Support understanding of the term *total*.

How Explain that *total* refers to a number or a whole amount. Have students find the word in *Try It*. Ask: *What do you need to find?* Provide the following sentence frame:

- *I need to find the total number of squares that will fit in the rectangle.*

TRY IT

Make Sense of the Problem

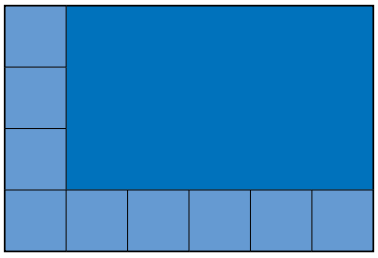
To support students in making sense of the problem, have them identify what they need to find.

LESSON 30 SESSION 2 ● ● ○ ○

Develop Partitioning a Rectangle into Squares

Use what you know to try to solve the problem below.

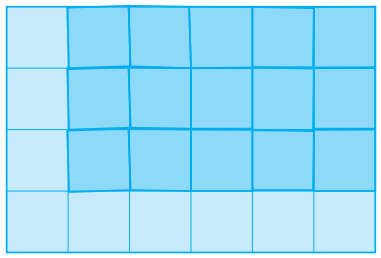
Bella starts filling this rectangle with squares. How many total squares does it take to fill the rectangle without going outside the edges?



TRY IT

Possible student work:

Sample A



24 squares

Sample B

6 squares in one row. 4 rows.

6 + 6 + 6 + 6 = 24.

24 squares

Math Toolkit

- 1-inch tiles
- 1-centimeter tiles
- 1-inch grid paper
- 1-centimeter grid paper
- $\frac{1}{2}$-inch grid paper

DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: A model I used was . . . It helped me . . .

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DISCUSS IT

Support Partner Discussion

Encourage students to describe the model or strategy they used as they talk to each other.

Support as needed with questions such as:

- *How did you show each of the missing squares?*
- *How is your partner's model or strategy like yours? How is it different?*

Common Misconception Look for students who find the number of missing squares, 15, rather than the total number of squares that will fill the rectangle.

Select and Sequence Student Solutions

One possible order for whole class discussion:

- drawing squares to fill the rectangle
- copying and completing the partially filled rectangle on grid paper or dot paper and then counting the total number of squares
- consecutively numbering the shown squares and the positions for the remaining squares
- adding the number of squares in the rows or columns by writing and solving the addition equation $6 + 6 + 6 + 6 = 24$ or $4 + 4 + 4 + 4 + 4 + 4 = 24$

Support Whole Class Discussion

Compare and connect the number of squares that are in the rectangle at the start and the total number of squares that are needed to fill the rectangle.

MODEL ITS

If no student presented these models, connect them to the student models by pointing out the ways they each represent:

- the number of squares Bella has used
- the remaining number of squares needed to fill the rectangle
- the total number of squares that will fill the rectangle

For using grid paper, prompt students to determine how the grid paper can be used to help solve the problem.

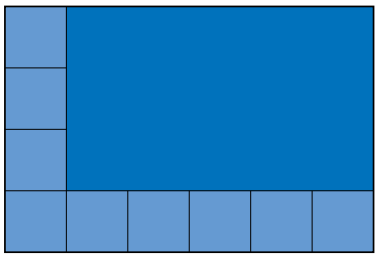
- *How do you show the squares Bella starts with?*
- *How do you locate the rest of the squares needed to fill the rectangle?*
- *How do you find the total?*

For using dot paper, prompt students to determine how the dot paper can be used to help solve the problem.

- *How is using dot paper different than using grid paper? How is it the same?*
- *Why might you use dot paper instead of grid paper?*
- *How can you make sure you have included all the squares in your total?*

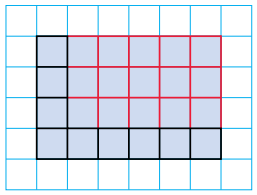
Develop different ways to understand using squares to fill a rectangle.

Bella starts filling this rectangle with squares. How many total squares does it take to fill the rectangle without going outside the edges?



