NUMBER® CORNER

SECOND EDITION

TEACHERS GUIDE

JANUARY

GRADE 4

Published by The MATH LEARNING CENTER Salem, Oregon

Number Corner January

Teacher Masters

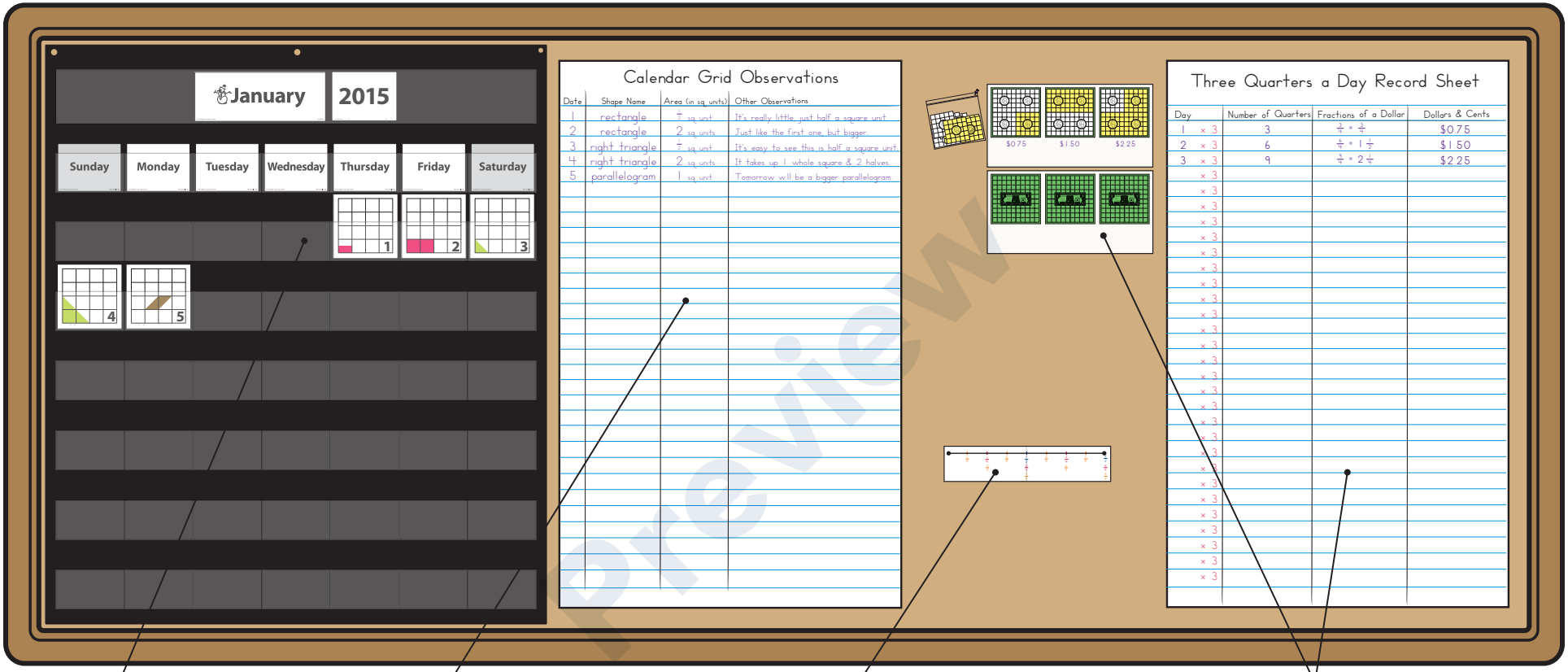
Pages renumber each month.

Number Corner Student Book Pages

Page numbers correspond to those in the consumable books.

January Sample Display

Of the items shown below, some are ready-made and included in your kit; you'll prepare others from classroom materials and the included teacher masters. Refer to the Preparation section in each workout for details about preparing the items shown. The display layout shown fits on a 10′ × 4′ bulletin board or on two 6′ × 4′ bulletin boards. Other configurations can be used according to classroom needs. If you have extra space to work with, a Number Corner header may be made from bulletin board letters, student-drawn letters, or other materials.



Calendar Grid Pocket Chart

Remember to consult a calendar for the starting day for this month and year.

Calendar Grid Observations Chart

You might use 24″ × 36″ chart paper. If you laminated a blank chart in September, you can erase it and reuse it this month.

One-Foot Number Lines

You'll create, post and write fractions on two number lines during Computational Fluency this month. The number lines are made from the included teacher master; see the Preparation section of the workout for details.

Calendar Collector Record Sheet & Collection

You might use 24″ × 36″ chart paper for the record sheet. If you laminated a blank record sheet for use in previous months, you can erase it and reuse it this month.

The paper dollar grids and quarter grids are made from teacher masters. See the Preparation section of the workout for details.

☑ January Daily Planner

Day	Date	Calendar Grid	Calendar Collector	Computational Fluency	Problem Strings	Solving Problems	Assessment
1			**Activity 1** Introducing the Calendar Collector (p. 17)				
2			*Update*		**Activity 1** Problem String 13 (p. 34)		
3		**Activity 1** Introducing the New Markers & Observations Chart (p. 8)	*Update*	**Activity 1** Fractions on the Number Line, Part 1 (p. 26)			
4		*Update*	*Update*	**Activity 2** Introducing Division Capture (p. 28)			
5		*Update*	**Activity 2** Introducing the Record Sheet (p. 20)				
6		*Update*	*Update*		**Activity 2** Problem String 14 (p. 36)		
7		**Activity 2** Taking a Closer Look at the Pattern (p. 9)	*Update*				
8		**Activity 3** Discussing Student Work (p. 10)	*Update*				
9		*Update*	**Activity 3** Discussing Patterns & Writing Equations (p. 22)				
10		*Update*	*Update*		**Activity 3** Problem String 15 (p. 38)		
11		*Update*	*Update*			**Activity 1** Thinking About Division Story Problems (p.42)	
12		**Activity 4** Discussing the Calendar Pattern (p. 12)	*Update*	**Activity 3** Fractions on the Number Line, Part 2 (p. 30)			
13		*Update*	*Update*	**Activity 4** Playing Division Capture (p. 32)			
14		*Update*	*Update*			**Activity 2** Division Story Problems with Remainders (p. 46)	
15		*Update*	*Update*				Number Corner Checkup 2, Part 1 (p. 52)
16		*Update*	*Update*	**Activity 4** Playing Division Capture (p. 32)			
17		*Update*	*Update*				Number Corner Checkup 2, Part 2 (p. 53)
18		*Update*	*Update*			**Activity 3** Partitive & Quotative Division (p. 48)	
19		*Update*	**Activity 4** Final Observations About the Pattern (p. 23)				
20		**Activity 5** Concluding the January Calendar Grid (p. 13)					

Note *Calendar Grid and Calendar Collector are updated by student helpers, except when the workout is the subject of an activity. Computational Fluency, Problem Strings, Solving Problems, and Assessments do not have updates. Update routines are explained in detail in the workout text. Summaries of the update routines appear below.*

Calendar Grid – Post one or more calendar markers so that the Calendar Grid is complete up to the current date. Update the Observations Chart.
Calendar Collector – Glue 3 quarters onto the dollar grids, and write the total value in decimal notation. Once it has been posted, update the record sheet, filling in the day, the total amount of quarters, the value in dollars and cents, and the value as a fraction or mixed number.

Number Corner
January

Overview

This month, three workout focus on division: Problem Strings, Computational Fluency, and Solving Problems, in which students learn and practice division strategies and consider division situations and contexts. The Calendar Grid focuses on geometric shapes and scaling, while the Calendar Collector deals with fractions. Students take the second Number Corner Checkup, a four-page assessment, which provides information on how students are doing with Number Corner skills and concepts addressed in the past few months.

Activities

Workouts	Day	Activities	D	G	SB
Calendar Grid Similar Figures Each pair of calendar markers features two similar shapes: first a small version of the shape, and then a larger one. In each case, the lengths of the shape's sides are doubled in the larger version, resulting in a shape with an area four times greater than the area of the first.	3	**1** Introducing the New Markers & Observations Chart	●		
	7	**2** Taking a Closer Look at the Pattern	●		●
	8	**3** Discussing Student Work	●		●
	12	**4** Discussing the Calendar Pattern	●		
	20	**5** Concluding the January Calendar Grid	●		
Calendar Collector Three Quarters a Day The class collects three quarters each day in the form of paper money value pieces. The class uses a record sheet to keep track of the growing collection of money in terms of a number of quarters, dollars and cents (shown using decimal notation), and whole and fractional parts of a dollar.	1	**1** Introducing the Calendar Collector	●		
	5	**2** Introducing the Record Sheet	●		
	9	**3** Discussing Patterns & Writing Equations	●		●
	19	**4** Final Observations About the Pattern	●		●
Computational Fluency Division Capture Students continue working on the number line, but this month, the scale shifts from 0 to 100 to 0 to 1, and students identify, compare, and order fractions between 0 and 1. They also play Division Capture, first as a whole group and later in pairs. Division Capture provides practice with basic division facts in the context of a simple but engaging strategy game.	3	**1** Fractions on the Number Line, Part 1	●		
	4	**2** Introducing Division Capture	●	●	●
	12	**3** Fractions on the Number Line, Part 2	●		
	13, 16	**4** Playing Division Capture	●	●	●
Problem Strings Division Strategies All three strings this month focus on the connection between multiplication and division. In the first string, students' thinking is represented with jumps on a number line. The second string focuses on arrays, and the third focuses on ratio tables. Each model lends itself to a different kind of strategy for solving division problems, all of which involve using what they know about the relationship between multiplication and division.	2	**1** Problem String 13	●		●
	6	**2** Problem String 14	●		●
	10	**3** Problem String 15	●		●
Solving Problems Multi-Step Division Problems Students solve multi-step division story problems. Before solving the problems, they make estimates so that they can evaluate whether their answers are reasonable. In many problems, students must also determine a logical way to handle the remainder. Students review the difference between partitive and quotative division problems.	11	**1** Thinking About Division Story Problems	●		●
	14	**2** Division Story Problems with Remainders	●		●
	18	**3** Partitive & Quotative Division	●		●
Assessment Number Corner Checkup 2 Students take the second Number Corner Checkup, which provides a snapshot of their understanding of fractions, including equivalent fractions, adding and subtracting fractions, and multiplying fractions by a whole number; multiplicative comparisons; adding, subtracting, multiplying, and dividing multi-digit numbers; parallel and perpendicular lines and lines of symmetry; and multi-step story problems.	15	**Number Corner Checkup 2, Part 1** Completing Pages 1 & 2			
	17	**Number Corner Checkup 2, Part 2** Completing Pages 3 & 4			

D – Discussion, **G** – Game, **SB** – Number Corner Student Book

Teaching Tips

January is a great time for learning. Students can extend and solidify the skills and concepts they have been working on this year. Look for areas of growth as well as areas where students may need extra support. There are opportunities to support students by working with them in small groups. Use these opportunities and, if possible, work in more times to work with students on areas of need.

The Number Corner Checkup 2 will provide a glimpse of where students are with many key skills and concepts. Use the results of this assessment to help guide your Number Corner planning in the months to come.

Division is emphasized in three workouts this month. If students are struggling with division in one workout, know that they will revisit it in another. The problem strings are intentionally early this month, so that students can use the strategies they learn in strings to help with the story problems later in the month.

Evaluate the pace of Number Corner. Do you need to speed up or slow down? Can you make any changes in pacing to boost student engagement?

Target Skills

The table below shows the major skills and concepts addressed this month. It is meant to provide a quick snapshot of the expectations for students' learning during this month of Number Corner.

Major Skills/Concepts Addressed	CG	CC	CF	PS	SP
4.OA.1 Make a comparison statement to match a multiplication equation	●				
4.OA.1 Write a multiplication equation to represent a verbal statement of a multiplicative comparison	●				
4.OA.3 Solve multi-step story problems involving only whole numbers, using addition, subtraction, multiplication, and division					●
4.OA.3 Solve multi-step story problems involving division with remainders					●
4.OA.3 Assess the reasonableness of answers to multi-step story problems using mental computation					●
4.OA.3 Assess the reasonableness of answers to multi-step story problems using rounding and other estimation strategies					●
4.OA.5 Generate a number pattern that follows a given rule	●				
4.OA.5 Identify features of a pattern that were not explicit in the rule used to generate that pattern	●				
4.NBT.5 Multiply a 2-digit whole number by a 1-digit whole number using strategies based on place value and the properties of operations				●	
4.NBT.5 Use an equation, a rectangular array, or an area model to explain strategies for multiplying with multi-digit numbers				●	
4.NBT.6 Divide a 2- or 3-digit number by a 1-digit number, using strategies based on place value, the properties of operations, or the relationship between multiplication and division			●	●	●
4.NBT.6 Divide a 2- or 3-digit number by a 1-digit number, with a remainder, using strategies based on place value, the properties of operations, or the relationship between multiplication and division				●	●
4.NBT.6 Use an equation, a rectangular array, or an area model to explain strategies for dividing a multi-digit number by a 1-digit number				●	●
4.NF.1 Recognize equivalent fractions			●		
4.NF.2 Compare two fractions with different numerators and different denominators			●		
4.NF.2 Demonstrate an understanding that a comparison of fractions is valid only when they refer to the same whole			●		
4.NF.2 Use the symbols >, =, and < to record comparisons of two fractions with different numerators and different denominators			●		
4.NF.2 Explain why one fraction must be greater than or less than another fraction			●		

Major Skills/Concepts Addressed	**CG**	**CC**	**CF**	**PS**	**SP**
4.NF.3a Explain addition of fractions as joining parts referring to the same whole		●			
4.NF.3b Express a fraction as the sum of other fractions with the same denominator in more than one way		●			
4.NF.4a Demonstrate an understanding that a fraction *a/b* is a multiple of the unit fraction 1/*b*		●			
4.NF.4a Write an equation showing that a fraction *a/b* is the product of $a \times 1/b$		●			
4.NF.4b Multiply a fraction by a whole number		●			
4.NF.3d Solve story problems involving addition of fractions referring to the same whole and with like denominators		●			
4.MD.2 Solve story problems involving money using addition or multiplication of simple fractions and decimals		●			
4.MD.3 Apply the area formula for a rectangle to solve a problem	●				
4.MP.1 Make sense of problems and persevere in solving them					●
4.MP.2 Reason abstractly and quantitatively	●				
4.MP.3 Construct viable arguments and critique the reasoning of others					●
4.MP.4 Model with mathematics		●	●		
4.MP.5 Use appropriate tools strategically					●
4.MP.6 Attend to precision			●	●	
4.MP.7 Look for and make use of structure		●			
4.MP.8 Look for and express regularity in repeated reasoning	●			●	

CG – Calendar Grid, **CC** – Calendar Collector, **CF** – Computational Fluency,
PS –Problem Strings, **SP** – Solving Problems

Assessments

Students take the second Number Corner Checkup this month, which provides information about student understanding of fractions, including equivalent fractions, adding and subtracting fractions, multiplying fractions by a whole number; multiplicative comparisons; adding, subtracting, multiplying, and dividing multi-digit numbers; parallel and perpendicular lines and lines of symmetry; and solving multi-step story problems. Students have two days to complete the assessment; they begin the checkup on Day 15, resume regular Number Corner Activities for Day 16, and complete the assessment on Day 17. Teachers can provide additional time if necessary.

Materials Preparation

Each workout includes a list of required materials by activity. You can use the table below to prepare materials ahead of time for the entire month.

Materials		Done
Copies	Run copies of Teacher Masters T1–T12 according to the instructions at the top of each master.	
	If students do not have their own Number Corner Student Books, run a class set of pages 42–52.	
	Run a single display copy of Number Corner Student Book pages 42, 43, 48, 50, and 52.	
Charts	Prepare the Calendar Grid Observations Chart according to preparation instructions in the workout.	
	Prepare the Calendar Collector Record Sheet, and also a Dollar Grids chart, according to preparation instructions in the Calendar Collector workout.	
	Follow preparation instructions in the Computational Fluency workout to create 2 One-Foot Number Lines, which you may want to laminate to reuse in future years.	

January Calendar Grid

Similar Figures

Overview

Each pair of calendar markers features two similar shapes: first a small version of the shape, and then a larger one. In each case, the lengths of the shape's sides are doubled in the larger version, resulting in a shape with an area four times greater than the area of the first.

Skills & Concepts

- Make a comparison statement to match a multiplication equation (4.OA.1)
- Write a multiplication equation to represent a verbal statement of a multiplicative comparison (4.OA.1)
- Generate a number pattern that follows a given rule (4.OA.5)
- Identify features of a pattern that were not explicit in the rule used to generate that pattern (4.OA.5)
- Apply the area formula for a rectangle to solve a problem (4.MD.3)
- Reason abstractly and quantitatively (4.MP.2)
- Look for and express regularity in repeated reasoning (4.MP.8)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Introducing the New Markers & Observations Chart	3	**TM T1–T2** Mini Similar Shapes Markers **TM T3** Key to Shape Names	• Similar Figures Calendar Markers • Day, Month, and Year Markers • Calendar Grid pocket chart	Used in all Calendar Grid activities this month: • Calendar Grid Observations Chart (see Preparation) • math dictionaries, optional
Activity 2 Taking a Closer Look at the Pattern	7	**TM T4** Geoboard Recording Paper **NCSB 42*** Taking a Closer Look at the Pattern		• scissors, class set • tape and paper to cover the Calendar Grid Observations Chart
Activity 3 Discussing Student Work	8	**TM T4** Geoboard Recording Paper **NCSB 42** Taking a Closer Look at the Pattern		
Activity 4 Discussing the Calendar Pattern	12			
Activity 5 Concluding the January Calendar Grid	20			

TM – Teacher Master, **NCSB** – Number Corner Student Book
Copy instructions are located at the top of each teacher master.

** Run 1 copy of this page for display.*

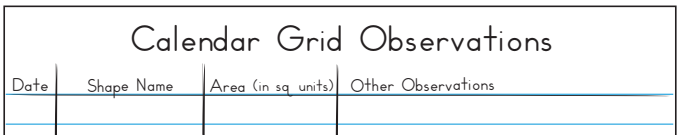
Vocabulary

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

congruent*
similar

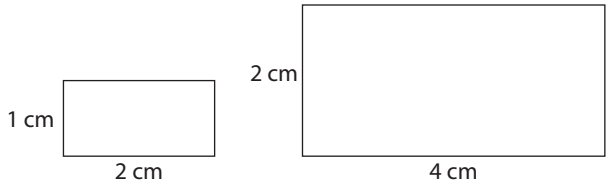
Preparation

Erase the entries on the Calendar Grid Observations Chart from last month. Draw lines to create 4 columns and 32 rows, and label them as shown below. Post the chart before Activity 1.

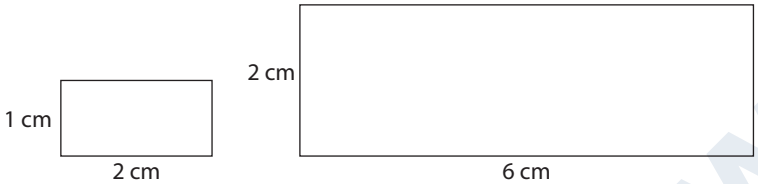


Mathematical Background

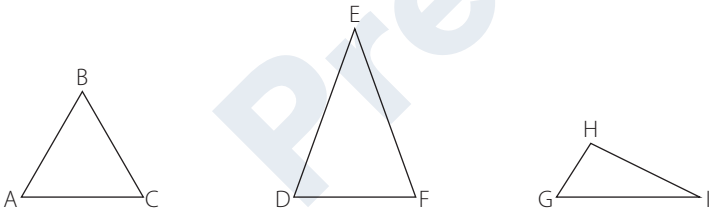
Two figures are said to be similar if they have exactly the same shape. Similar figures may or may not be of the same size. (Two figures that are exactly the same shape and size are said to be congruent. Congruent figures are a subset of similar figures.) When identifying and constructing similar figures, it is helpful to keep in mind that all of the side lengths must change by the same ratio from one figure to the next, while the angles must remain exactly the same. For example, if you double the lengths of all sides of the smaller rectangle below, the result is a similar rectangle.



However, if you double one dimension while tripling the other, for example, the resulting rectangle is not similar to the first, as shown below.



The triangles on this month's calendar grid fall into a few categories. The definitions below will help you make sense of how each has been categorized. One way to classify triangles is by the relationships among their sides. In an equilateral triangle, all three sides are of equal length. In an isosceles triangle, just two sides are of equal length. A scalene triangle has three sides of different lengths. The side lengths of triangles are also related to the angles within them. In an equilateral triangle, all three angles are equal (60º). In an isosceles triangle, two angles are equal. In a scalene triangle, no angles are equal. As you can see, these categories do not overlap.

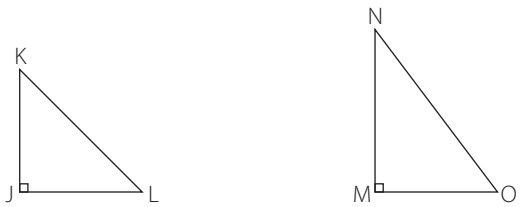


equilateral
All sides are equal.
All angles are equal.

isosceles
Sides DE and EF are equal.
Angles D and F are equal.

scalene
No sides are equal.
No angles are equal.

A right triangle contains one right angle (90º). Therefore, it is not possible for a right triangle to be equilateral. However, right triangles may be isosceles or scalene, as shown below. The triangle on the left is similar to the triangles on markers 3 and 4, and the triangle on the right is similar to the triangles on markers 7 and 8.



isosceles right triangle
J is a right angle.
Sides JK and JL are equal.
Angles K and L are both 45°.

scalene right triangle
M is a right angle.
None of the sides are equal.
None of the angles are equal.

