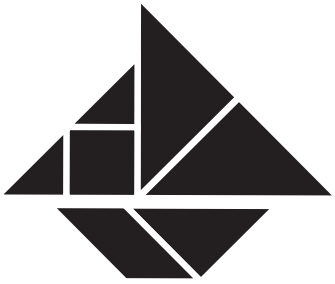

Teachers Guide

GRADE 3 – UNIT 5 – MODULE 4

Preview

BRIDGES®
IN MATHEMATICS

Preview

Module 4

Introducing Area

Session 1 Paper Rectangles 3

Session 2 Finding Areas Large & Small 9

Session 3 Measuring Area in Customary Units 13

Session 4 Rainbow Rectangles 17

Session 5 Adding Areas 23

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Teacher Masters

Pages renumber with each module.

Division Checkpoint T1

Rectangles T2

Rectangle Z T3

Areas for Chickens T4

Unit 5 Post-Assessment T5

Student Book Pages

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Grid Paper 175

More Multiplication Arrays 176

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Grid Paper 179

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Page numbers correspond to those in the consumable books.

Division & Fraction Review 95

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Playing with Area 99

Preview

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Preview

Module 4
Introducing Area

Overview

This module introduces the concept of area, which will be addressed in greater depth during Unit 6. Over the course of five sessions, students come to understand that area is an attribute of plane figures such as rectangles and squares, and is measured in square units. After measuring paper rectangles and surfaces around the classroom in nonstandard units, students move into estimating and measuring area in customary units: square inches, square feet, and square yards. In Sessions 4 and 5, they begin to investigate the link between area and multiplication, discovering that the area of a rectangle can be efficiently calculated by multiplying its side lengths. Students take the Unit 5 Post-Assessment in Session 6.

Planner

Session	P&I	MF	WP	A	HC	DP
Session 1 Paper Rectangles This is the first of five sessions related to area. After completing a brief checkpoint on division, students explore the concept of area by covering four different paper rectangles with square tile units and then copying them onto grid paper.	●			●	●	●
Session 2 Finding Areas Large & Small Students use construction paper squares to find the area of several different classroom surfaces. They also determine the area of several smaller rectangles that are already marked with square units.	●		●			●
Session 3 Measuring Area in Customary Units Students consider the fact that area is usually measured in standard, or commonly agreed upon, units. They measure the dimensions of a colored tile to find that it has an area of 1 square inch. After that, the teacher displays two squares of paper and works with the class to find the area of each. Students brainstorm some items that might be best measured in each of these units and then measure the cover of their student journal in square inches.	●		●		●	●
Session 4 Rainbow Rectangles Students estimate and measure the area of paper rectangles in square inches, working toward increasingly efficient methods, such as multiplying the side lengths.	●		●			●
Session 5 Adding Areas After sharing what they've learned about area so far, students decompose a rectangle into smaller regions and discover that the sum of the areas of the smaller parts equals the area of the original rectangle. Then they solve a story problem that involves adding two areas. The teacher solicits students' solutions to the problem and invites volunteers to share their thinking.	●		●		●	●
Session 6 Unit 5 Post-Assessment Students take the Unit 5 Post-Assessment and then go to Work Places.			●	●		●

P&I – Problems & Investigations, **MF** – Math Forum, **WP** – Work Place, **A** – Assessment, **DP** – Daily Practice, **HC** – Home Connection

Preview

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Materials Preparation

Each session includes a complete list of the materials you'll need to conduct the session, as well as notes about any preparation you'll need to do in advance. If you would like to prepare materials ahead of time for the entire module, you can use this to-do list.

Task		Done
Copies	Run copies of Teacher Masters T1–T8 according to the instructions at the top of each master.	
	Run a single display copy of Student Book pages 177–178, 181 and 183.	
	If students do not have their own Student Books, run a class set of Student Book pages 175–186.	
	If students do not have their own Home Connections books, run a class set of the assignments for this module using pages 95–100 in the Home Connections Book.	
Paper Cutting	Before Session 2, follow preparation instructions to cut 16 four-inch squares of construction paper per student.	
	Before Session 4, prepare a set of 6 construction paper rectangles in the following colors and sizes for each group of 4 students: 6″ × 9″ (blue), 7″ × 8″ (green), 9″ × 9″ (yellow), 8″ × 10″ (red), 10″ × 12″ (purple), 12″ × 12″ (orange).	

Additional Resources

Please see this module's Resources section of the Bridges Educator site for a collection of resources you can use with students to supplement your instruction.

Preview

Session 1
Paper Rectangles

Summary

This is the first of five sessions related to area. After completing a brief checkpoint on division, students explore the concept of area by covering four different paper rectangles with square tile units and then copying them onto grid paper. At the end of the session, the teacher assigns the Division & Fraction Review Home Connection.

Skills & Concepts

- Solve division story problems with dividends to 100 involving situations of equal groups (3.OA.3)
- Solve division problems by finding an unknown factor (e.g., solve 32 ÷ 8 by finding the number that makes 32 when multiplied by 8) (3.OA.6)
- Demonstrate an understanding that a square with a side length of 1 unit is called a "unit square" and has 1 square unit of area (3.MD.5a)
- Demonstrate an understanding that unit squares can be used to measure the areas of other plane figures (3.MD.5a)
- Demonstrate an understanding that a plane figure that can be covered without gaps or overlaps by *n* unit squares has an area of *n* square units (3.MD.5b)
- Measure the area of a plane figure by counting the number of square units that cover it, with no gaps or overlaps (3.MD.6)
- Find the area of a rectangle with whole-number side lengths by tiling it (3.MD.7a)
- Model with mathematics (3.MP.4)
- Attend to precision (3.MP.6)

Materials

Copies	Kit Materials	Classroom Materials
Assessment Division Checkpoint		
TM T1 Division Checkpoint	• colored tiles • red linear pieces	
Problems & Investigations Paper Rectangles		
TM T2 Rectangles (see Preparation) **TM T3** Rectangle Z **SB 175** Grid Paper	• colored tiles (about 30 per student pair, as well as a set for display) • Word Resource Card for *area* • tangrams (3 sets, optional for challenge suggestion)	• scissors (class set) • rulers (class set) • crayons or colored pencils (class set)
Home Connection		
HC 95–96 Division & Fraction Review		
Daily Practice		
SB 176 More Multiplication Arrays		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

area*
dimension*
divide*
equation*
estimate*
measure
multiply*
rectangle*
square*
square unit*

Preview

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Preparation

- Run a half-class set of the Rectangles Teacher Master on 3 or 4 different colors of copy paper. This will make it easier for the students to keep their work separate from the work of others nearby.
- Organize your colored tiles so each student pair will have easy access to about 30, and you'll also have a set for display. (Students will also need to be able to access colored tiles and red linear pieces if they choose to use them to help with the problems on the Division Checkpoint.)

Assessment

Division Checkpoint

Assessment Guide

See the Grade 3 Assessment Guide for scoring and intervention suggestions.

1 Open the session by telling students they will take a quick checkpoint on division. Then they will do a new measuring activity.

2 Display the Division Checkpoint, and give each student a copy. Give students a minute to look over it and ask any questions, and then have them begin.

- Encourage students to read each question carefully, and remind them they can ask you for help reading any of the questions.
- Let them know that they are welcome to use the colored tiles and red linear pieces to help with any of the problems on the assessment, and tell them how to access these materials if they need them.
- Remind students to work quietly by themselves.
- While students work, circulate around the room to make observations and answer questions.
- Give students about 15 minutes or so to do the checkpoint.
- If some students finish earlier than others, ask them to read quietly.

3 Collect students' checkpoints.

SUPPORT Since this is not a timed test, give students who are unable to complete the work more time to finish later in the day or early the next day.

Preview

Problems & Investigations

Paper Rectangles

4 Move into this part of the session by posting the Word Resource Card for *area* on the whiteboard and giving students a minute to share anything they already know about this term.

Students *It's something with shapes.*

I think it's a kind of measuring.

I think it's about how big some shapes are, like rectangles and triangles.

5 Explain that when people measure area, they find out how many square units it takes to cover a shape. Today, students are going to use the colored tiles to measure the area of several different rectangles.

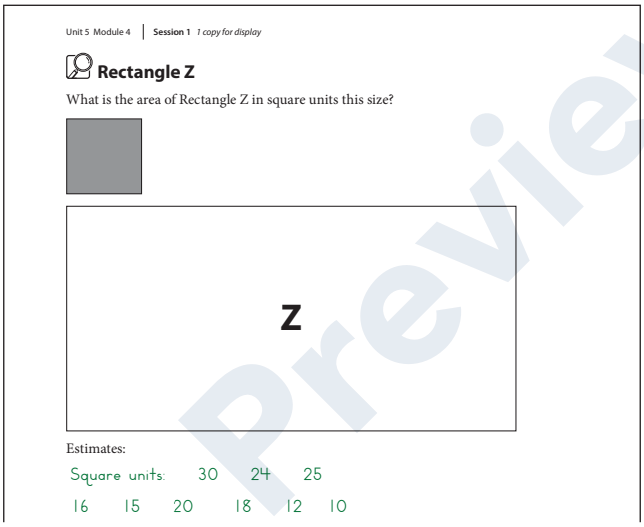
6 Ask students to pair up, or assign partners. Give each pair a copy of the Rectangles Teacher Master, along with about 50 colored tiles.

If you give each pair at a table a different color sheet, they'll be able to keep track of their own rectangles more easily.

- Have them work together to cut apart the four rectangles along the heavy lines.
- If someone mentions that one of the shapes on the sheet is a square, ask the class to consider how a square a special kind of rectangle, one with four equal sides.

7 As the first pairs finish cutting their rectangles apart, reconvene the class and have students set their materials aside for a minute. Display the Rectangle Z Teacher Master, and discuss it with the class.

- Read the text aloud and ask students to estimate how many square units it would take to measure the area of the rectangle. That is, how many units would it take to cover the entire rectangle, without leaving any holes, gaps, or overlaps?
- Record some of their estimates, and then cover the rectangle with colored tiles as they watch.


Unit 5 Module 4 | Session 1 *1 copy for display*

Rectangle Z

What is the area of Rectangle Z in square units this size?

Z

Estimates:

Square units: 30 24 25

16 15 20 18 12 10

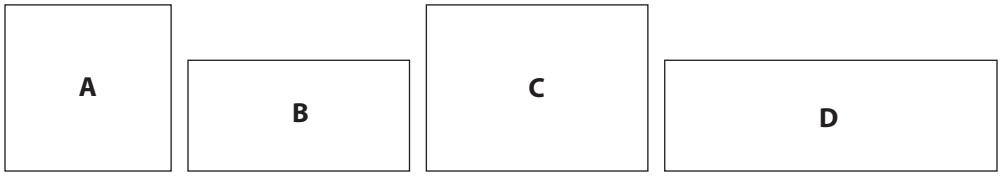
Preview

8 Ask students to whisper the number of square units it actually took to cover the rectangle.

- Can they figure it out without counting the tiles one by one? Perhaps they see 3 rows of 6, or 3 × 6. Others may skip-count by 3s or by 6s, and some may see 2 groups of 6 plus 6 more.
- Write the actual area on the sheet once students agree that it's 18 square units.

9 Now have them return to their own paper rectangles. Before they measure the area of the rectangles with colored tiles, ask them to use their estimation skills to place the four in order, from smallest to greatest area.

Have them discuss their thinking with their partners as they sequence the rectangles, and then choose a few volunteers to share their ideas with the class.



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Student *We put them on top of each other, like if you put A on top of C, you can see that C is bigger, and D is bigger than B. We're not totally sure about A and B, but we think it's right.*

10 Next, ask students to use colored tiles to determine the area of each rectangle.

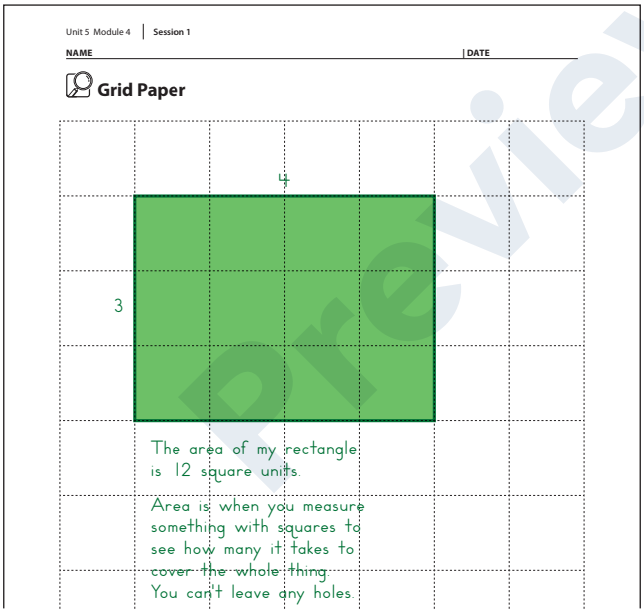
- Press them to use efficient computation strategies rather than counting the tiles one by one.
- Have them record the area directly on the paper rectangles.
- Circulate as students are working to observe and provide support as needed. Encourage students to compare their results with the estimates they made earlier.

