NUMBER® CORNER

SECOND EDITION

TEACHERS GUIDE

SEPTEMBER

GRADE 4

Published by The MATH LEARNING CENTER Salem, Oregon

Number Corner September

Teacher Masters

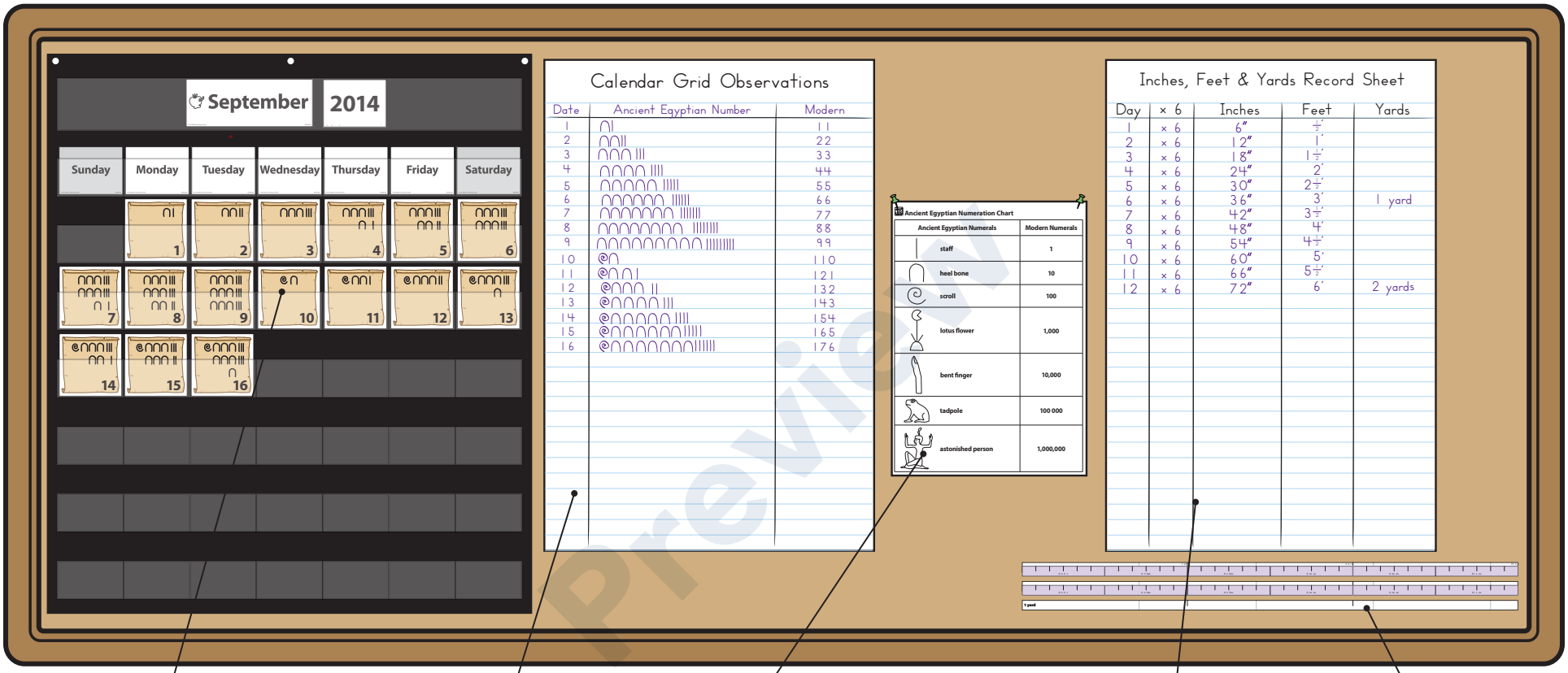
Pages renumber each month.

Number Corner Student Book Pages

Page numbers correspond to those in the consumable books.

September 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 laminate the paper before writing on it, you can reuse it in future months.

Ancient Egyptian Numeration Chart

Enlarge onto 11″ × 17″ or larger paper from the September Calendar Grid teacher masters.

Classroom Number Line

During Computational Fluency Activity 1, students will mark multiples of 2, 3, and 6 on this line.

Calendar Collector Record Sheet

You might use 24″ × 36″ chart paper. If you laminate the paper before writing on it, you can reuse it in future months.

Calendar Collector Collection

You'll post a Six-Inch Strip each school day and Yard Strips to accommodate them as needed.

September Daily Planner

Day	Date	Calendar Grid	Calendar Collector	Computational Fluency	Problem Strings	Solving Problems	Assessment
1		**Activity 1** Introducing the Calendar Grid (p. 8)		**Activity 1** Marking Multiples of 2, 3 & 6 on the Number Line (p. 25)			
2		*Update*				**Activity 1** Introducing Solving Problems & Solving Marbles Problem (p. 44)	
3		*Update*	**Activity 1** Introducing the October Calendar Collector (p. 17)				
4		**Activity 2** Updating & Discussing the Calendar Grid (p. 9)	*Update*	**Activity 2** Introducing Splat! (p. 27)			
5		*Update*	*Update*			**Activity 2** Discussing Marbles & Solving a Related Problem (p. 47)	
6		*Update*	**Activity 2** Introducing the Calendar Collector Record Sheet (p. 18)				
7		**Activity 3** Revealing the Tenth Marker & Introducing the Observations Chart (p. 10)	*Update*	**Activity 1** Marking Multiples of 2, 3 & 6 on the Number Line (p. 25)			
8		*Update*	*Update*				Baseline Assessment, Part 1 (p. 56)
9		*Update*	*Update*				Baseline Assessment, Part 2 (p. 57)
10		**Activity 4** Comparing Numeration Systems (p. 12)	*Update*	**Activity 3** Playing Splat! with a Partner (p. 30)			
11		*Update*	*Update*		**Activity 1** Problem String 1 (p. 34)		
12		**Activity 5** Completing a Number Corner Student Book Page (p. 13)	*Update*	**Activity 1** Marking Multiples of 2, 3 & 6 on the Number Line (p. 25)			
13		*Update*	*Update*		**Activity 2** Problem String 2 (p. 38)		
14		*Update*	**Activity 3** Sharing Observations & Computing Total Inches, Feet & Yards (p. 20)				
15		*Update*	*Update*			**Activity 3** Solving Xavier's Garden Problem (p. 50)	
16		**Activity 5** Completing a Number Corner Student Book Page (p. 13)	*Update*	**Activity 3** Playing Splat! with a Partner (p. 30)			
17		*Update*	*Update*			**Activity 4** Discussing Xavier's Garden Problem (p. 52)	
18		*Update*	**Activity 4** Completing the Inches, Feet & Yards Page (p. 21)				
19		*Update*	*Update*		**Activity 3** Problem String 3 (p. 40)		
20		**Activity 6** Concluding the September Calendar Grid	*Update*	**Activity 4** Looking Back at the Month (p. 31)			

Note *The Calendar Grid and Calendar Collector are updated by student helpers, except when each 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 the day's marker and any previous markers that have not been posted; after the Observations Chart has been posted, update it as well.
Calendar Collector – Post a 6" strip on the paper yard for each day of school. Once the Record Sheet has been posted, update it with the day, and number of inches, feet, and yards.