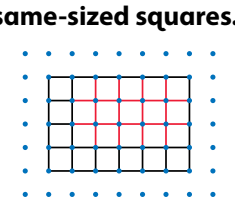
MODEL IT

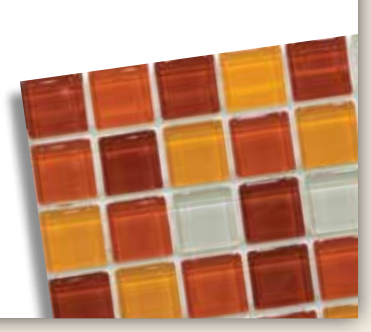
Use grid paper to fill a rectangle with same-sized squares.



MODEL IT

Use dot paper to fill a rectangle with same-sized squares.





Deepen Understanding

Using Dot Paper to Partition a Rectangle

SMP 7 Look for structure.

When discussing using dot paper, point out that it is made up of dots that can be connected to create squares and other rectangles.

Ask *Why are some of the squares outlined in black? Why are some of the squares outlined in red? How do you know that the rectangle on the dot paper is the same size as the rectangle that Bella is filling with squares?*

Listen for The squares outlined in black are the squares that Bella has already put inside of the rectangle. The squares outlined in red are those that need to be added so that the entire rectangle is filled with squares. Both rectangles are the same size because they both have 4 squares in each column and 6 squares in each row.

Generalize *How could you use dot paper to solve any problem about finding the number of squares needed to fill a rectangle?* Listen for understanding that dot paper can be used to draw rows and columns of squares that would fill a rectangle of any size.

CONNECT IT

- Remind students that one thing that is alike about all the representations is the number of squares in each row, the number of squares in each column, and the total number of squares that are needed to fill the rectangle.
- Explain that on this page, students will use the problem from the previous page to learn how to use squares to fill a rectangle.

Monitor and Confirm

1 Check for understanding that:

- the rectangle must be filled with squares, with no gaps or overlaps
- 15 more squares are needed to fill the entire rectangle
- the number of squares in each column, 4, can be added one time for each row, 6, to find a total of 24 squares

Support Whole Class Discussion

2 Be sure students understand that this problem is asking them to identify that two same-sized rectangles can be partitioned using different-sized squares.

Ask *How many squares did Jaime use to fill the rectangle? How many squares did Ava use to fill the rectangle? Why does Ava's partitioning use fewer squares than Jaime's?*

Listen for Jaime used 8 squares to fill the rectangle; Ava used 2 squares. Ava used fewer squares because each of her squares is larger than each of Jaime's squares. So, each of Ava's squares covers a larger part of the rectangle than each of Jaime's squares.

3 REFLECT Have all students focus on the strategies used to solve this problem. If time allows, have students share their preferences with a partner.

CONNECT IT

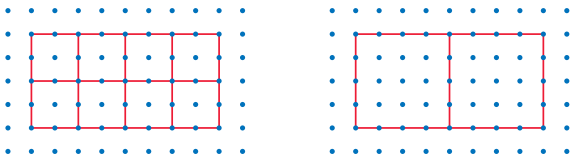
Now you will use the problem from the previous page to help you understand how to use squares to fill a rectangle.

1 **a.** Complete the equation to show how many squares Bella breaks the rectangle into.

4 + 4 + 4 + 4 + 4 + 4 = 24

b. It takes 24 squares to fill the rectangle.

2 Jaime and Ava both draw lines to break apart same-sized rectangles into squares. Why is there a different number of squares in each of their rectangles?



Jaime's rectangle Ava's rectangle

Possible answer: The squares are different sizes.

3 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for filling a rectangle? Explain.

Possible answer: I like using dot paper to draw squares on the rectangle because it is easy to draw and count the squares.

Hands-On Activity

Create a mosaic.

If . . . *students are having difficulty using grid paper to determine the number of squares needed to fill a rectangle,*

Then . . . *have them use colored squares to partition a rectangle on grid paper.*

Materials For each student: Activity Sheet *1-Inch Grid Paper*, at least 28 1-inch squares in varied colors cut from a half-sheet copy of Activity Sheet *1-Inch Grid Paper*, glue

- Tell students that they will use squares to make a rectangle by covering part of the grid paper. Share with them that their design can be called a *mosaic*.
- Students may arrange the squares in any way they choose, staying within the grid lines. Suggest that they place the squares on the grid in the way they would like before gluing them.
- Have students glue the squares on the grid paper with no gaps or overlaps.
- Ask: *How many squares does it take to fill the rectangle?* [28]
- Provide a place for students to display their mosaics when completed.