Some of the students may be surprised to discover that rectangles C and D actually have the same area (12 square units).

11 When the pairs have measured the area of all four rectangles, have them find the Grid Paper Student Book page in their books. Ask each student to copy one of the rectangles onto the grid paper by coloring in the correct number of square units.

They may want to outline the rectangle using a pencil and ruler before coloring it in.

- Then have them label its dimensions and area.
- At the bottom of the grid paper, have students write what they know about area right now.



CHALLENGE If some of your students need more of a challenge, have them draw triangles or parallelograms on a piece of grid paper and find the area of these shapes in square units.

CHALLENGE Using one or more sets of the tangrams from your Bridges Kit, have students use their estimation skills to order the 7 pieces by area. Then have them use the square in the tangram set to find the area of the other pieces. (If the square is assigned an area of 1 unit, each small triangle has an area of ½. The medium triangle and the parallelogram each have an area of 1 square unit. The area of the large triangle is 2 square units.)

12 At the end of class, close the session.

- Have students clean up and put away their materials.
- Invite a few students to share something they have learned about area today.

Preview

Home Connection

13 Introduce and assign the Division & Fraction Review Home Connection, which provides more practice with the following skills:

- Interpret quotients of whole numbers (3.OA.2)
- Fluently divide with dividends to 100 using strategies (3.OA.7)
- Solve two-step story problems using addition, subtraction, multiplication and division; solve these equations with a letter standing for the unknown quantity (3.OA.8)
- Demonstrate an understanding of a fraction a/b as a equal parts, each of which is $1/b$ of a whole (3.NF.1)
- Place fractions in their correct positions on a number line (3.NF.2)
- Identify equivalent fractions by comparing their sizes (3.NF.3a)
- Recognize simple equivalent fractions and explain why two fractions must be equivalent (3.NF.3b)

Daily Practice

The optional More Multiplication Arrays Student Book page provides additional opportunities to apply the following skills:

- Interpret products of whole numbers (3.OA.1)
- Multiply using the distributive property (3.OA.5)
- Fluently multiply with products to 100 using strategies (3.OA.7)

Preview

Preview

Session 2
Finding Areas Large & Small

Summary

Students use construction paper squares to find the area of several different rectangular surfaces in the classroom. They also determine the area of several smaller rectangles that are already marked with square units. When they complete the assignment, students spend the remainder of the session at Work Places.

Skills & Concepts

- Demonstrate an understanding that a square with a side length of 1 unit is called a "unit square" and has 1 square unit of area, and can be used to measure the areas of other plane figures (3.MD.5a)
- Demonstrate an understanding that a plane figure that can be covered without gaps or overlaps by *n* unit squares has an area of *n* square units (3.MD.5b)
- Measure the area of a plane figure by counting the number of square units that cover it, with no gaps or overlaps (3.MD.6)
- Find the area of a rectangle with whole-number side lengths by tiling it (3.MD.7a)
- Model with mathematics (3.MP.4)
- Attend to precision (3.MP.6)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Finding Areas Large & Small		
SB 177–178* Finding Areas Large & Small **SB 179** Grid Paper		• 12″ × 18″ construction paper in any color (1 piece per student, see Preparation) • a piece of copy paper • 2 or 3 pieces of 18″ × 24″ chart paper
Work Places in Use		
4C Target One Thousand (introduced in Unit 4, Module 2, Session 3) **4D** Hexagon Spin & Fill (introduced in Unit 4, Module 3, Session 3 **5A** Solving Game Store Problems (introduced in Unit 5, Module 1, Session 6) **5B** Scout Them Out (introduced in Unit 5, Module 2, Session 2) **5C** Line 'Em Up (introduced in Unit 5, Module 3, Session 3) **5D** Division Capture (introduced in Module 3, Session 4)		
Daily Practice		
SB 180 Finding More Areas		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master. ** Run 1 copy of these pages for display.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

area*
dimension*
estimate*
measure
rectangle*
square*
square unit*

Preparation

- Each student pair needs 32 four-inch squares for today's activity. A sheet of 12″ × 18″ construction paper can be cut into 16 four-inch squares, so you just need to count out and cut 1 sheet per student. It's best if each student's squares are all of one color. Students will need these squares to complete the Finding More Areas Daily Practice Sheet in their Student Books, so be sure to save them.
- Write a list of Work Places from which students can choose today. You can just write the numbers (4C–5D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)

Preview

Problems & Investigations

Finding Areas Large & Small

1 Open the session by letting students know that they're going to be working in pairs to measure some rectangular surfaces around the classroom with larger square units today.

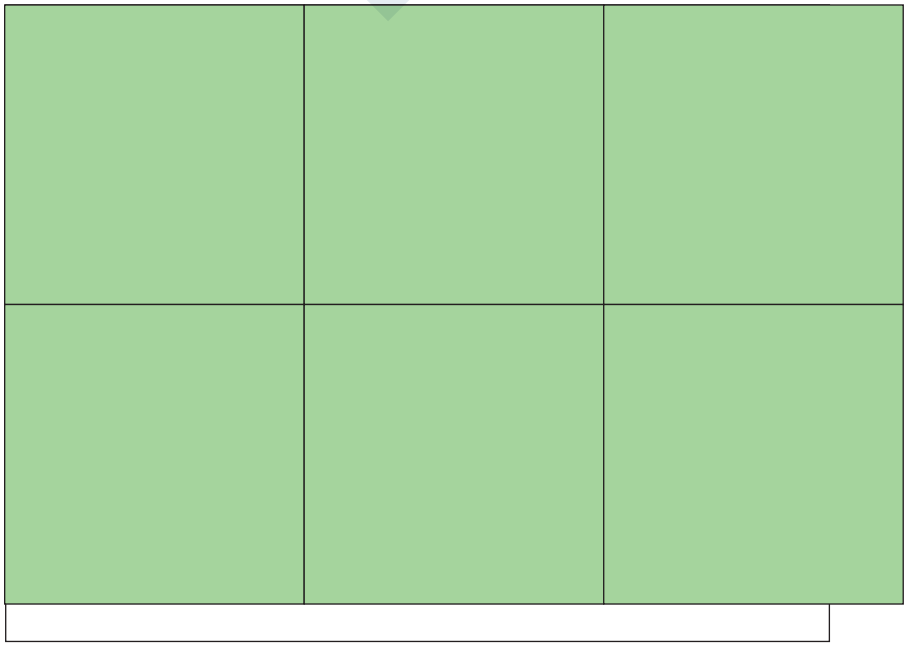
- Ask students to identify by name what aspect of the surfaces they'll be measuring.
- Then ask them to share, first in pairs and then as a class, what they know about measuring area right now.

> ***Teacher*** *When we measure the surface of something with square units, what are we measuring?*
>
> ***Students*** *Area!*
>
> ***Teacher*** *What do you know about area and how to measure it? Please talk to the person next to you for a minute, and then we'll have some people share with the class.*
>
> ***Students*** *Area is like covering something.*
>
> *You have to see how many squares it takes to cover something like a rectangle or a square.*
>
> *When you measure area, you can't leave any holes between the squares or lay any squares on top of each other.*

2 Show students one of the 4″ paper squares you've cut, along with a piece of copy paper. Ask them to think privately about how many of the squares it might take to cover the piece of paper.

3 Ask volunteers to share their estimates with the class. Then use some of the squares to cover a piece of copy paper as the students watch.

- Note with them that the measurements aren't exact. The paper squares run a little over the length of the paper and don't quite cover the width.
- What would they say the approximate measurement is in square units?



Math Practices in Action 3.MP.6

When students are just beginning to understand that area is an attribute of a plane figure that can be measured in square units, it makes good sense for them to measure area using those square units, instead of measuring in linear units and then multiplying. By considering the fractional parts of the square unit, they are attending to precision as best they can and, in so doing, are deepening their understanding of area.

Preview

Students *The squares go over the end, but they don't quite cover the paper to the bottom.*

If you think about cutting the extra off and putting it on the bottom, it's about 6.

Yeah, I'd say the paper is about 6 squares big.

Teacher *So we can say that the approximate area of this paper is 6 square units, correct?*

4 Then explain that they're going to work in pairs to measure some different surfaces around the classroom.

- Display a copy of the Finding Areas Large & Small Student Book page 1, and have students find the page in their books.
- Review the headings at the top of the page with the class. Note with students that to complete this part of the assignment they'll need to work with their partners to:
  - » Locate each of the items shown on the sheet and estimate the area in large paper squares.
  - » Measure each item and record its approximate area
  - » Find and record the difference between their estimate and the approximate measure

5 Review and clarify the second part of the assignment as necessary, and then let students get started.

To reduce the amount of classroom traffic, you might want to have half of the pairs complete page 2 first and then do the first page.

6 As students complete both parts of the Finding Areas Large & Small assignment in their books, have them share and compare their work with at least one other student pair.

- If their answers aren't the same on the first page, encourage the students to work together to either find the reason for the discrepancy (e.g., perhaps each pair measured a different-sized desk or table, and so got different answers).
- If their answers on the second page don't match, ask them to work together to determine the correct answers and revise their work as needed.

Preview

Work Places

7 When students have finished the assignment, invite them to spend the remainder of the session at Work Places.

Have them pick up their Work Place folders and a pencil, and remind them to fill out their Work Place Logs as they finish each activity.

SUPPORT Suggest specific Work Places for struggling students to work on critical skills.

CHALLENGE Encourage students to think about the strategies they are using and share their thinking. Encourage them to generalize what happens in certain Work Places.

8 At the end of class, close the session.

- Have students clean up and put away their materials.
- Invite a few more students to share something they have learned about area over the past two sessions.

Daily Practice

The optional Finding More Areas Student Book page provides additional opportunities to apply the following skills:

- Demonstrate an understanding that a square with a side length of 1 unit is called a "unit square" and has 1 square unit of area (3.MD.5a)
- Demonstrate an understanding that unit squares can be used to measure the areas of other plane figures (3.MD.5a)
- Demonstrate an understanding that a plane figure that can be covered without gaps or overlaps by *n* unit squares has an area of *n* square units (3.MD.5b)
- Measure the area of a plane figure by counting the number of square units that cover it, with no gaps or overlaps (3.MD.6)

Note Students will need to work in pairs, and each pair will need 32 four-inch squares to complete the Finding More Areas Daily Practice sheet, so this Daily Practice page will probably not work well as a homework assignment.

Preview

Session 3

Measuring Area in Customary Units

Summary

Today, students consider the fact that area is usually measured in standard, or commonly agreed upon, units. They measure the dimensions of a colored tile to find that it has an area of 1 square inch. After that, the teacher displays two squares of paper and works with the class to find the area of each (1 square foot and 1 square yard). The students brainstorm some items that might be best measured in each of these units and then measure the cover of their math journals in square inches. When they complete the assignment, students spend the remainder of the session at Work Places. Finally, the teacher assigns the Unit 5 Review Home Connection.