Number Corner
September

Overview

During this first month of school, students become familiar with the rhythms and routines of each Number Corner workout, while reviewing, revisiting, and extending skills and concepts addressed in third grade and exploring those new to fourth grade. While each workout stands alone, there are also connections among them that invite students to consider the material in different contexts and that help solidify and deepen their understandings. The primary mathematical emphasis this month is multiplication: students review multiplication facts, work with multiples of 10, think about factors and multiples, and work on strategies for multiplication with larger numbers.

Activities

Workouts	Day	Activities	D	G	SB
Calendar Grid Ancient Egyptian Numerals The calendar markers this month feature unfamiliar symbols, which students learn mid-month are ancient Egyptian numerals. Students search for patterns among the symbols to determine how the ancient Egyptian system of numeration works and how the markers are changing from day to day. This pattern provides a place value review that will help as they work with larger numbers and decimal numbers later in the year.	1	**1** Introducing the Calendar Grid	●		
	4	**2** Updating & Discussing the Calendar Grid	●		
	7	**3** Revealing the Tenth Marker & Introducing the Observations Chart	●		
	10	**4** Comparing Numeration Systems	●		●
	12, 16	**5** Completing a Student Book Page	●		●
	20	**6** Concluding the September Calendar Grid	●		●
Calendar Collector Six Inches a Day The class collects a 6-inch strip of paper each day and glues it onto a yard-long strip marked at 1-foot increments. Students keep a chart to show the growing collection of inches, feet, and yards. They make conversions from one unit to another that involve both whole numbers and fractions.	3	**1** Introducing the October Calendar Collector	●		
	6	**2** Introducing the Calendar Collector Record Sheet	●		
	14	**3** Sharing Observations & Computing Total Inches, Feet & Yards	●		
	18	**4** Completing the Inches, Feet & Yards Page	●		●
Computational Fluency The Number Line & Splat! Students identify and consider multiples of 2, 3, and 6 on a number line and and play a game called Splat! In the number line activities, students review factors and multiples, do count-arounds (i.e., count by a particular number), and record the multiples of 2, 3, and 6 on a number line. The game Splat! provides practice multiplying by 10 and by multiples of 10.	1, 7, 12	**1** Marking Multiples of 2, 3 & 6 on the Number Line	●		
	4	**2** Introducing Splat!		●	●
	10, 16	**3** Playing Splat! with a Partner		●	●
	20	**4** Looking Back at the Month	●		
Problem Strings Multiplication Models Students explore multiplication models and strategies as they review and solidify their understanding of how problem strings work.	11	**1** Problem String 1	●		●
	13	**2** Problem String 2	●		●
	19	**3** Problem String 3	●		●
Solving Problems One-Step Multiplication Problems Students solve problems and then discuss their solutions in pairs and as a class. For each problem, they paraphrase the question they are being asked to answer, identify the pertinent information in the problem, show their work, and state the answer in the form of a complete sentence. The mathematical content focuses mainly on one-step multiplication problems, including multiplication in the context of calculating area.	2	**1** Introducing Solving Problems & Solving Megan's Marbles Problem	●		●
	5	**2** Discussing Megan's Marbles & Solving a Related Problem	●		●
	15	**3** Solving Xavier's Garden Problem	●		●
	17	**4** Discussing Xavier's Garden Problem	●		●
Assessment Baseline Assessment Students spend two periods completing a written assessment that provide teachers with information about some of the most critical skills students should have mastered in third grade.	8	**Baseline Assessment, Part 1** Completing Pages 1–3			
	9	**Baseline Assessment, Part 2** Completing Pages 4 & 5			

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

Teaching Tips

Set up your Number Corner materials before the start of the school year. This will help you familiarize yourself with the workouts and will make organization easier once the school year starts.

Use the first month of Number Corner to establish routines that students will use for the rest of the year. For example, if students are coming to a discussion area or space designated for Number Corner, help them learn how to get there quickly and quietly, and make sure they know what materials to bring. Be very explicit about the expectations for these routines and transitions, and make time for students to reflect on how they are doing and what they could be doing better.

Don't worry too much if students are not getting all of the math in this month's workouts (or if it seems too easy). Use this month as an opportunity to get to know your students. Number Corner provides great opportunities for informal assessment.

Number Corner should take about 20 minutes a day. It's great if you can spend more time on Number Corner activities, but don't worry if you feel that you are not getting everything done in each activity this month. As you and your students adjust to the rhythms and routines of Number Corner, the activities will begin to go faster.

Number Corner Student Book pages accompany many of the workouts. Ideally, these will be done and discussed in class. However, if you are running out of time, you can assign them as homework. These Student Book pages can be used as another form of casual assessment.

Try to have all students participate as much as possible during Number Corner. You'll frequently ask them to explain their thinking and to share their strategies. Try to refrain from explaining for them or to them. When students have the opportunity to talk through their thinking, they are learning and their learning experience is more positive and meaningful. If a student makes a mistake, refrain from identifying it right away. Usually, the student or a classmate will catch it. Encourage students to ask questions, summarize each other's ideas, and make connections to the conversation. These steps will contribute to powerful learning in your classroom.

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 Write a multiplication equation to represent a verbal statement of a multiplicative comparison				●	●
4.OA.2 Solve story problems involving a multiplicative comparison using multiplication or division					●
4.OA.4 Demonstrate an understanding that a whole number is a multiple of each of its factors and determine whether a whole number between 1 and 100 is a multiple of a given 1-digit number			●		
4.OA.4 Find all factor pairs for a whole number between 1 and 100					●
4.OA.5 Generate a number or shape pattern that follows a given rule and identify features of the pattern that were not explicit in the rule used to generate it	●				
4.NBT.1 Demonstrate an understanding that in a multi-digit number, each digit represents ten times what it represents in the place to its right	●		●	●	
4.NBT.2 Read and write multi-digit whole numbers represented with numerals, words (number names), and in expanded form	●				
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 Multiply two 2-digit numbers 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.NF.1 Recognize equivalent fractions		●			
4.NF.3a Explain addition of fractions as joining parts referring to the same whole		●			

Major Skills/Concepts Addressed	CG	CC	CF	PS	SP
4.NF.3d Solve story problems involving addition of fractions referring to the same whole and with like denominators		●			
4.NF.4b Multiply a fraction by a whole number		●			
4.MD.1 Express a measurement in a larger unit in terms of a smaller unit within the same system of measurement (e.g., convert from inches to feet)		●			
4.MD.1 Record equivalent measurements in different units from the same system of measurement using a 2-column table		●			
4.MD.2 Solve story problems involving distance using addition or multiplication of fractions		●			
4.MD.2 Solve story problems that involve expressing measurements given in a larger unit in terms of a smaller unit within the same system of measurement		●			
5.OA.2 Write a simple expression to record calculations with numbers	●			●	
5.NBT.2 Explain patterns in the number of zeroes in the product when multiplying by powers of 10			●		
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

During the second or third week of school, students will take two Number Corner periods to complete a written Baseline Assessment. The Baseline Assessment is a one-time tool, designed to inform your instruction rather than gauge students' growth over time. Quarterly checkups that appear in October, January, March, and May serve a similar purpose: each provides a snapshot of individual students at that particular time of year with regard to the skills that have been emphasized in the couple of months prior to the checkup. If you want to gauge students' growth and progress over time with regard to the Common Core State Standards, you can use the optional Comprehensive Growth Assessment, located in the Grade 4 Number Corner Assessment Guide.