APPLY IT

For all problems, encourage students to draw a picture or write an equation to solve the problem.

4 See Student Worktext page. The rectangle is broken into 12 total squares.

5 Gia uses 20 squares to fill the rectangle.

Close: Exit Ticket

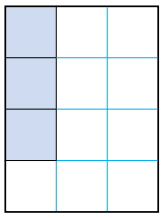
6 **B**, **D**

Error Alert **If** students choose **A**, **C**, or **E**, **then** remind them that they can find the total by counting the number of squares in a row, 6, and then use 6 as an addend 5 times, because 5 is the number of rows. They also can use the number of squares in a column, 5, as an addend 6 times because 6 is the number of columns.

APPLY IT

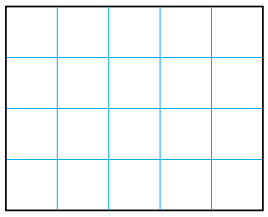
Use what you just learned to solve these problems.

4 Tam starts breaking apart this rectangle into squares. Draw lines to finish breaking it apart. How many total squares is the rectangle broken into?



The rectangle is broken into 12 total squares.

5 Gia breaks apart this rectangle into squares. How many squares does Gia use?



Possible answer:

Gia uses 20 squares to fill the rectangle.

6 Kyle wants to make this design using square letter and number tiles.

A	B	C	D	E	F
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V	W	X
Y	Z	0	1	2	3

Which equations could Kyle use to find the number of square tiles he will need in all?

Ⓐ 5 + 5 + 5 + 5 + 5 = ?

Ⓑ 5 + 5 + 5 + 5 + 5 + 5 = ?

Ⓒ 6 + 6 + 6 + 6 = ?

Ⓓ 6 + 6 + 6 + 6 + 6 = ?

Ⓔ 6 + 6 + 6 + 6 + 6 + 6 = ?

Solutions

1. 7 rows
Basic

2. 3 squares in each row
Basic

3. 7 + 7 + 7 = 21
Medium

4. 21 squares
Medium

Name: _____ LESSON 30 SESSION 2

Practice Partitioning a Rectangle into Squares

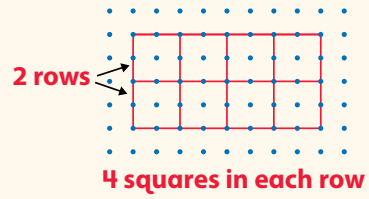
Study the Example showing how to draw and count squares. Then solve problems 1–8.

EXAMPLE

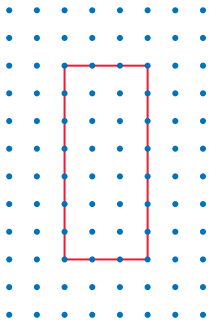
Sal draws squares on dot paper to fill a rectangle. How many squares does he draw in all?

- You can count each square.
- Or you can count the rows and number of squares in each row. Then add: 4 + 4 = ?

Sal draws 8 squares in all.



Break apart the rectangle into same-size squares. Then answer the questions below.



1. How many rows of squares are there?

7 rows

2. How many squares are in each row?

3 squares in each row

3. Complete the equation to find how many squares in all.

7 + 7 + 7 = 21

4. How many squares are in the rectangle?

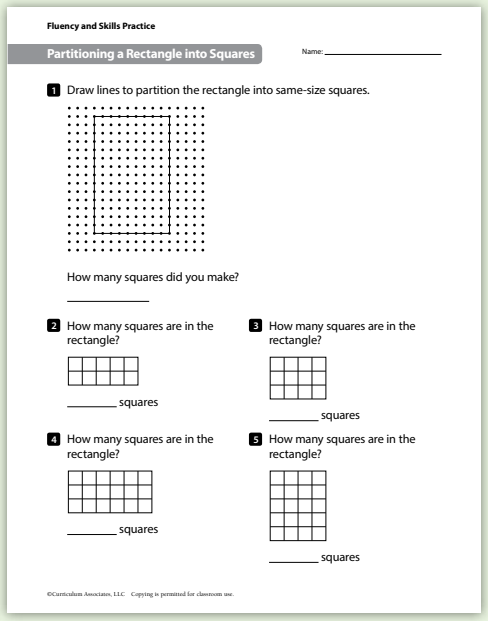
21 squares

Fluency & Skills Practice

Teacher Toolbox

Assign *Partitioning a Rectangle into Squares*

In this activity students practice partitioning a rectangle into same-size squares and finding the number of squares that compose a rectangle. These skills are useful for reinforcing students' understanding of the attributes of a rectangle. Also, this activity helps prepare students for using arrays and for exploring the concept of area.