Skills & Concepts

- Demonstrate an understanding that a square with a side length of 1 unit is called a "unit square" and has 1 square unit of area, and can be used to measure the areas of other plane figures (3.MD.5a)
- Demonstrate an understanding that a plane figure that can be covered without gaps or overlaps by *n* unit squares has an area of *n* square units (3.MD.5b)
- Measure the area of a plane figure by counting the number of square inches that cover it, with no gaps or overlaps (3.MD.6)
- Find the area of a rectangle with whole-number side lengths by tiling it (3.MD.7a)
- Model with mathematics (3.MP.4)
- Use appropriate tools strategically (3.MP.5)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Measuring Area In Customary Units		
SB 181* Measuring My Math Journal	• colored tiles (at least 80 per student pair) • Word Resource Card for *area*	• 12″ × 12″ piece of construction paper in a light color • 36″ × 36″ piece of butcher paper in a different light color • rulers (class set) • yardstick or measuring tape • blue masking tape
Work Places in Use		
4C Target One Thousand (introduced in Unit 4, Module 2, Session 3) **4D** Hexagon Spin & Fill (introduced in Unit 4, Module 3, Session 3 **5A** Solving Game Store Problems (introduced in Unit 5, Module 1, Session 6) **5B** Scout Them Out (introduced in Unit 5, Module 2, Session 2) **5C** Line 'Em Up (introduced in Unit 5, Module 3, Session 3) **5D** Division Capture (introduced in Module 3, Session 4)		
Home Connection		
HC 97–98 Unit 5 Review		
Daily Practice		
SB 182 Areas to Find		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master. ** Run 1 copy of this page for display.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

area*
customary system*
dimension*
estimate*
measure
rectangle*
square*
square inch (in.)*
square foot (ft.)*
square yard (yd.)*

Preparation

Write a list of Work Places from which students can choose today. You can just write the numbers (4C–5D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)

Preview

Problems & Investigations

Measuring Area in Customary Units

1 Open the session by posting the Word Resource Card for *area* on the whiteboard and taking a minute to review this term with the class.

Be sure students understand that when people measure area, they find the total number of square units needed to cover a two-dimensional surface.

2 Talk with students about measuring in nonstandard and standard units.

- Recall with students that when they were in kindergarten and first grade, they may have measured length in with paperclips, craft sticks, and the like, by placing these units end-to-end and then counting them. By second grade, they were probably measuring length in inches, feet, centimeters, and meters with rulers, yardsticks, measuring tapes, and meter sticks.
- Briefly discuss with the class the need for standard units. Why do people usually measure length in inches and feet instead of paperclips and Popsicle sticks? Can students give examples of other standard units they've used to measure length, weight, or liquid volume?
- Explain that people measure area in standard units as well, and let them know that today they'll investigate some of these.

3 Work with students to find the dimensions and area of a single colored tile.

- Ask them to get out their rulers while you or a helper places a good supply of colored tiles at each table or cluster of desks.
- Have each student take 1 colored tile from the supply and measure its dimensions—length and width.
- When there is general agreement that the length and width of a colored tile are 1 inch, explain that a square unit with dimensions of 1 inch by 1 inch is called a *square inch*.
- Fasten 1 colored tile to the whiteboard with a small loop of blue (removable) masking tape. Work with input from the students to label its dimensions and record its area on the board.

4 Then work with students to find the dimensions and area of the construction paper square you prepared.

- As students watch, fasten the 12″ × 12″ piece of construction paper to the whiteboard. Ask students to share, first in pairs and then as a class, ideas about the area of this piece of paper.

> ***Teacher*** *What do you think the area of this square is? Talk with the person next to you. Then we'll have people share ideas with the class.*
>
> ***Students*** *It's big!*
>
> *Way bigger than that little tile.*
>
> *It looks like it would take about 100 of those tiles to cover the paper, so maybe it's 100 square inches.*
>
> *Or maybe it's a thousand square inches. It's really big!*

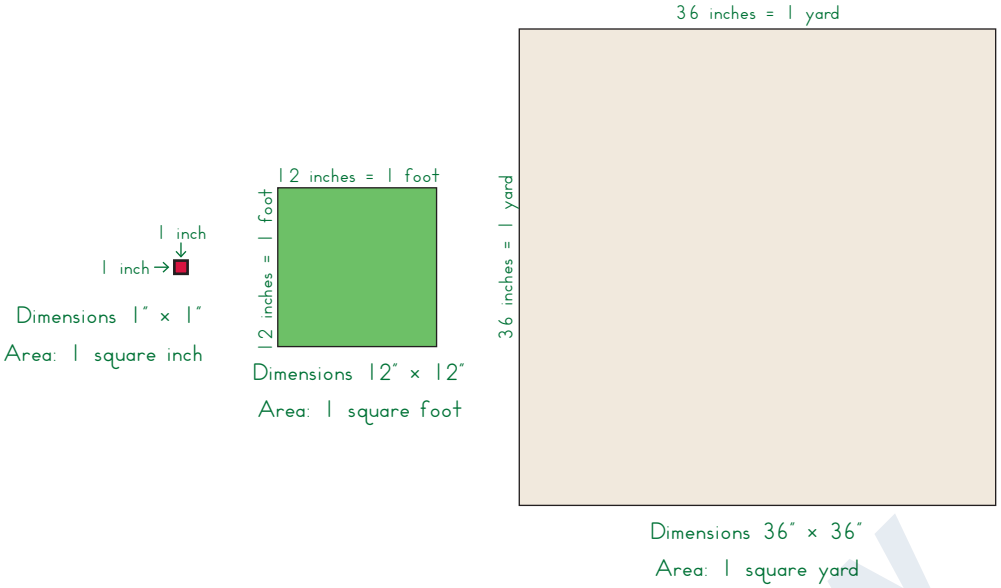
- After some discussion, have one of the students bring a ruler up to the board and measure the dimensions of the square.
- Work with input from the class to label the dimensions of the construction paper square.
- Then explain that because 12″ is the same as a foot, people call this unit of area a *square foot*.

5 Repeat the actions described in step 4 with the butcher paper square.

This time, call two students up to do the measuring, and offer them a choice of tools—a ruler, a yardstick, and a measuring tape.

Preview

The display on the board will look something like this when you finish. If possible, find a place in the classroom to recreate this display later, and leave it up for students' reference over the next week or two; longer if you can.



CHALLENGE Invite interested students to find the area of the square foot and the square yard in square inches and the area of the square yard in square feet, during Work Places or at another time. Offer them the use of any of the measuring tools you have in the classroom, and encourage them to invent their own methods. Have them record and post their discoveries where their classmates can see them.

6 Ask students to consider some of the things they might measure in square inches, square feet, or square yards.

Pose several examples and ask them to share, first in pairs and then as a class, which of the three units they would use to measure each item, and why. Examples you might pose include:

- The area of the rug in your classroom
- The area of the playground at your school
- The area of a student desk or table
- The area of the whiteboard
- The area of an index card (hold one of these up for students to see before they respond)

7 Now ask the students to take out their math journals, turn to the upside-down handbook section at the back, and record the phrases *square inches*, *square feet*, and *square yards*. Then ask them to record at least one object they would measure with each unit.

8 When they have finished writing, ask students to share their ideas as you record them at the board or the projector.

Encourage students to add to the lists in their journals as others share their suggestions.

9 Display a copy of the Measuring My Math Journal Student Book page as students find the page in their books.

- Review the sheet together, and discuss the measuring tools available to them. Which might be most efficient?
- Note with them that the supply of colored tiles in the room is limited, so they will either need to share with at least one other person—probably more—or come up with ways to accomplish the task without entirely covering the front of their journal with tile.

Preview

10 Once students understand what to do, have them get started.

Circulate as they work, and continue to encourage them to devise methods that are more efficient than covering their math journals with tile and then counting the tile one by one.

Work Places

11 When students have finished the assignment, invite them to spend the remainder of the session at Work Places.

Have them pick up their Work Place folders and a pencil, and remind them to fill out their Work Place Logs as they finish each activity.

SUPPORT Suggest specific Work Places for struggling students to work on critical skills.

CHALLENGE Encourage students to think about the strategies they are using and share their thinking. Encourage them to generalize what happens in certain Work Places.

12 At the end of class, close the session.

- Have students clean up and put away their materials.
- Invite students to add a few more ideas to the class list of things to measure in square inches, square feet, or square yards. Or, name several different objects and have students respond with the unit of area they'd choose to measure each.

Home Connection

13 Introduce and assign the Unit 5 Review Home Connection, which provides more practice with the following skills:

- Write story problems or describe problem situations to match a multiplication expression or equation (3.OA.1)
- Write story problems or describe problem situations to match a division expression or equation (3.OA.2)
- Solve multiplication and division story problems with products and dividends to 100 involving situations of equal groups (3.OA.3)
- Solve for the unknown in a multiplication or division equation involving 3 whole numbers (3.OA.4)
- Fluently multiply and divide with products and dividends to 100 using strategies (3.OA.7)
- Demonstrate that the area of a rectangle with whole-number side lengths can be found by multiplying the side lengths (3.MD.7a)

Daily Practice

The optional Areas to Find Student Book page provides additional opportunities to apply the following skills:

- Fluently multiply with products to 100 using strategies (3.OA.7)
- Demonstrate that the area of a rectangle with whole-number side lengths can be found by multiplying the side lengths (3.MD.7a)

Preview

Session 4
Rainbow Rectangles

Summary

Students estimate and measure the area of paper rectangles in square inches, working toward increasingly efficient methods, such as multiplying the side lengths.

Skills & Concepts

- Measure the area of a plane figure by counting the number of square inches that cover it with no gaps or overlaps (3.MD.6)
- Find the area of a rectangle with whole-number side lengths by tiling it (3.MD.7a)
- Demonstrate that the area of a rectangle with whole-number side lengths can be found by multiplying the side lengths (3.MD.7a)
- Find the area of a rectangle by multiplying its side lengths (3.MD 7b)
- Reason abstractly and quantitatively (3.MP.2)
- Look for and express regularity in repeated reasoning (3.MP.8)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Rainbow Rectangles		
SB 183* Rainbow Rectangles	• colored tiles (at least 80 per student pair)	• construction paper rectangles (see Preparation) • rulers (class set) • tape
Work Places in Use		
4C Target One Thousand (introduced in Unit 4, Module 2, Session 3) **4D** Hexagon Spin & Fill (introduced in Unit 4, Module 3, Session 3 **5A** Solving Game Store Problems (introduced in Unit 5, Module 1, Session 6) **5B** Scout Them Out (introduced in Unit 5, Module 2, Session 2) **5C** Line 'Em Up (introduced in Unit 5, Module 3, Session 3) **5D** Division Capture (introduced in Module 3, Session 4)		
Daily Practice		
SB 184 Estimating & Measuring Area in Square Inches		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master. ** Run 1 copy of this page for display.*

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

area*
customary system*
dimension*
estimate*
measure
multiply*
rectangle*
square inch (in.)*

Preparation

- You will need a set of 6 construction paper rectangles in the following colors and sizes for each group of 4 students: 6″ × 9″ (blue), 7″ × 8″ (green), 9″ × 9″ (yellow), 8″ × 10″ (red), 10″ × 12″ (purple), 12″ × 12″ (orange).
- Write a list of Work Places from which students can choose today. You can just write the numbers (4C–5D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)

Preview

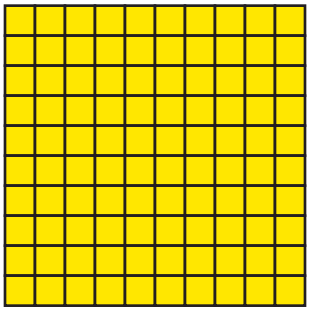
Problems & Investigations

Rainbow Rectangles

1 Explain that you're going to do some more work with area today. Hold up a single colored tile, and ask students to tell you what its area is in square inches.

SUPPORT If necessary, have a volunteer measure the dimensions of the tile. Work with students to review the fact that each of the colored tiles has an area of exactly 1 square inch.

2 Distribute sets of tiles. Ask students to work in groups of four to build a square with an area of exactly 100 square inches. After they've had a few minutes to work, have students share and compare their results.



Students *We thought it was going to be really big, but it's not so big after all.*

We knew it was going to be a 10" × 10" square because 10 × 10 is 100.

We each made 2 rows of 10 and put them together. Then we each made a little row of 5 and hooked them onto the big square. It went pretty fast for us.

3 Ask each group to measure the dimensions of the square they've just built with the inch side of their ruler. What can they tell you about the square now?

As volunteers share with the class, press them to explain their thinking.

Matt *It's 10 inches on both sides.*

Teacher *What is the area of your square, and how do you know?*

Students *It's 100 square inches because that's what you told us to do.*

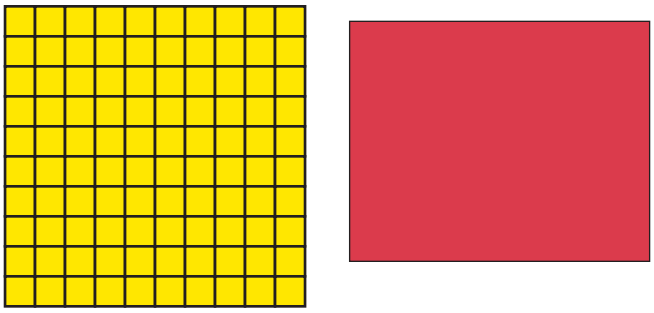
It's 100 square inches because we used 100 tiles, and each tile is 1 square inch.