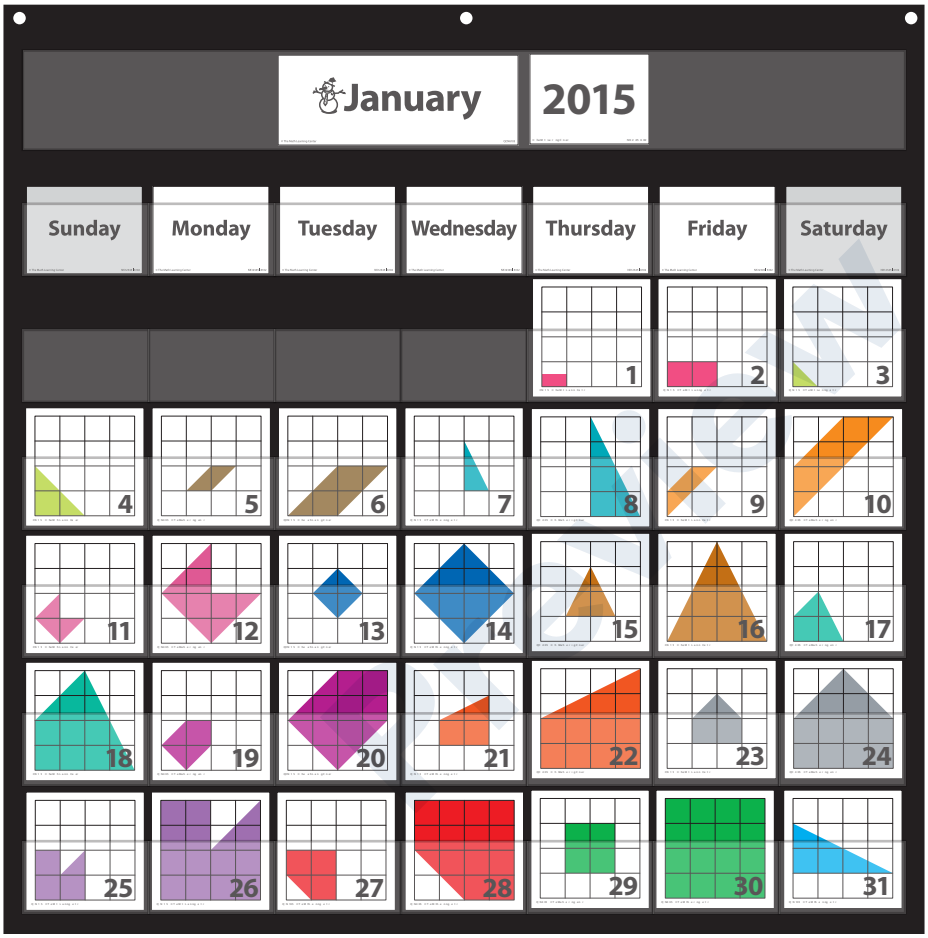
Key Questions

Use the following questions to guide students' discussion this month:

- What do you notice about the Calendar Grid markers?
- What shapes do you see?
- What attributes can you use to describe these shapes?
- What is the relationship between these two calendar markers?
- What does similar mean? How can you tell if two figures are similar?
- Imagine a 1-by-3 rectangle and a 2-by-6 rectangle. Are they similar figures? Why or why not?
- Imagine a 2-by-4 rectangle and a 4-by-16 rectangle. Are they similar figures? Why or why not?

About the Pattern

January's markers feature pairs of similar shapes. Each pair begins with a small version of the shape followed by a larger version in which the dimensions are doubled, resulting in a shape that has exactly 4 times the area of the first. The area of the shapes increases in a consistent predictable manner: the area of the first shape is ½ and the area of the second shape is 2. The area of the third shape is 1 and the area of the fourth shape is 4. If you look at every other shape, beginning with the first shape, the area increases by ½ with each new shape. If you look at every other shape, beginning with the second shape, the area increases by 2 with each new shape. There are other patterns for students to notice and explore. For example, the number of sides of the figures alternates from even to odd: one set of shapes has an even number of sides and the next has an odd number.



Update

Starting after Activity 1, have the student helper(s) complete this update procedure every day that the Calendar Grid is not a featured activity. You'll update the Calendar Grid as part of Activities 2, 3, 4, and 5 as well.

Procedure

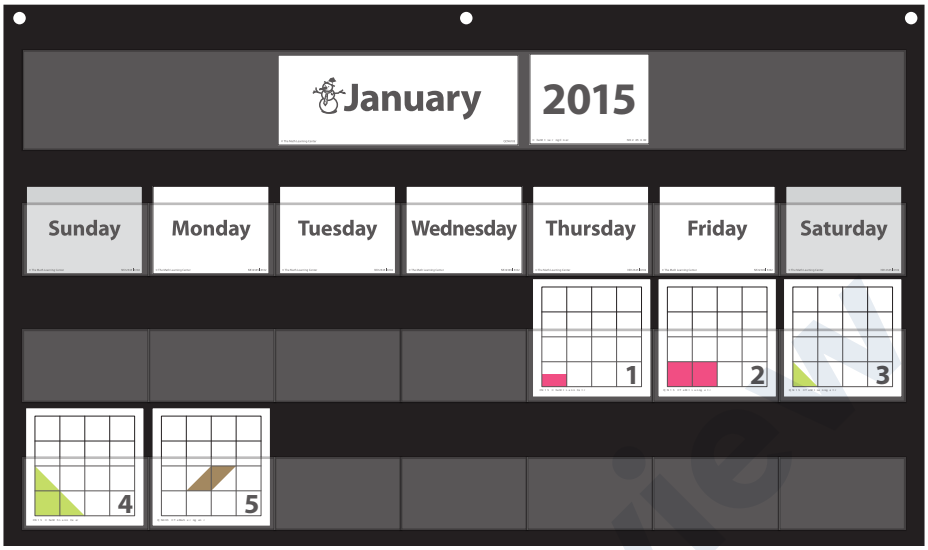
- Post one or more calendar markers so that the Calendar Grid is complete up to the current date.
- Record the date, the shape name, its area, and any other observations on the Observations Chart.

Activity 1

Introducing the New Markers & Observations Chart Day 3

If today is before the 4th of January, go ahead and reveal markers up through the 4th so students can see more of the pattern.

1 Invite a volunteer to post the calendar markers up to and including today's. Give students a few minutes to examine the collection quietly. Then invite volunteers to describe what they see and make predictions about future markers.



Students *There are 2 rectangles and then 2 triangles.*

There's a little one and a big one each time.

The little one and the big one are both the same color.

They all start in the corner.

Today's shape is a parallelogram.

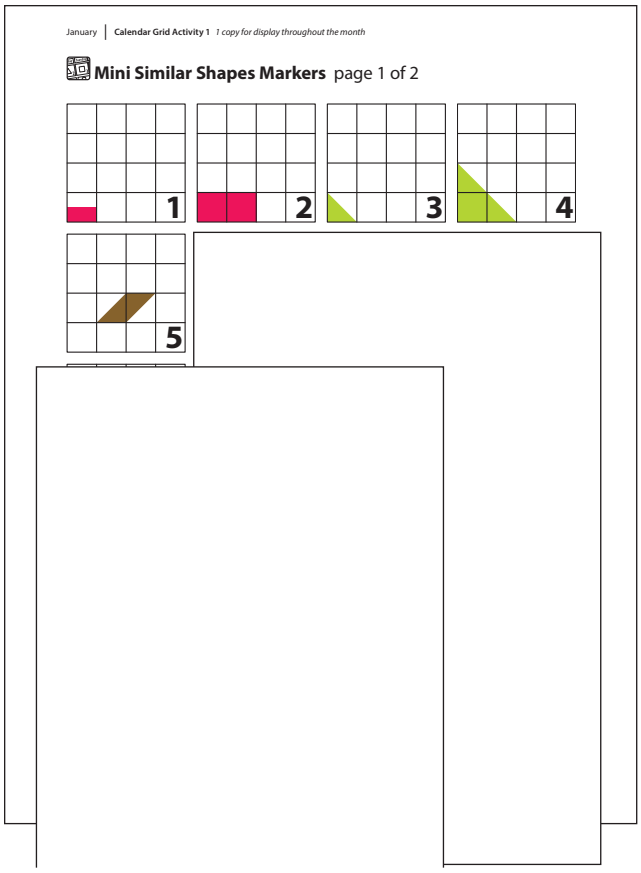
I'll bet tomorrow's shape will be the same as today's, only bigger.

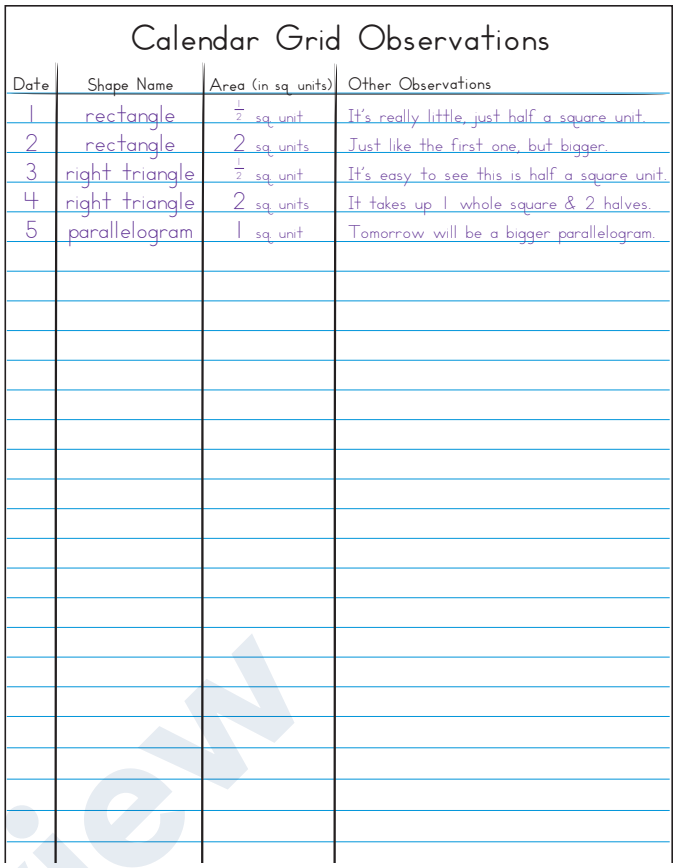
2 If students don't use the word *similar*, let them know that the shapes on markers 1 and 2, and on markers 3 and 4, are similar, which means that they are exactly the same shape (although they are not the same size).

3 Then draw students' attention to the Calendar Grid Observations Chart, and, with input from the class, fill in the information up to the present date. Before having students identify the area of each figure, explain that the smallest square on the grid is 1 square unit of area.

If students cannot see the markers clearly from where they sit, you might want to display the first Mini Similar Shapes Markers Teacher Master. Be sure to mask the other figures on the teacher master so as not to spoil the surprise of future markers.

4 Once the Observations Chart has been brought up to date, ask students to share further observations and predictions.





Calendar Grid Observations

Date	Shape Name	Area (in sq units)	Other Observations
1	rectangle	$\frac{1}{2}$ sq unit	It's really little, just half a square unit.
2	rectangle	2 sq units	Just like the first one, but bigger.
3	right triangle	$\frac{1}{2}$ sq unit	It's easy to see this is half a square unit.
4	right triangle	2 sq units	It takes up 1 whole square & 2 halves.
5	parallelogram	1 sq unit	Tomorrow will be a bigger parallelogram.

5 Finally, describe the update procedure for this month.

- Student helpers will post a new calendar marker and update the Observations Chart each day.
- Make sure students know how they can find information if they are not sure what the name of a particular shape is (e.g., use an illustrated math dictionary).

For your own reference, the names of the shapes and more information about triangle classification are included on the Key to Shape Names Teacher Master.

Activity 2

Taking a Closer Look at the Pattern — Day 7

You will need to cover the Observations Chart before students begin working on the Number Corner Student Book page, so have tape and paper ready to cover the Observations Chart in the middle of the activity.

1 Open today's activity by reviewing the Calendar Grid and Observations Chart.

- Direct students' attention to the Calendar Grid and Observations Chart.
- Ask them to examine the new markers that have been revealed over the past few days and to look at the notes taken about them on the Observations Chart.
- Ask students if there is anything they would add to or change on the Observations Chart.

SUPPORT If students are struggling to determine the area of each shape, let them know that the activity they do today will help them.

- Take a moment to invite students to share any new observations or insights about this month's calendar pattern.

2 Display your copy of the Taking a Closer Look at the Pattern page, and introduce it.

- Explain that they will complete this page independently to practice identifying the names and areas of the shapes.
- Show students a copy of the Geoboard Recording Paper, and let them know they are welcome to use this paper to help them find the area of each shape. They can draw on the paper, cut it up, or use it in any way that would be helpful to them.
- Have students find the Taking a Closer Look at the Pattern page in their Number Corner Student Books.
- Cover or fold up the January Calendar Grid Observations Chart, so that students cannot simply copy the information there.
- Answer any questions students have about the page.

3 Give students time to work on the page.

While students should generally work independently, let them know it is OK to ask a partner a question or to work through one or two questions with a peer. While they work, circulate around the room to make observations, answer questions, and provide differentiated instruction.

ELL Help students with the vocabulary for this activity, especially the shape names. If you can, provide a sheet of labeled shapes for them to refer to. Encourage ELL students to work with a partner.

SUPPORT Help students focus their work by encouraging them to look for similarities and differences between each pair of shapes. You might also encourage students to think about how the side lengths and area of each pair of similar shapes are related.

CHALLENGE Ask students to come up with two calendar markers that follow the patterns they have observed so far.

SUPPORT If a majority of the class seems to struggling at any one time, bring the whole class together to discuss the challenges they are having. Invite students to share their confusion and their questions. Build discussion so that students can help each other, with support from you, understand what they need to do.

4 At the end of the activity today, let students know they will share their work the next time they have Number Corner. Have them put away their materials.

Activity 3

Discussing Student Work — Day 8

1 Open today's activity by telling students that they will share their work on the Taking a Closer Look at the Pattern page, which they completed last time, and give them a moment to get ready.

- Give students a minute to find and look over their work on the Taking a Closer Look at the Pattern page in their Number Corner Student Books.
- If necessary, give students a few minutes to finish the page.

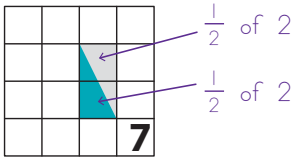
2 Review the shape names, and take time to resolve any questions or uncertainties for students.

3 Once everyone agrees on all the shape names, review the areas of the shapes, focusing on those shapes that were most challenging.

Invite students to share how they determined the areas of these challenging shapes. Encourage students to use the Geoboard Recording Paper to prove their assertions about the figures.

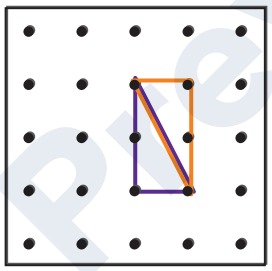
Jasmine *I imagined cutting the tip of the triangle part off, turning it around, and fitting it in on the bottom. You can see it would fill 1 square.*

Alicia *I drew a box around the rectangle the triangles in. Then I could see that the triangle fills half of it. Since the rectangle is 2 squares big, the triangle is half of that: 1.*



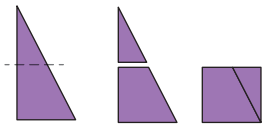
Teacher *Please spend some time talking to the person next to you about how you can tell whether or not these two ideas are true or not. You can use the Geoboard Recording Paper to explore the ideas. Then we'll share as a group. …*

Chris *We thought about the second idea. If the two triangles are the same, then they are each half of the rectangle. So we made the rectangle and triangle on one piece of the geoboard paper, and we made them on another piece of paper too. Then we put them on top of each other. We could see the triangles were the same. So each one is half of the rectangle.*



Diamond *Right, so since the rectangle is 2, each triangle is 1.*

Earl *I thought about Jasmine's idea, because if I could see it all in 1 square, that would make more sense to me. So I drew the triangle on the geoboard paper and then I cut the tip off. You can flip it around and it fits right in there, see? It's 1 square when you fit it together like that.*



4 After discussing the area of the shapes, invite students to share one observation they made about the pattern. Challenge them to make it around the room without repeating any observations. Afterward, students can share additional observations and predictions as time allows.

5 At the end of your Number Corner time today, have students clean up and put away materials.

Activity 4

Discussing the Calendar Pattern — Day 12

1 Open today's activity by reviewing the Calendar Grid and Observations Chart.

- Direct students' attention to the Calendar Grid and Observations Chart.
- Ask them to examine the new markers that have been revealed over the past few days and to look at the notes taken about them on the Observations Chart.
- Ask students if there is anything they would add to or change on the Observations Chart.
- Take a moment to invite students to share any new observations or insights they have about the markers.

2 Then, ask students to focus on a few pairs of shapes and consider how the shapes change from one marker to the next. Use the following questions to build discussion:

- What happens to the angles, the length of each side, and the area when the smaller shape is enlarged?
- What would happen if the grids were larger and each figure could be enlarged a third time?
- What patterns do you see in the number of square units?

3 Next, ask students how they describe the relationship between the area of the 13th marker and the area of the 14th marker.

If students cannot see the calendar markers clearly from their seats, you may want to display these two markers using a document camera or projector, if available, using the mini markers or just the markers themselves.

> ***Teacher*** *Can you describe the relationship between the area of the 13th and 14th markers? Can you explain it as a comparison statement?*
>
> ***Students*** *What? What do you mean a comparison statement?*
>
> *I think he wants us to compare the area of those two shapes.*
>
> *One has an area of 2 units and the other has an area of 8 units.*
>
> *Eight units is bigger than 2 units. It is 6 units bigger.*
>
> *Or, you could say it is 4 times bigger.*
>
> *I agree. The area in the 14th marker is 4 times as big as the area of the shape in the 13th marker.*

4 Then, ask students how they would write a multiplication equation for the comparison sentence they just made.

> ***Gregory*** *That would be $2 \times 4 = 8$. The area of the first one was 2 and then we multiply it by 4 to get the next one because it is 4 times bigger.*

5 Wrap up today's activity by encouraging students to continue looking for patterns and making observations as the month continues.

Activity 5

Concluding the January Calendar Grid — Day 20

1 Open today's activity by inviting students to share any comments or questions now that all or nearly all of the calendar markers are showing.

2 Then, review ask students how they would write a multiplication equation for the following multiplicative comparisons:

SUPPORT If students are confused, take time to discuss the statements and equations in more depth.

- Figure A has an area of 5 square units. Figure B's area is 6 times as big as Figure A's. What is the area of Figure B? [$5 \times 6 = 30$]
- Figure C has an area of 9 square units. Figure D's area is 7 times as big as Figure C's. What is the area of Figure D? [$9 \times 7 = 63$]
- Figure E has an area of 56 square units. Figure E's area is 8 times as big as Figure F. What is the area of Figure F? [$8 \times 7 = 56$ or $56 \div 8 = 7$]

3 Reverse the challenge and ask students to make a comparison statement for the following equations. They do not need to stay in the context of area, but they are welcome to.

SUPPORT Again, if students are confused, take time to discuss the statements and equations in more depth. Provide more examples for practice as well.

- $3 \times 8 = 24$ [Sample answer: Figure A's area is 3 square units. Figure B's area is 8 times as big as Figure A's area.]
- $7 \times 6 = 42$ [Sample answer: Sophia is 7 years old. Her mom is 6 times as old as she is.]
- $9 \times 12 = 108$ [Sample answer: There are 9 apples in a box. There are 12 times as many apples in a crate.]

4 Then, write following number pattern where everyone can see: 5, 25, 125, 625. Ask students if they can figure out what is happening in this pattern.

Each subsequent number is multiplied by 5 to get the next number.

5 Then tell students you are going to reverse the question. Instead of asking them to look at a pattern and figure out what is happening, you will tell them what happens in the pattern and they will generate the numbers. Ask students what numbers they might see if each subsequent number is multiplied by 2.

Student answers will vary, depending on what they start with. Encourage students to discuss and defend their patterns. Sample answers include: 2, 4, 8, 16, 32, 64, and so on; 6, 12, 24, 48, 96, and so on; 10, 20, 40, 80, 160 and so on.

CHALLENGE Have students work with the rule ×4 or ×6 instead of ×2.

6 At the end of your Number Corner time today, ask students to summarize some of the big ideas they learned from exploring the January Calendar Grid. Then, recognize students for their learning this month. Let them know that February's Calendar Grid pattern will also involve geometry.

Students *How to figure out if shapes are similar or not.*

How to find the area of different shapes.

How to think about relationships between similar shapes.

More about patterns and shapes in general.

Extension

If there are more days in January, encourage students to continue to post calendar markers and update the Observations Chart. You may want to find time to discuss the final calendar marker with students.

January Calendar Collector

Three Quarters a Day

Overview

The class collects three quarters each day in the form of paper money value pieces. Money value pieces help students visualize and understand the connection between fractions and decimals. The class uses a record sheet to keep track of the growing collection of money in terms of a number of quarters, dollars and cents (shown using decimal notation), and whole and fractional parts of a dollar.

Skills & Concepts

- Explain addition of fractions as joining parts referring to the same whole (4.NF.3a)
- Express a fraction as the sum of other fractions with the same denominator in more than one way (4.NF.3b)
- Demonstrate an understanding that a fraction a/b is a multiple of the unit fraction $1/b$ (4.NF.4a)
- Write an equation showing that a fraction a/b is the product of $a \times 1/b$ (4.NF.4a)
- Multiply a fraction by a whole number (4.NF.4b)
- Solve story problems involving addition of fractions referring to the same whole and with like denominators (4.NF.3d)
- Solve story problems involving money using addition or multiplication of simple fractions and decimals (4.MD.2)
- Model with mathematics (4.MP.4)
- Look for and make use of structure (4.MP.7)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Introducing the Calendar Collector	1	**TM T5** Quarter Grids **TM T6** Dollar Grids		• 5 pieces of 6″ by 12″ white construction paper • 2 sheets each of yellow and white copy paper • 4 sheets of light green copy paper • glue stick
Activity 2 Introducing the Record Sheet	5			• Three Quarters a Day Record Sheet (see Preparation) • tape or tacks to post the record sheet
Activity 3 Discussing Patterns & Writing Equations	9			
Activity 4 Final Observations About the Pattern	19	**NCSB 43*** Quarters & Dollars		

TM – Teacher Master, **NCSB** – Number Corner Student Book
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.

decimal*
dollar
fraction*
quarter
times as many

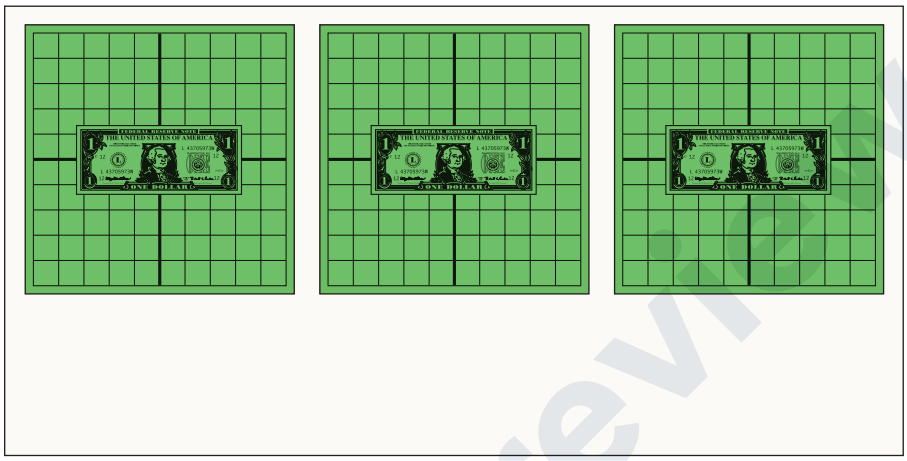
Preparation

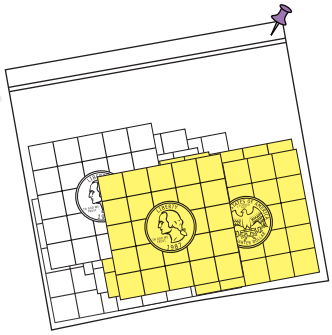
Erase the entries on the Calendar Collector Record Sheet from last month. Then redraw the lines to create 5 columns and 17 rows. Label them as shown here for use with this month's collector. You might want use a different color of marker to write the × 3 in each row. You will post the record sheet during Activity 2.