Fluency and Skills Practice

Partitioning a Rectangle into Squares

Name: _____

1 Draw lines to partition the rectangle into same-size squares.

How many squares did you make?

_____

2 How many squares are in the rectangle?

_____ squares

3 How many squares are in the rectangle?

_____ squares

4 How many squares are in the rectangle?

_____ squares

5 How many squares are in the rectangle?

_____ squares

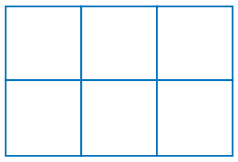
5 $2 + 2 + 2 = 6$; 6 squares
Medium

6 Possible answer: $4 + 4 + 4 + 4 + 4 + 4 = 24$; 24 squares
Medium

7 Possible answer: The rectangle in problem 6 has more squares because they are smaller squares than those used in problem 5. So, you need more of them to fill the same space.
Challenge

8 See student page.
Challenge

5 Write an equation to find how many squares are in the rectangle.

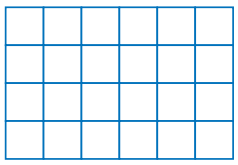


2 + 2 + 2 = 6

How many squares are in the rectangle?

6 squares

6 Write an equation to find how many squares are in the rectangle.



Possible answer: 4 + 4 + 4 + 4 + 4 + 4 = 24

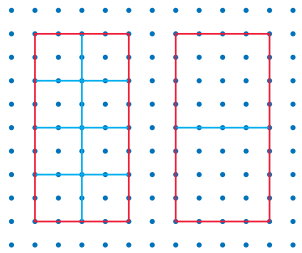
How many squares are in the rectangle?

24 squares

7 The rectangles in problems 5 and 6 are the same size. Why does the rectangle in problem 6 have more squares than the other rectangle?

Possible answer: There are more squares because the squares in problem 6 are smaller so you need more of them to fill the same space.

8 Draw lines to show two different ways to break apart the rectangles into same-size squares. Possible answer:



ELL English Language Learners: Differentiated Instruction

Prepare for Session 3
Use with *Apply It*.

Levels 1–3

Listening/Speaking Have students chorally read ***Apply It*** problem 1. Ask them to share a fact about squares with their partners. Listen for *equal sides* or look for a sketch of a square with the same length for all sides. (Ask students to label their sketch to show the length of each side.) Have students look at the sketch in the problem and say whether they agree or disagree with each of the following statements:

- *There are 9 squares.*
- *There are 3 rectangles.*

Levels 2–4

Speaking/Writing Have students chorally read ***Apply It*** problem 1. Ask students to write two complete sentences describing squares. Instruct them to take turns reading aloud their sentences to each other. Ask: *What shape or shapes do you see inside the rectangle? How do you know? Do you agree with Tim? Why or why not?* Have students orally complete the following sentence frames:

- *There are* ___6___ *squares.*
- *There are* ___3___ *rectangles.*

Levels 3–5

Reading/Writing Have students take turns reading ***Apply It*** problem 1 with partners. Encourage them to take turns explaining the characteristics of rectangles and squares. Then have students write a response to the problem using one of the following sentence starters:

- *I agree because* _____.
- *I disagree because* _____.

Once complete, have students take turns reading aloud their sentences to each other.

LESSON 30

SESSION 3 Refine

Purpose In this session, students use different strategies to solve problems about partitioning a rectangle.

Start

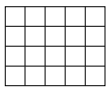
Connect to Prior Knowledge

Why Support students' knowledge of determining the number of squares in rows and columns of different rectangles, foreshadowing writing an equation to find the total number of squares needed to partition a rectangle.

How Have students find the number of squares in each row and column of different rectangles.

Answer the questions for each rectangle.

How many squares are in each row?



How many squares are in each column?