There are 10 in each row, right? If you count by 10s, you get 100 in all.

If you just multiply 10 × 10, it makes 100.

4 Next, hold up one of the red construction paper rectangles you've prepared. Ask students to estimate the area in square inches, using their tile square as a visual benchmark.

Preview



Students *That paper rectangle is a little smaller than our square.*

I think it's just smaller on one side. Can we hold it up against our square?

Teacher Sure, here it is. If you want to stand up where you are so you can see what Vanessa is doing, go ahead. Raise your hand if you have an estimate. What do you think the area of the red paper rectangle is in square inches?

Students *Less than 100. Maybe about 60.*

I think it's 10 along the top and maybe 7 or 8 inches along the side. I'd say 70 or 80 square inches.

I agree with 70.

5 Now ask student pairs to share ideas for finding the actual area of the red paper rectangle. Challenge them to think of a method that's more efficient than covering the paper with individual tiles.

Some may propose laying the rectangle on top of the tile square they just built. Others may suggest laying tiles across the top to see how wide the paper is, and then laying tiles down the side to see how many rows would be required without actually laying out every single tile.

6 Try some of the suggestions students have made to determine the area of the red paper rectangle. If it doesn't come from the class, propose measuring the side and top of the rectangle and multiplying the two numbers.

Ask students to evaluate your suggestion.

- Will it work?
- Will it yield the same answer as the other methods? Why or why not?

> ***Elena*** *I think it'll work. We already know from holding it right on top of our tiles that it's 10 inches across the top and 8 inches along the side. So 8 × 10 is 80, and we already found out that it's 80 square inches.*

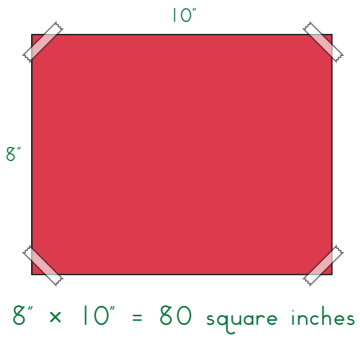
7 Tape the red rectangle to the board. Ask a volunteer to measure and label the dimensions as the others watch. Record the numbers on the board and then have students multiply them.

Ask them to comment on the results. Does the method work? Why?

Math Practices in Action 3.MP.2

In this activity, students are beginning to move from quantitative reasoning about area (counting square units) to more abstract reasoning in which they see that they can multiply the linear dimensions to find the area. In the following session, students will find the areas of rectangles when given their side lengths.

Preview



Students *The 10 tells you how many tiles fit across the top. The 8 tells you how many rows of tiles you'd need.*

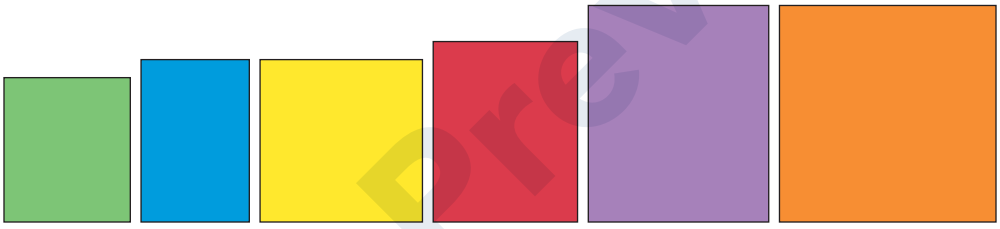
You can just multiply them together to get the answer.

This is cool! It's way faster than covering the paper with tiles.

8 Have students put their tiles away for now, and give each group of four students a set of 6 construction paper rectangles. Ask them to use their estimation skills to place the 6 in order, from least to most area.

- Let them know that the red rectangle in the set is the same size as the one you just measured together.
- Have them discuss their thinking as they sequence the rectangles, and then choose a few volunteers to share their ideas with the class.

Note The illustration below portrays one group's (incorrect) ordering of rectangles; actually, the red rectangle's area is smaller than the yellow rectangle's and the blue's is smaller than the green's.



Jordan *You can definitely see that the orange one is the biggest, and then the purple. It's a little harder to tell with the green and blue, and the yellow and red.*

Austin *We put them on top of each other. We think blue is the smallest, and then green. We're not sure about the yellow and red, but we agree that purple and orange are the biggest.*

9 Display a copy of the Rainbow Rectangles Student Book page, and have students find the page in their books. Review the instructions on the sheet with the class.

- After reviewing the instructions, have students get out their rulers (if they haven't done so already).
- Encourage them to work together in their groups, even though each student needs to complete his or her own sheet.
- Circulate as they work and continue to challenge them to find methods more efficient than covering each of the paper rectangles with tiles and then counting the tiles one by one. If they are multiplying the side lengths to get their answers, press them to explain how and why this method works.

Preview

Work Places

10 When students have finished the assignment, invite them to spend the remainder of the session at Work Places.

Have them pick up their Work Place folders and a pencil, and remind them to fill out their Work Place Logs as they finish each activity.

SUPPORT Suggest specific Work Places for struggling students to work on critical skills.

CHALLENGE Encourage students to think about the strategies they are using and share their thinking. Encourage them to generalize what happens in certain Work Places.

11 At the end of class, close the session.

- Have students clean up and put away their materials.
- Ask students if they can spot anything in the classroom that looks like it has an area of about 1 square inch, 1 square foot, or 1 square yard. Then ask them to be on the lookout for things around the school with these areas.

Daily Practice

The optional Estimating & Measuring Area Student Book page provides additional opportunities to apply the following skills:

- Measure the area of a plane figure by counting the number of square inches that cover it, with no gaps or overlaps (3.MD.6)
- Find the area of a rectangle with whole-number side lengths by tiling it (3.MD.7a)
- Demonstrate that the area of a rectangle with whole-number side lengths can be found by multiplying the side lengths (3.MD.7a)
- Find the area of a rectangle by multiplying its side lengths (3.MD.7b)

Note Students will need access to tiles to do some of the problems on this page, so it will probably not work well as a homework assignment.

Preview

Preview

Session 5
Adding Areas

Summary

After sharing what they've learned about area so far, students decompose a rectangle into smaller regions and discover that the sum of the areas of the smaller parts equals the area of the original rectangle. Then they solve a story problem that involves adding two areas. As they finish the assignment, they go to Work Places. The teacher reconvenes the class shortly before the end of the session, solicits students' solutions to the problem, and invites volunteers to share their thinking. Finally, the teacher introduces and assigns the Playing with Area Home Connection.

Skills & Concepts

- Measure the area of a rectangle by counting the number of square inches that cover it with no gaps or overlaps (3.MD.6)
- Demonstrate that the area of a rectangle with whole-number side lengths can be found by multiplying the side lengths (3.MD.7a)
- Solve story problems involving finding the area of a rectangle (3.MD.7b)
- Use tiling to show that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$ (3.MD.7c)
- Recognize area as additive; find areas of rectangles by decomposing them into non-overlapping rectangles and adding the areas of the parts (3.MD.7d)
- Reason abstractly and quantitatively (3.MP.2)
- Look for and express regularity in repeated reasoning (3.MP.8)

Materials

Copies	Kit Materials	Classroom Materials
Problems & Investigations Adding Areas		
TM T4 Areas for Chickens	• colored tiles (see Preparation) • red linear pieces (see Preparation) • magnetic tiles (see Preparation) • Magic Wall (see Preparation)	• student math journals
Work Places in Use		
4C Target One Thousand (introduced in Unit 4, Module 2, Session 3) **4D** Hexagon Spin & Fill (introduced in Unit 4, Module 3, Session 3 **5A** Solving Game Store Problems (introduced in Unit 5, Module 1, Session 6) **5B** Scout Them Out (introduced in Unit 5, Module 2, Session 2) **5C** Line 'Em Up (introduced in Unit 5, Module 3, Session 3) **5D** Division Capture (introduced in Module 3, Session 4)		
Home Connection		
HC 99–100 Playing with Area		
Daily Practice		
SB 185 Finding More Small Areas		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

area*
dimension*
factor*
length
multiply*
product*
side length
square unit*
width

Preview

Preparation

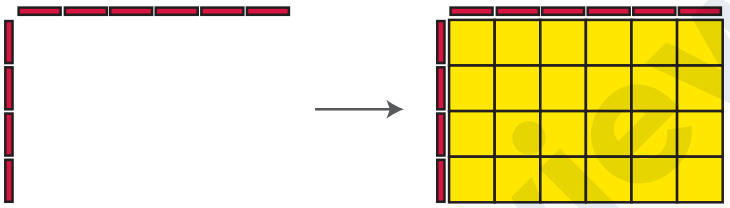
- Write a list of Work Places from which students can choose today. You can just write the numbers (4C–5D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)
- Organize your colored tiles and red linear units so each student has easy access to these materials. You will need a set of tiles and linear units for display as well. If you want to display tile arrangements on the whiteboard or Magic Wall, you can use the foam magnetic tiles from your kit and draw the linear units around them.

Problems & Investigations

Adding Areas

1 Open today's session by asking students to frame and build a tile rectangle.

- Distribute colored tiles and red linear pieces so the students at each table have access to a good supply of these materials.
- Use linear pieces to form a 4-by-6 frame for display. Then ask students to replicate the frame with their red linear pieces and fill it in with tiles, as you fill the frame you've made.



2 Now ask students to record in their journals at least three things they know about area, using the tile rectangle they just built to help generate ideas.

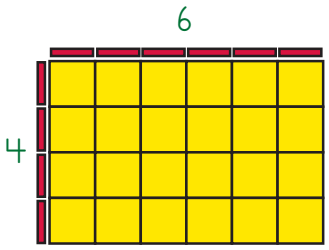
- Have them write the date and the heading *Area* at the top of the next blank page in their journals.
- Encourage them to support their writing with a labeled sketch of their tile rectangle.

3 After students have had time to record their ideas, invite volunteers to share with the class.

As they share, record some of their statements below the tile rectangle you have on display.

> ***Hamid*** *Area is how many squares fit inside a rectangle. It has to be filled up, with no holes or overlaps.*
>
> ***Kaylee*** *The rectangle we just made has an area of 24.*
>
> ***Teacher*** *OK—24 what? What unit should we use when we talk about this measurement?*
>
> ***Kaylee*** *It's 24 square inches, because the tiles are 1 inch long on each side. We measured them a couple days ago.*
>
> *You can see 4 rows of 6 or 6 columns of 4 and either way it adds up to 24 squares. I mean, square inches.*
>
> ***Teacher*** *So you can find area by adding rows or columns of square units. What other math can help find area?*
>
> ***Maria*** *You can multiply the lengths of the sides.*
>
> ***Anthony*** *I agree with you, Maria. The sides are like the numbers you multiply, and the area is the answer. Like with the rectangle we just built, the sides are 4 and 6, and the area is 24. That's just the same as* $4 \times 6 = 24$.

Preview



Area = 24 square inches

4 rows of 6

6 + 6 + 6 + 6 = 24 square inches

6 columns of 4

4 + 4 + 4 + 4 + 4 + 4 = 24 square inches

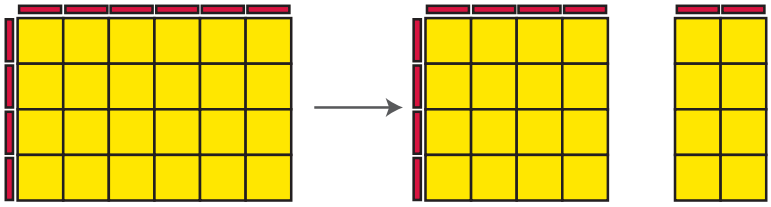
4 × 6 = 24 square inches

4 Now ask students to predict and then investigate the results of separating their tile rectangle into two smaller rectangles. Will the total area of the two smaller rectangles be the same as the area of the original rectangle, or will it change? Why?

> ***Teacher*** *What do you think would happen to the area of your rectangle if you pulled it apart into two smaller rectangles? Talk to the person next to you about this, and then we'll have some folks share their thinking with the class.*
>
> ***Students*** *I kind of don't get it. If you made it into two littler rectangles, they'd each have less area.*
>
> *But if you added up the areas, they'd come out the same, unless you left out some of the tiles from the first rectangle.*

5 As the students watch, pull your 4-by-6 rectangle apart to make two smaller rectangles, as shown here.

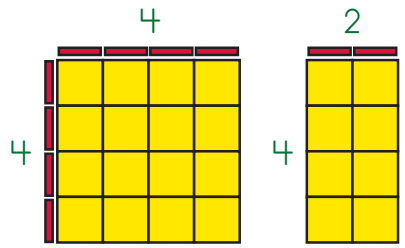
- Then have the students each pull their tile rectangles apart to match what you just did.
- Ask them to share observations about the results, first in pairs and then as a class.