Three Quarters a Day Record Sheet

Day	Number of Quarters	Fractions of a Dollar	Dollars & Cents
× 3			
× 3			
× 3			

Glue 3 Dollar Grids across each of the 5 pieces of 6″ × 12″ white construction paper, as shown below. Glue them across the top of the paper to leave space below for recording money amounts. Post one page of 3 dollars on your calendar display board at the beginning of the month, and keep the other 4 in reserve to use as needed.

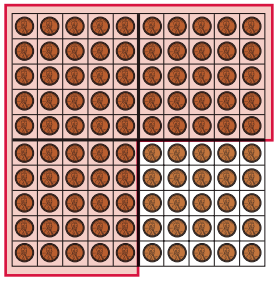




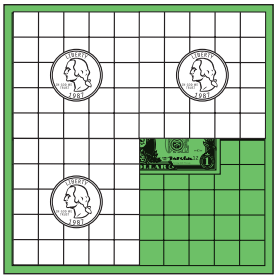
Cut the quarter grids you copied and store them in an envelope or zip-top bag. Place them near the posted Dollar Grids with a glue stick nearby.

Mathematical Background

The dollar grid is 100 small squares (100 cents or pennies), and 3 quarters cover 75 out of those 100 squares (75 cents or pennies). If students consider the entire grid of 100 as one whole, then 3 quarters cover ¾ of the grid. In this way, the model makes it clear that ¾ is equal to 75/100 or 0.75.



$75¢ = \frac{75}{100}$ or \$0.75



$75¢ = \frac{3}{4}$ of \$1.00

While this might seem potentially confusing, fourth graders are usually fascinated by the idea of shifting the unit, from the cent being 1 whole to the dollar being 1 whole. Because most can understand that a dollar is both 100 cents and a single dollar, they can see the dollar grid as either 100 (small squares) or 1 (large square).

Literature Connections

Here are a few good books to share with your students this month. You might enjoy them with the class or make them available for students to read on their own.

- *The Coin Counting Book* by Rozanne Lanczak
- *If You Made a Million* by David M. Schwartz
- *The Story of Money* by Betsy Maestro
- *Four Dollars and Fifty Cents* by Eric Kimmel
- *Once Upon a Dime* by Nancy Kelly Allen

This workout targets many of the key ideas for fractions in fourth grade. As students accumulate quarters, they see that they are accumulating fractions and decimals, which provides opportunities to add fractions with like denominators and to multiply fractions by whole numbers. They generate equations for these situations. They also come up with different equations to show fractions as the sum of other fractions with the same denominator.

The visual model of the quarters on the dollar grids makes what might seem challenging (multiplying fractions and decimals) much more manageable. The visual model shows when they have accumulated whole dollars, making it easy to see that, for example, when solving 18×0.25, students see that 16×0.25 or 16 quarters is 4 dollars, and then they just need to add on 2 more quarters to find 18×0.25. Students also review multiplicative comparisons and complete a Number Corner Student Book page in which they write equations for comparison statements and comparative statements for equations.

Key Questions

Use the following questions to guide students' discussion this month:

- How much is one-quarter worth?
- What fraction of a dollar is one-quarter? Three quarters?
- How can you write $1.50 as a fraction?
- How can you write $2 ¾ as a decimal?
- How can you show the value of ¾ as an addition equation? [for example, ¼ + ¼ + ¼ = ¾]
- How can you show the value of ¾ as a multiplication equation? [i.e., 3 × ¼ = ¾]
- Conrad has 6 quarters. Jimmy has 5 times as many quarters as Conrad. How many quarters does Jimmy have?
- If you collect 3 quarters a day for 20 days, will you have more than or less than $10? How can you tell?
- What patterns do you notice on the Calendar Collector Record Sheet?

Update

Starting after Activity 1, have the student helper(s) complete this update procedure every day that the Calendar Collector is not a featured activity. You'll update the Calendar Collector as part of Activities 2, 3, and 4 as well.

Procedure

- For each day of school, student helpers glue 3 quarters onto the dollar grids.
- They write the total value in decimal notation underneath.
- After it is posted in Activity 2, students also update the record sheet by filling in the day, the total number of quarters, the value as a fraction or mixed number, and the value in dollars and cents (decimal form).

Activity 1

Introducing the Calendar Collector — Day 1

1 Open today's activity by embedding the collection in the following scenario.

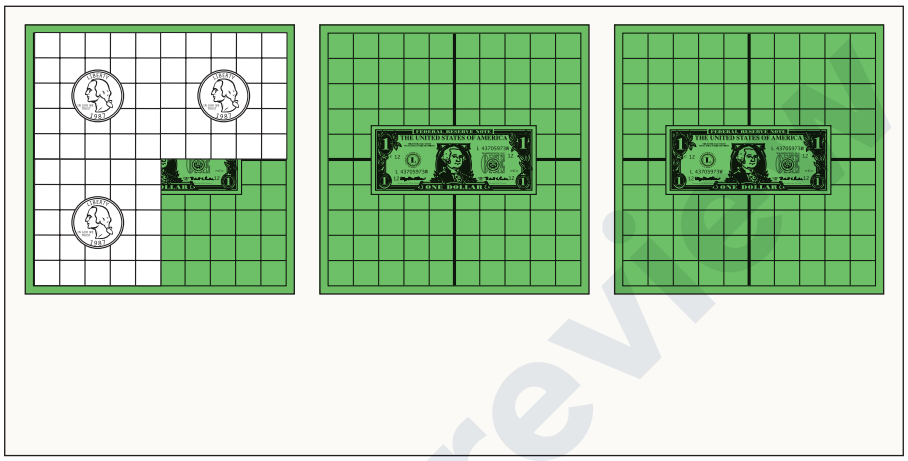
- Ask students to imagine that their mother (or one of their grandparents) has offered to give them some spending money in a few weeks.
- She will either give them $10 on January 20th or 3 quarters a day, starting on January 1st and ending on January 20th.
- Either way, they can't have the money to spend until the 20th.
- Ask students to think about which option they would choose and why.

2 Give students time to discuss the scenario with a partner. Then, invite pairs to share with the whole group.

While some students may be interested in considering the relative merits of a $10 bill versus a bunch of quarters, others may start to do some quick mental calculations to determine if the offer of 3 quarters a day for 20 days will result in more money (20 days × $0.75 per day = $15.00). Although there is likely to be some lively discussion and debate, there is no need for students to reach a final resolution. Let them know that they will actually collect 3 quarters a day for each school day in January, and they'll have plenty of chances to change their minds about which option they would choose.

3 Then draw students' attention to the three dollar pieces posted on the calendar display board and the quarter pieces. Ask them to share observations about these pieces.

> ***Teacher*** *We'll be gluing three of these quarter money value pieces to one of these dollar grids. What do you notice about these paper quarter and dollar pieces?*
>
> ***Students*** *Three of those quarter pieces will almost fill a dollar.*
>
> *It looks like it will take four of them to fill a dollar.*
>
> *It will. I remember from last year when we used pieces like this.*
>
> *Three quarters will fill up ¾ of the dollar. Hey—three quarters fills three-quarters of the square!*
>
> *And that's how it works with real money. It takes four quarters to make a dollar, and each of those little quarter pieces is a fourth of the square for the dollar.*
>
> *I bet that's why they call it a quarter!*



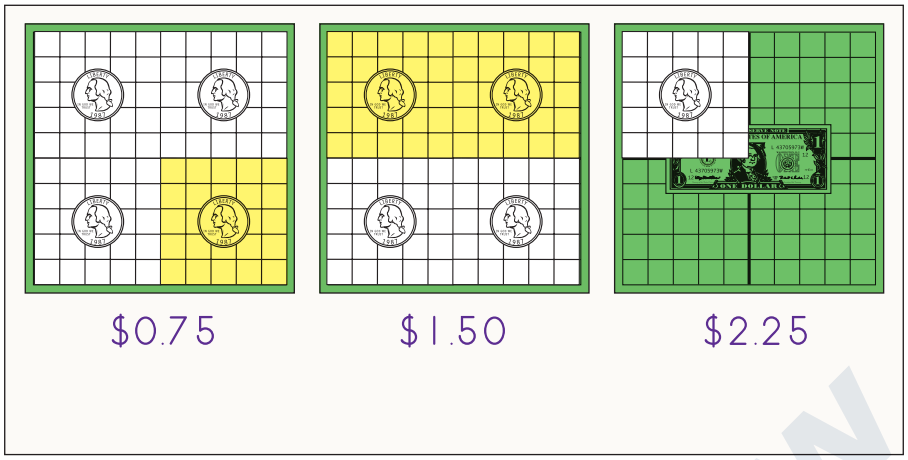
4 Students are almost sure to notice that the dollar is represented by a 10 × 10 grid, while the quarter is represented by a 5 × 5 grid. If they don't mention it, call their attention to this fact and ask for further observations.

This fact is important because the money value pieces lay groundwork for connecting fractions and decimals.

> ***Teacher*** *Many of you have said that it will take four of these quarter pieces to fill a dollar grid. How are you thinking about that?*
>
> ***Students*** *It takes four quarters to make a dollar.*
>
> *Also, you can just see it if you hold the quarter piece up against one of the dollars.*
>
> *We've seen these before and we know how they work.*
>
> *Also, I can see that the dollar grid is a 10-by-10, and the quarter grid is a 5-by-5. It's a quarter of the 100 grid.*
>
> ***Teacher*** *What does a dollar have to do with 100?*
>
> ***Students*** *There are 100 pennies in a dollar and 25 pennies in a quarter.*
>
> *And 25 is a quarter of 100, because it takes four 25s to make 100.*

5 Invite student volunteers to come up and glue three quarter pieces for each day that has passed so far this month onto the dollar grids you have prepared. Record the total value in decimal notation along the bottom, and call students' attention to how this notation is used.

Have students alternate colors as they post each group of three quarters, so that the first set of 3 quarters is white, the next set is yellow, the third set is white, and so on. This makes it easier to see the amount of money that has been posted each day.



6 Wrap up today's activity by telling students that they will start a record sheet for this month's collector soon. For now, when students update the Calendar Collector, they just need to glue the three quarters to the dollar grids for each day of school.

7 Finally, invite students to share any observations they have at this point.

> ***Students*** *We still have room for three more quarters.*
>
> *Hey, here's a funny thing. It'll take four days to get three dollars. Get it? Three dollars in four days, just like three quarters is ¾ of a dollar!*

Activity 2

Introducing the Record Sheet — Day 5

You will post the record sheet you prepared before this activity. Also, make sure there are enough dollar grids for student helpers to update the collector during this activity.

1 Open today's activity by directing students' attention to the dollar grids. Invite students to share any observations about the collection of quarters.

2 Then, ask students what kinds of information they think they will collect on the record sheet this month.

> ***Students*** *How many quarters we have.*
>
> *How much money we have.*
>
> *Maybe we will write the money in different ways? Like, as fractions?*

3 Post the Three Quarters a Day Record Sheet. Tell students that they will use the record sheet to keep track of how much money they have collected in quarters, dollars and cents, and in whole and fractional parts of dollars.

4 Explain that students can count the pieces to determine how many quarters have been collected so far, but they can also multiply the date by 3 to find out.

5 Ask students how they can figure out the amount of money collected on each day as a fraction.

The visual model helps students see how much money they have. Each time a dollar grid is filled, they know they have a whole number. Then, they just have to determine the remaining fraction of a dollar, which will always be ¼, ²⁄₄ or ½, or ¾. For this reason, it might be easier for students to write each amount as a mixed number first. Also press them to express it as an improper fraction that shows how many fourths; for example, ⁶⁄₄ = 1 ½ or ⁹⁄₄ = 2 ¼. In doing so, they will see multiplication and addition of fractions with like denominators as an iteration of the unit fraction, in this case ¼.

6 Ask students how they can figure out how much money in dollars and cents they have collected on each day.

Although they can count by 25s to determine how much money has been collected in dollars and cents, the visual model allows students to see the total quickly. While it may be challenging for some to compute the value of 27 quarters, it's easy to see on the display that it's $6.75. The money value pieces also lend visual support to such operations as dividing 27 by 4 to determine the dollar amount: 27 quarters ÷ 4 quarters per dollar = number of dollars in decimal form.

7 Invite student volunteers, one for each day of school that has passed so far, to come up and fill in the record sheet. Encourage students to verbalize their thinking as they fill in the sheet.

Three Quarters a Day Record Sheet

Day	Number of Quarters	Fractions of a Dollar	Dollars & Cents
1 × 3	3	$\frac{3}{4} = \frac{3}{4}$	$0.75
2 × 3	6	$\frac{6}{4} = 1\frac{1}{2}$	$1.50
3 × 3	9	$\frac{9}{4} = 2\frac{1}{4}$	$2.25
4 × 3	12	$\frac{12}{4} = 3$	$3.00
5 × 3	15	$\frac{15}{4} = 3\frac{3}{4}$	$3.75

8 Take some time to deepen students' understanding of what is happening when you compose and decompose fractions with the same denominator. Build discussion and record students' answers. Be sure to express the total value as the product of some whole number (the number of quarters) and ¼.

Ask students the following questions for the first and second days:

- How many quarters did we have on the ___ day?
- How do you say that as a fraction?
- How can we write that fraction as an equation? Can you think of more than one way?

> ***Teacher*** *Let's break down some of these fractions a little. Look back to the first day. We had three quarters. Who can tell me how to say that as a fraction?*
>
> ***Aleeyah*** *Three-fourths.*
>
> ***Teacher*** *Right. So, each quarter is what part of a dollar?*
>
> ***Aleeyah*** *One-fourth.*
>
> ***Teacher*** *Can someone help me write an equation that shows why three quarters is the same as ¾ of a dollar?*
>
> ***Cindy*** *You can write ¼ + ¼ + ¼ = ¾.*
>
> ***Darius*** *Or, you can write 3 × ¼ = ¾.*
>
> $$\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$
> $$\frac{3}{4} = 3 \times \frac{1}{4}$$
>
> ***Teacher*** *Great. Let's keep going. How about the second day? Now how many quarters did we have?*
>
> ***Joshua*** *Six quarters—or ⁶⁄₄.*
>
> ***Teacher*** *What are some different ways to write ⁶⁄₄ as an equation? Can anyone build on what we did with the first one or something else they see on the dollar grid to see more ways to write equations?…*
>
> $$\frac{6}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$
> $$\frac{6}{4} = 6 \times \frac{1}{4}$$
> $$\frac{6}{4} = 2 \times \frac{3}{4}$$
> $$\frac{6}{4} = \frac{3}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$
> $$\frac{6}{4} = \frac{3}{4} + \frac{3}{4}$$
> $$\frac{6}{4} = \frac{4}{4} + \frac{1}{4} + \frac{1}{4}$$

9 After exploring several different ways to write equations for fractions, ask students to make predictions about the next few days.

You might use the following questions to help build discussion.

- When will we next have a whole number for dollars? How do you know?
- When will we have $10? How do you know?
- Do you see any patterns on the record sheet that help you make prediction? Explain.

10 Wrap up today's activity by recognizing students' efforts and persistence.

Activity 3

Discussing Patterns & Writing Equations — Day 9

1 Open today's activity by working with students to update the collection of quarters and the record sheet.

2 Work together as a class to make sure that each day's total value is represented with an improper fraction with a 4 in the denominator.

3 Then invite students to look at the record sheet in silence and think about what they notice about the patterns they see in the rows and columns.

You might use the following questions to prompt discussion.

- Our collection of quarters is almost half done. Do you think we will have more or less than $10 when 20 days have passed? How can you tell?
- On how many more days will we have a whole number of dollars? Which days will those be?
- What patterns do you notice on our record sheet and in the money value pieces?

4 Take some time to have students discuss some of the most mathematically meaningful observations, using the money value pieces and the record sheet to explain what they are seeing.

- For example, students might notice that on days that are multiples of 4 (days 4 and 8), the total value is a whole number.
- They might also notice that when the value expressed as a fraction has a ½ in it, the value expressed as a decimal ends in .50. (If the fraction has a ¼, the decimal ends in .25. If the fraction has a ¾, the decimal ends in .75.)

5 Ask students to write addition and multiplication equations to show the total value on different days.

- Select a day and ask students to work individually to write an equation that shows the total value of the day in fractions.
- Have students share their equations until you have recorded five equations or no one has a new equation to offer.
- In the course of this sharing, be sure that students see that any of these amounts can be represented as the product of ¼ and the number of quarters. [$\frac{9}{4} = 9 \times \frac{1}{4}$] Also be sure that they see that the improper fractions can be expressed as mixed numbers that are the sum of a whole number and a fraction. [$3\frac{3}{4} = 3 + \frac{3}{4}$]
- Repeat with another day.

6 Close the activity by asking students to think and talk about how long it would take them to accumulate $27 if they continued to collect 3 quarters per day. [36 days]

Some students might figure that since it took 4 days to collect $3, it will take 9 times as long to collect $27, and 9 × 4 = 36.

Activity 4

Final Observations About the Pattern — Day 19

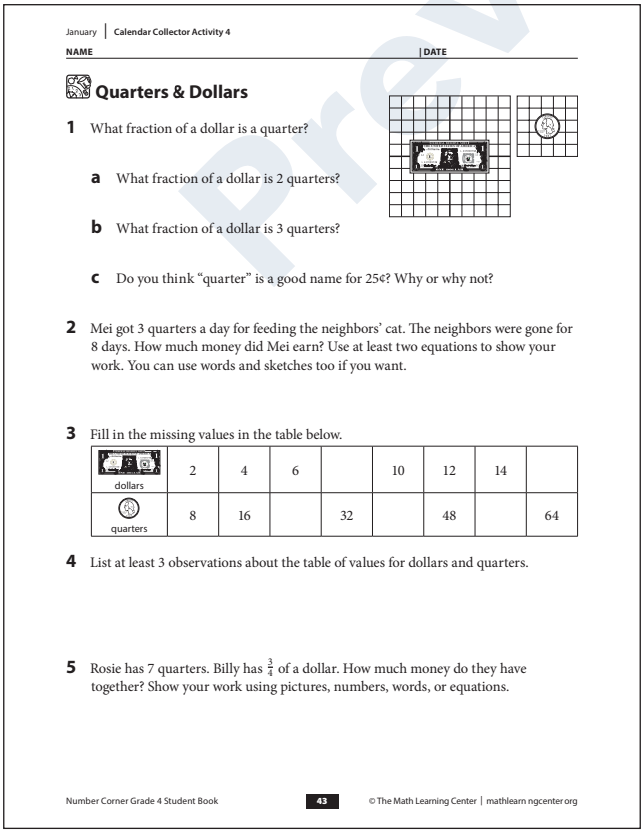
1 Begin today's activity by directing students' attention to the dollar grids and Calendar Collector Record Sheet. Invite students to share any observations they have at this point.

If it doesn't come up, ask students about the patterns they see on the record sheet. What do students notice about the numbers that have been recorded in each column? Why do they think the patterns work they way they do?

2 If you are not already at the 20th day, ask students to reconsider the question of whether they would prefer to have $10 or 3 quarters a day for 20 days. If you have filled in the record sheet through the 20th day, ask students which option was better and why.

> ***Students*** *We will definitely get more than $10.*
>
> *I wasn't sure at first, but now I can see that getting 3 quarters a day was better.*
>
> *If we got 50 cents a day, it would take 20 days to get $10. So, it is definitely better to go for 75 cents a day for 20 days. It has to be more.*

3 Then, display your copy of the Quarters & Dollars Number Corner Student Book page. Give students a moment to look it over, and then ask students if they have any questions.



January | Calendar Collector Activity 4

NAME | DATE

Quarters & Dollars

1 What fraction of a dollar is a quarter?

a What fraction of a dollar is 2 quarters?

b What fraction of a dollar is 3 quarters?

c Do you think "quarter" is a good name for 25¢? Why or why not?

2 Mei got 3 quarters a day for feeding the neighbors' cat. The neighbors were gone for 8 days. How much money did Mei earn? Use at least two equations to show your work. You can use words and sketches too if you want.

3 Fill in the missing values in the table below.

dollars	2	4	6		10	12	14	
quarters	8	16		32		48		64

4 List at least 3 observations about the table of values for dollars and quarters.

5 Rosie has 7 quarters. Billy has $\frac{3}{4}$ of a dollar. How much money do they have together? Show your work using pictures, numbers, words, or equations.

Number Corner Grade 4 Student Book 43 © The Math Learning Center | mathlearn ngcenter.org

4 Have students begin working on the page. They can work independently or with a partner.

SUPPORT Consider working with a small group of students who need extra support.

5 As students finish the Quarters & Dollars page, have them compare their work with a partner.

6 You might want to collect their work and review it to see how students are doing with these fraction ideas.

January Computational Fluency

Division Capture

Overview

Students continue working on the number line, but this month, the scale shifts from 0 to 100 to 0 to 1 and students identify, compare, and order fractions between 0 and 1. They also play Division Capture, first as a whole group and later in pairs. Division Capture provides practice with basic division facts in the context of a simple but engaging strategy game.

Skills & Concepts

- Divide a 2-digit number by a 1-digit number using strategies based on place value, the properties of operations, or the relationship between multiplication and division (4.NBT.6)
- Recognize equivalent fractions (4.NF.1)
- Compare two fractions with different numerators and different denominators (4.NF.2)
- Demonstrate an understanding that a comparison of fractions is valid only when they refer to the same whole (4.NF.2)
- Use the symbols >, =, and < to record comparisons of two fractions with different numerators and different denominators (4.NF.2)
- Explain why one fraction must be greater than or less than another fraction (4.NF.2)
- Model with mathematics (4.MP.4)
- Attend to precision (4.MP.6)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Fractions on the Number Line, Part 1	3	**TM T7** One-Foot Number Lines		• ruler • fine-tipped markers or felt-tipped pens in blue, red, and orange
Activity 2 Introducing Division Capture	4	**TM T8** Introducing Division Capture	• die numbered 1–6	• fine-tipped markers or felt-tipped pens in red and blue
Activity 3 Fractions on the Number Line, Part 2	12	**TM T7** One-Foot Number Lines		• ruler • fine-tipped markers or felt-tipped pens in purple, green, and pink
Activity 4 Playing Division Capture	13, 16	**NCSB 44** Division Capture Instructions **NCSB 45–47** Division Capture Record Sheets 1–3	• spinner overlays, half-class set	• colored pencils in red and blue, class set

TM – Teacher Master, **NCSB** – Number Corner Student Book
Copy instructions are located at the top of each teacher master.