Solutions

2 squares in each row and 3 squares in each column; 5 squares in each row and 4 squares in each column

EXAMPLE

18; The equations shown are two ways to solve the problem. Students could also solve the problem by skip-counting by 3s six times or by skip-counting by six 3 times.

Look for Adding the number of squares in each row or adding the number of squares in each column gives the same total number of squares for partitioning the rectangle.

APPLY IT

1 Possible explanation: I don't agree with Tim. Three of the shapes Tim drew are rectangles. So, there are not 9 squares.
DOK 2

Look for Partitioning a rectangle must use same-sized squares.

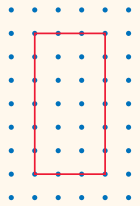
LESSON 30 SESSION 3 ● ● ● ○

Refine Partitioning Rectangles

Complete the Example below. Then solve problems 1–3.

EXAMPLE

You can break apart a rectangle into same-size squares and count to find the total number of squares it takes.



How can you add to find the total number of squares it takes to partition the rectangle?

You can add the rows.

There are 6 rows, with 3 squares in each row.

$3 + 3 + 3 + 3 + 3 + 3 = ?$

You can add the columns.

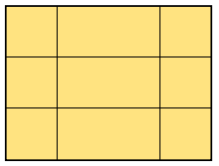
There are 3 columns, with 6 squares in each column.

$6 + 6 + 6 = ?$

Solution 18

APPLY IT

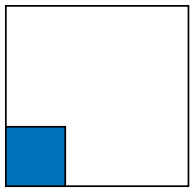
1 Tim says this shows it takes a total of 9 squares to fill this rectangle. Do you agree? Explain.



How has Tim divided the rectangle?

Possible answer: I don't agree with Tim. Three of the shapes he drew are rectangles. There are not 9 squares.

2 Nina pastes a square on a poster. She will fill the rest of the poster with squares that are the same size as the first one. How many squares will there be on Nina's filled poster? Show your work.



Nina's square

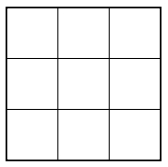
What does it mean to fill a rectangle with squares?

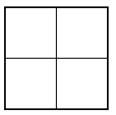
Possible student work: hand-drawn squares, approximating the size of the blue square, with a total of 9 squares filling the larger square.

There will be 9 squares on Nina's filled poster.

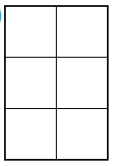
3 Juan breaks apart a rectangle into same-size squares. He writes the equation 2 + 2 + 2 = 6 to find the total number of squares. Which could be Juan's rectangle?

You can look at the rows and columns of each rectangle.

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

2 There will be 9 squares on Nina's filled poster; see Student Worktext page.
DOK 2

Look for The poster is also a square.

3 **D**; Students could solve the problem by drawing a rectangle made up of 3 rows with 2 squares each or a rectangle made up of 2 rows with 3 squares each.

Explain why the other answer choices are not correct:

A is not correct because the square has 3 rows with 3 squares each.

B is not correct because the square has 2 rows with 2 squares each.

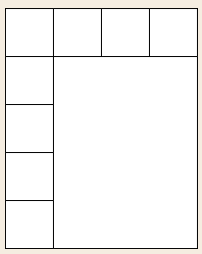
C is not correct because the square has 1 row of 5 squares.
DOK 2

Close: Exit Ticket

Check for Understanding

Ask students to solve the following problem:

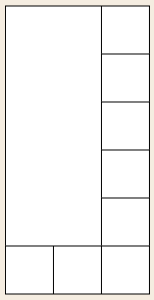
Adarsh is partitioning this rectangle with squares. How many total squares will he use to partition the rectangle without going outside of the edges? [20 squares]



For students who are still struggling, use the table at the right to guide remediation.

After providing remediation, check students' understanding using the following problem:

Adarsh fills another rectangle with squares. How many total squares will he use to fill the rectangle without going outside of the edges? [18 squares]



Error Alert

If the error is . . .	*Students may . . .*	*To support understanding . . .*
8	have just counted the squares that are partially filling the rectangle.	Have students reread the problem. Ask them if the rectangle is filled with just 8 squares. Point out the part of the rectangle that is not filled.
12	have just counted the additional squares that are needed to finish partitioning the rectangle.	Have students reread the problem. Ask them to count the number of squares in each row and write an addition equation to show how many squares are needed to fill the entire rectangle.
any other number	have drawn the squares incorrectly.	Remind students that the rectangle has the same number of squares in each row and in each column. Help students correct their drawings and try to solve the problem again.