Skills/Concepts Assessed in the Baseline Assessment

- Solve multiplication story problems with products to 100, and division story problems with dividends to 100, involving situations of equal groups (3.OA.3)
- Solve for the unknown in a multiplication equation involving 3 whole numbers (a multiplicand, multiplier, and product) (3.OA.4)
- Recall from memory all products of two 1-digit numbers (3.OA.7)
- Fluently add with sums to 1000 and subtract with minuends to 1000 (3.NBT.2)
- Use strategies based on place value, properties of operations, or the relationship between addition and subtraction to add fluently with sums to 1000 and to subtract fluently with minuends to 1000 (3.NBT.2)
- Demonstrate an understanding of a unit fraction $1/b$ as 1 of b equal parts into which a whole has been partitioned (e.g., ¼ is 1 of 4 equal parts of a whole) (3.NF.1)
- Demonstrate an understanding of a fraction a/b as a equal parts, each of which is $1/b$ of a whole (e.g., ¾ is 3 of 4 equal parts of a whole or 3 parts that are each ¼ of a whole) (3.NF.1)
- Place fractions in their correct positions on a number line (3.NF.2)
- Demonstrate that fractions can only be compared when they refer to the same whole (3.NF.3d)
- Use the symbols >, =, and < to record comparisons of two fractions (3.NF.3d)

- Demonstrate that the area of a rectangle with whole-number side lengths can be found by multiplying the side lengths (3.MD.7a)
- Find the area of a rectangle by multiplying its side lengths (3.MD.7b)
- Solve story problems involving finding the area of a rectangle (3.MD.7b)
- Find the perimeter of a polygon, given its side lengths (3.MD.8)
- Identify rhombuses, rectangles, and squares as quadrilaterals (3.G.1)
- Draw quadrilaterals that are not rhombuses, rectangles, or squares (3.G.1)
- Identify shared attributes of shapes in different categories (e.g., rhombuses and rectangles have 4 sides) (3.G.1)
- Partition shapes into parts with equal areas and express the area of each part as a unit fraction of the whole (e.g., each of b equal parts is $1/b$ of the whole) (3.G.2)

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–T5 according to the instructions at the top of each master.	
	Run a single display copy each of Number Corner Student Book pages 1–13.	
	If students do not have their own Number Corner Student Books, run a class set of pages 1–13.	
Charts	Create the Inches, Feet & Yards Record Sheet before the second Calendar Collector activity (Day 6) according to the instructions in the Preparation section of the workout.	
	Create the Calendar Grid Observations Chart before the third Calendar Grid workout (Day 7) according to the instructions in the Preparation section of the workout.	
Paper Cutting	Before the first Calendar Collector Activity this month, prepare all of the Six-Inch Strips (TM T2) and one Yard Strip (TM T3). Store the strips in a plastic bag or envelope and post near the display. Include a glue stick in the bag or envelope.	
Special Tasks	Assemble, post, and label the number line before the first Computational Fluency activity (Day 1) according to the instructions in the Preparation section of the workout.	

September Calendar Grid

Ancient Egyptian Numerals

Overview

The calendar markers this month feature unfamiliar symbols, which students learn mid-month are ancient Egyptian numerals. Students search for patterns among the symbols to determine how the ancient Egyptian system of numeration works and how the markers are changing from day to day. This pattern provides a place value review that will help as they work with larger numbers and decimal numbers later in the year.

Skills & Concepts

- Generate a number or shape pattern that follows a given rule and identify features of the pattern that were not explicit in the rule used to generate it (4.OA.5)
- Demonstrate an understanding that in a multi-digit number, each digit represents ten times what it represents in the place to its right (4.NBT.1)
- Read and write multi-digit whole numbers represented with numerals, with words, and in expanded form (4.NBT.2)
- Write a simple expression to record calculations with numbers (5.OA.2)
- Construct viable arguments and critique the reasoning of others (4.MP.3)
- Look for and make use of structure (4.MP.7)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Introducing the Calendar Grid	1		• Calendar Grid pocket chart • Ancient Egyptian Numerals Calendar Markers • Month, Day, and Year Cards	
Activity 2 Updating & Discussing the Calendar Grid	4			
Activity 3 Revealing the Tenth Marker & Introducing the Observations Chart	7	**TM T1** Ancient Egyptian Numeration Chart		• Calendar Grid Observations Chart (see Preparation) • 1 piece of lined chart paper (see Preparation) • erasable pen or dry-erase marker
Activity 4 Comparing Numeration Systems	10	**NCSB 1*** Comparing Numeration Systems		
Activity 5 Completing a Number Corner Student Book Page	12, 16	**NCSB 2*** Expanded Form **NCSB 3*** Equations for Egyptian Numerals		
Activity 6 Concluding the September Calendar Grid	20	**NCSB 4*** Cracking the Code		

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.

equation*
numeral
place value
predict

Preparation

Develop your system for how students will update the Calendar Grid on days when you are not doing a Calendar Grid activity as a class. For example, if you have a helper of the day, it can be the helper's job to turn over the calendar marker, sometime other than Number Corner time. If you have time, another way to handle updating the Calendar Grid is to take a minute or two to update the grid as a class by having a student turn over the day's calendar marker right before or after you do the assigned activity. It can be tempting to talk about the new marker, so encourage students to save their observations and ideas until you complete the activity. However you handle the updates, make sure that students do not have access to all of the markers. If they see the markers and get clues about the pattern too soon or ahead of other students, it will hinder everyone's exploration and thinking about the important mathematical ideas in the pattern.

To make the Calendar Grid Observations Chart, cut a piece of lined chart paper vertically and record the title, "Calendar Grid Observations." Laminate the chart for use during the rest of the year. Next, use an erasable marker and straight edge to create the columns and rows, and label them as shown here for use with this month's collection. Do not post the chart until you are ready to do Activity 3.

Calendar Grid Observations

Date	Ancient Egyptian Number	Modern

Notes

- Try not to let students see the Student Book pages in the first week of September as they will give away the pattern.
- If students' interest is high or if it fits with your social studies curriculum, you may want to stock your classroom bookshelves with books about ancient Egypt.