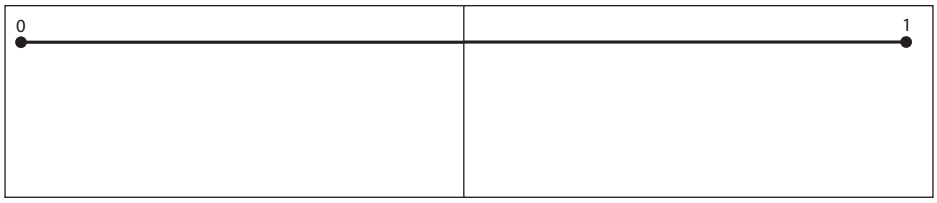
Preparation

Create two One-Foot Number Lines from the One-Foot Number Lines Teacher Master. You may want to laminate these for use in future years. Post one of the number lines before Activity 1 (Day 3) and add the second one for Activity 3 (Day 12).

Vocabulary

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

denominator*
dividend*
divide*
division
divisor*
fraction*
greater than
less than
numerator*
quotient*



Mathematical Background

This month, students move from working with whole numbers on the number line to fractions. They have a new number line that goes from 0 to 1, on which they locate and compare halves, fourths, eighths and then thirds, sixths, and twelfths.

To support their work with division in the Problem Strings and Solving Problems workouts this month, students review their basic division facts by playing Division Capture, which was introduced as a Work Place during Bridges earlier this year. In the game of Division Capture, partners take turns rolling a die and using the number that comes up to complete one of 20 division equations on a grid. Each partner uses a different color to write their numbers on the grid, and once all the equations are completed, players seek out any equations they completed that fall in a vertical, horizontal, or diagonal row.

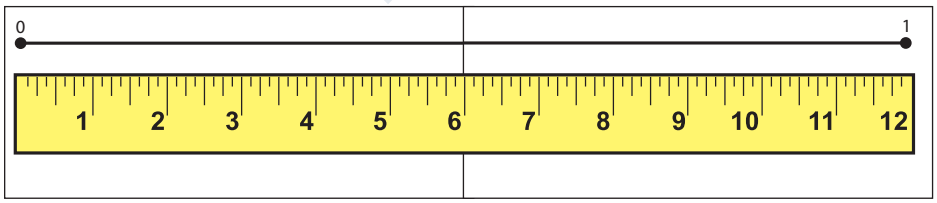
Activity 1

Fractions on the Number Line, Part 1 — Day 3

There is an optional challenge activity described in step 6. This can be for a few students or all students, depending on where your class is with their understanding of equivalent fractions and comparing and ordering fractions between 0 and 1. If you choose to do the activity, you can introduce it earlier than step 6.

1 Open today's activity by directing students' attention to the new number line you have posted. Invite them to share comments, questions, and observations about this number line.

2 Then, tell students that the number line is exactly 1 foot or 12 inches long. Use a ruler to measure the number line.



3 Then, ask students how many halves there are in 1 foot and how they would know where to mark the halves. With student input, label the halves on the number line in blue.

> ***Students*** *There are 2 halves in 1 foot.*
>
> *Divide the foot in half, then you know where the halves are.*
>
> *One foot is 12 inches, so half of that is 6 inches. Mark the half at 6 inches.*
>
> ***Teacher*** *Let's label halves in blue. Are there any other halves we can label?*
>
> ***Students*** *No. There is just one-half between 0 and 1.*

Key Questions

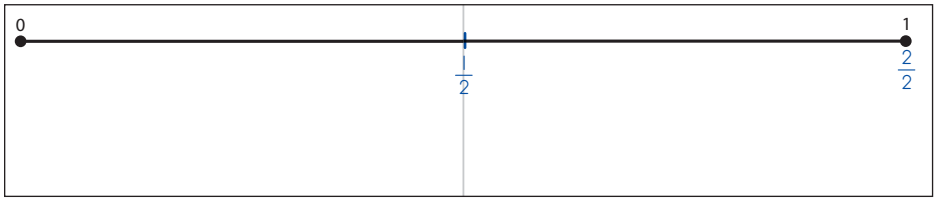
Use questions like the following to guide students' discussion this month. You can change the fractions when asking the questions.

- How many ¼s are in ½? How many ⅛s are in ½?
- How many 1/12s are in ⅓? How many ⅙s are in ⅓?
- Which is smaller, ⅔ or ¾?
- Which is bigger, 4/12 or ½?
- Put these fractions in order from least to greatest: ½, ⅞, ⅙, ¾, 4/4, 3/12.
- Put these fractions in order from greatest to least: ⅜, 4/6, ⅓, 6/6, 1/12, 4/8.
- What strategies can you use to divide a 2-digit number by a 1-digit number?
- How can you use multiplication to solve division combinations?

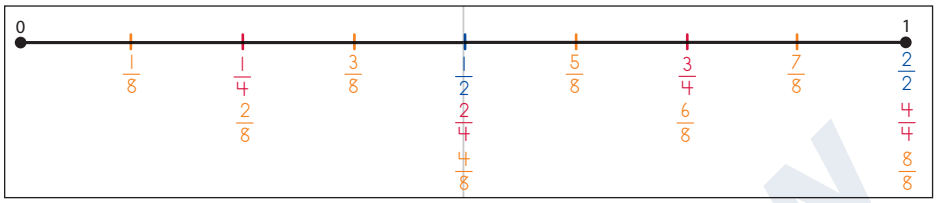
I have a different idea. There are two halves in one, so we can label the one as two halves.

How do you write that?

Two over 2. Write a 2 as the numerator, a fraction bar, and then another 2 for the numerator.



4 Repeat step 3 with fourths and eighths. Ensure students identify all the fourths and eighths on the number line.



5 Give students a minute to study the number line, and then invite them to share what they notice.

6 Then, ask students a series of questions about equivalencies. Build the conversation to help students resolve any confusion they have.

- How many fractions can you find that are equivalent to ½?
- How many fractions can you find that are equivalent to ¾?
- How many fractions can you find that are equivalent to ⅝?
- Can you think of a fraction that is equivalent to ¼ that is not on our number line? How do you know it is equivalent to ¼?

CHALLENGE If this activity is too simple for some of your students, challenge them to extend the number line to 2 and to add the halves, fourths, and eighths between 1 and 2. Encourage them to use improper fractions and mixed numbers. Have them work as a small group to create a new number line on paper while you work with the rest of the class. If you have time, you can invite them to share their work with the rest of the class.

7 Ask students the following questions to help them compare fractions. Encourage them to justify their thinking, and record their answers with the <, >, = symbols.

- Which is bigger, ⅝ or ½? [⅝ > ½]
- Which is bigger, ⅞ or ¾? [⅞ > ¾]
- Which is smaller, ⅜ or ½? [⅜ < ½]
- Which is smaller, ¾ or ⅚? [¾ = ⅚]

8 Write the following sets of numbers and ask students to tell you which symbol (<, >, =) to write between the numbers to complete the expressions.

- ¼ ___ ⅜ [<]
- ¾ ___ ⅝ [>]
- 7/4 ___ 14/8 [=]

9 Finally, ask students what would happen to the fractions if the size of the number line changed. What if the number line still went from 0 to 1, but the number line were stretched out to 2 feet long? Squished down to an inch?

Help students see that a comparison of fractions is only valid when they refer to the same whole. For example, ½ on the original number line is not the same as ½ on a number line that is longer or shorter.

10 Wrap up today's activity by asking students if they have any questions or comments about the work they did on the number line today.

Activity 2

Introducing Division Capture — Day 4

1 Open today's activity by introducing Division Capture.

- If your classroom uses Bridges in Mathematics, acknowledge that students may have already played this game during Work Places. Explain that you're bringing it back to provide a review of some of the division facts that will help them with two of the other workouts this month, both of which feature division with larger numbers.

ELL Throughout this activity, look for opportunities to help ELL students with division-related vocabulary, especially *dividend, divisor,* and *quotient*.

2 Display your copy of the Introducing Division Capture Teacher Master.

- Give students a few moments to examine the sheet quietly, and then review the instructions on the sheet with the class.
- Explain that you're going to play the game against the class right now, and later in the month, students will have a chance to play it again in pairs.
- Decide with the class which team—you or the students—will play for blue and which for red, and fill in the boxes on the teacher master accordingly.
- Then take turns with a volunteer rolling the 1–6 die to determine whether you or the students will go first.

3 Roll the die, and then ask students to study the 20 equations on the grid quietly and raise their hands when they have found one or more that will work.

- Give students plenty of time so that nearly everyone has a chance to find an equation that will work, and let them know that there will be more than one equation that works with this number. (There will be between 2 and 4 equations on the grid that work with any number on the die.)
- When students identify the equations that would work with this number, ask them to explain how they know that the number will make the equation true.

January | **Computat onal Fluency Activity 2** *1 copy for display*

Introducing Division Capture

1 Have each team choose a color and fill in the boxes below to show what they are. Then roll the 1–6 die to see who goes first (high number starts).

2 Roll the die and use the number you get to make one of the equations below true. Write the number in the box using your color.

3 Take turns until all the boxes are filled. (If you roll a number you can't use, you lose that turn.) Try to capture 3, 4 or 5 boxes in a row—across, up and down, or diagonally. After all the boxes are filled, circle the places on the grid where you got 3 or 4 in a row, and then add up both scores. You get 1 point for every set of 3 in a row, 2 points for every set of 4 in a row, and 3 points for every set of 5 in a row.

Students Teacher

45 ÷ ☐ = 9	36 ÷ ☐ = 12	55 ÷ 5 = 11	12 ÷ ☐ = 12
32 ÷ ☐ = 8	11 ÷ ☐ = 11	36 ÷ ☐ = 9	24 ÷ ☐ = 8

Teacher *I rolled a 5. Which equations can I complete by writing a 5 in the box? I'm going to ask that we all study the game board in silence and when you see several equations that would work, just raise your hand. When I see lots of hands, I'll call on people to share their ideas. …*

Tara *Five would work in that one in the top row that says, "45 divided by box equals 9." Then it would be 45 ÷ 5 = 9, and I know that's true because 9 × 5 = 45.*

Rob *I see another one in the top row that would work. If you put the 5 in the third box over, it would say 55 ÷ 5 = 11. I know it works because 11 × 5 = 55.*

- Then fill in the box you or the students selected, using the correct color for that team.

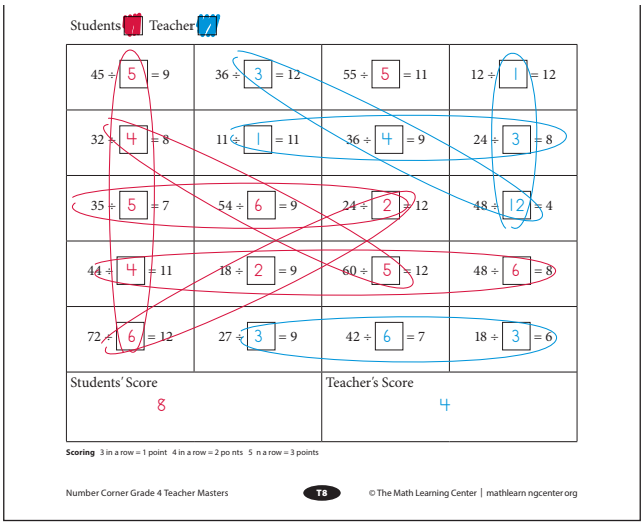
4 Take turns rolling and recording with the class, and have a different student roll and record each time it is the class' turn.

Continue to give students time to think carefully about their choice of equation, especially toward the middle of the game when they will need to strategize in order to capture adjacent equations and block you from capturing adjacent equations.

If you or the student rolls a number that can't be used, play passes to the other player. Toward the end of the game, you may have to pass the die back and forth a number of times until you or they are able to capture the last few equations.

5 When all 20 equations are complete, ask a student volunteer to circle in their team's color any equations captured by the class that fall 3, 4, or 5 in a row.

Do the same for yourself using your color, and then have students use the scoring guide at the bottom of the teacher master to calculate both scores.



Students Teacher

45 ÷ 5 = 9	36 ÷ 3 = 12	55 ÷ 5 = 11	12 ÷ 1 = 12
32 ÷ 4 = 8	11 ÷ 1 = 11	36 ÷ 4 = 9	24 ÷ 3 = 8
35 ÷ 5 = 7	54 ÷ 6 = 9	24 ÷ 2 = 12	48 ÷ 12 = 4
44 ÷ 4 = 11	18 ÷ 2 = 9	60 ÷ 5 = 12	48 ÷ 6 = 8
72 ÷ 6 = 12	27 ÷ 3 = 9	42 ÷ 6 = 7	18 ÷ 3 = 6

Students' Score	Teacher's Score
8	4

Scoring 3 in a row = 1 point 4 in a row = 2 po nts 5 n a row = 3 points

Number Corner Grade 4 Teacher Masters T8 © The Math Learning Center | mathlearn ngcenter org

6 Wrap up today's activity by asking students to summarize the directions for Division Capture.

Note Don't erase or throw away the teacher master you used to play the game until after the fourth Computational Fluency activity. You will use it then to review the game before students play on their own in pairs.

Activity 3

Fractions on the Number Line, Part 2 — Day 12

Post the second One-Foot Number Line directly under the first one. If students tried the challenge exercise in Activity 1, you may want them to repeat it today with thirds, sixths, and twelfths. Do bring them back to the whole class discussion before step 10 or even step 7 if the work in steps 7–9 would be beneficial for them.

1 Open today's activity by directing students' attention to the number line they created earlier this month. Invite students to make and share comments or questions they have about this number line.

2 Then, tell students that they will fill in another number line today. This time they will label the number line in thirds, sixths, and twelfths.

3 With student input, label the thirds on the number line in pink.

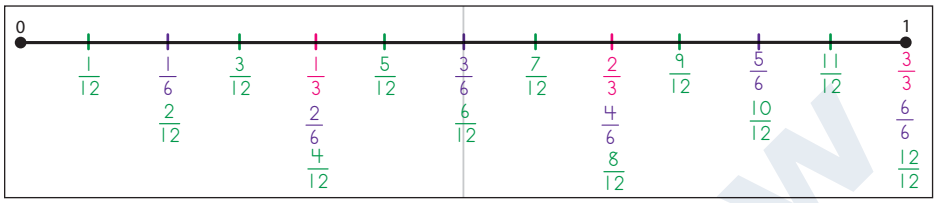
> ***Teacher*** *Just like the last number line we marked with fractions, this number line is exactly 1 foot long. How can we label it with thirds? Talk to a partner and then we'll talk about your ideas. …*
>
> ***Students*** *Divide the line into 3 equal parts.*
>
> *But how do you know exactly where to mark the fractions?*
>
> *We can do what we did before. We know the line is 1 foot or 12 inches long. We need to divide 12 by 3.*
>
> *That's 4. Wait, do we need to mark off 4 fractions?*
>
> *No, I think that means mark one fraction after every 4 inches.*
>
> *Put the ruler up again. Measure 4 inches from the 0. Write ⅓ there.*
>
> ***Teacher*** *All right, here's ⅓. How do I know what to do next?*
>
> ***Students*** *Now measure another 4 inches from that ⅓ and label it ⅔.*

Then, do that again for ⅔.

Teacher *OK, we labeled the thirds. Does this make sense to everyone? Does anyone have a question?*

4 Then, with student input, label sixths in purple and twelfths in green. Continue to build discussion to ensure that students identify all of the sixths and ninths on the number line.

SUPPORT If students are confused, help them see that they can divide the thirds in half to find the sixths and then divide the sixths in half to find the twelfths.



5 Give students a minute to study the number line, and then invite them to share their observations and insights.

6 Then, ask students a series of questions about equivalencies. Build the conversation to help students resolve any confusion they have.

- How many fractions can you find that are equivalent to ⅔?
- How many fractions can you find that are equivalent to 4/12?
- How many fractions can you find that are equivalent to 6/6?
- Can you think of a fraction that is equivalent to 3/12 that is not on our number line? How do you know it is equivalent to 3/12?

7 Ask students the following questions to help them compare fractions. Encourage them to justify their thinking, and record their answers with the <, >, = symbols.

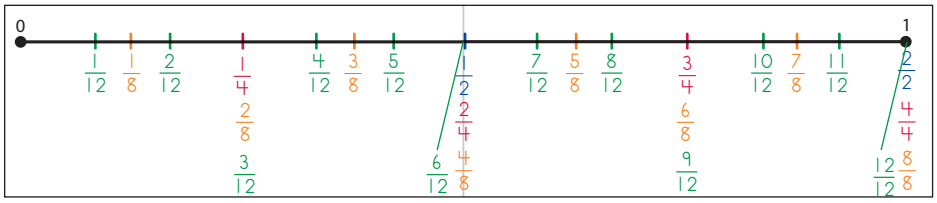
- Which is bigger, 5/12 or ⅓? [5/12 > ⅓]
- Which is bigger, ⅙ or 3/12? [⅙ < 3/12]
- Which is smaller, 5/6 or 12/12? [5/6 < 12/12]
- Which is smaller, ⅔ or 8/12? [⅔ = 8/12]

8 Write the following sets of numbers and ask students to tell you which symbol (<, >, =) to write between the numbers to complete the expressions.

- 3/6 _____ 7/12 [<]
- 4/6 _____ 8/12 [=]
- 9/12 _____ 5/6 [<]

9 Elicit support from students as you add twelfths in green to the first number line. Then, invite students to share their observations about the number line now.

SUPPORT Have students start by filling in the fractions they know, such as using what they know about ½ to identify and label 6/12. Once the equivalent fractions have been filled in, ask students if they can figure out where the remaining twelfths would go. See if they can figure out that since there are 3/12 in ¼, they can divide the ¼ into 3 equal parts to be able to label 1/12 and 2/12.



10 Wrap up today's activity by asking students to share anything they learned or realized during today's number line work.

Activity 4

Playing Division Capture — Days 13, 16

1 The first time you conduct this activity, display the Introducing Division Capture Teacher Master you used to play the game with students earlier in the month.

- Invite students to summarize how the game is played.
- Have students find the Division Capture Instructions in their Number Corner Student Books. Give them a minute to read the page. Then clarify the instructions as needed, noting with the students that they'll use a spinner instead of a die to generate the divisor in this version of the game.

2 Make sure students see that there are three different Division Capture Record Sheets in their Number Corner Student Books, each more challenging than the previous.

3 Ask students if they have any questions about the game. Then, have them find a partner and begin to play. Encourage students to continue to explain and justify their thinking.

4 Circulate as students play the game, making observations, answering questions, and offering differentiated instruction as needed.

SUPPORT Watch for students who are struggling with their division facts. Review strategies for finding quotients. Encourage students to use what they know about multiplication to solve the division problems. Students may also want to review work from division problem strings.

SUPPORT Run copies of Division Capture Record Sheet 1 as needed. Make these available the second time you conduct this activity for use by students who still need to practice basic division facts in a lower range.

CHALLENGE Even fourth graders who are quite fluent with their basic division facts will find the game strategies engaging, but you might also encourage these students to start with Division Capture Record Sheet 2 or 3, and possibly go on to design and use their own record sheets and spinners the second time you conduct the activity.

5 At the conclusion of the activity, invite students to share strategies they used in the game. They can share strategies for solving division facts or game strategies.

January Problem Strings

Division Strategies

Overview

All three strings this month focus on the connection between multiplication and division, but each string features a different model for division. In the first string, students' thinking is represented with jumps on a number line. The second string focuses on arrays, and the third focuses on ratio tables. Each model lends itself to a different kind of strategy for solving division problems, all of which involve using what they know about the relationship between multiplication and division.

Skills & Concepts

- Multiply a 2-digit whole number by a 1-digit whole number using strategies based on place value and the properties of operations (4.NBT.5)
- Use an equation, a rectangular array, or an area model to explain strategies for multiplying with multi-digit numbers (4.NBT.5)
- Divide a 2- or 3-digit number by a 1-digit number, with or without remainders, using strategies based on place value, the properties of operations, or the relationship between multiplication and division (4.NBT.6)
- Use an equation or a rectangular array to explain strategies for dividing a multi-digit number by a 1-digit number (4.NBT.6)
- Attend to precision (4.MP.6)
- Look for and express regularity in repeated reasoning (4.MP.8)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Problem String 13	2	**NCSB Appendix** Problem String Work Space		
Activity 2 Problem String 14	6	**NCSB Appendix** Problem String Work Space		
Activity 3 Problem String 15	10	**NCSB Appendix** Problem String Work Space		

TM – Teacher Master, **NCSB** – Number Corner Student Book
Copy instructions are located at the top of each teacher master.

Preparation

If you are not familiar with solving division problems using the models and strategies featured in these strings, practice solving a few problems on your own before representing student work. The graphics in the activity descriptions will help you.

Vocabulary

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

array*
divide*
dividend*
division
divisor*
quotient*
ratio table*
remainder*

Mathematical Background

Students' experience with strategies and models for multiplication provides a great foundation for working with division. Students may be surprised to realize that they can use the multiplication models and multiplication strategies to solve division problems. Once they see the connection between multiplication and division, using the same strategies and models becomes much more logical. The strings this month are designed to show how the operations are related. As usual, context often helps build student understanding, and contexts are built into the strings to support student thinking.

Each string focuses on a different model, but students can use a variety of strategies. In the first string, the teacher represents student thinking on a number line. The questions are specifically designed to emphasize the number line. For example, the teacher asks, "How many jumps of 6 does it take to get to 90?" In addition to emphasizing the connection between multiplication and division, this string gets students thinking about efficiency. For example, when dividing 90 by 3, students begin to question whether they would prefer to take jumps of 3 or to figure out how big each jump would have to be of they got from 0 to 90 with just 3 equal jumps.

In the second string, student thinking is represented with an array. Students see that they can use an array to build up to a quotient (putting together facts they know) or they can break down the dividend into chunks they know or can easily figure out. The visual model of the array helps students when they move to the ratio table in the third string, where they see similar relationships, which are represented by numbers and equations.

Finally students also begin exploring remainders and what to do with them. They see that they can use the same models and strategies whether the problem has a remainder or not. The strategies and models presented here will help students with the challenges in this month's Solving Problems workout.

Activity 1

Problem String 13 — Day 2

1 Open today's activity by gathering students in the discussion area and reviewing the process of doing a problem string.
   - Remind students to bring their Number Corner Student Books and a pencil.
   - Ask students to turn to the person sitting next to them and summarize how a problem string works.
     - » Problems are delivered one at a time.
     - » Students solve the problem independently and then give a silent thumbs up to show when they are done.
     - » Students share their strategies for solving the problem.
     - » Generally, the earlier problems are easier and the later problems more difficult. Students should try to use the solutions to the earlier problems to help solve the later ones.