Solutions

1 Possible answer: There are 8 shapes in the rectangle, but not all of them are squares that are the same size. Nick could draw one more line inside the rectangle to make all the shapes squares. Then he would have a total of 10 squares inside of his rectangle.
Challenge

2 **a.** See student page.

b. See student page.
Challenge

Name: _____ LESSON 30 SESSION 3

Practice Partitioning Rectangles

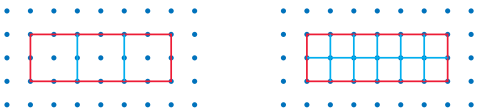
1 Nick drew this rectangle.

He says that there are a total of 8 squares in his rectangle. What is Nick's mistake, and how can he fix it?

Possible answer: There are 8 shapes in the rectangle, but not all of them are squares that are the same size. Nick could draw one more line inside the rectangle to make all the shapes squares. Then he would have a total of 10 squares inside his rectangle.

Count the squares inside the rectangle.

2 The two outlined rectangles are the same size.



a. Break apart the rectangle into the fewest number of same-size squares you can.

How many squares did you use? 3

b. Break apart the rectangle into the greatest number of same-size squares you can.

How many squares did you use? 12

Think about the size of the squares.

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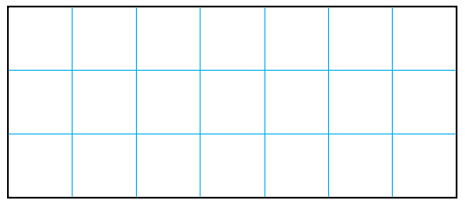
3 3 rows of 7 squares each
Medium

4 **C, E**
Challenge

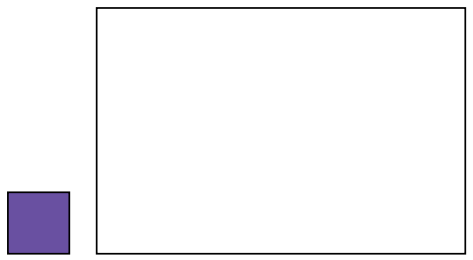
3 Anuj has 21 squares of colored paper. Show how he can arrange the squares to form a rectangle.



Possible answer: 21 can be arranged using 3 rows of 7 squares.

Make sure each square is the same size.

4 Which equations show how Trish can find the number of purple squares it will take to fill the rectangle?



Ⓐ 1 + 1 + 1 + 1 = ?

Ⓑ 1 + 1 + 1 + 1 + 1 + 1 = ?

Ⓒ 4 + 4 + 4 + 4 + 4 + 4 = ?

Ⓓ 6 + 4 = ?

Ⓔ 6 + 6 + 6 + 6 = ?

You can think about rows and columns.

LESSON 30

SESSION 4 Refine

Purpose In this session, students gain fluency with using squares to partition a rectangle.

Start

Develop Fluency

Why Support students' facility with using squares to partition a rectangle.

How Have students use any strategy they choose to solve a problem about partitioning a rectangle.

How many of the small squares would you need to fill the rectangle?

Solution
8

APPLY IT

1 **A, E**
DOK 2

2 No; Possible explanation: Craig needs to put the squares into rows and columns so that the rectangle can be filled without gaps.
DOK 3

3 **C**
DOK 2

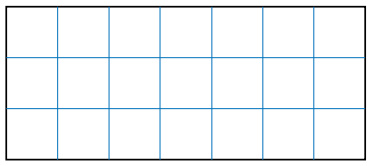
4 **a.** 12 more squares
b. 16 squares
DOK 2

LESSON 30 SESSION 4 ● ● ● ●

Refine Partitioning Rectangles

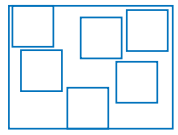
APPLY IT

1 Winny fills this rectangle with squares. Which statements describe her rectangle?



Ⓐ There are 3 rows of 7 squares.
Ⓑ There are 7 rows of 2 squares.
Ⓒ There are 8 rows of 3 squares.
Ⓓ There are 6 columns of 3 squares.
Ⓔ There are 7 columns of 3 squares.