About the Pattern

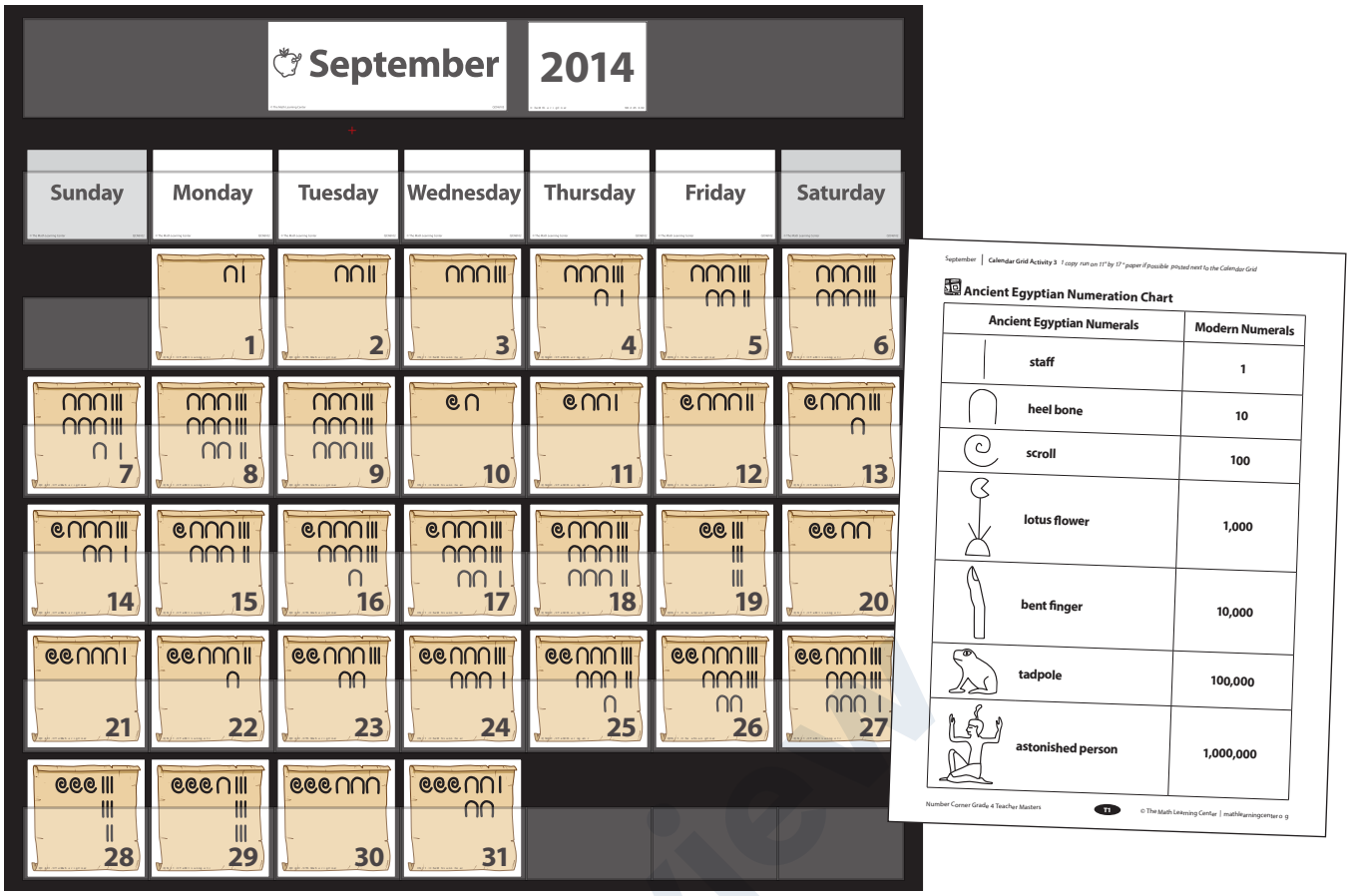
This month's pattern is explained below for your benefit. Don't tell students what the patterns are: instead, help them make and test their own ideas as a new marker is added each day. Don't worry if their ideas seem off base; as they accumulate information and discuss their observations, their ideas will be revised and refined into something more logical that can be justified with what they see.

September's Calendar Grid markers show ancient Egyptian numerals, which were used from approximately 4000 B.C.E. through 1000 C.E. Like our counting system, the ancient Egyptian system functions in base ten, which provides students with a review of place value. The first marker shows the equivalent of the number 11: a "heel bone" for 10 and a "staff" for 1. The numerical value of each marker increases by 11 each day. Symbols for Ancient Egyptian numerals accumulate until they reach a greater power of ten. So, 22, or the second marker, consists of 2 heel bones and 2 staffs, 33 consists of 3 heel bones and 3 staffs, and so on up to the ninth day, which shows 99 or 9 heel bones and 9 staffs. The pattern is predictable up to the tenth day when the symbol for 100 is introduced: a scroll is used with a heel bone to show 110 or 11×10. The pattern continues for the rest of the month, increasing by 11 each day.

Key Questions

Learning to search for, describe, and extend patterns facilitates algebraic thinking. Use these questions to help your students investigate this month's pattern.

- What will today's marker look like? What number and model will it show? How do you know?
- What equivalencies can be recorded?
- What patterns can you see so far?
- Does the pattern remain constant, or does it change over time? If so, how does it change?
- How are non-unit fractions related to unit fractions?



Mathematical Background

This month's pattern provides a review of place value and double-digit multiplication and a preview of work students will do with algebra later in the year. The pattern gives students the opportunity to think about place value in a new way as they compare and contrast the ancient and modern systems. During the activities and discussions, students also read and write numbers in words, expanded form, and as numerals.

As the month continues, students' observations may help them develop a new appreciation for the efficiency of our base ten number system. Some students will notice that the Egyptians had no symbol for 0 and that the other Egyptian numerals functioned in a purely additive way. For example, to show 8, you have to draw 8 lines; to show 88, you have to draw 8 hoops and 8 lines. There were no separate symbols for the numbers 2–9. As wonderful as the invention of symbols for each power of 10 was, it must have been tedious to draw 9 spirals, 9 heel bones, and 9 staffs to represent 999. As they consider our system of numeration and the ancient Egyptian one, some of your fourth graders may gain a new sense of appreciation for the very idea of creating symbols for groups of numbers. Viewed in this context, the developments that took place after the days of the ancient Egyptians—the invention of a symbol for each quantity from 1 through 9, the creation of 0 as a place holder, and the device of place value itself, wherein the position of any given numeral determines its worth—are all the more impressive.

In addition to developing a deeper understanding of place value, students are also working with multiplication and the distributive property. Students will realize that the relationship between the date and the Egyptian numeral is multiplicative, and they will find different ways to express this relationship. On the 6th day, for example, students will see 6 heel bones and 6 staffs, which can be expressed as $(6 \times 11) = (6 \times 10) + (6 \times 1)$. On the 16th day, they will see 1 scroll, 7 heel bones, and 6 staffs, which can be expressed as $(16 \times 11) = (10 \times 10) + (10 \times 1) + (6 \times 10) + (6 \times 1)$ or more simply $(16 \times 11) = (16 \times 10) + (16 \times 1)$ or $(10 \times 11) + (6 \times 11)$. You will help students write equations likes these as they discuss how to determine the value for each calendar marker.