2 Have students turn to the next blank page of Problem String Work Space in their Number Corner Student Books. Have them write the date and get ready for the first problem of today's string.

3 Deliver the problem string shown in this table, and model students' strategies for solving the problems on a number line.

Key Questions

Use these questions to help your students investigate this month's problem strings.

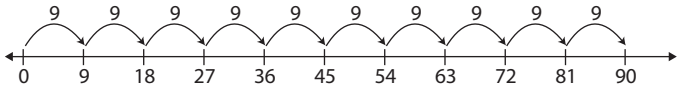
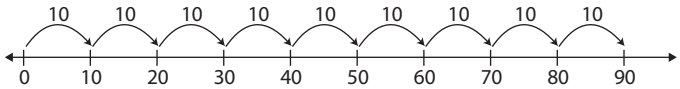
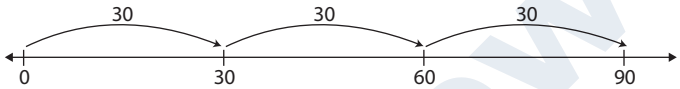
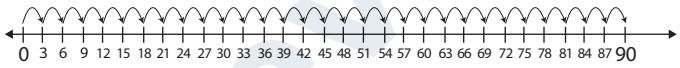
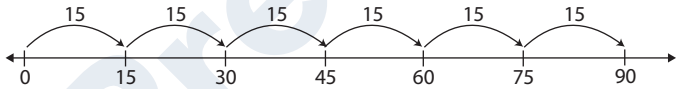
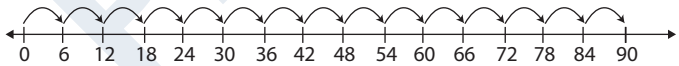
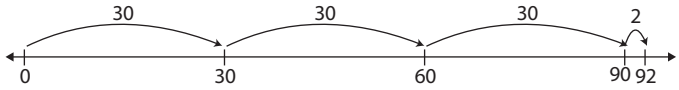
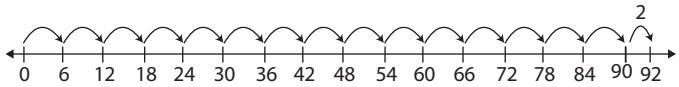
- What do you notice about the numbers in this problem?
- How is this problem related to some of the earlier problems you solved in this string?
- Can you break this problem down into easier parts to work with?
- Do you see a similar problem that is easier to solve?
- Where do you see the numbers in this problem on this number line/ array/ratio table?
- What is the most efficient way for you to solve this problem?
- Do you see a relationship or connection between multiplication and division? Explain.

Literature Connections

Here are a couple of good books to share with your students this month. You might enjoy them with the class or make them available for students to read on their own.

- *Bean Thirteen* by Matthew McElligott
- *The Multiplying Menace Divides* by Pam Calvert
- *Ten Times Better* by Richard Michelson
- *A Remainder of One* by Elinor J. Pinczes
- *The Great Divide* by Dayle Anne Dodds

Problem String 13

Problems	Strategies & Recording	Connections
$10 \times 9 =$ ___ If we start at 0 and make 10 jumps of 9, where will we land?	Most students will simply know that $10 \times 9 = 90$. Model the problem on the number line anyway, because it will serve as a foundation for solving later problems in the string. Many will probably see that this number line illustrates the solution to the second problem: there are 10 jumps of 9 between 0 and 90.  Model the third problem on a new number line. Students will see that the distance is the same (90), but the size and number of the jumps are different: there are 9 jumps of 10 between 0 and 90.  	After creating the number line with 30 jumps of 3, invite students to consider how they could use the first number line for that set of three problems to think about 90 divided by 3. You might rephrase the question in this way to help them see the connection: "If I take 3 jumps of equal size to get from 0 to 90, how big is each jump?" **Big Idea** Division and multiplication are inverse operations, so if you know, for example, that $3 \times 30 = 90$, you also know that $90 \div 3 = 30$ and $90 \div 30 = 3$. If you know that $10 \times 9 = 90$, you also know that $90 \div 10 = 9$ and $90 \div 9 = 10$. When you are thinking about division as equal jumps on a number line, it is often most efficient to think about a smaller number of larger jumps (3 jumps of 30, for example, rather than 30 jumps of 3).
$90 \div 9 =$ ___ How many jumps of 9 does it take to get from 0 to 90?		
$90 \div 10 =$ ___ How many jumps of 10 does it take to get from 0 to 90?		
$3 \times 30 =$ ___ If we start at 0 and make 3 jumps of 30, where will we land?	Again, once you have created a number line that shows 3 jumps of 30 result in a product of 90, students can use that number line to answer the division question, "How many jumps of 30 does it take to get from 0 to 90?"  Model the third problem in this set on a new number line. Students will see that the distance is the same (90), but the size and number of the jumps are different: there are 30 jumps of 3 between 0 and 90. To save time, do not write a 3 over every jump.  	
$90 \div 30 =$ ___ How many jumps of 30 does it take to get from 0 to 90?		
$90 \div 3 =$ ___ How many jumps of 3 does it take to get from 0 to 90?		
$6 \times 15 =$ ___ If we start at 0 and make 3 jumps of 30, where will we land?	  	
$90 \div 6 =$ ___ How many jumps of 6 does it take to get from 0 to 90? If we take 6 equal jumps to get from 0 to 90, how big is each jump?		
$90 \div 15 =$ ___ How many jumps of 15 does it take to get from 0 to 90?		
$92 \div 30 =$ ___ How many jumps of 30 does it take to get from 0 to 92?	Model these problems on a number line, and show that once they get to 90, there is a small jump of 2 yet to make.   	Show students how to record this 2 as the remainder in the two ways shown here. You can simply show the remainder of 2, or you can express that remainder as a fraction: 2 is $\frac{1}{15}$ of 30, so in the first problem you could also write 30 $\frac{1}{15}$. In the second problem, 2 is $\frac{1}{3}$ of a jump of 6, so you can record 15 $\frac{1}{3}$.
$92 \div 6 =$ ___ How many jumps of 6 does it take to get from 0 to 92?		

4 Wrap things up by asking students to talk for a moment about the big ideas they were noticing as they solved the problems in the string.

> ***Students*** *Multiplication and division are really similar.*
>
> *I never thought about using the number line for division, but now it makes sense to me.*
>
> *You can use the same strategies for multiplying on the number line as you can for solving division with the number line.*
>
> *If you know multiplication, that can help with division.*
>
> *I like that you can think about the number you are dividing by as the group or the amount in the group.*

Activity 2

Problem String 14 — Day 6

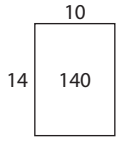
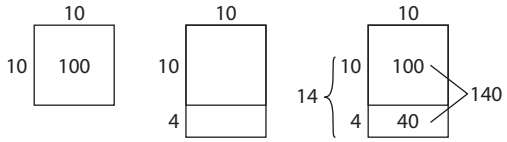
1 Open today's activity by gathering students in the discussion area and letting them know they will do another string about division today.

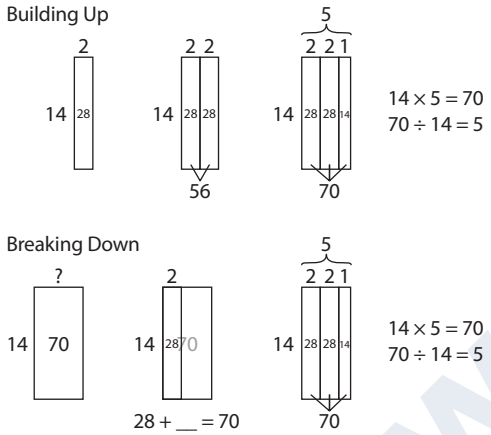
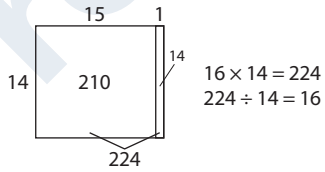
2 Have students turn to the next blank page of Problem String Work Space in their Number Corner Student Books and write today's date at the top of the page.

3 Deliver the problem string shown in this table, and model students' strategies for solving the problems using an array.

You could embed the problems in a context—for example, finding the area of different pieces of paper—that lends itself to using an open array.

Problem String 14

Problems	Strategies & Recording	Connections
14 × 10 = ___ I had a piece of paper that was 14 inches long and 10 inches wide. What was the total area of the piece of paper?	This combination is likely to be quick and easy for students. Nonetheless, model it on an array that represents the dimensions and area of the piece of paper so that students can see the relationships among them.  	The array model nicely represents both multiplication and division. The two dimensions are the numbers being multiplied, and the area is their product. When the problem involves division, the area is the dividend (number to be divided). The known dimension is the divisor, and the unknown dimension is the quotient. **Big Idea** The array model represents multiplication and its inverse operation, division. It can be used to represent multiplication and division situations and to answer questions about them.
140 ÷ 10 = ___ I wanted to cut a piece of paper that had the same area as the first, 140 square inches. If one side is 10 inches, how long must the other side be?	Some students might immediately connect this problem with the multiplication problem they just solved and see that the other side must be 14 inches. Others might begin with what they know, for example that the paper would have an area of 100 square inches if it were a 10-by-10-inch square. Then they would need 40 more square inches, which they can get by adding on another 4 inches to one side.  	
140 ÷ 14 = ___ I wanted to cut a piece of paper that had the same area as the others, 140 square inches. If one side is 14 inches long, how long must the other side be?	Many, if not all, students will recognize that to cut a piece of paper with the same total area and one of the same dimensions, they must make the other dimension the same as the original piece. In this problem, the unknown dimension is 10.	

Problems	**Strategies & Recording**	**Connections**
70 ÷ 14 = ___ I wanted to cut a piece of paper that had an area of 70 square inches instead of 140. If one side is 14 inches long, how long must the other side be?	Look for students who are using the array as a tool to find the quotient. They may build the array up, starting with something they know such as 14 times 2, or they may start with an array of 70 and break it down into groups of 14. They may see that 70 is half of 140, so 70 divided by 14 must be half of 10: 5. You can represent student thinking on the array even if they did not use one. For example, skip-counting by 14s can be represented by five 1-by-14 arrays together to form an entire 14-by-5 array.  	Students might see that they can use the array for 10 × 14 = 140 to solve this problem. If one dimension remains the same while the area is cut in half, then the other dimension must be cut in half, so the answer is 5 inches. Students can also build up to the total dividend using smaller arrays. **Big Idea** The area model can be used to solve division problems. You can build up to the dividend by adding rectangles with one dimension that is equal to the divisor. You can also use the model to see relationships among combinations (e.g., 14 × 10 = 140 and 14 × 5 = 70) and between multiplication and division. Understanding these relationships helps students solve division problems.
14 × 15 = ___ I cut a piece of paper to 14 inches by 15 inches. What is the total area?	Look for students who see how they can use previous problems—14 × 10 and 14 × 5—to solve this one. They might triple the product of 14 and 5 (3 × 70 = 210) or add the products of 14 × 10 and 14 × 5.	
210 ÷ 14 = ___	Look for students who realize that they can use the problem 14 × 15 to solve and explain 210 ÷ 14. Continue to represent student work on an array to solidify and extend students' understanding of the connection between multiplication and division strategies on the array model.	Students often build arrays piece by piece, building up to the dividend. This method helps them begin to think about partial-quotient strategies for division.
224 ÷ 14 = ___	Look for students who saw that 224 is just 1 more group of 14 than 210.  	

4 Wrap up today's string by asking students to share any observations or comments they have about using arrays to solve division problems. Then, recognize them for their participation and effort and let them know they will do one more division string this month.

> ***Students*** *It's not that different from multiplication, especially when you build up to the dividend.*
>
> *Right, you can make an array showing the whole number and then break it into pieces or you can start the array with a piece you know and then keep going.*

Activity 3

Problem String 15 — Day 10

Today you will deliver the following problem string: 10 × 8, 80 ÷ 8, 6 × 8, 128 ÷ 8, 136 ÷ 8, 160 ÷ 8, 168 ÷ 8, 184 ÷ 8, 84 ÷ 6. Students extend their work with division to see how they can use a ratio table and ratio table strategies to solve division problems. They use the context of packs of markers to help them think proportionally. At the end of the string, the context changes slightly so that students can apply what they have learned with a final problem. Once again, students consider what to do with remainders at the end of the string.

1 Open today's activity by letting students know that now that they have looked at division on number lines and arrays, now they will explore division on a ratio table.

2 Establish the context for today's string as you write the first problem for everyone to see: 10 × 8 = _____.

If students are confused that the first problem in a division string is a multiplication problem, remind them that this month they have been focusing on the connection between multiplication and division and it will help them with future problems.

> ***Teacher*** *Today we are going to use packs of markers to help us think about division on a ratio table. Let's say there are 8 markers in a pack. I'll use that information to start our ratio table: 1 pack, 8 markers.*

packs	1	
markers	8	

Problem String 15

Problems	Strategies & Recording	Connections
10 × 8 = ___ How many markers are in 10 packs?	× 10 packs | 1 | 10 markers | 8 | 80 × 10 10 × 8 = 80 80 ÷ 8 = 10 or 8 × ___ = 80	Take some time with these first two problems to emphasize how students can use what they know about multiplication to solve division problems. Record equations to show the connection between the two operations.
80 ÷ 8 = ___ If there are 80 markers, how many packs is that?		
6 × 8 = ___ How many markers are in 6 packs?	× 6 packs | 1 | 10 | 6 markers | 8 | 80 | 48 × 6	Help students see how the ratio table can be used to record partial quotients and to show the relationship between multiplication and division.
128 ÷ 8 = ___ If I have 128 markers, how many packs can I fill?	Look for students who saw that 10 × 8 and 6 × 8 combine to 16 × 8, which equals 128; therefore 128 ÷ 8 = 16. This may be a leap for some students. If students used an array to solve the problem, represent their work on the ratio table, but show the connection between the parts of the array and the parts of a ratio table. 10 + 6 packs | 1 | 10 | 6 | 16 markers | 8 | 80 | 48 | 128 80 + 48	
136 ÷ 8 = ___ If I have 136 markers, how many packs can I fill?	Look for students who realized that 136 is 1 more group of 8 than 128, which means 136 ÷ 8 = 17. + 1 packs | 1 | 10 | 6 | 16 | 17 markers | 8 | 80 | 48 | 128 | 136 + 8	
160 ÷ 8 = ___ If I have 160 markers, how many packs can I fill?	× 2 + 1 + 2 packs | 1 | 10 | 6 | 16 | 17 | 20 | 21 | 23 markers | 8 | 80 | 48 | 128 | 136 | 160 | 168 | 184 × 2 + 8 +16	
168 ÷ 8 = ___ If I have 168 markers, how many packs can I fill?		
184 ÷ 8 = ___ If I have 184 markers, how many packs can I fill?		
84 ÷ 6 = ___ I have 84 pencils and packets that each hold 6 pencils. How many packs can I fill?	Even if students didn't use a ratio table to solve the problem, show them how to record the partial quotients they were working with on the ratio table. × 10 10 + 4 packs | 1 | 10 | 4 | 14 pencils | 6 | 60 | 24 | 84 × 10 60 + 24	

3 Finally, revisit the idea of remainders. Ask students how many packs of pencils they could fill if they had 87 pencils. Build discussion around the idea that there are not enough pencils to fill another bag. What would students do with the extra pencils?

> ***Analee*** *Wait a second… we can't fill another pack. We can fill 14 packs with 84 pencils, but 87 is only 3 more.*
>
> ***Byron*** *Well, 3 is half of 6, so you could say that you can fill 14 ½ packs.*
>
> ***Carlos*** *Or, you could fill 14 packs and have 3 extra pencils.*

packs	1	10	4	14	?
pencils	6	60	24	84	87

87 ÷ 6 = 14 R 3
or
14 3/6 = 14 ½
or
14 packs with 3 pencils left over.

4 If you have time and interest, try another problem with a remainder: Ask students how many packs they could fill if they had 95 pencils. Again, build discussion around what to do with the remainder, as well as how to show the problem on a ratio table.

10 + 5

packs	1	10	5	15	?
pencils	6	60	30	90	95

60 + 30

95 ÷ 6 = 15 R 5
or
15 5/6
or
15 packs with 5 pencils left over.

5 Wrap up today's activity by recognizing students for their work in all three problem strings this month. Let them know that the strategies they focused on in the string will help them with the Solving Problems work this month and beyond.

January Solving Problems

Multi-Step Division Problems

Overview

In this workout, students solve multi-step division story problems. Before solving the problems, they make estimates so that they can evaluate whether their answers are reasonable. In many problems, students must also determine a logical way to handle the remainder. Students review the difference between partitive and quotative division problems. Students discuss the problems before solving them and then share their solutions, engaging in a critique of each other's thinking.

Skills & Concepts

- Solve multi-step story problems involving only whole numbers, using addition, subtraction, multiplication, and division (4.OA.3)
- Solve multi-step story problems involving division with remainders (4.OA.3)
- Assess the reasonableness of answers to multi-step story problems using mental computation and rounding and other estimation strategies (4.OA.3)
- Divide a 2- or 3-digit number by a 1-digit number, with and without a remainder, using strategies based on place value, the properties of operations, or the relationship between multiplication and division (4.NBT.6)
- Use an equation or a rectangular array to explain strategies for dividing a multi-digit number by a 1-digit number (4.NBT.6)
- Make sense of problems and persevere in solving them (4.MP.1)
- Construct viable arguments and critique the reasoning of others (4.MP.3)
- Use appropriate tools strategically (4.MP.5)

Materials

Activities	Day	Copies	Materials
Activity 1 Thinking About Division Story Problems	11	**NCSB 48*–49** Division Story Problems	
Activity 2 Division Story Problems with Remainders	14	**NCSB 50*–51** Division with Remainders	
Activity 3 Partitive & Quotative Division	18	**NCSB 52*** Partitive & Quotative Division	

TM – Teacher Master, **NCSB** – Number Corner Student Book
Copy instructions are located at the top of each teacher master. ** Run 1 copy of this page for display.*

Preparation

Note that the activities focus mainly on the division aspect of the multi-step story problems. If your students are struggling with interpreting multi-step story problems, plan to spend more time helping them understand the parts and pieces of each problem. Next month, students will also solve multi-step story problems and write equations to represent those problems.

Mathematical Background

In this workout, students continue to work on solving multi-step story problems. Each activity addresses basic problem-solving skills, such as understanding what the question is asking, and each activity has its own particular focus. In the first activity, students focus on estimating. The teacher helps students see that estimating is a useful skill, not just a quick process of making a guess, and they discuss different estimation strategies for each of the problems they solve.

In the second activity, the problems are designed to help students think about how to deal with remainders. The context helps them see whether they can split the remainder into fractions, for example, or if they need to round up or down. In the third activity, students think more deeply about the problems and discuss whether the situations are partitive–knowing how many groups there are and determining the number of items in each group–or quotative–knowing how many items are in each group and determining how many groups there are.

Students will continue working on multi-step problems in February, when they will focus on writing equations for the problems. The problem-solving strategies addressed this month will help students get ready for this work in February.

Key Questions

Use these questions to help guide your students' discussion this month.

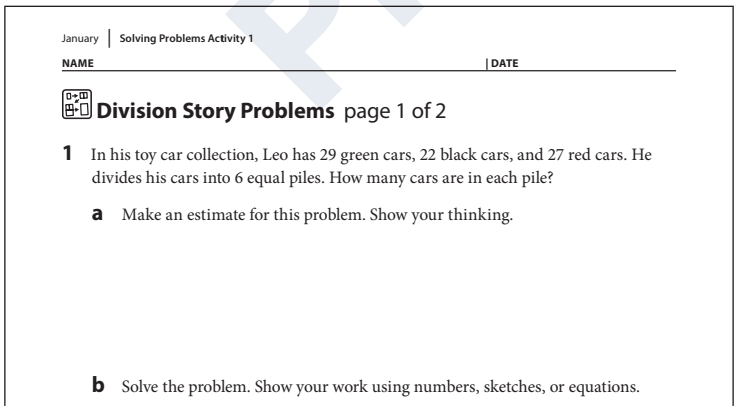
- What is the problem asking?
- What steps do you have to take to solve the problem?
- Can you draw a picture of the problem?
- Can you make an estimate?
- Is your answer reasonable?
- How can you check your work after you have solved the problem?
- How do you know what to do with the remainder?
- Is this problem partitive or quotative? How can you tell?
- Can you write a partitive division problem? Can you write a quotative division problem?

Activity 1

Thinking About Division Story Problems — Day 11

1 Open today's activity by introducing this month's Solving Problems emphasis.
- Let students know that the problems this month focus on division.
- Tell students that they should use the division strategies they have used in the game Remainder Roundup and the problems strings to help them with these problems.

2 Display your copy of the first Division Story Problems Number Corner Student Book page, and review the first problem as a class.
- Reveal only the first problem.
- Invite a student to read the problem aloud.


January | Solving Problems Activity 1

NAME | DATE

Division Story Problems page 1 of 2

1 In his toy car collection, Leo has 29 green cars, 22 black cars, and 27 red cars. He divides his cars into 6 equal piles. How many cars are in each pile?

a Make an estimate for this problem. Show your thinking.

b Solve the problem. Show your work using numbers, sketches, or equations.

- Ask students to turn to a partner to talk about what the problem is asking.
- Invite a few students to share their thinking.

> ***Students*** *You need to know how many cars there are in each pile.*
> *First you have to know how many cars there are in all.*
> *Then, you can divide that by 6 to find out how many are in each pile.*

3 Have students work in pairs to estimate what the solution will be.

- Remind students that making an estimate is a smart way to begin solving a problem. It gets them thinking about how they could solve it and it gives them something to compare to their actual answer.
- Ask students to turn to their partners to make an estimate for the problem.
- Emphasize the fact that estimating is actually a skill. It is not just a guess; they should use what they know about the numbers and the situation to determine about what a reasonable answer would be.

4 Invite a few students to share their estimates and record them on the board. Encourage them to be explicit about how and why they determined their estimate.

Provide feedback as needed on student estimation strategies. If students are unsure how to estimate, review rounding or using landmark numbers. Ideally, some students will have good estimation strategies to share with the rest of the class. Emphasize and discuss these strategies. Ask students who are unsure if they think they could use these strategies for another problem.