> ***Teacher*** *What happened when we pulled our 4-by-6 rectangle apart to make two smaller rectangles?*
>
> ***Students*** *We got a square and a little rectangle.*
>
> *We got a 4-by-4 square and a 4-by-2 rectangle.*
>
> *The square has 16 in it, and the rectangle has 8. If you add 16 and 8, it comes out to 24, so the number of tiles didn't change.*
>
> *I think if you add up the areas of the little ones, it's the same as the big one.*
>
> *It has to be. We just put the big rectangle into two little ones. We didn't change anything else.*

Preview

6 With student input, label the dimensions of the two smaller rectangles. Then record the dimensions and area of each as shown here.



7 Ask students to add the areas of the smaller rectangles.

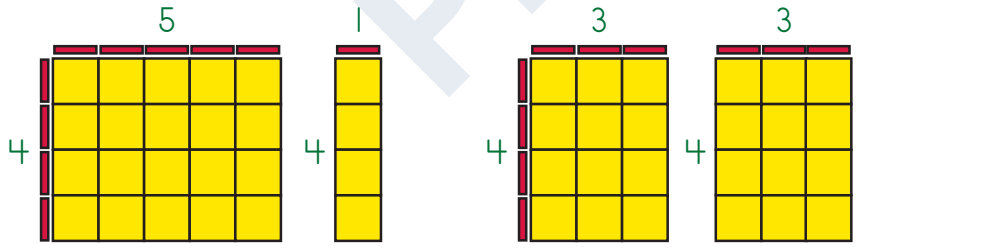
What is their sum? What do students notice?

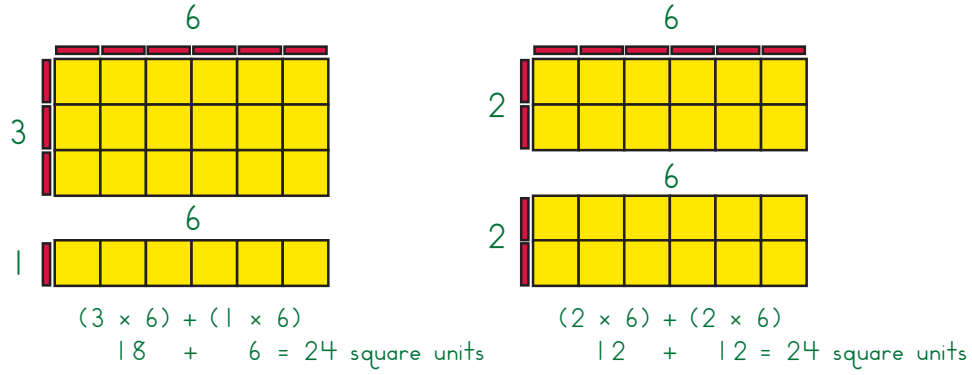
> ***Anthony*** *They add up to the area of the big rectangle we started out with.*
>
> ***Kaylee*** *That makes sense. We didn't add or take away any tiles, we just moved some over so it's still the same amount.*

8 Now have students slide their smaller rectangles back into the 4-by-6 rectangle. Challenge them find other combinations of two smaller rectangles they can make out of the 4-by-6 rectangle, without removing any of the tiles from the collection.

- Encourage them to share and compare their work with one another as they go.
- Have them record in their journals the dimensions and areas of their smaller rectangles using the notation you modeled in steps 6 and 7. They can include labeled sketches of their work if they like.
- Circulate as students are working to observe and provide support as needed.

Here are some possible responses to the problem.



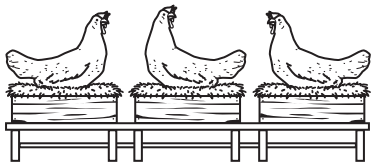


Preview

9 When most of the students have come up with at least one or two responses to the problem, ask them to put their tiles aside for a few minutes. Display the Areas for Chickens Teacher Master, read it with the class, and have students clarify what the story is asking them to do.

Areas for Chickens

Barbara has three chickens: Ruby, Verna, and Bella. She takes excellent care of "the girls." When they aren't scratching around in the yard looking for bugs, grubs, and worms, they enjoy the pen and chicken house Barbara built for them. Most mornings at least two of them lay eggs.



The chickens' pen is 6 feet wide and 10 feet long. The chicken house is 5 feet wide and 6 feet wide. How much of Barbara's back yard area is taken up by the pen and chicken house together?

10 When students understand what they're being asked to do, have them work in pairs to solve the problem.

- Encourage them to use any math tools available to them, and any strategies they can generate that will help them find the answer to the question.
- Ask them to record their thinking with numbers and labeled sketches in their journals.

Work Places

11 As student pairs complete the assignment, have them get their folders and go to Work Places.

12 When most students have finished solving the Areas for Chickens problem, or about 10 minutes before the end of the session, reconvene the class to share solutions and strategies.

- Solicit and record on the board students' answer(s) to the problem.
- Invite a few pairs of students to share their strategies for solving the problem.

If you have a document camera, invite these pairs to bring their journals to the camera so their classmates can see their work as they describe their thinking.

13 Close the session.

- Have students clean up and put away their materials.
- Ask students to share, first in pairs and then as a class, ideas about the connection between area and multiplication.

Preview

Home Connection

14 Introduce and assign the Playing with Area Home Connection, which provides more practice with the following skills:

- Solve for the unknown in a multiplication or division equation involving 3 whole numbers (3.OA.4)
- Demonstrate that the area of a rectangle with whole-number side lengths can be found by multiplying the side lengths (3.MD.7a)
- Find the area of a rectangle by multiplying its side lengths (3.MD.7b) Solve story problems involving finding the area of a rectangle (3.MD.7b)

Daily Practice

The optional Finding More Small Areas Student Book page provides additional opportunities to apply the following skills:

- Find the area of a rectangle by multiplying its side lengths (3.MD.7b)
- Use tiling to show that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$ (3.MD.7c)
- Recognize area as additive; find areas of rectangles by decomposing them into non-overlapping rectangles and adding the areas of the parts (3.MD.7d)

Preview

Session 6
Unit 5 Post-Assessment

Summary

Students take the Unit 5 Post-Assessment and then go to Work Places.

Skills & Concepts

- Interpret products of whole numbers; write story problems or describe problem situations to match a multiplication expression or equation (3.OA.1)
- Interpret quotients of whole numbers; write story problems or describe problem situations to match a division expression or equation (3.OA.2)
- Solve multiplication and division story problems with products to 100 involving situations of equal groups and arrays (3.OA.3)
- Solve for the unknown in a multiplication or division equation involving 3 whole numbers (3.OA.4)
- Solve division problems by finding an unknown factor (3.OA.6)
- Fluently multiply and divide with products and dividends to 100 using strategies (3.OA.7)
- Solve two-step story problems using multiplication and division; select equations with a letter standing for the unknown quantity to represent two-step story problems (3.OA.8)
- Demonstrate an understanding that unit squares can be used to measure the areas of other plane figures (3.MD.5a)
- Demonstrate an understanding that a plane figure that can be covered without gaps or overlaps by *n* unit squares has an area of *n* square units (3.MD.5b)
- Measure the area of a plane figure by counting the number of square units that cover it, with no gaps or overlaps (3.MD.6)
- Find the area of a rectangle with whole-number side lengths by tiling it (3.MD.7a)
- Find the area of a rectangle by multiplying its side lengths (3.MD 7b)
- Make sense of problems and persevere in solving them (3.MP.1)
- Attend to precision (3.MP.6)

Materials

Copies	Kit Materials	Classroom Materials
Assessment Unit 5 Post-Assessment		
TM T5–T8 Unit 5 Post-Assessment	• colored tiles (see Preparation) • red linear pieces	• scratch paper (optional)
Work Places in Use		
4C Target One Thousand (introduced in Unit 4, Module 2, Session 3) **4D** Hexagon Spin & Fill (introduced in Unit 4, Module 3, Session 3 **5A** Solving Game Store Problems (introduced in Unit 5, Module 1, Session 6) **5B** Scout Them Out (introduced in Unit 5, Module 2, Session 2) **5C** Line 'Em Up (introduced in Unit 5, Module 3, Session 3) **5D** Division Capture (introduced in Module 3, Session 4)		
Daily Practice		
SB 186 Fractions Revisited		

HC – Home Connection, **SB** – Student Book, **TM** – Teacher Master
Copy instructions are located at the top of each teacher master.

Vocabulary

An asterisk [*] identifies those terms for which Word Resource Cards are available.

area*
array*
dimension*
divide*
equal*
equation*
fact family
group
measure
multiply*
rectangle*
story problem

Preview

Preparation

- Look around the room and think about what you want to take down or cover before students take the post-assessment.
- Organize your colored tiles and red linear pieces for use by students at their tables or desks during the assessment. All students will need tile to solve problem 8.
- Write a list of Work Places from which students can choose today. You can just write the numbers (4C–5D) or write out the full names if you prefer. (See the Work Places in Use row of the Materials Chart for the complete list of Work Places in use today.)

Assessment

Unit 5 Post-Assessment

1 Set the stage for today.

- Briefly talk with students about the math they have been learning the past few weeks.
- Encourage students to do their best work and make sure they explain their thinking where requested.
- Tell students they will have as long as they need to complete the assessment.

Most students will need about 40–50 minutes.

2 Place the Unit 5 Post-Assessment Teacher Master on display as helpers give a copy of the assessment to each student.

- Have students write their name and the date on the first page.
- Remind students to wait to begin the test.
- Give students a minute to look over the assessment.

3 Review strategies students can use that will help them during an assessment.

- Let students know that they can use scratch paper, colored tiles, and red linear pieces to help with any of the problems on the assessment.
- Explain that everyone will need colored tiles to solve problem 8. Have helpers set containers of the tiles at students' tables, and ask each student to take a large handful.
- Model the following strategies as you describe them to students.
  - » Read the whole assessment before you begin to get a sense of what you need to do.
  - » Notice which problems might be easier or more difficult for you. You might put a small star by easier problems and a question mark by more challenging ones.
  - » Think about how to use your time during the test so that you have time and energy to finish all the problems.

4 After students have read through the assessment, refer to the first page and ask students to point out important math vocabulary.

- Encourage students to look for words they have seen on Word Resource Cards or put in their math journals.
- Have them underline these words.
- Remind students to raise their hands if they need help reading a problem. This is not meant to be a reading test.

5 When students understand what to do, let them begin.

SUPPORT If some students are unable to complete the assessment before the end of the session, allow them additional time later in the day or early the next to finish their work.

Assessment Guide

See the Grade 3 Assessment Guide for scoring and intervention suggestions.

Think about how and when you want to show students their scored post-assessments. You may decide, as well, to give them time to compare the results of their pre- and post-assessments and identify those skills and concepts they still need to work on. You'll find a Post-Assessment Student Reflection Sheet for this purpose in the Assessment Guide.

Preview

Note Think about how and when you want to show students their scored post-assessments. If you decide that you want to give them time to compare the results of their pre- and post-assessments, and identify those skills and concepts with which they still need to work, you will find a Unit 5 Post-Assessment Student Reflection Sheet in the Assessment Guide.

Work Places

6 As students finish the Unit 5 Post-Assessment, have them turn in their papers, get their folders, and choose a Work Place.

Have students pick up their Work Place folders and a pencil and remind them to fill out their Work Place Logs as they finish each activity.

7 Close the session.

- Have students clean up and put away the Work Place Bins.
- Take a few minutes to discuss the unit post-assessment with the class. Did the problems seem easier this time than when they took the pre-assessment several weeks ago? Why or why not?