Students' efforts to determine a relationship between the date and the number shown on each marker also serves as a precursor to the more formal study of algebraic functions later in the year. They can simply multiply the date by 11, or they may surmise that the value of the marker is 10 times the date plus the date itself $(10 \times d) + d$.

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, 5, and 6 as well, so do not have students update on these days.

Procedure

The student helper:

- Posts one or more calendar markers so that the Calendar Grid is complete up to the current date.
- After the Observations Chart is posted, the student will update the chart as well.
  Make sure students do not turn over the 10th marker. You will want this marker to be revealed when you are able to discuss it as a class. See Activity 3 for more information.

Activity 1

Introducing the Calendar Grid — Day 1

Post upside-down Calendar Grid markers up to today's date in the Calendar Grid pocket chart. For example, if today is September 4, post the first four markers in the calendar, upside-down so students cannot see them until they are revealed during today's workout.

1 Begin by gathering students in the Number Corner area and introducing the Calendar Grid.

- Explain that the class will post a new calendar marker for each day of the month.
- Over time, they will look for patterns among the markers.
- A couple times a week, they will make observations and predictions about the patterns they are noticing.
- On the days when they don't talk about the calendar together, the student helper will turn over the new marker for the day.
- Ask students to share anything they remember about calendar patterns from previous years in school.

2 Invite a student volunteer to reveal the first marker and discuss it as a class.

- Ask students to study the marker quietly for a minute.
- Invite them to come closer to the Calendar Grid if they need to take a better look.
- Then invite volunteers to describe what they see.

> ***Students*** *What are those marks supposed to mean?*
> *Is this some kind of secret code or something?*
> *It looks like a little arch and a little stick.*
> *I think it looks like a horseshoe.*

3 Then, have one or more student volunteers reveal the markers for the rest of the days that have passed this month. Pause after each marker is revealed to have students share observations and make predictions about what will come next.

Key Questions

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

- What do you notice about the markers themselves?
- What is the relationship between each day's date and the Egyptian number written on that marker?
- Do you expect the patterns you're noticing to change, or do you think they will continue this way for the whole month?
- What can you observe about the numbers on the record sheet that might help us understand how each day's date has been transformed into a particular Egyptian numeral?
- What do you predict the Egyptian and modern numbers will be for the 20th of the month? What about the 24th? The 30th? How are you getting your answers? Can you write an equation that shows your work?

Challenge Questions

- Why do you think the Egyptians invented symbols for 10 and 100 instead of just using lines to represent larger and larger quantities?
- Why do you think they chose to make symbols for 10 and 100 instead of some other numbers, like 8 and 64, for example?
- What are the differences between our modern system of numeration and the Ancient Egyptian system, and in what ways are the two systems alike?

If they don't begin to do it on their own, invite them to speculate about what the markers will look like for future dates.

ELL Calendar Grid pattern are great for ELL students because they are so visual. Help ELL students understand that they should look for patterns. Encourage them to share their thinking, using words in their own language if needed.

> ***Students*** *Oh look, there's the same number of each one as the date. So look on the third. There's 3 horseshoes and 3 sticks.*
>
> *Oh yeah! And for today, there's 5 horseshoes and 5 sticks. It's always like that.*
>
> *I bet tomorrow there's going to be 6 horseshoes and 6 sticks.*
>
> *It's going to keep doing that! On the 15th, there will be 15 of each. Maybe they'll be smaller to fit on the marker, though.*

4 Wrap up today's Calendar Grid activity by explaining helpers will update the Calendar Grid on days when the class as a whole is not discussing it.

One student will turn over a calendar marker. Explain the system you chose for selecting students to update the Calendar Grid markers. See the Preparation note for this month's Calendar Grid for more information.

Literature Connections

If you have access to these or similar books, consider using them as read-alouds or make them available in the classroom this month.

- *Science in Ancient Egypt* by Geraldine Woods
- *Hieroglyphs* by Joyce Milton and Charles Micucci
- *Tales of Ancient Egypt* by Roger Lancelyn Green and Michael Rosen

Activity 2

Updating & Discussing the Calendar Grid — Day 4

Take just a few minutes to discuss the new markers revealed over the past few days. If the date is the 10th or later, skip Activity 2 and do Activity 3.

1 Have students gather in front of the Calendar Grid, and ask them to study the grid quietly for a minute or so.

If students did not update the grid before now, turn over calendar markers so the grid shows the markers up to yesterday.

2 Then, invite students to share their observations, focusing in particular on the new markers that were turned over between the first time they discussed the calendar and now.

> ***Students*** *There are just more of those sticks and horseshoe things.*
>
> *There is one more stick, one more loop and one more horseshoe each day.*
>
> *Is it going it keep going like this until the end of the month?*
>
> *I think the background is a clue. It looks like old paper. Maybe that means these were numbers or symbols used a long time ago.*

3 Then, ask students to predict what the next calendar marker will look like. Invite a few students to share their thinking.

> ***Students*** *Yesterday there were 6 horseshoes and 6 sticks so today there will be seven horseshoes and 7 sticks.*
>
> *Maybe it will change today.*
>
> *It has to change soon. We can't fit all those shapes on the cards.*

4 Then, ask students if they have any ideas about what the symbols on the cards might mean. Don't suggest whether their ideas are right or wrong. Instead, focus on having students justify their ideas.

> ***Caroline*** *I think the pictures are symbols for numbers.*
>
> ***Teacher*** *Can you say more about that?*
>
> ***Students*** *They could be the symbol for the day of the month. 1 horseshoe and 1 stick could mean 1. Two horseshoes and 2 sticks could mean 2.*
>
> *It's funny how they separate the horseshoe things from the sticks. Maybe each of those is a symbol for something.*
>
> *Maybe the horseshoe means a number and the stick means another number. Like, the horseshoe could be 10 and the stick could be 1.*
>
> *Maybe they stand for letters.*

5 Wrap up today's brief activity by asking students to make predictions for the next few days. Have them turn to a partner and share their ideas.

Note

Figure out who is responsible for updating the grid on the 10th day, and ask them not to update the grid for September 10th until the whole class is discussing the pattern again.

Activity 3

Revealing the Tenth Marker & Introducing the Observations Chart — Day 7

Post the Calendar Grid Observations Chart you prepared (see the Preparation note at the beginning of this write-up).

1 Open today's activity by taking a moment to look at the first 9 markers. Review the predictions students have made about what might come next.

2 Then, invite a student to turn over the 10th marker. Ask students to think quietly for a minute about what they notice, and give them a few moments to share observations and ideas in pairs before opening the discussion to the whole group.

Encourage students to make sense of the change in the pattern. Build discussion and continue encouraging students to support their thinking. The following questions may help:

- Why do you think the change happened on the 10th day?
- Is there something particular about the number 10 that would cause this change?
- If the symbols stand for numbers, what might these numbers be?