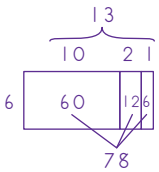
> ***Felipe*** *We started by thinking about how many cars there were in all. We rounded each amount to the nearest ten. That gave us 30 plus 20 plus 30, which is 80.*
>
> ***Bianca*** *Then we had to think about how to divide 80 into 6 groups. It was hard to estimate that, so we thought about 60 instead. We knew 60 cars in 6 groups would be 10 cars in each group, so we know they answer will be more than 10, probably a few more than 10.*
>
> ***Ralph*** *We did it a little differently. We kind of thought about combinations of 10. In the 29 and the 22, you have a 9 and a 2 in the ones place, which is close to 10. So, we said 20 and 20 and 10 is 50. Then, we just added 27 and got 77.*
>
> ***Daphne*** *And, we were also not so sure about dividing 77 by 6, but we knew that 72 divided by 6 was 12, so we think the answer will be around 12.*

5 Give students time to solve the problem in pairs.

6 Invite students to share their work. Represent the division strategies they used for everyone to see.

> ***Jorge*** *We added the green cars, black cars, and red cars and got 78. Then, we had to divide 78 by 6.*
>
> ***Amanda*** *So, we started by multiplying 6 by numbers that might help us. We did 6 times 10 and got 60. We were getting close. Then, we did 6 times 2 and got 12. 60 and 12 are 72. We realized we needed just one more 6 to get to 78.*
>
> ***Jorge*** *In the end it was 6 times 13 equals 78 or 78 divided by 6 equals 13. So, 13 cars in each pile.*
>
> ***Teacher*** *How did you show your work? Did you use arrays? A ratio table? Or just equations?*
>
> ***Amanda*** *Arrays and equations.*
>
> ***Teacher*** *I'll sketch some arrays and equations.*

78 ÷ 6 = _____



6 × 10 = 60
6 × 2 = 12
6 × 1 = 6
6 × 13 = 78

Teacher *Where is the answer on the array? Where is the answer for the equations?*

Students *On the array, they built up to the answer with the 10, the 2, and the 1 on top of the array.*

See, 10 and 2 and 1 makes 13 and that's the answer.

For the equations, it's the same thing, just not on an array. You see the 10, the 2, and the 1 in the equations.

In the 6 times 10, the 6 times 2, and the 6 times 1.

Teacher *Great. Who solved it differently?*

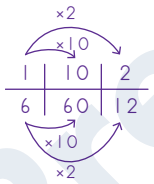
Candice *We used a ratio table.*

Teacher *Please tell us what you did.*

Frank *We built up until we got to 78. We started with 1 times 6 because we're trying to divide 78 by 6.*

Candice *Then, we did 10. Ten times 6 is 60, so we added 10 and 60 to the ratio table.*

Frank *We doubled 6 to get 12. Now our ratio table has a 1, a 10, and a 2 across the top and a 6, a 60 and a 12 on the bottom.*

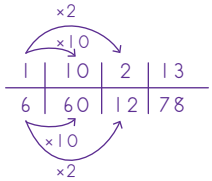


Teacher *Does anyone see a connection between the ratio table and the array?*

Esperanza *It's like they used the same problems, just on different models. They both have 6 times 1, 6 times 2 and 6 times 10.*

Teacher *Good. Now, how did you finish with the ratio table?*

Candice *Well, we thought we might be at the answer. So, we added what we had so far. The 1, the 10, and the 2 are 13 and the 6, the 60, and the 12 are 78. That means there are 13 sixes in 78 or 13 cars in each pile.*



7 Direct students' attention back to the estimates you recorded earlier. Ask them if their final answer seems reasonable compared to their estimates.

8 Ask students if they have any questions about the problem or the strategies they just discussed.

9 Have students get ready to work on the rest of the page in pairs.

- Reveal the rest of the page and ask students to find the same page in their own Number Corner Student Books.
- Explain that students will work with a partner on the next two problems.
- Emphasize the fact that students must not only make an estimate before solving the problem, they must also explain how they made their estimate.
- Answer any questions students have.

10 Give students time to work.

As they work, circulate around the room to make observations, answer questions, and provide differentiated instruction.

ELL Help ELL students understand the context as well as what the problems are asking. Make labeled sketches as you explain the questions in more details. Help students identify words that correspond with operations: for example, in problem 2, "dropped" means students must subtract and "share" means students should divide.

SUPPORT Let students know it is OK if they do not get to problem 3. Encourage students to refer back to strategies they saw in Problem Strings: have them find examples in their Number Corner Student Books. Encourage students to use the models and strategies that work best for them.

CHALLENGE Some students can skip problem 2 and go right to problem 3. Encourage students to write an equation for the problem. Encourage students to write their own multi-step division problem.

11 After students have solved one or both of the problems, reconvene the class and invite a few students to share their estimates, strategies for estimating, and solutions to the problem.

12 Wrap up today's activity by asking students to summarize some of the big ideas from today's activity.

> ***Students*** *It does help when you estimate first.*
>
> *You need to know actual estimation strategies: don't just guess.*
>
> *Your estimating might end up being how you solve the problem.*
>
> *We used division strategies in story problems.*
>
> *Even though they were division problems, we used a lot of multiplication strategies.*
>
> *We had to solve story problems with more than one step.*

Activity 2

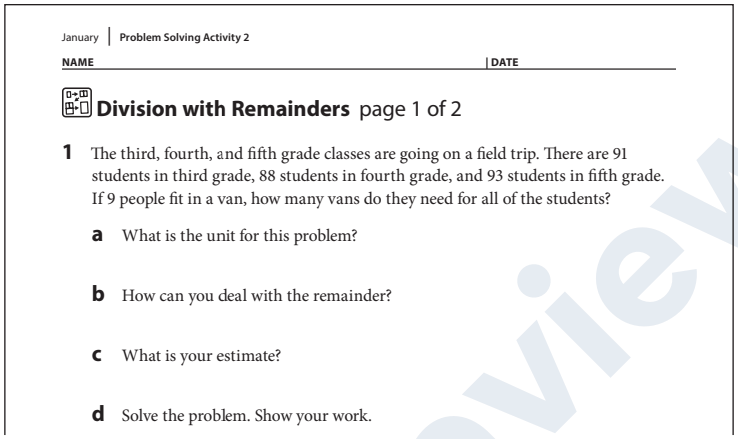
Division Story Problems with Remainders — Day 14

1 Open today's activity by explaining that today students will solve division problems that have remainders.

This means that when they have finished dividing, there will still be some left over and they will need to how to handle those remainders. Let them know that many people, children and adults, often make mistakes with division by not being careful about remainders.

2 Display your copy of the first Dealing with Remainders Number Corner Student Book page, and review the first problem as a class.

- Reveal only the first problem.
- Invite a student to read the problem aloud.



January | Problem Solving Activity 2

NAME | DATE

Division with Remainders page 1 of 2

1 The third, fourth, and fifth grade classes are going on a field trip. There are 91 students in third grade, 88 students in fourth grade, and 93 students in fifth grade. If 9 people fit in a van, how many vans do they need for all of the students?

a What is the unit for this problem?

b How can you deal with the remainder?

c What is your estimate?

d Solve the problem. Show your work.

- Ask students to turn to a partner to talk about what the problem is asking.
- Invite a few students to share their thinking.

> ***Students*** *We need to figure out how many vans they need.*
>
> *First we have to add up all the kids in the fifth grade. Then, we divide that by 9.*

3 Work through parts a–c of the problem with the class. Ask students to share and justify their thinking for each question, and record their answers on the page.

> ***Students*** *The unit is vans since they are asking how many vans they need.*
>
> *If the unit is vans and there is a remainder, then we might need to round up to have enough.*
>
> *Right, there might be a few people left over. They have to go in another van. It won't be full, but there is no other way to make it work.*
>
> *I think they're going to need about 30 vans. The numbers are all close to 90. 90 times 3 is 270. If they can fit 9 kids in a van, then they need about 30 vans.*

4 Have students turn to a partner to solve the problem. Then, invite a few pairs to share their strategy, their solution, and how they actually dealt with the remainder.

As students work and share, look for students who may have trouble working on their own. Plan to help these students when the class works on problems 2 and 3.

> ***Aleeyah*** *We added the kids in each grade and got 272. Then, we had to divide 272 by 9. We knew that 270 divided by 9 was 30 because 27 divided by 9 is 3.*
>
> ***Natalie*** *But, then there were 2 kids left over, so we needed an extra van. If this was just a number problem and not a story problem, the answer would be 30 remainder 2, but since you need another van for those 2 other kids, you have to add 1 more. So, we really need 31 vans.*
>
> ***Julissa*** *We got the same answer, but we solved it differently. We did 9 times 10 and then 9 times 20. We added those and that got us to 270, so we knew 9 times 30 was 270.*
>
> ***Jason*** *We got a little confused then because we couldn't remember what the 270 was and what the 30 was. So we went back to the problem to see that the 270 was kids, and there were really 272. The 30 was how many vans we needed, because 9 kids fit in each van.*
>
> ***Julissa*** *But actually we needed 31 vans for those extra kids.*
>
> ***Teacher*** *I'm really glad you shared where you got confused. I think that happens a lot when we are doing these problems. I like how you went back to the problem. Does anyone else have any other suggestions for how to keep everything straight in problems like these?*

5 Have students get ready to work on the rest of the page in pairs.

- Reveal the rest of the page, and ask students to find the same page in their own Number Corner Student Books.
- Explain that students will work with a partner on the next two problems.
- Emphasize the importance of answering all parts of the question. If they are unsure about part b before solving the problem, they can wait to answer it, but they should answer parts a and c before solving the problem.
- Answer any questions students have.

6 Give students time to work.

As they work, circulate around the room to make observations, answer questions, and provide differentiated instruction.

ELL Continue to help ELL students understand the context as well as the question. Draw sketches or encourage students to draw sketches of the problems. Encourage students to explain the problems in their own words.

SUPPORT Work with students who struggled with problem 1. Provide a few examples that show how to deal with remainders. Sometimes, like when you are cutting cookies or string into pieces of a certain size, you can divide the remainder into some fraction of that size. Other times, like when you are distributing passengers among buses, you must add on an additional group to account for the incomplete group that is left over. Continue to encourage students to estimate first. Remind students that they can find division strategy work on the recent Problem String Work Space pages in their Number Corner Student Books. Again, let students know it is OK if they do not get to problem 3.

CHALLENGE Some students can skip problem 2 and go right to problem 3. Encourage students to come up with scenarios where the remainder is divided into pieces (fractions) and when it is not.

7 After students have solved one or both of the problems, bring them back together as a class and invite a few students to share their work. Focus the discussion on how they decided what to do with the remainder.

8 Wrap up today's activity by asking students to summarize some different ways to deal with remainders.

> ***Students*** *Sometimes you can cut them up to make each group really equal.*
>
> *You can do that with anything you can cut, like pieces of paper and lots of foods.*
>
> *You can't do that with people or other things you can't cut, like a classroom or a car.*
>
> *Right. Then, you have to round up or maybe have a different amount in each group.*

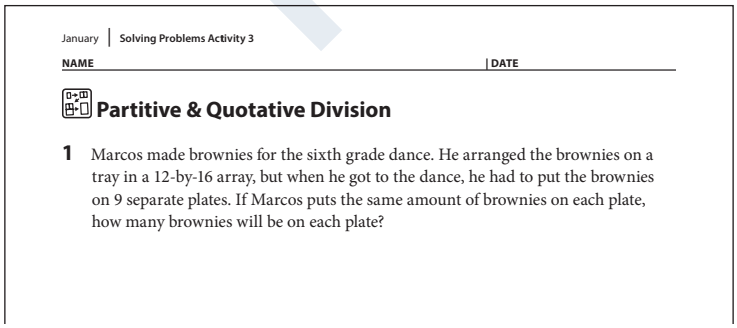
Activity 3

Partitive & Quotative Division — Day 18

If students need more work with interpreting and solving multi-step problems or dealing with remainders, consider focusing on one of those skills instead of emphasizing partitive and quotative division.

1 Open today's activity by displaying your copy of the Partitive & Quotative Division Number Corner Student Book page and introducing the first problem.

- Let students know that they will continue to work on division problems today.
- Ask students if they know anything about partitive or quotative division.
  - » If they do not, assure them that they will by the end of the activity.
  - » If they do, invite them to share what they know.
- Have students find the same page in their Number Corner Student Books, and invite a student to read the first problem aloud.


January | Solving Problems Activity 3

NAME _____ | DATE _____

Partitive & Quotative Division

1 Marcos made brownies for the sixth grade dance. He arranged the brownies on a tray in a 12-by-16 array, but when he got to the dance, he had to put the brownies on 9 separate plates. If Marcos puts the same amount of brownies on each plate, how many brownies will be on each plate?

2 Begin working on the problem together by having students determine the total number of brownies.

- Ask students to identify what they need to do first before they can determine how many brownies will be on each of the 9 plates. [Determine the total number of brownies.]
- Have students multiply 12 by 16 in their Number Corner Student Books.
- Then, have a few students share their answers.

3 Work together to illustrate the problem.

- Now that students know that they have 192 brownies to divide by 9, ask them to imagine that they are Marcos and they are placing the brownies on 9 individual plates.
- Draw a quick sketch of 9 plates and ask students how they would distribute the 192 brownies.

> ***Students*** *You could do it one at a time. One brownie to each plate until you run out of brownies.*
>
> *I think you can do it faster, like 5 or 10 at a time.*
>
> *Or even 20 at a time. I know you can have 20 brownies on a plate because 9 times 20 is 180 and that is less than 192.*

4 Give students time to solve the problem with a partner. Then invite a few students to share their thinking and their solution.

5 Introduce and discuss the second problem.

- Reveal the second problem.
- Invite a student to read the problem aloud.
- Then, ask the class how this problem is different from the first one.

> ***Students*** *The units are different.*
>
> *In the first one, you needed to know how many were on each plate. Now, you need to know how many plates you need.*
>
> *It's kind of like thinking about groups. How many groups do you have or how many things are in each group.*

6 Begin working on the problem together by having students determine the total number of pizzas.

- Ask students to identify what they need to do first before they can determine how many plates of 8 pizzas Olivia can make. [Determine the total number of pizzas.]
- Have students multiply 7 by 36 in their Number Corner Student Books.
- Then, have a few students share their answers.

7 Invite students to imagine they are Olivia and they are organizing pizzas in groups of 8. Ask students how they could use the experience of pretending to be Olivia to help them figure out the problem.

> ***Students*** *So, I'm Olivia and I take 8 pizzas and put them on one plate. Then, I get another 8 and put them on this plate. I keep going until I run out of pizza.*
>
> *If you wanted to know how many plates you need first, you could think about the groups of 8 pizzas. Like, you need 10 plates for 80 pizzas, 20 plates for 160 pizzas, and 30 plates for 240 pizzas. That gets you pretty close to 252. You need at least 30 plates and probably a couple more.*

8 Give students time to solve the problem with a partner. Then invite a few students to share their thinking and their solution.

> ***Ahmad*** *We knew we needed at least 25 plates because we know that 25 times 8 is 200. Then, 5 times 8 is 40, so you need 30 plates for 240 pizzas. Then, you need one more plate to have 31 plates for 248 pizzas.*
>
> ***Billy*** *Actually, you need 32 plates because you still have 4 more pizzas. They have to go on a plate even though they don't fill it up. You can't put more than 8 on the other plates.*

9 After discussing student strategies and solutions, explain the difference between a partitive division problem and a quotative problem, using the two problems students just solved to illustrate the difference.

In a partitive division scenario, students are considering how many items are in each group. The first problem is partitive because Marcos needs to know how many brownies fit on each plate. In quotative division scenarios, students consider how many groups are needed. The second problem is quotative because Olivia knows how many pizzas she can fit on each plate, but she wants to know how many plates she needs.

> ***Students*** *I think they are different because you handle the remainders differently.*
>
> *The problems are different in another way too. Sometimes you need to know how many are in a group, and sometimes you need to know how many groups there are.*
>
> *The first one you needed to know how many were in the group.*
>
> ***Teacher*** *Right. That's called partitive. Do you hear the word "part" in partitive? That can help you remember that partitive problems are about finding how many parts in a group.*
>
> ***Billy*** *So, the second one was quotative. But, what does that mean?*
>
> ***Gloria*** *That's the opposite. You know how many are in the group, but you don't know how many groups there are.*

10 Present the following scenarios, and ask students to identify whether each is partitive or quotative.

- Sam has 200 apples. He is dividing them equally into 5 bags. How many apples go in each bag? [partitive]
- Maria has 300 oranges. She is packing them in boxes. She can fit 24 oranges in a box. How many boxes does she need? [quotative]

11 Invite students to come up with and share their own examples of partitive and quotative division problems.

CHALLENGE If there is time and interest, you might ask students if they notice anything about how they might deal with the remainders in partitive and quotative situations. Ask them to think about it now and when they work on division story problems in the future.

It still depends somewhat on the context, but in quotative situations, you are less likely to split or cut up the unit as you are dealing with the group. So, you will most likely round up or down, rather than split a unit.

12 Wrap up today's activity by letting students know they will continue working with multi-step problems in February.

January Assessment

Number Corner Checkup 2

Overview

Students take the second Number Corner Checkup this month. It provides a snapshot of student understanding of fractions, including equivalent fractions, adding and subtracting fractions, multiplying fractions by a whole number; multiplicative comparisons; adding, subtracting and multiplying multi-digit numbers; parallel and perpendicular lines and lines of symmetry; and solving multi-step story problems. Students have two days to complete the assessment.

Skills & Concepts

- Make a comparison statement to match a multiplication equation; write a multiplication equation to represent a verbal statement of a multiplicative comparison (4.OA.1)
- Solve multi-step story problems involving only whole numbers, using addition, subtraction, and multiplication; assess reasonableness of solutions (4.OA.3)
- Find all factor pairs for a whole number between 1 and 100 (4.OA.4)
- Determine whether a whole number between 1 and 100 is prime or composite (4.OA.4)
- Use the standard algorithm with fluency to add and subtract multi-digit whole numbers (4.NBT.4)
- Recognize and generate equivalent fractions; use a visual model to explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ (4.NF.1)
- Compare two fractions with different numerators and different denominators (4.NF.2)
- Write an equation showing a fraction a/b as the sum of a number of the unit fraction $1/b$ (4.NF.3)
- Express a fraction as the sum of other fractions with the same denominator in more than one way (4.NF.3b)
- Demonstrate an understanding that a fraction a/b is a multiple of the unit fraction $1/b$ and write an equation to represent this information (4.NF.4a)
- Multiply a fraction by a whole number (4.NF.4b)
- Solve story problems that involve multiplying a fraction by a whole number (4.NF.4c)
- Express a fraction with denominator 10 as an equivalent fraction with denominator 100 (4.NF.5)
- Write fractions with denominator 10 or 100 in decimal notation (4.NF.6)
- Solve story problems involving distance, intervals of time, or money using addition, subtraction and multiplication of whole numbers (4.MD.2)
- Draw parallel and perpendicular lines, and identify these in 2-dimensional figures. (4.G.1)
- Identify and draw lines of symmetry; identify figures with line symmetry (4.G.3)

Materials

Activities	Day	Copies	Materials
Number Corner Checkup 2, Part 1 Completing Pages 1 & 2	15	**TM T9–T10** Number Corner Checkup 2, Pages 1 & 2	• scratch paper • rulers, class set • 4-inch squares of scratch paper available • scissors, class set
Number Corner Checkup 2, Part 2 Completing Pages 3 & 4	17	**TM T11–T12** Number Corner Checkup 2, Pages 3 & 4	• scratch paper

TM – Teacher Master, **NCSB** – Number Corner Student Book
Copy instructions are located at the top of each teacher master.

Vocabulary

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

denominator*
equation*
estimate*
fraction*
line of symmetry*
multiplicative comparison
parallel*
perpendicular*

Mathematical Background

As you approach the midpoint of the school year, having a sense of where students are with key fourth grade skills and concepts will help you plan and focus the second half of the school year. There will be another checkup in March, the results of which will help you track students' progress over the next two months. You may want to share information from these assessments with others (e.g., parents, administrators, paraprofessionals and resource room teachers) so they can recognize student growth and target any areas that need improvement.

Number Corner Checkup 2, Part 1

Assessment Guide

See the Grade 4 Assessment Guide for scoring and intervention suggestions.

Completing Pages 1 & 2 — Day 15

1 Open today's activity by letting students know that instead of their usual Number Corner activities, today students will have a chance to show what they have learned during Number Corner over the past few months. Remind students of the checkup they took in October, and let them know that today's assessment will be very similar.

2 Explain that students will begin the checkup today and finish it in a couple of days. Encourage students to do their best and not to worry if they are not sure how to do every single problem. Also, ask them to do the following:

- Listen carefully to the instructions for the checkup.
- Work independently.
- Raise your hand if you have a question.
- Try to answer all of the problems, even those you don't fully understand.
- Explain how you solved a problem when the directions ask you to. You can use pictures, numbers, and words in your explanations.

3 Display your copy of Number Corner Checkup 2, pages 1 and 2, and give each student a copy.

- Give students a few moments to examine both sheets quietly.
- Have students write their name and date at the top on the lines provided.
- Make scratch paper available to students, and let them know that they can use it, along with their rulers to help with any of the items on the checkup.
- Show students the 4-inch squares of scratch paper you have prepared, and let them know they might want to take 1 or 2 of these squares to cut and fold as they work on item 4 on the first page of the checkup today.

4 Read aloud the first question. When students are ready, state the following multiplicative comparison: *Pablo is 8 years old. Pablo's grandfather is 9 times as old as Pablo. How old is Pablo's grandfather?*

Ask students to write and solve an equation that represents the multiplicative comparison.

ELL/SUPPORT Repeat the statement at least once, more if necessary, especially for ELL students.

5 Ask students if they have any questions about the checkup. Then, remind them to work quietly and independently and have them get started.

- Let students know you can read questions aloud if it would be helpful.
- While students work independently, circulate to observe how they work and answer questions as needed.

- Ask students who finish before their classmates to double-check their work, and then read or draw quietly until everyone else is done.

SUPPORT None of the items on this assessment need to be timed. If there are students who are unable to complete the assessment, have them finish it later, perhaps during math stations or a seatwork period.

ELL If necessary, read questions aloud to ELL students and help them understand the content of the questions.

6 At the end of Number Corner time, let students know they will finish the assessment in a couple of days.

Number Corner Checkup 2, Part 2

Completing Pages 3 & 4 — Day 17

1 Let students know that they are going to finish the last two pages of the Number Corner Checkup today.

2 Display your copy of Number Corner Checkup 1, pages 3 and 4, and give each student a copy.

Give students a few moments to examine both pages quietly and remind them that they can use scratch paper and rulers to help with any of the items on today's portion of the checkup.

3 Ask students whether they have any questions. Then, tell students that they will have the rest of Number Corner time to complete the last two pages of the checkup. Remind them of the following directions:

- Work quietly and independently.
- Raise your hand if you have a question.
- Follow all directions, especially if the problem tells you to show your work or write an equation.
- Try your best, even on questions you are not sure about.

SUPPORT None of the items on this assessment need to be timed. If there are students who are unable to complete the assessment, have them finish it later, perhaps during math stations or a seatwork period.