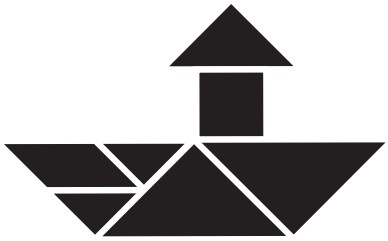
Daily Practice

The optional Fractions Revisted Student Book page provides additional opportunities to apply the following skills:

- Demonstrate an understanding of a fraction a/b as a equal parts, each of which is $1/b$ of a whole (e.g., ¾ is 3 of 4 equal parts of a whole or 3 parts that are each ¼ of a whole) (3.NF.1)
- Recognize fractions that are equivalent to whole numbers (3.NF.3c)

Preview

Preview



Teacher Masters

GRADE 3 – UNIT 5 – MODULE 4

Preview

BRIDGES®
IN MATHEMATICS

Preview

NAME | **DATE**

Division Checkpoint

1 Solve each story problem. Use numbers, labeled sketches, or words to show your thinking, and write the answer. Then write an equation to match the problem.

a The Bead Store just got lots of new beads. Addy is going to take 24 of the new glass beads and put them into bags. If she puts 8 beads in each bag, how many bags does she need?

Work:

Answer: Addy needs _____ bags.

Equation: _____

b Tim comes into the Bead Store and buys 36 of the new beads. He is planning to use them to make 4 bracelets. If he uses all the beads and divides them evenly, how many will he have for each bracelet?

Work:

Answer: Tim will have _____ beads for each bracelet.

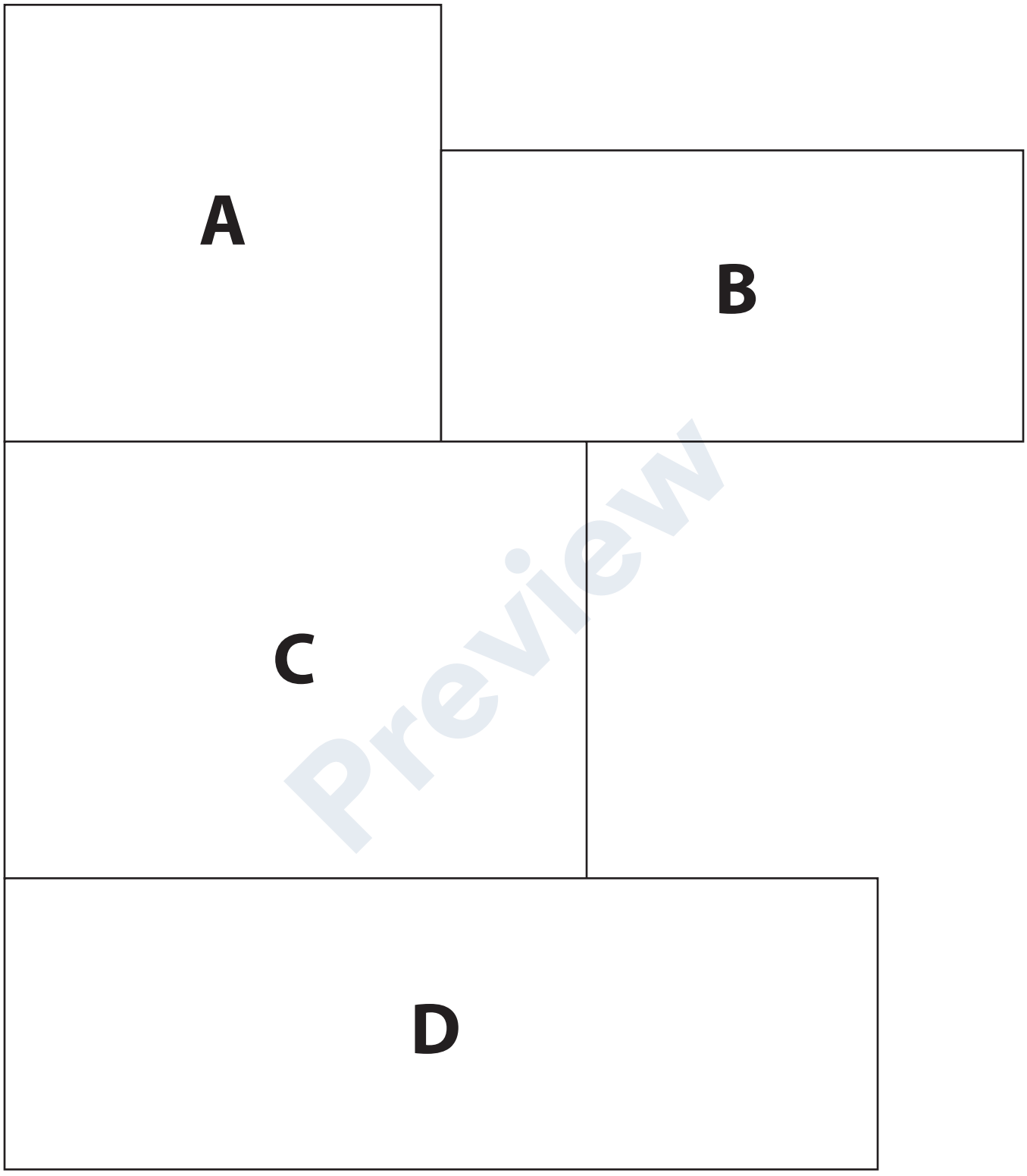
Equation: _____

2 Anna is doing her homework. She has to solve some division problems. Her big sister says that if Anna thinks of the multiplication facts she knows, it will make the work easier. For each of the division problems below, circle the multiplication fact that would help Anna the most. Then write the answer to the division problem.

24 ÷ 4 = _____	3 × 8 = 24	4 × 6 = 24	2 × 12 = 24
30 ÷ 6 = _____	3 × 10 = 30	2 × 15 = 30	6 × 5 = 30
36 ÷ 4 = _____	4 × 9 = 36	6 × 6 = 36	4 × 8 = 32
28 ÷ 7 = _____	7 × 6 = 42	7 × 4 = 28	2 × 14 = 28
35 ÷ 5 = _____	5 × 5 = 25	1 × 35 = 35	5 × 7 = 35

Preview

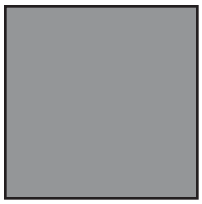
Rectangles

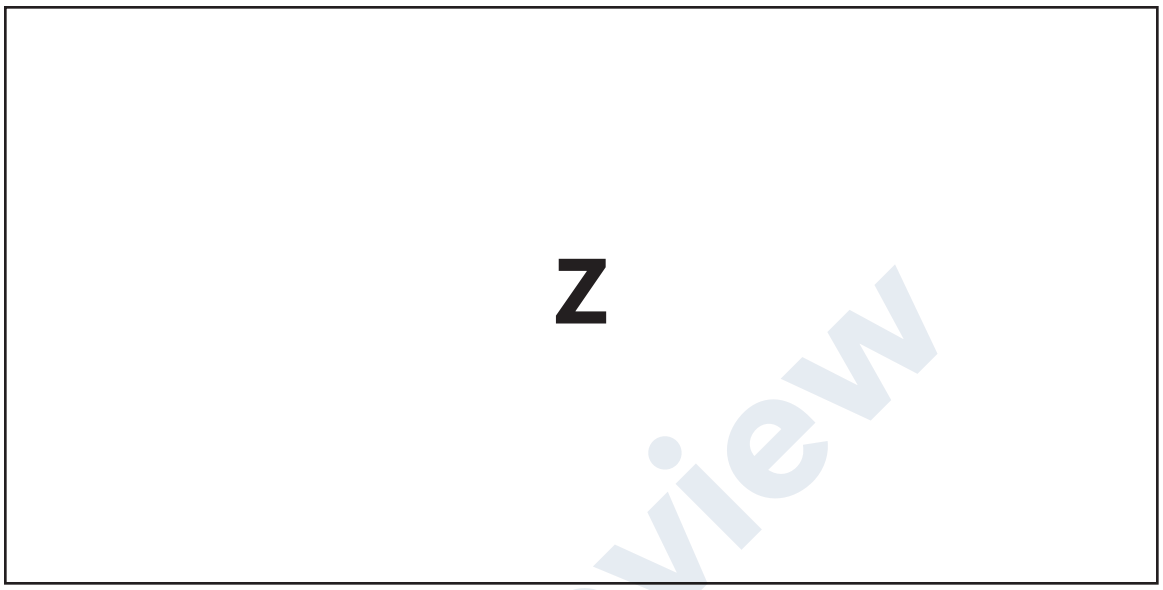


Preview

Rectangle Z

What is the area of Rectangle Z in square units this size?





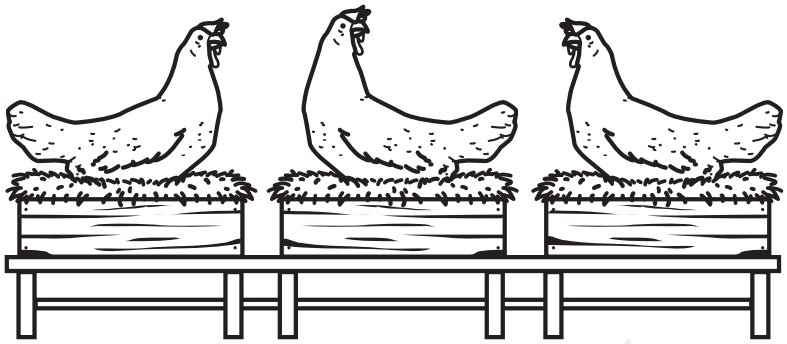
Estimates:

Actual Measure: _____ square units

Preview

Areas for Chickens

Barbara has three chickens: Ruby, Verna, and Bella. She takes excellent care of "the girls." When they aren't scratching around in the yard looking for bugs, grubs, and worms, they enjoy the pen and chicken house Barbara built for them. Most mornings at least two of them lay eggs.



The chickens' pen is 6 feet wide and 10 feet long. The chicken house is 5 feet wide and 6 feet wide. How much of Barbara's back yard area is taken up by the pen and chicken house together?

Preview

NAME | **DATE**

Unit 5 Post-Assessment page 1 of 4

1 Draw a line from each problem on the left to the matching equation on the right. Then write the correct answer.

a A T-shirt costs $9 at the mall. A pair of shoes costs 5 times as much as a T-shirt. How much does a pair of shoes cost?

$8 \times 5 =$ _____

b There are 40 chairs in the gym. Mr. Brown wants to set them up in rows of 8. How many rows can he make?

$9 \times 5 =$ _____

c Jon has 8 pieces of string. Each piece of string is 5 feet long. How many feet of string does Jon have in all?

$45 \div 5 =$ _____

d Maddie picked 45 plums and divided them evenly into 5 bags for her friends. How many plums did she put in each bag?

$40 \div 8 =$ _____

2 Fill in the answer to both equations. Then write a story problem to match each one.

a $9 \times 4 =$ _____

My Story Problem:

b $14 \div 2 =$ _____

My Story Problem:

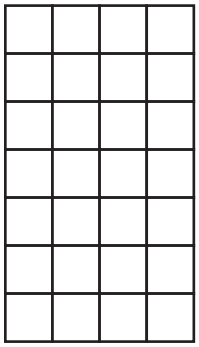
Preview

(continued on next page)

NAME | **DATE**

Unit 5 Post-Assessment page 2 of 4

3 Write 2 multiplication and 2 division equations (a fact family) to describe this array.



_____ × _____ = _____ _____ ÷ _____ = _____

_____ × _____ = _____ _____ ÷ _____ = _____

4 Solve each story problem. Use numbers, labeled sketches, or words to show your thinking, and write the answer. Then write an equation to match the problem.

a The Game Store just got 60 new videogames. Devon is putting the games into stacks of 10. How many stacks can he make if he uses all 60 games?

Work:

Devon can make _____ stacks.

Equation: _____

b The Game Store has 7 stacks of board games for little kids. If there are 5 board games in each stack, how many board games is that in all?

Work:

The Game Shop has _____ board games for little kids.

Equation: _____

(continued on next page)

Preview

NAME | **DATE**

Unit 5 Post-Assessment page 3 of 4

5 The Game Store got 6 cartons of jigsaw puzzles. There were 6 puzzles in each carton. Devon unpacked all the puzzles and arranged them into 4 equal stacks. How many puzzles in each stack?

a Choose the equation that could help you solve this problem.

- ○ $(6 \times 6) \times 4 = p$
- ○ $(6 + 6) \div 4 = p$
- ○ $(6 \times 6) \div 4 = p$
- ○ $6 + 6 - 4 = p$

b Solve the problem. Show all your work.

Answer: There were _____ puzzles in each stack.