> ***Students*** *Whoa! It's different!*
>
> *I thought it was going to be 10 loops and 10 lines today.*
>
> *It's like all the sticks disappeared and turned into a spiral or something.*
>
> *Now we've got a spiral and a hoop. It's kind of like 10, 'cause there are 2 numbers, or marks, or whatever those things are.*
>
> *But there were 2 marks on the first day too. There was a hoop and a line on the 1st, and now there's a spiral and a hoop. I don't get it.*

3 After discussing students' ideas, post the Ancient Egyptian Numeration Chart as you explain that students have been looking at ancient Egyptian numerals. As they may have guessed, the symbols they have seen so far do stand for 1s, 10s, and now 100.

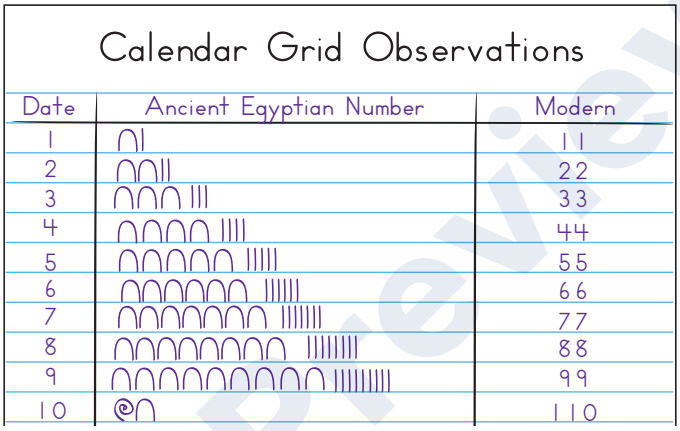
ELL Help ELL students with the words on the chart, especially *staff, scroll, tadpole, lotus flower,* and any other words that seem confusing.

4 Give students a moment to study the chart. Encourage them to figure out or confirm the numbers for previous calendar markers.

> ***Students*** *So that line is a staff. That's a 1, and the thing we called a horseshoe is a 10.*
>
> *So that means the first day was really 11.*
>
> *And the second day was 22 because there are 2 tens and 2 ones. Cool!*
>
> *And today is 110 because that's a hundred and a ten.*

5 Post the September Calendar Grid Observations Chart that you prepared beside the Calendar Grid, and fill it in with students' help for the first 10 markers.

You could invite a new student to fill in the row for each date.



Calendar Grid Observations

Date	Ancient Egyptian Number	Modern
1	∩|	11
2	∩∩||	22
3	∩∩∩ |||	33
4	∩∩∩∩ ||||	44
5	∩∩∩∩∩ |||||	55
6	∩∩∩∩∩∩ ||||||	66
7	∩∩∩∩∩∩∩ |||||||	77
8	∩∩∩∩∩∩∩∩ ||||||||	88
9	∩∩∩∩∩∩∩∩∩ |||||||||	99
10	∩	110

6 After the first ten rows of the Observations Chart have been filled in, give students time to share observations, conjectures, and generalizations about the numbers on the Calendar Grid and the record sheet.

> ***Teacher*** *Now that we can see the modern translations of our calendar markers so far, what do you notice?*
>
> ***Students*** *It goes 11 for 1, 22 for 2, 33 for 3, 44 for 4, and it keeps going like that until the 10th. Then it does something I don't get when it goes to 110.*
>
> *It's like one one, two two, three three, up until day 10, and then it's 1 ten.*
>
> *I think each number goes up by 11—it goes 11, 22, 33, 44, 55—that's adding 11 each time.*

7 Wrap up today's activity by asking students to predict what the next two or three calendar markers will look like and what the equivalent number in our modern counting system would be.

If today is not the 10th day of the month, reveal the rest of the markers through today's date and complete the rows on the Observations Chart for them.

8 Tell students that from now on, when they update the Calendar Grid, they will also fill in the Observations Chart with the date, Ancient Egyptian number, and the modern number.

Activity 4

Comparing Numeration Systems — Day 10

1 Begin by asking students predict what today's marker will look like, having a student reveal today's marker, and then discussing it as a class.

2 Ask a student to record the new information on the Observations Chart.

3 Now that students know what the symbols mean, focus on how they figured out the equivalent modern number for the symbol shown on some of the earlier calendar markers. Record their thinking as an expression for everyone to see.

Clarify the difference between an expression and an equation as you record student work.

> ***Teacher*** *Now that we know what these symbols mean, can you explain how you figured out what the number was in our numerals? Let's look at some of the earlier markers. How did you think about the 4th day of September?*
>
> ***Kevin*** *That one had 4 heel bones and 4 staffs. That means 4 tens and 4 ones, which is 44.*
>
> ***Teacher*** *How could I write an equation or an expression that shows your thinking?*
>
> ***Kevin*** *10 + 10 + 10 + 10 + 1 + 1 + 1 + 1.*
>
> ***Teacher*** (Recording the student's expression) *OK. This is an expression because it does not have an equal sign. It is just the calculation you would do to find an answer. If we added = 44, then it would be an equation.*
>
> Expression: 10 + 10 + 10 + 10 + 1 + 1 + 1 + 1
>
> Equation: 10 + 10 + 10 + 10 + 1 + 1 + 1 + 1 = 44
>
> or: 44 = 10 + 10 + 10 + 10 + 1 + 1 + 1 + 1
>
> ***Teacher*** *You got to 44 by adding. Did anyone think about it in another way?*
>
> ***Cherise*** *I thought it was faster to multiply. I did 4 times 10 and 4 times 1.*
>
> ***Teacher*** *So, I could record your thinking like this: (4 × 10) + (4 × 1). Is this an expression or an equation?*
>
> ***Cherise*** *An expression. There is no equal sign.*
>
> ***Teacher*** *Great. Let's look at another card. How did you figure out the numbers for the 9th day? The 12th day?*

4 Then, display your copy of the Comparing Numeration Systems Student Book page and give students a moment to study it in silence.

5 Make sure students understand what they need to do to complete the page, and then have them work on the page in their Number Corner Student Books.

- Explain that the table on the top of the page shows three different counting systems.
- Explain that students will determine the value of base ten pieces and then write the value in modern numerals and in Ancient Egyptian numerals.
- Ask students if they have any questions.
- Have them turn to the Comparing Numeration Systems page in their own Number Corner Student Books and get started.

6 As students finish, have them pair up with a partner and compare their work.

7 Wrap up today's activity by bringing the class back together to discuss item 2 on the page. Invite several students to share their responses.

> ***Students*** *They are similar because they both use ones, tens, hundreds, and so on.*
>
> *They are different because the Egyptian system doesn't have 0 and we do.*
>
> *They are different because we have numbers for 2, 3, 4, and so on and they just make 2, 3, or 4 or however many marks. Like you have to make 6 staffs to show the number 6. There isn't a picture that shows each number.*
>
> *I like the pictures in their system, but I think ours is easier to use. We don't have to write so much.*

Activity 5

Completing a Number Corner Student Book Page Days 12 & 16

1 Begin by asking students predict what today's marker will look like, having a student reveal today's marker, and then discussing it as a class.