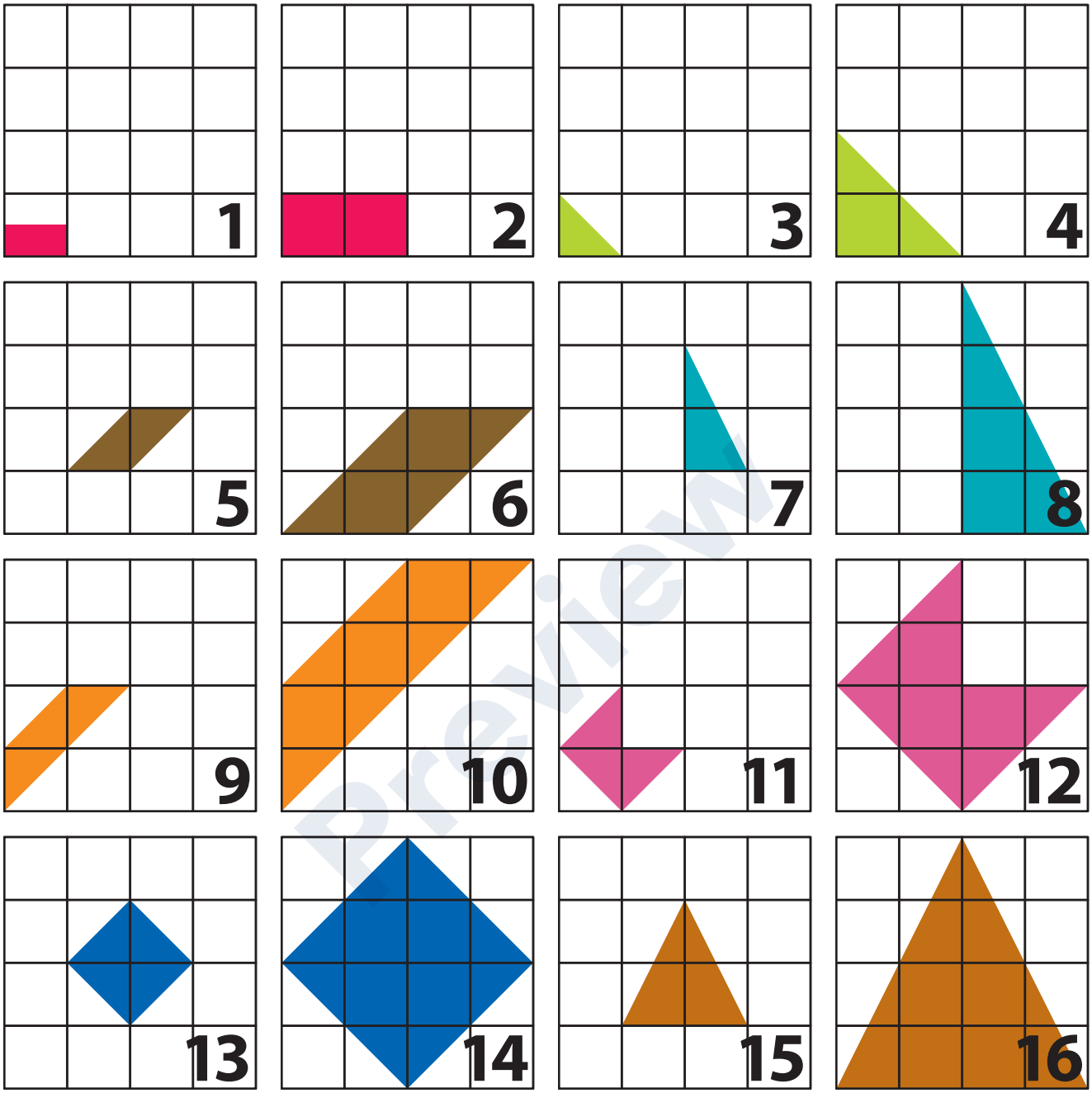
ELL If necessary, read questions aloud to ELL students and help them understand the content of the questions.

Teacher Masters

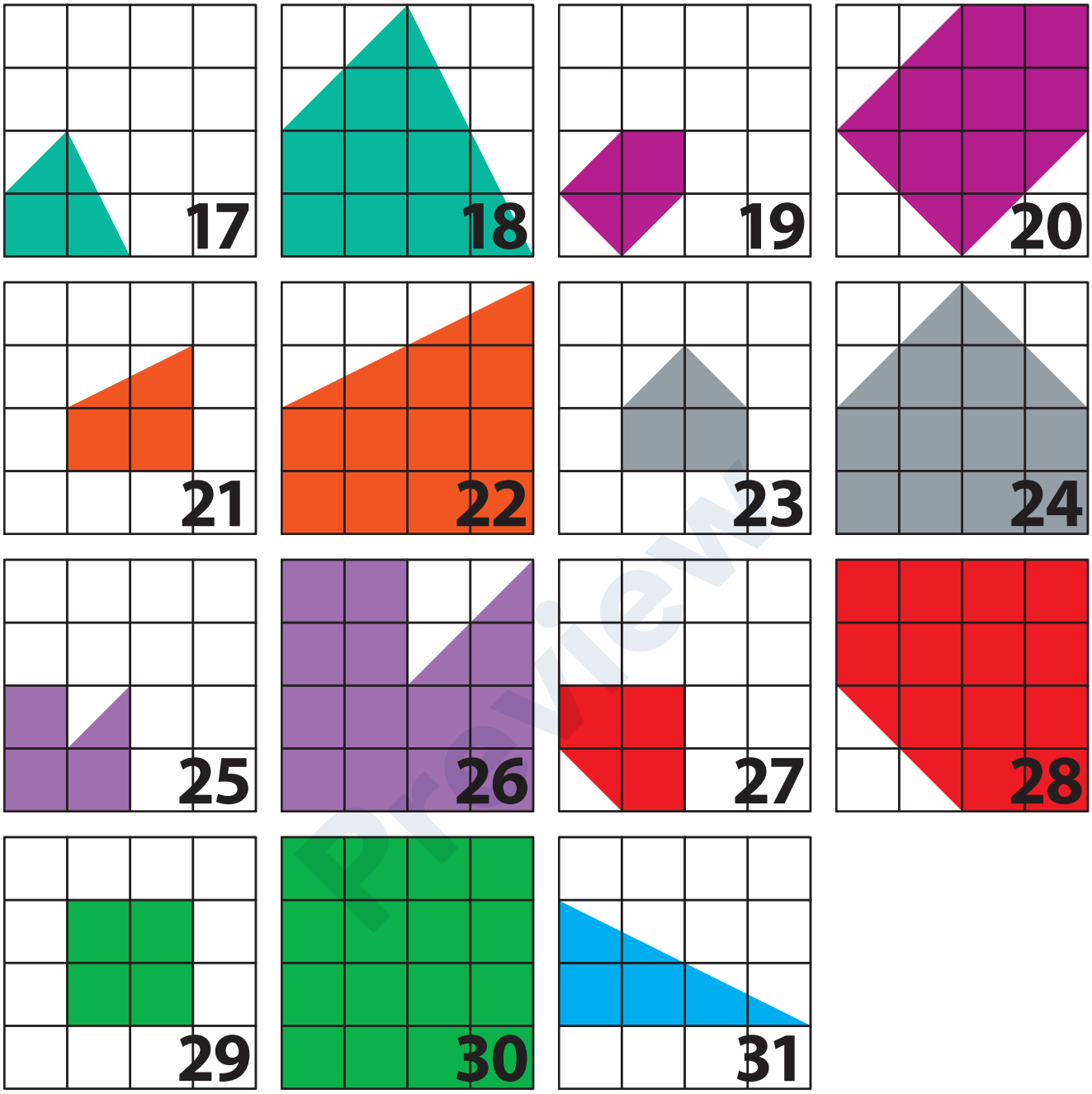
GRADE 4 – JANUARY

NUMBER® CORNER

Mini Similar Shapes Markers page 1 of 2



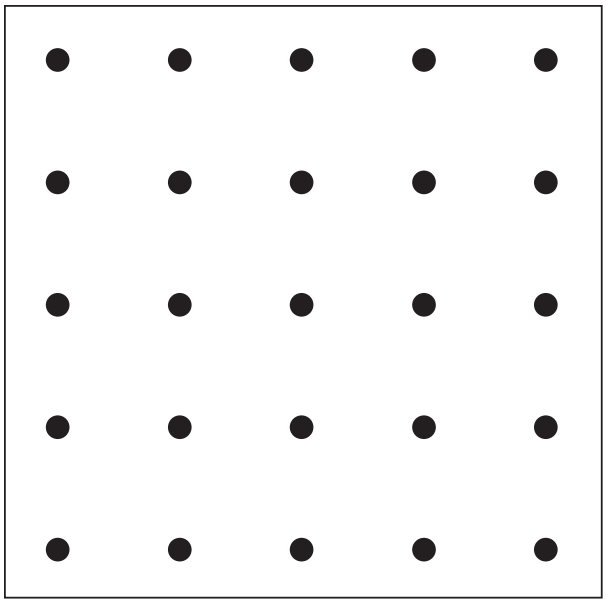
Mini Similar Shapes Markers page 2 of 2

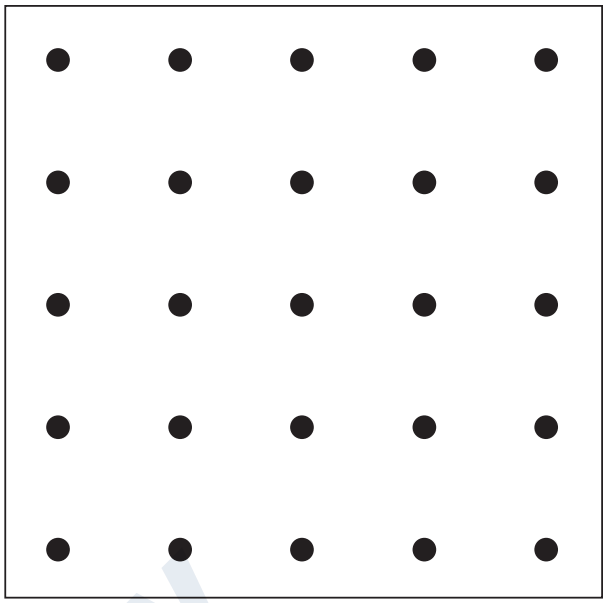


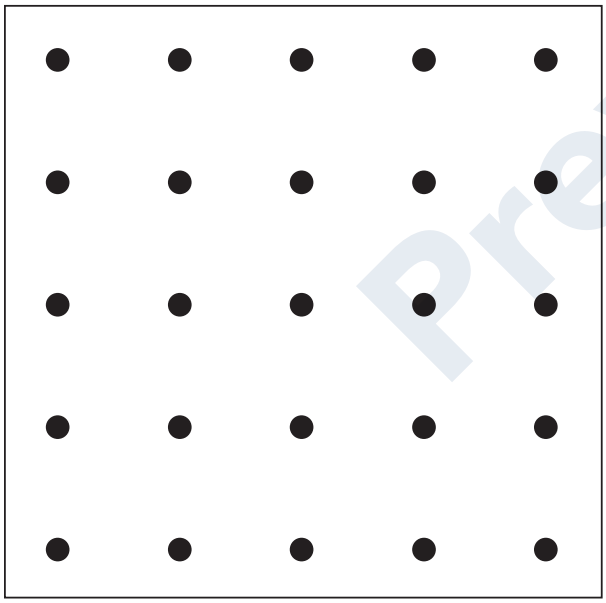
Key to Shape Names

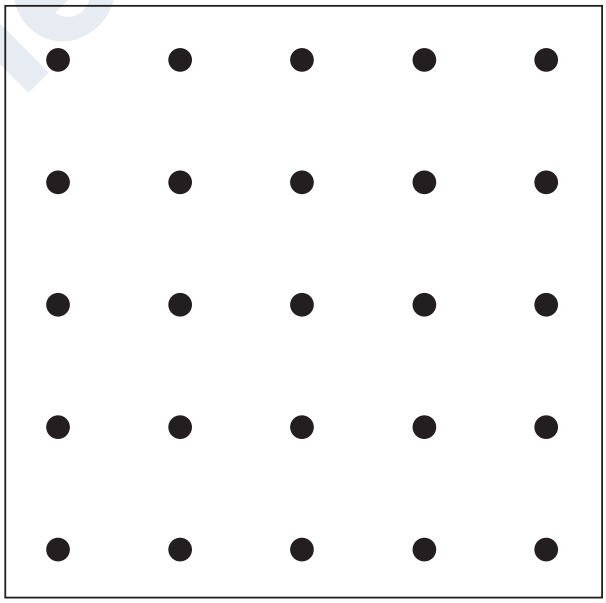
Marker Pair	Shape Name
1 and 2	rectangle
3 and 4	isosceles right triangle
5 and 6	parallelogram
7 and 8	scalene right triangle
9 and 10	trapezoid
11 and 12	pentagon
13 and 14	square
15 and 16	isosceles triangle
17 and 18	quadrilateral
19 and 20	pentagon
21 and 22	trapezoid
23 and 24	pentagon
25 and 26	hexagon
27 and 28	pentagon
29 and 30	square
31	scalene right triangle