6 Fill in the missing number to solve each equation.

$30 \div$ _____ $= 10$ $35 = 5 \times$ _____

$9 =$ _____ $\div 4$ _____ $\times 8 = 40$

7 Jeff has to solve this story problem:

The librarian just got 28 new books. She is planning to put 7 of the new books on each shelf in her book rack. How many shelves of new books can she make?

a Jeff says he can solve the problem by thinking, "7 times *what number* equals 28?" Do you agree with Jeff? Why or why not?

b Write and solve a division equation to match Jeff's problem.

(continued on next page)

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NAME | **DATE**

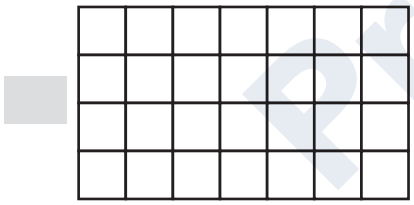
Unit 5 Post-Assessment page 4 of 4

8 Use colored tiles to find the area of this rectangle.

The area of this rectangle is _____ square units.

9 Label each rectangle with its dimensions and area. Then write a multiplication equation to show how you found the area of the rectangle.

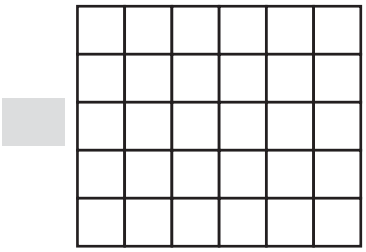
a



Area = _____ square units

Equation:

b



Area = _____ square units

Equation:

10 Mark **all** the statements about area that are true.

- ○ If you want to find out how many cups something holds, you measure its area.
- ○ It would make sense to use square inches to find the area of a piece of copy paper, and square yards to find the area of a football field.
- ○ You can find the area of a rectangle by multiplying its length by its width.
- ○ Ms. Kelly's whiteboard is 4 feet wide and 8 feet long. Its area is 32 square feet.

Preview

Student Book

GRADE 3 – UNIT 5 – MODULE 4

Preview

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Grid Paper

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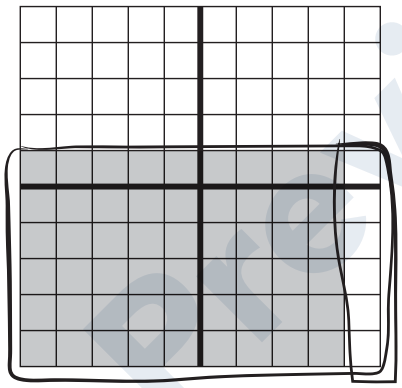
More Multiplication Arrays

1 Complete the multiplication facts.

6 × 7	3 × 8	4 × 9	9 × 9	4 × 7	3 × 9	7 × 3
8 × 2	2 × 9	6 × 8	3 × 6	5 × 9	6 × 6	9 × 7

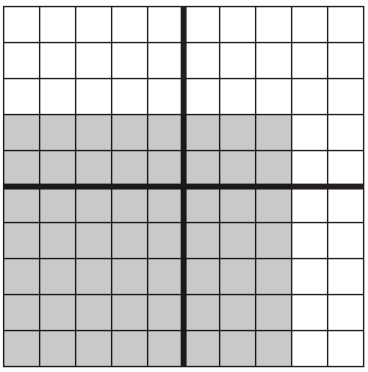
2 Use the array to show how you could solve each fact if you didn't already know the answer.

ex $6 \times 9 = 54$

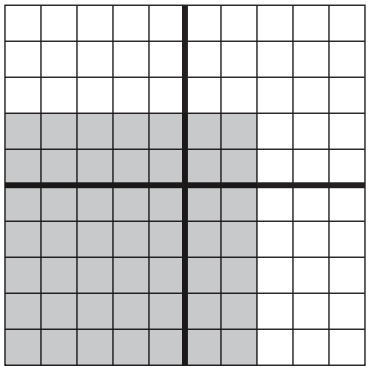


6 × 10 = 60
60 − 6 = 54

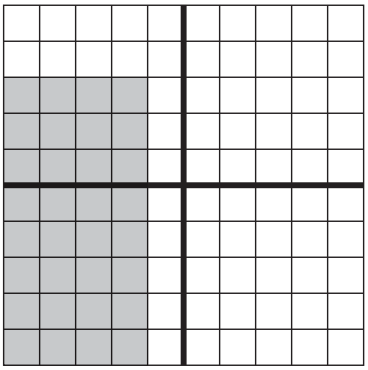
a $7 \times 8 =$ _____



b $7 \times 7 =$ _____



c $8 \times 4=$ _____



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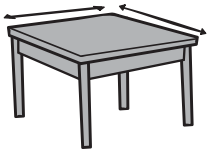
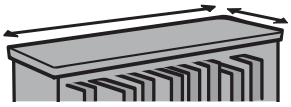
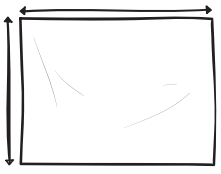
NAME | DATE

Finding Areas Large & Small page 1 of 2

Object	Your Estimate (in square units)	Approximate Measurment (in square units)	The Difference (in square units)
1 Area of a large picture book 			
2 Area of a chair seat 			
3 Area of a desk or a small table 			
4 Area of the top of a bookshelf 			
5 Area of a piece of chart paper 			

I noticed:

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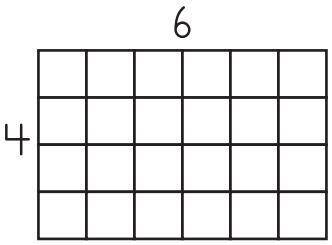
NAME | DATE

Finding Areas Large & Small page 2 of 2

6 The rectangles below have already been marked with square units. Record the dimensions of each and then find the area. Write 2 different equations to show how you found the area of each.

ex



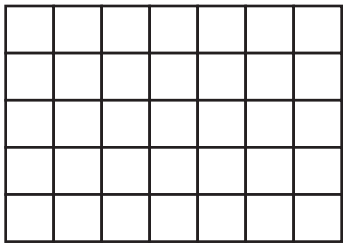
Area = 24 square units

Equations:

6 + 6 + 6 + 6 = 24

4 × 6 = 24

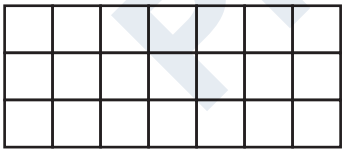
a



Area = _____ square units

Equations:

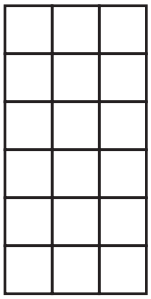
b



Area = _____ square units

Equations:

c



Area = _____ square units

Equations:

Preview

NAME | **DATE**

Grid Paper

Preview

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NAME | DATE

Finding More Areas

You'll need a partner and some large square units made out of construction paper to do this sheet. Choose 5 different rectangular surfaces around the room to measure with the large square units. Be sure to estimate the area first.

Object	Your Estimate (in square units)	Approximate Measurment (in square units)	The Difference (in square units)
1			
2			
3			
4			
5			

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Measuring My Math Journal

1 Estimate the area of the front cover of your math journal in square inches.

Estimate: _____

2 Using measurement tools from your classroom (ruler, tiles, grid paper, etc.), determine the area of the front cover of your math journal in square inches. Use words, labeled sketches, and numbers to explain how you got your answer.

Area of my math journal _____:

3 **CHALLENGE** If you were to make a book cover for your entire math journal, front and back, approximately how many square inches of paper would you need? Explain your answer below.

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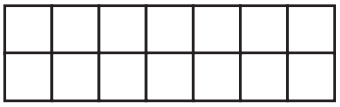
NAME | DATE

Areas to Find

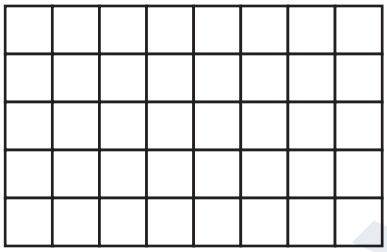
1 Label each rectangle with its dimensions and area.

a



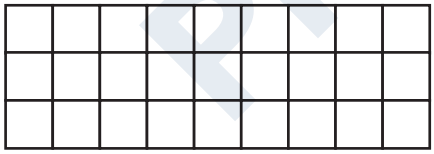
Area = _____ square units

b



Area = _____ square units

c



Area = _____ square units

Preview

2 Multiply.

3 × 4	7 × 4	4 × 5	10 × 5	9 × 5	4 × 6	9 × 9	5 × 5
7 × 7	12 × 10	8 × 2	5 × 8	11 × 9	13 × 7	10 × 15	7 × 4

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Rainbow Rectangles

1 Work with the students in your group to put the rectangles in order, from least to most area.

2 After you've agreed on the order, write the colors of the rectangles where you think they belong in the boxes below.

Least Area					Most Area

3 Estimate the area of each rectangle and then measure it in square inches. Remember to label your work with the correct units (square inches). Record your work on the chart below. (Hint: Use the red rectangle as a benchmark to help make your estimates.)

Color Rectangle	Your Estimate in Square Inches (sq. in.)	Actual Area in Square Inches (sq. in.)

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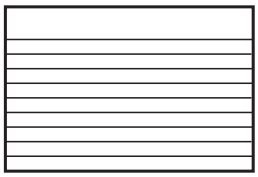
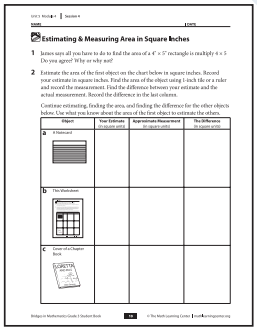
Estimating & Measuring Area in Square Inches

1 James says all you have to do to find the area of a 4" × 5" rectangle is multiply 4 × 5 Do you agree? Why or why not?

2 For each object on the chart below:

- Estimate the area of the first object on the chart below in square inches.
- Record your estimate in square inches.
- Find the area of the object using 1-inch tiles or a ruler, and record the measurement.
- Find the difference between your estimate and the actual measurement. Record the difference in the last column.

Hint: Use what you know about the area of the first object to estimate the others.

Object	Your Estimate (in square units)	Approximate Measurement (in square units)	The Difference (in square units)
a A notecard 			
b This worksheet 			
c Cover of a chapter book 			

Preview

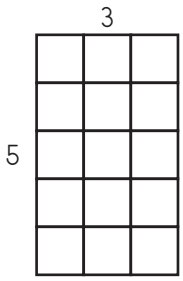
NAME | DATE

Finding More Small Areas

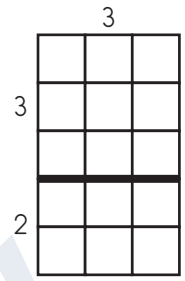
The rectangles below have already been filled with square units. For each pair of rectangles:

- Label the dimensions of the first one.
- Multiply the dimensions to find the area. Write an equation to match.
- Break the second rectangle into two smaller ones. Find the area of each of the smaller rectangles and add them. Write equations to show your work.

ex



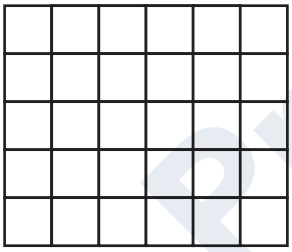
5 × 3 = 15 square units



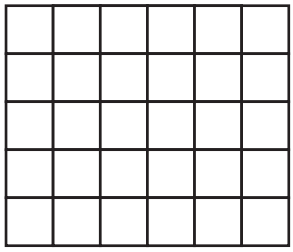
(3 × 3) + (2 × 3)

9 + 6 = 15 square units

1



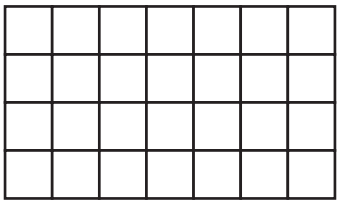
_____ square units



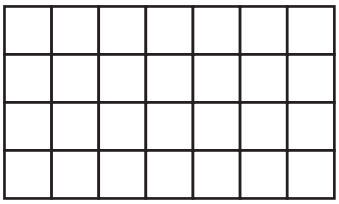
(_____ × _____) + (_____ × _____)

_____ + _____ = _____ square units

2



_____ square units



(_____ × _____) + (_____ × _____)