2 Ask a student to record the new information on the Observations Chart, and make sure the chart is up to date.

3 Display your copy of the Number Corner Student Book page for today's activity, give students a minute to review the page, and then invite a student to read the directions.

4 Spend a few minutes answering questions students have about the page.

5 Have students find the page in their own Number Corner Student Books and give them time to complete it.

6 While students work, circulate around the room to make observations and answer students' questions.

If some students finish before others, have them pair up and compare their work.

CHALLENGE On the Equations for Egyptian Numerals page, have students write equations for Egyptian numerals that have a variety of symbols in them, such as the numerals they have seen on the calendar markers. For example:

Notes About This Activity

Students will do the Expanded Form page on Day 12 and the Equations for Egyptian Numerals page on Day 16.

7 Once everyone has finished the page, gather the students together to discuss their work. Invite students to share their answers and their thinking with the class.

8 Close the activity by having students predict what the next calendar marker will show, in both Ancient Egyptian and modern numerals.

Activity 6

Concluding the September Calendar Grid — Day 20

1 Begin by asking students predict what today's marker will look like, having a student reveal today's marker, and then discussing it as a class.

2 Ask a student to record the new information on the Observations Chart, and make sure the chart is up to date.

3 Ask students to choose any calendar marker on the calendar and tell you how they determined the modern number or value for the Egyptian numerals. Record their thinking as an expression.

See step 3 in Activity 4 to review recording student thinking as expressions.

4 Then, invite students to turn over the rest of the calendar markers for the month, one by one, pausing to allow students to make silent observations in their minds after each one is revealed.

5 Ask students to look at the Calendar Grid for the entire month and think about the following questions:

- Now that you can see the whole month, do you have any new observations or insights about the pattern?
- Do you see any new patterns that you did not notice before?
- What math did you do when you were thinking about and figuring out this pattern?

6 If you have time, display the Cracking the Code page as students turn to the page in their Number Corner Student Books. Explain that students will translate the numbers, either from the Ancient Egyptian system to the modern or from the modern to the Ancient Egyptian system.

ELL Explain to any ELL students that "Cracking the Code" is an expression for figuring out a code or pattern.

7 Ask students if they have any questions and then have them get started.

CHALLENGE Have students compose numbers in ancient Egyptian numerals and have a partner determine what they are in modern numerals.

8 As students finish, have them get together with a partner to check, compare, and share their work.

9 Wrap up today's activity by letting students know that they will explore a new pattern in October.

September Calendar Collector

Six Inches a Day

Overview

The class collects a 6-inch strip of paper each day and glues it onto a yard-long strip marked at 1-foot increments. Students keep a chart to show the growing collection of inches, feet, and yards. In the process, they make conversions from one unit to another, working in both whole numbers and fractions through the month.

Skills & Concepts

- Recognize equivalent fractions (4.NF.1)
- Explain addition of fractions as joining parts referring to the same whole (4.NF.3a)
- Solve story problems involving addition of fractions referring to the same whole and with like denominators (4.NF.3d)
- Multiply a fraction by a whole number (4.NF.4b)
- Express a measurement in a larger unit in terms of a smaller unit within the same system of measurement (e.g., convert from feet to inches) (4.MD.1)
- Record equivalent measurements in different units from the same system of measurement using a 2-column table (4.MD.1)
- Solve story problems involving distance using addition or multiplication of fractions (4.MD.2)
- Solve story problems that involve expressing measurements given in a larger unit in terms of a smaller unit within the same system of measurement (4.MD.2)
- Reason abstractly and quantitatively (4.MP.2)
- Attend to precision (4.MP.6)

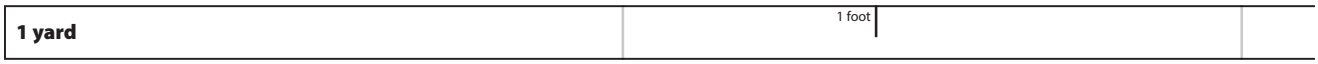
Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Introducing the September Calendar Collector	3	**TM T2** Six-Inch Strips **TM T3** Yard Strips		• glue stick • calculators, optional • yard stick, optional
Activity 2 Introducing the Calendar Collector Record Sheet	6			• Inches, Feet & Yards Record Sheet (see Preparation)
Activity 3 Sharing Observations & Computing Total Inches, Feet, & Yards	14			
Activity 4 Completing the Inches, Feet & Yards Page	18	**NCSB 5*** Inches, Feet & Yards		

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

Before the first Calendar Collector Activity this month, prepare all of the Six-Inch Strips and one Yard Strip. Store the strips in a plastic bag or envelope and post near the display. Include a glue stick in the bag or envelope. Post one Yard Strip before Activity 1 and add more Yard Strips as needed through the month. Post the Inches, Feet & Yards Record Sheet on the display before the second activity.



To make a reusable Calendar Collector record sheet, cut a piece of lined chart paper vertically and laminate for use during the rest of the year. Next, use an erasable marker and straight edge to draw 5 columns and 22 rows, and label them as show here for use with this month's collection. Write "x 6" in each row of the second column. If possible, shade in this column or designate it as different in some way.

Inches, Feet & Yards Record Sheet

Day	× 6	Inches	Feet	Yards
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			

Mathematical Background

This month's workout addresses skills and concepts related to both measurement and fractions. Each day, students add one six-inch strip to the collection, so that they add 1 foot every 2 days and 1 yard every 6 days. They use yard-long strips to keep track of this growing collection of inches. Students add and multiply fractions easily as they keep track of the number of inches, feet, and yards. The workout directly addresses one of the three critical areas for the Common Core State Standards for fourth grade: students should develop an "understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers."

As students see the same quantity expressed in different units within the same measurement system, they develop a greater understanding of fraction equivalence. They explore and record fractions, mixed numbers, and improper fractions as they accumulate 6-inch (½ foot) strips. The work addresses not only fractions but also measurement as students make conversions from one unit to another, using both whole numbers and fractions. They multiply whole numbers and fractions using repeated addition, doubling, and other multiplication strategies. Because measurement is a natural context for discussing "times," this workout nicely elicits these multiplication strategies. The exposure to this kind of thinking about fractions builds a strong foundation for the work students will do with fractions later in the school year.

Update

Starting after Activity 1, have the student helper(s) complete this update procedure every day (of school) 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

- With a glue stick, post a 6-inch strip on the paper yard for each day of school.
- Once the record sheet has been posted, update the record sheet with the day, and number of inches, feet, and yards.

Key Questions

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

- How many inches are in a foot? A yard? How many feet are in a yard?
- Name a few things around the classroom that are longer (shorter) than an inch, a foot, a yard.
- Can you spot something that might be about 6 feet long? How many inches would that be?
- [72] How many yards? [2]
- Name some things you might measure in inches (or feet or yards). If you had to measure the height of a kindergartner, which unit would you use? Why? If you had to measure the distance between the classroom and the playground, which unit would you use? Why?
- How long will it be before you've collected enough inches to fill the yard-long strip? [6 days] Two yard-long strips? [12 days]

Literature Connections

Share the following books with students this month, either as read-alouds for the whole class or as choices for independent reading.