Geoboard Recording Paper

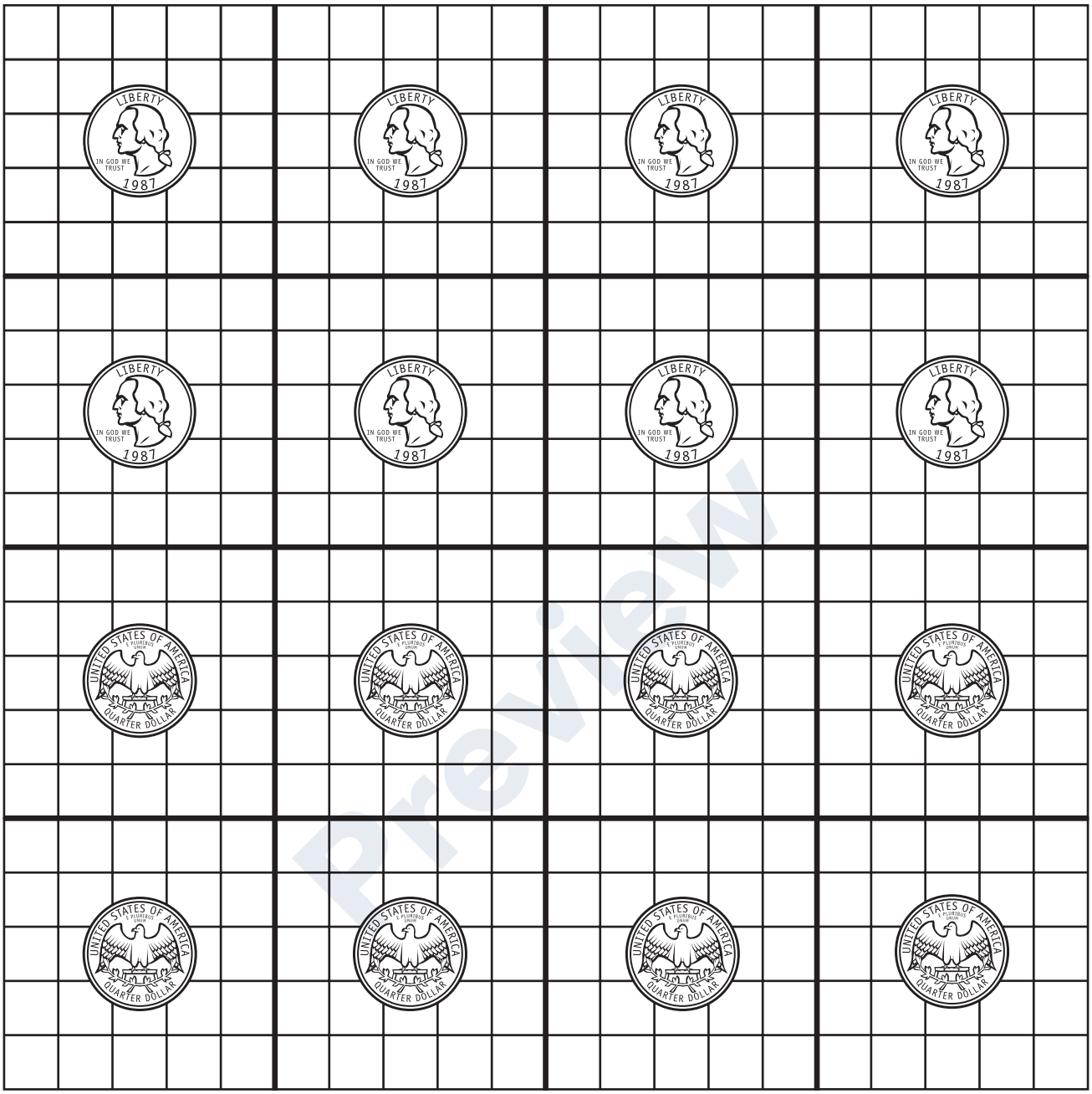




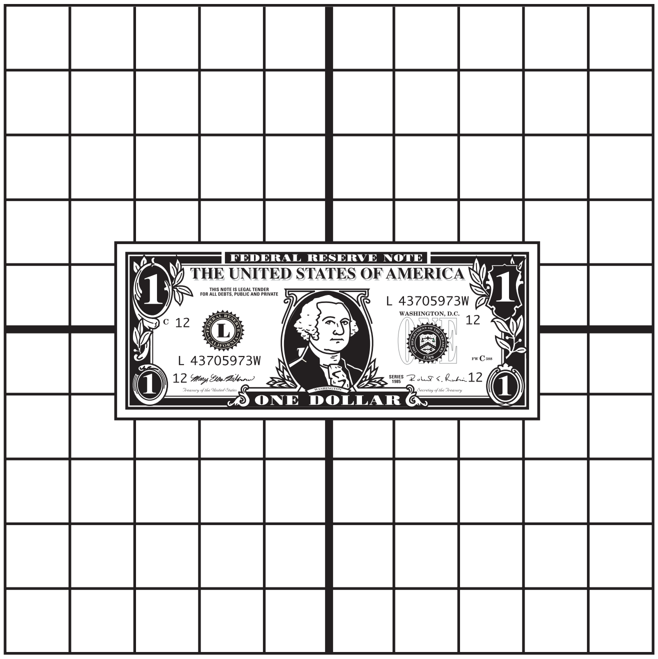


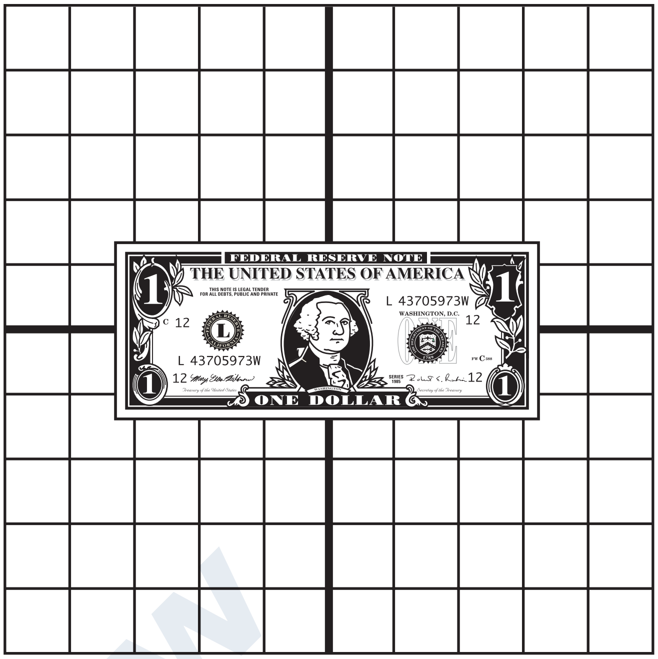


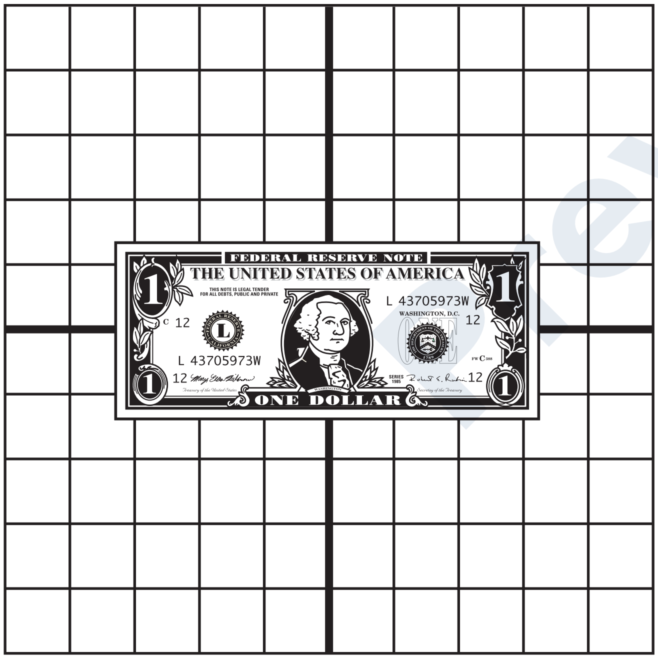
Quarter Grids

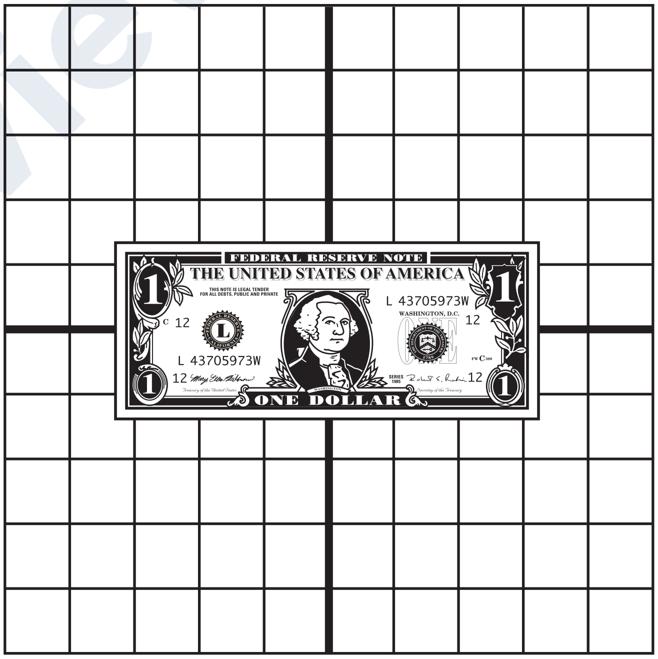


Dollar Grids

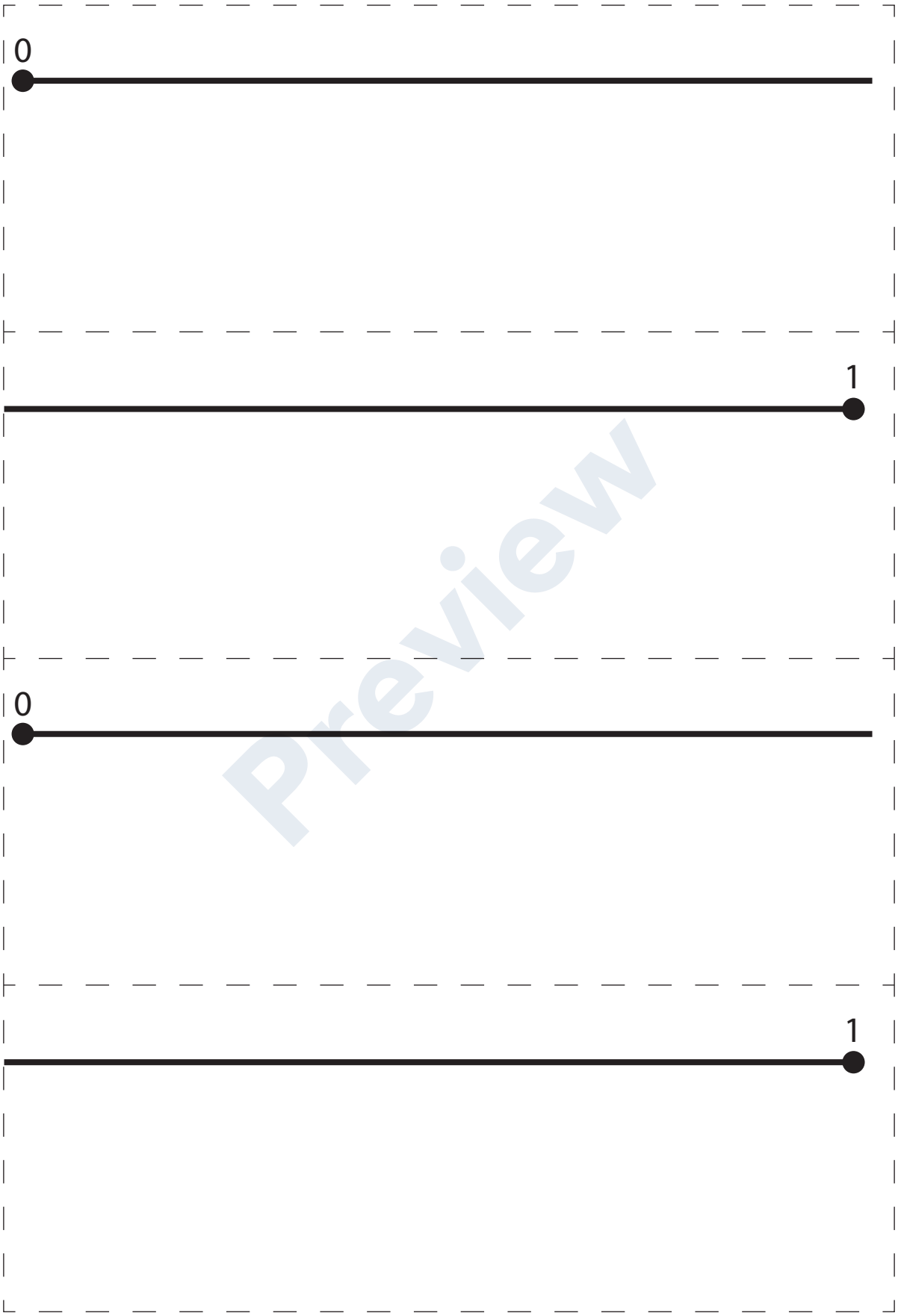








One-Foot Number Lines



Introducing Division Capture

1 Have each team choose a color and fill in the boxes below to show what they are. Then roll the 1–6 die to see who goes first (high number starts).

2 Roll the die and use the number you get to make one of the equations below true. Write the number in the box using your color.

3 Take turns until all the boxes are filled. (If you roll a number you can't use, you lose that turn.) Try to capture 3, 4 or 5 boxes in a row—across, up and down, or diagonally. After all the boxes are filled, circle the places on the grid where you got 3 or 4 in a row, and then add up both scores. You get 1 point for every set of 3 in a row, 2 points for every set of 4 in a row, and 3 points for every set of 5 in a row.

Students ☐ Teacher ☐

45 ÷ ☐ = 9	36 ÷ ☐ = 12	55 ÷ ☐ = 11	12 ÷ ☐ = 12
32 ÷ ☐ = 8	11 ÷ ☐ = 11	36 ÷ ☐ = 9	24 ÷ ☐ = 8
35 ÷ ☐ = 7	54 ÷ ☐ = 9	24 ÷ ☐ = 12	48 ÷ ☐ = 4
44 ÷ ☐ = 11	18 ÷ ☐ = 9	60 ÷ ☐ = 12	48 ÷ ☐ = 8
72 ÷ ☐ = 12	27 ÷ ☐ = 9	42 ÷ ☐ = 7	18 ÷ ☐ = 6
Students' Score		Teacher's Score	

Scoring 3 in a row = 1 point 4 in a row = 2 points 5 in a row = 3 points

NAME | **DATE**

Number Corner Checkup 2 page 1 of 4

1 Your teacher will give you a multiplicative comparison. Write and solve an equation for the comparison.

Equation:

2 Write a multiplicative comparison for this equation: $4 \times 6 = 24$.

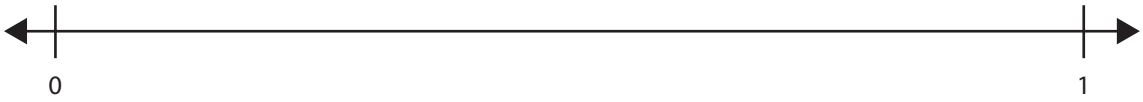
3 Mark doesn't understand why $\frac{1}{2}$ is equal to $\frac{3}{6}$. Draw a labeled picture that helps Mark understand that $\frac{1}{2}$ is equal to $\frac{3}{6}$.

4 Isabel cut a sandwich in half. Then, she cut each half in half again. Now she has fourths. Isabel asks, "If I cut 2 of these fourths in half, I will have 6 pieces. Does that mean I will have sixths?"

Respond to Isabel. How would you answer her question? Does she have sixths? It may help to draw a picture showing how Isabel cut her sandwich.

5 Put the following fractions in order from least to greatest on the number line below:

$\frac{7}{8}$ $\frac{1}{12}$ $\frac{3}{4}$ $\frac{6}{6}$ $\frac{1}{4}$ $\frac{6}{12}$



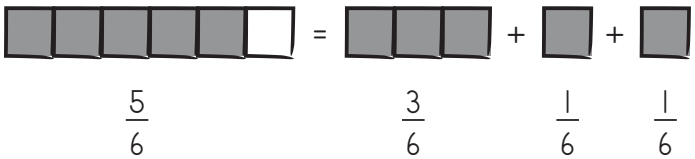
(continued on next page)

NAME | **DATE**

Number Corner Checkup 2 page 2 of 4

6 Roza wrote the following equation and drew the picture below. Write another equation for $\frac{5}{6}$. Draw a picture that represents your equation.

$$\frac{5}{6} = \frac{3}{6} + \frac{1}{6} + \frac{1}{6}$$



7 Frances bought 8 new songs for her computer. She listened to $\frac{1}{4}$ of them. Carlos bought 8 new songs for his computer. He listened to $\frac{1}{2}$ of them.

Find and mark the true statement.

- ◯ Frances listened to 4 songs.
- ◯ Frances and Carlos listened to the same number of songs.
- ◯ There are 6 songs that Carlos did not listen to.
- ◯ Frances listened to 2 songs and Carlos listened to 4 songs.

8 Erkan has $\frac{6}{10}$ of a dollar. Fill in the blanks to show different ways to write the value of Erkan's money.

a $\frac{6}{10} = \frac{\square}{100}$

b $\frac{6}{10}$ = \$ __.____

9 Zoe has $\frac{3}{4}$ of a dollar. Fill in the blanks to show different ways to write the value of Zoe's money.

a $\frac{3}{4} = \frac{\square}{100}$

b $\frac{3}{4}$ = \$ __.____

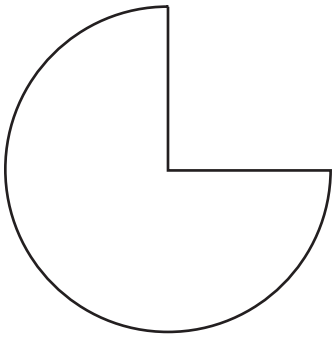
(continued on next page)

NAME | **DATE**

Number Corner Checkup 2 page 3 of 4

10 Draw a figure that has exactly one pair of parallel sides and at least one line of symmetry. Label the parallel sides and any lines of symmetry.

11 Andy says the figure below has perpendicular sides. Do you agree or disagree? How could Andy prove that his figure does have perpendicular sides?



12 Solve this problem with the standard algorithm for addition.

$$\begin{array}{r} 358 \\ +\ 497 \\ \hline \end{array}$$

Do you think the standard algorithm is the most efficient way to solve this problem? Why or why not?

13 Solve this problem with the standard algorithm for subtraction.

$$\begin{array}{r} 302 \\ -\ 187 \\ \hline \end{array}$$

Do you think the standard algorithm is the most efficient way to solve this problem? Why or why not?

(continued on next page)

NAME | **DATE**

Number Corner Checkup 2 page 4 of 4

14 Write all the factors for the number 15.

15 Is the number 21 prime or composite? How do you know?

16 It takes 12 minutes for Tyson to make a bracelet. He sells bracelets for $4 each. If Tyson spends 2 hours (120 minutes) making bracelets and sells them all, how much money does he make?

a Make an estimate for this problem. Explain your thinking.

b Solve the problem. Show your work using numbers, pictures, or words.

17 Tonya wants to run 36 miles this month. So far she has run 17 miles. If she runs 2 miles a day for 8 days, will she have run all 36 miles?

a Make an estimate for this problem. Explain your thinking.

b Solve the problem. Show your work using numbers, pictures, or words.

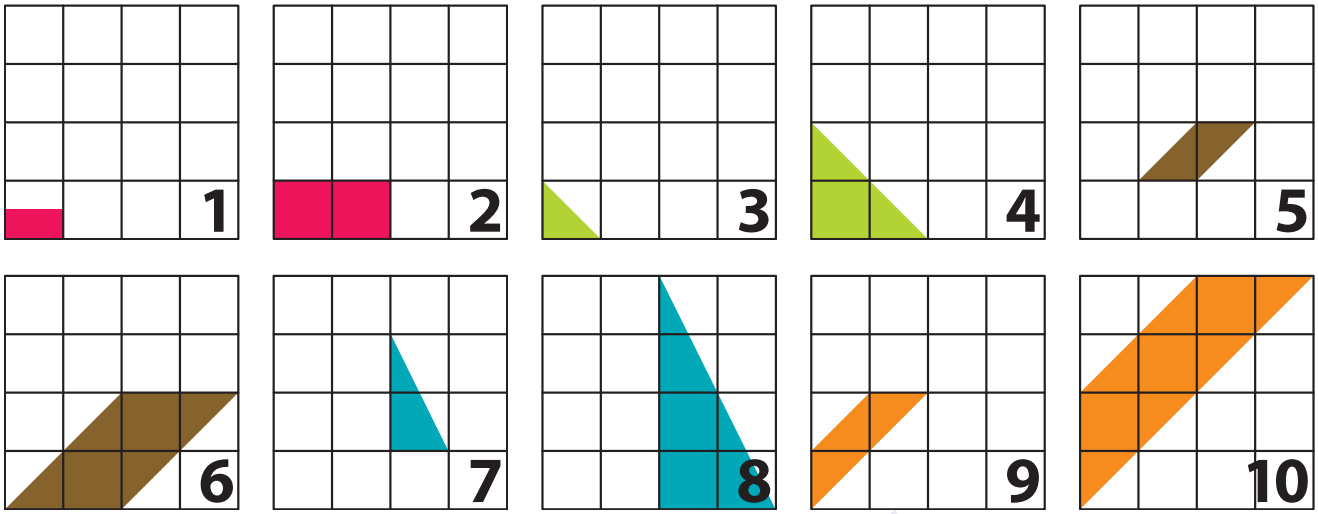
Student Book

GRADE 4 – JANUARY

NUMBER® CORNER

NAME | DATE

Taking a Closer Look at the Pattern



1 Fill in the chart below to show the name of each shape above and the area in square units.

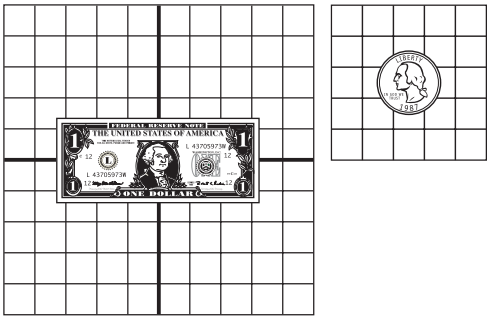
Date	Shape Name	Area in Square Units
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

☐ = 1 square unit

2 List at least 4 different mathematical observations about the pattern so far.

NAME | DATE

Quarters & Dollars



1 What fraction of a dollar is a quarter?

a What fraction of a dollar is 2 quarters?

b What fraction of a dollar is 3 quarters?

c Do you think "quarter" is a good name for 25¢? Why or why not?

2 Mei got 3 quarters a day for feeding the neighbors' cat. The neighbors were gone for 8 days. How much money did Mei earn? Use at least two equations to show your work. You can use words and sketches too if you want.

3 Fill in the missing values in the table below.

dollars	2	4	6		10	12	14	
quarters	8	16		32		48		64

4 List at least 3 observations about the table of values for dollars and quarters.

5 Rosie has 7 quarters. Billy has $\frac{3}{4}$ of a dollar. How much money do they have together? Show your work using pictures, numbers, words, or equations.

NAME | DATE

Division Capture Instructions

Each pair of partners needs:

- 1 Division Capture Record Sheet to share
- 1 spinner overlay to share
- 1 red and 1 blue colored pencil

1 Players each spin the spinner. The player who gets the higher number goes first and decides whether to use the red or the blue pencil to mark their combinations.

2 Players take turns spinning the spinner and using the number spun to complete one of the division problems on the sheet.

- Each player needs to be sure to use their own color, blue or red.
- If the box a player needs is already filled, that player loses the turn.
- Players try to capture 3, 4 or 5 boxes in a row, horizontally, vertically, or diagonally.

3 Players continue taking turns until the game board is filled or neither player can use the number they spin 3 times in a row.

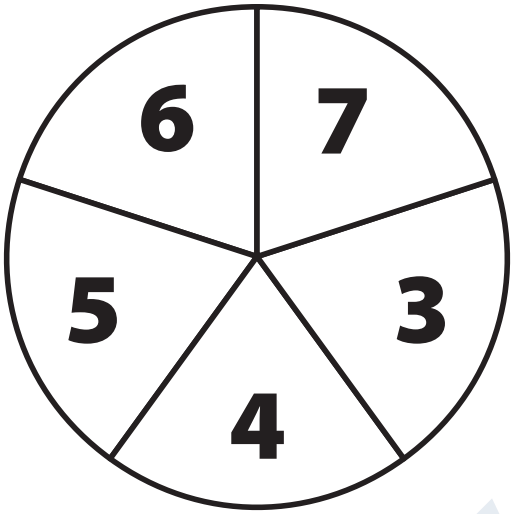
4 Players then circle the places on the grid where they got 3, 4 or 5 in a row, and add up their scores. The player with the higher score wins the game.

3 in a row scores 1 point; 4 in a row scores 2 points; 5 in a row scores 3 points

Note There are three different record sheets for this game. Each is more challenging than the one before it. If the first and second sheets are easy, try using the third sheet.

NAME | DATE

Division Capture Record Sheet 1

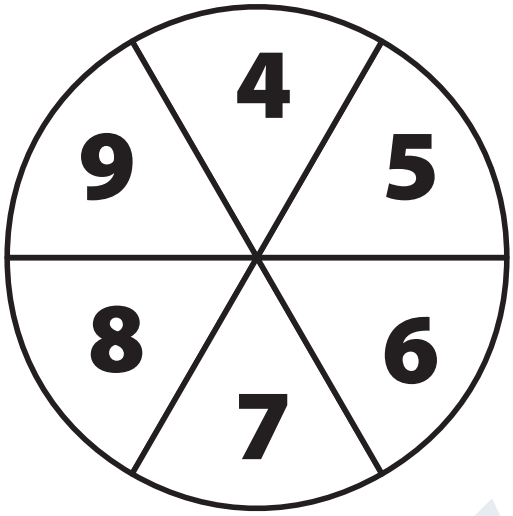


63 ÷ ☐ = 9	60 ÷ ☐ = 12	54 ÷ ☐ = 9	84 ÷ ☐ = 12
30 ÷ ☐ = 5	18 ÷ ☐ = 3	42 ÷ ☐ = 6	36 ÷ ☐ = 9
72 ÷ ☐ = 12	36 ÷ ☐ = 12	48 ÷ ☐ = 8	49 ÷ ☐ = 7
27 ÷ ☐ = 9	35 ÷ ☐ = 5	45 ÷ ☐ = 9	24 ÷ ☐ = 4
56 ÷ ☐ = 8	48 ÷ ☐ = 12	42 ÷ ☐ = 7	32 ÷ ☐ = 8
Player 1 Points:		Player 2 Points:	

Scoring 3 in a row = 1 point 4 in a row = 2 points 5 in a row = 3 points

NAME | DATE

Division Capture Record Sheet 2

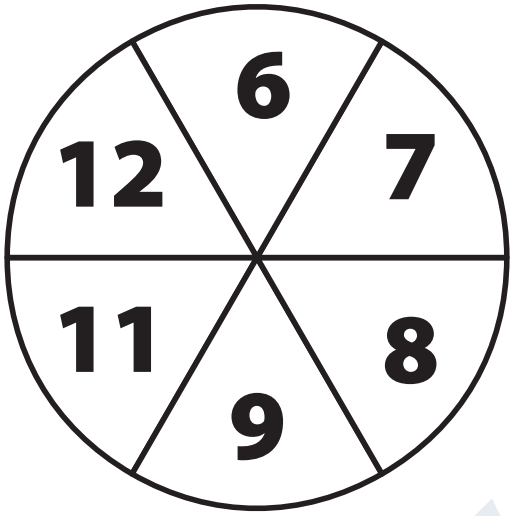


36 ÷ ☐ = 9	63 ÷ ☐ = 9	27 ÷ ☐ = 3	45 ÷ ☐ = 9
108 ÷ ☐ = 12	48 ÷ ☐ = 6	54 ÷ ☐ = 6	84 ÷ ☐ = 12
56 ÷ ☐ = 7	60 ÷ ☐ = 12	48 ÷ ☐ = 12	72 ÷ ☐ = 9
81 ÷ ☐ = 9	56 ÷ ☐ = 8	72 ÷ ☐ = 8	54 ÷ ☐ = 9
72 ÷ ☐ = 12	96 ÷ ☐ = 12	64 ÷ ☐ = 8	63÷ ☐ = 7
Player 1 Points:		Player 2 Points:	

Scoring 3 in a row = 1 point 4 in a row = 2 points 5 in a row = 3 points

NAME | DATE

Division Capture Record Sheet 3



72 ÷ ☐ = 12	63 ÷ ☐ = 7	121 ÷ ☐ = 11	91 ÷ ☐ = 13
96 ÷ ☐ = 8	96 ÷ ☐ = 12	78 ÷ ☐ = 13	72 ÷ ☐ = 8
104 ÷ ☐ = 13	132 ÷ ☐ = 12	84 ÷ ☐ = 12	110 ÷ ☐ = 10
120 ÷ ☐ = 10	84 ÷ ☐ = 14	81 ÷ ☐ = 9	112 ÷ ☐ = 14
144 ÷ ☐ = 12	108 ÷ ☐ = 12	98 ÷ ☐ = 14	108 ÷ ☐ = 9
Player 1 Points:		Player 2 Points:	

Scoring 3 in a row = 1 point 4 in a row = 2 points 5 in a row = 3 points

NAME | DATE

Division Story Problems page 1 of 2

1 In his toy car collection, Leo has 29 green cars, 22 black cars, and 27 red cars. He divides his cars into 6 equal piles. How many cars are in each pile?

a Make an estimate for this problem. Show your thinking.

b Solve the problem. Show your work using numbers, sketches, or equations.

2 Katina had 108 strawberries to share with her 24 classmates. On the way to school, she dropped 12 berries. If she shares the remaining strawberries with her classmates, how many strawberries will each student get?

a Make an estimate for this problem. Show your thinking.

b Solve the problem. Show your work using numbers, sketches, or equations.

NAME | DATE

Division Story Problems page 2 of 2

3 **CHALLENGE** Ahmet is picking oranges. He puts oranges into a basket and when the basket is full, he puts it into a bin. A basket can hold 25 oranges. A bin can hold 200 oranges. If Ahmet fills 2 bins of oranges, how many baskets did he fill?

a Make an estimate for this problem. Show your thinking.

b Solve the problem. Show your work using numbers, sketches, or equations.

NAME | DATE

Division with Remainders page 1 of 2

1 The third, fourth, and fifth grade classes are going on a field trip. There are 91 students in third grade, 88 students in fourth grade, and 93 students in fifth grade. If 9 people fit in a van, how many vans do they need for all of the students?

a What is the unit for this problem?

b How can you deal with the remainder?

c What is your estimate?

d Solve the problem. Show your work.

2 The fourth grade class is also going on a field trip. They have 91 students in all, but 23 of them will ride the subway. They have 6 small buses for the rest of the students. If about the same amount of students go on each bus, how many students will ride on each small bus?

a What is the unit for this problem?

b How can you deal with the remainder?

c What is your estimate?

d Solve the problem. Show your work.

NAME | DATE

Division with Remainders page 2 of 2

3 **CHALLENGE** Misha and her cousin Darius made muffins for the Clark family reunion. Misha made 17 more muffins than Darius. Darius made 56 muffins. They put the same amount of muffins on 12 plates. How many muffins are on each plate?

a What is the unit for this problem?

b How can you deal with the remainder?

c What is your estimate?

d Solve the problem. Show your work.

NAME | DATE

Partitive & Quotative Division

1 Marcos made brownies for the sixth grade dance. He arranged the brownies on a tray in a 12-by-16 array, but when he got to the dance, he had to put the brownies on 9 separate plates. If Marcos puts the same amount of brownies on each plate, how many brownies will be on each plate?

2 Olivia made mini pizzas for the sixth grade dance. She brought 7 trays of mini pizzas. Each tray holds 36 pizzas. The mini pizzas also had to be divided among several plates. If Olivia can put 8 pizzas on each plate, how many plates does Olivia need?