2 Craig is partitioning this rectangle with squares. Will he find the correct number of squares that fills the rectangle? Explain.



No; Possible answer: Craig needs to put the squares into rows and columns so that the rectangle can be filled without gaps.

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Differentiated Instruction

RETEACH

Hands-On Activity

Create a rectangular mosaic.

Students struggling with partitioning a rectangle with no gaps or overlaps

Will benefit from additional work with creating a partitioned rectangle.

Materials For each student: Activity Sheet *1-Inch Grid Paper*, at least twelve 2-inch squares in varied colors cut from Activity Sheet *2-Inch Grid Paper*, glue

- Before distributing the 1-inch grid paper, cut off one column of squares so that the grid has rows of 6 squares and columns of 8 squares.
- Tell students that they are to make a rectangular design, using 24 of the 2-inch squares, on the paper grid. Suggest that they arrange the squares on the grid paper before gluing to ensure they like the design.
- Have students glue the squares on the paper, reminding them to stay within the grid lines. Provide a place for students to display their designs when completed.

Close: Exit Ticket

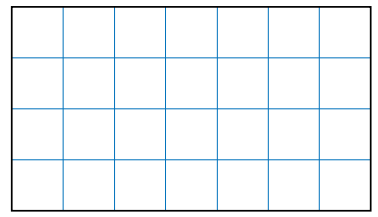
5 MATH JOURNAL

Student responses should indicate understanding that addition could be used to find the total number of squares by adding the number of squares in each row or column. Students could write and solve the addition equation $2 + 2 + 2 + 2 + 2 = 10$ to add the squares in each row or solve the addition equation $5 + 5 = 10$ to add the squares in each column. Students also could skip-count by two 5 times or skip-count by five 2 times in order to determine that the rectangle is partitioned into 10 squares.

Error Alert **If** students are unable to clearly explain how to find the number of squares that the rectangle is partitioned into using two different ways, **then** ask students to count the number of squares in one row and have them suggest how they could use that number to find the number of squares in all of the rows. Repeat the procedure for finding the number of squares in one column and then in two columns.

☑ SELF CHECK Have students consider whether they feel they are ready to check off any new skills on the Unit 5 Opener.

3 Luis fills this rectangle with equal-sized squares. Which equation could he use to find the total number of squares?



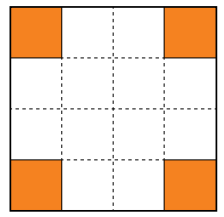
Ⓐ $4 + 7 = 11$

Ⓑ $7 + 7 + 7 = 21$

Ⓒ $7 + 7 + 7 + 7 = 28$

Ⓓ $4 + 4 + 4 + 4 + 4 + 4 = 24$

4 Jamal starts making a design with orange squares.



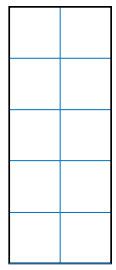
a. How many more squares does Jamal need to fill the rectangle?

12 more squares

b. How many squares will Jamal use in all? 16

5 MATH JOURNAL

What are two different ways you can find the total number of squares in this partitioned rectangle?



Possible answer: There are 5 rows, and each row has 2 squares. I can add 5 two times, $5 + 5 = 10$. I can also add 2 five times: $2 + 2 + 2 + 2 + 2 = 10$. The rectangle is partitioned into 10 squares.

☑ SELF CHECK Go back to the Unit 5 Opener and see what you can check off.

EXTEND

Challenge Activity

Find all the ways to fill a rectangle.

Students who have achieved proficiency with using squares to partition rectangles

Will benefit from deepening understanding of determining what sizes of squares can be used to partition different rectangles.

Materials For each student: 12 in. × 18 in. sheet of construction paper, inch ruler

- Distribute the sheets of construction paper, but do not tell students the size of the paper.
- Tell students that their challenge is to find out what sizes of squares they could use to partition this rectangular paper. They may only consider squares that are whole-inch sizes, such as 1-inch, 2-inch, 3-inch, and so on.
- Tell students that they need to find *all* the possible sizes of squares that would work and justify why those are the *only* sizes that would work.

PERSONALIZE

i-Ready

Provide students with opportunities to work on their personalized instruction path with *i-Ready* Online Instruction to:

- fill prerequisite gaps
- build up grade-level skills