_____ + _____ = _____ square units

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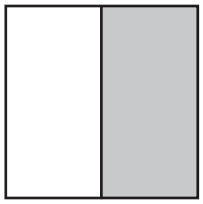
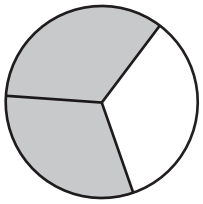
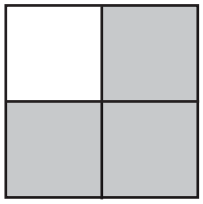
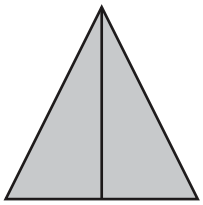
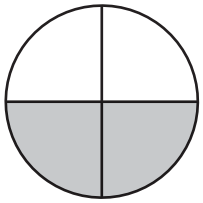
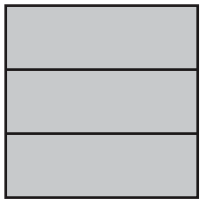
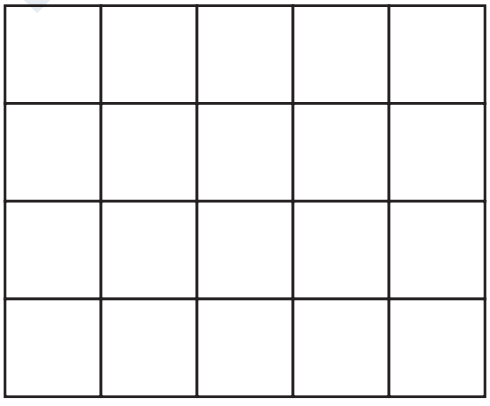
Fractions Revisited

1 Fill in the bubble next to the fraction that shows how much of each shape is filled in.

ex ◉ $\frac{1}{2}$ ○ $\frac{1}{3}$ ○ $\frac{1}{4}$		**a** ○ $\frac{1}{2}$ ○ $\frac{1}{3}$ ○ $\frac{2}{3}$	
b ○ $\frac{1}{2}$ ○ $\frac{3}{4}$ ○ $\frac{4}{3}$		**c** ○ $\frac{2}{1}$ ○ $\frac{1}{2}$ ○ $\frac{2}{2}$	
d ○ $\frac{2}{4}$ ○ $\frac{2}{3}$ ○ $\frac{2}{2}$		**e** ○ $\frac{1}{3}$ ○ $\frac{2}{3}$ ○ $\frac{3}{3}$	

2 Follow the instructions to color the array below.

- Color half the squares in the array red.
- Color one-fourth of the squares in the array blue.
- Color the rest of the squares in the array green.



What fraction of the array is green?

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GRADE 3 – UNIT 5 – MODULE 4

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Division & Fraction Review page 1 of 2

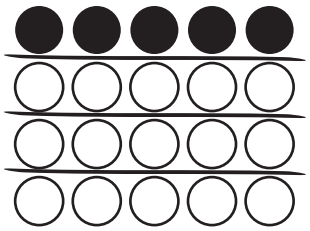
1 Complete the division facts. They may help you with the next problem.

20 ÷ 4 = _____ 18 ÷ 3 = _____ 15 ÷ 3 = _____

16 ÷ 4 = _____ 16 ÷ 2 = _____ 20 ÷ 5 = _____

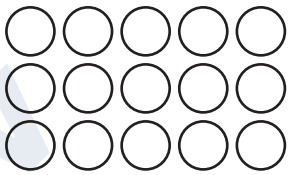
2 Divide each set into equal groups. Shade in some circles as directed.

ex Shade in $\frac{1}{4}$ of the circles.



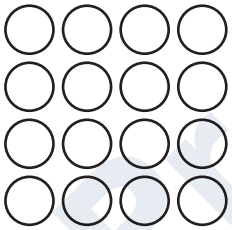
a Shade in $\frac{1}{3}$ of the circles.

Hint: Divide the set into 3 equal groups first.



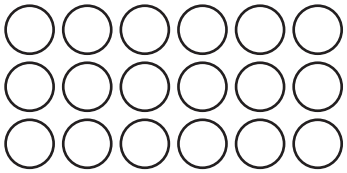
b Shade in $\frac{1}{2}$ of the circles.

Hint: Divide the set into 2 equal groups first.



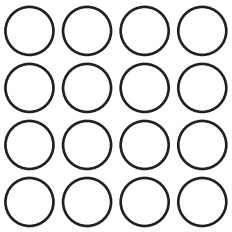
c Shade in $\frac{2}{3}$ of the circles.

Hint: Divide the set into 3 equal groups first.



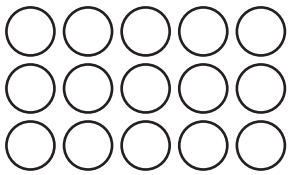
d Shade in $\frac{2}{4}$ of the circles.

Hint: Divide the set into 4 equal groups first.



e **CHALLENGE** Shade in $\frac{3}{5}$ of the circles.

Hint: Divide the set into 5 equal groups first.



3 **a** Find two fractions above that are equal. Write them here: _____ = _____

b How do you know these fractions are equal?

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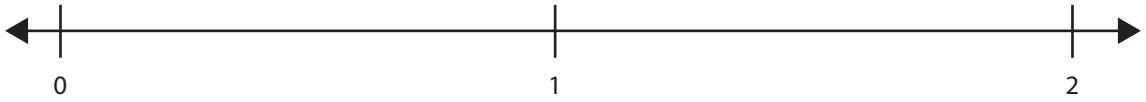
Division & Fraction Review page 2 of 2

4 Mark and label each of these fractions on the number line: $\frac{1}{2}$, $1\frac{1}{4}$, $1\frac{1}{3}$, $1\frac{3}{4}$.



5 David, Mary, Claire, and Mark were picking strawberries in their grandparents' garden. They had each picked the same number of strawberries when their grandma gave everyone 2 more strawberries. Now the 4 kids had 36 strawberries in all.

a How many strawberries did each child have before Grandma gave them more? Show your work.

b Mark the ***two*** equations below that could help you solve the problem.

- ○ $(s + 2) \times 4 = 36$
- ○ $2 \times 4 + s = 36$
- ○ $36 - (2 \times 4) = s$
- ○ $(36 \div 4) - 2 = s$

6 **CHALLENGE** The next day the kids picked 124 strawberries in all. They gave $\frac{1}{4}$ of the strawberries to their neighbor, and their mother used $\frac{2}{4}$ of the strawberries in a pie. The rest of the strawberries were saved for snacks.

a How many strawberries went into the pie? Show your work.

b How many strawberries did the family have for snacking on? Show your work.

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Unit 5 Review page 1 of 2

1 Complete the multiplication facts.

7 × 2	6 × 3	8 × 3	4 × 4	7 × 10	9 × 5	3 × 9
5 × 6	8 × 6	7 × 0	4 × 7	7 × 8	4 × 9	8 × 9

2 Solve the division facts. (Hint: Use the multiplication facts above to help.)

16 ÷ 4 = _____ 28 ÷ 4 = _____ 45 ÷ 5 = _____ 30 ÷ 5 = _____

18 ÷ 3 = _____ 24 ÷ 3 = _____ 14 ÷ 2 = _____ 70 ÷ 10 = _____

3 Fill in the missing number in each fact. Then write a related division equation.

ex	4 × 5 = 20	20 ÷ 5 = 4
a	☐ × 3 = 21	_____ ÷ _____ = ☐
b	5 × ☐ = 25	_____ ÷ _____ = ☐
c	☐ × 7 = 14	_____ ÷ _____ = ☐

4 Write the answer to each equation below, and then write a story problem to match.

6 × 4 = _____	30 ÷ 3 = _____

(continued on next page)

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Unit 5 Review page 2 of 2

5 Solve each of the story problems below. Use another piece of paper if you need more room. Use numbers, labeled sketches, or words to show your thinking. Then write an equation to represent the problem and the answer.

a The pet store just got 32 new turtles. Elena is putting the turtles into terrariums. She puts 4 turtles in each terrarium. How many terrariums does she use?

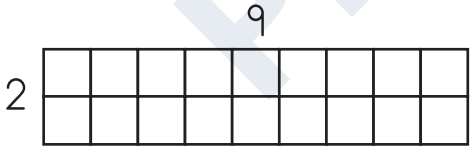
My equation: _____

b The pet store has 9 puppies. Each puppy drinks 6 cups of water every day. How much water do all 9 of the puppies drink in one day?

My equation: _____

6 The rectangles below have already been marked off in square units. Record the dimensions of each and then find the area. Write two equations to show how you found the area of each.

ex

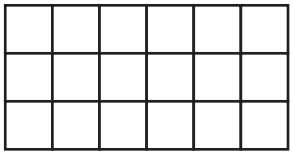


Area = 18 square units

Equations:

9 + 9 = 18 2 × 9 = 18

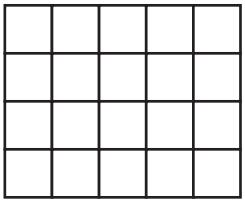
a



Area = _____ square units

Equations:

b



Area = _____ square units

Equations:

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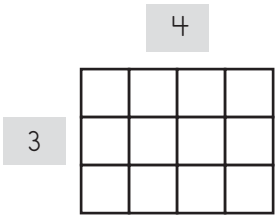
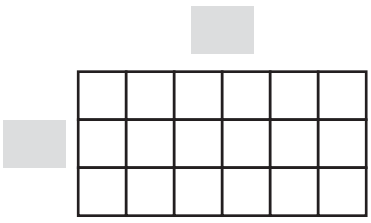
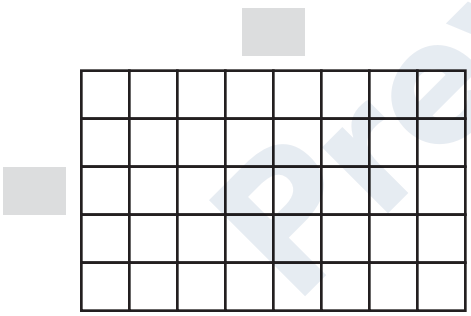
Playing with Area page 1 of 2

1 Label the dimensions and area of each rectangle. Write two (or more) different equations to show how someone could find the area.

ex  Area = 12 square units	Equations: 3 + 3 + 3 + 3 = 12 4 + 4 + 4 = 12 3 × 4 = 12 (3 × 2) + (3 × 2) = 12
a  Area = _____ square units	Equations:
b  Area = _____ square units	Equations:

2 Fill in the missing number in each fact. Then write a related division equation.

ex	3 × 6 = 18	18 ÷ 3 = 6
a	____ × 6 = 48	___ ÷ ___ = ___
b	3 × ____ = 24	___ ÷ ___ = ___
c	4 × ____ = 28	___ ÷ ___ = ___
d	____ × 9 = 45	___ ÷ ___ = ___
e	9 × ____ = 90	___ ÷ ___ = ___
f	8 × ____ = 32	___ ÷ ___ = ___

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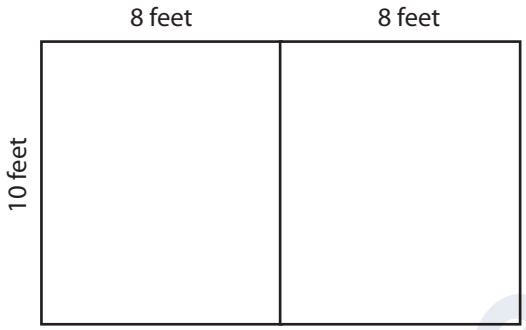
Playing with Area page 2 of 2

3 Frank bought a rug for his room. It is 5 feet by 3 feet. What is the total area of the rug in square feet? Use labeled sketches, numbers, or words to solve this problem. Show all your work.

Area = _____ square feet

4 The tumbling mats in the gym are each 10 feet by 8 feet. Miranda pushed 2 of the mats together so she would have enough room to do her routines. Use the sketch below to help find the total area of the 2 mats in square feet. Show your work.



Area = _____ square feet

5 **CHALLENGE** Andrea got some free carpet squares at a carpet store. Each carpet square has an area of 1 square foot. She got enough blue squares to cover a space on her bedroom floor that is 2 feet by 8 feet. She got enough red squares to cover another space on her bedroom floor that is 5 feet by 8 feet.

a How many total square feet can be covered if Andrea puts these carpet squares together? Show your work. Use another piece of paper if you need more room.

Area = _____ square feet

b There are two equations below you could use to help solve this problem. Mark both of them.

- ○ $(2 + 8) \times (5 + 8) = a$
- ○ $(2 + 5) + 8 = a$
- ○ $(2 \times 8) + (5 \times 8) = a$
- ○ $(2 + 5) \times 8 = a$

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