How Big Is a Foot?
by Rolf Myller

Counting on Frank
by Houghton Mifflin

The Wishing Club: A Story about Fractions
by Donna Jo Napoli

The Lion's Share
by Matthew McElligot

Activity 1

Introducing the September Calendar Collector — Day 3

1 Gather students in front of the Calendar Collector display (the yard and bag of 6-inch strips you posted earlier) and explain that this year, just as they may have done in earlier grades, students will make a new collection together each month.

2 Explain that students will collect a 6-inch strip of paper for each day of school this month by gluing the strip to the yard posted on the wall.

ELL Help ELL students learn the vocabulary for this month's calendar collector. Hold up the 6-inch strips, and point to a foot and yard (on the yard strip or on an actual yardstick if you have one) as you explain the collector.

3 Prompt student thinking about this month's collection with these questions:

- How many inches will they have by the end of the month?
- How long is that number of inches? If they walked that many inches from where they are right now, where would they end up?
- You might also ask them if there is another way to express that length (e.g., converting to feet or yards).

If you pose these initial questions in a very open-ended way, students' answers may provide you with some sense of what they already know about U.S. customary units of linear measure.

4 After a bit of discussion, glue one 6-inch strip to the posted paper yard. Ask students to share their observations about this first element in their collection.

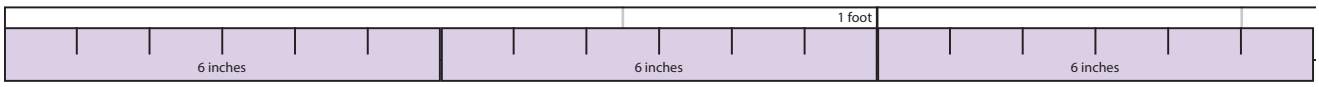
Students *Six inches is about as long as my hand.*

That's half a foot.

We know that because 6 is half of 12, and there are 12 inches in a foot.

I think it'll take 6 of those to fill up the yard, because it takes 2 for each foot, and there's 3 feet in that yard.

5 Once they've had a chance to share observations, invite a helper to add as many 6-inch strips to the Yard strip as there have been school days in September so far. If, for instance, you are doing this activity on the third day of school, the helper will need to post two more 6-inch strips.



6 After the 6-inch strips have been posted, pose some of the key questions to build speculation and develop understanding about what this month's Calendar Collector is all about.

Use this initial conversation as an informal assessment of what students know and understand about measurement and fractions.

More Key Questions

- How many yard-long strips do you think we will have collected by the end of the month? [a little more than 3]
- If the first yard starts here on the calendar display board, where will we stop at the end of the month if you place the yard-long strips end-to-end?
- 6 inches are what fraction of a foot? A yard? 1 foot is what fraction of a yard?
- What are some equivalent fractions for 1/6? 1/3? 3/6?
- A bus is 3 times as long as a car. If a car is 12 feet long, how long is a bus?
- Leo's apartment building is 60 feet tall. It is 3 times as tall as it is wide. How wide is Leo's apartment building?

7 Wrap up today's activity by explaining how students will update the Calendar Collector when students are not discussing it as a class.

For each day of school, a student helper will glue a 6-inch strip to the yard. After the second activity, the student helper will also update the record sheet.

If necessary, review your system for determining who gets to update the Number Corner components.

Activity 2

Introducing the Calendar Collector Record Sheet — Day 6

Post the Calendar Collector Record Sheet before this activity. Make sure the student helpers have been posting 6-inch strips for each day of school.

1 Post and introduce the Inches, Feet & Yards Record Sheet. Before you begin to enter data, take a few minutes to have students share observations and comments about the record sheet itself.

Inches, Feet & Yards Record Sheet

Day	× 6	Inches	Feet	Yards
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			
	× 6			

Andrea *Why is there a times 6 on every row?*

Teacher *What do you all think about this question? Take a moment to discuss this with the person sitting next to you.*

Students *We think it says times 6 in each row because we're getting 6 inches every day. If you read across, it makes a times fact, like today would be 6 × 6 because it's the sixth day of school in September.*

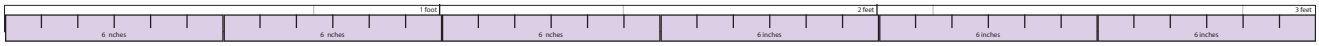
We think it's there to remind us that we can multiply to find out how many inches we have each day.

2 Ask students to compute the number of inches you have today, and then have them fill in the inch values for all the previous days.

Although some students may add 6 inches repeatedly to get the total number of inches for each day, they can also multiply the number of days by the number of inches. The × 6 on the record sheet is a nudge toward this kind of multiplicative thinking.

3 Once the inches column has been brought up to date, ask students to help fill in the number of feet that have been collected each day.

Take this opportunity to have students work with halves. For the days when the number of feet isn't a whole number, you might record the number of feet as both improper fractions and mixed numbers, depending on the responses from students as you make the chart entries.



Teacher *So, how many feet have we collected today?*

Students *Six!*

Wait, we have 6 strips, but that's 3 feet. See the feet marks on the long strip?

Oh right, I mean we collected 6 halves.

There are 3 feet on the top strip. The next yard is empty. We'll start that one tomorrow.

Teacher *I heard someone mention 6 halves, and other folks are saying it's 3 feet. Are those the same? Talk it over with your neighbor for a minute—what do you think?*

4 Next, invite students to help fill in the yards column.

Depending upon how comfortable students are with fractions, you might fill in only those rows that show a whole number of yards or that include halves of yards. If students are more comfortable with fractions, encourage them to fill in all of the rows, which requires them to think about thirds and sixths of a yard. You can record responses as improper fractions, mixed numbers, or both, and you can also have students record equivalent fractions where applicable (e.g., 2/6 and 1/3 for Day 2).

Inches, Feet & Yards Record Sheet

Day	× 6	Inches	Feet	Yards
1	× 6	6″	$\frac{1}{2}$′	
2	× 6	12″	1′	
3	× 6	18″	$1\frac{1}{2}$′	
4	× 6	24″	2′	
5	× 6	30″	$2\frac{1}{2}$′	
6	× 6	36″	3′	

5 Once the record sheet has been brought up to date, give students a minute or so to look it over and share any new observations or insights they have at this point.

6 Then, pose the following problems, which prompt students to make multiplicative comparisons involving measurements in feet, one at a time.

- Give students a moment to think about the question.
- Record an equation to represent the problem and its solution.
  - » Mingo is 2 feet tall. His father is 3 times as tall is Mingo. How tall is Mingo's father? (6 feet; 2 × 3 = 6)
  - » Sarah's backyard is 50 feet long. The backyard is 5 times as long as her garden. How long is Sara's garden? (10 feet; 5 × 10 = 50 or 50 ÷ 5 = 10)
  - » A baby blue whale is about 20 feet long. Its mother is 4 times as long. How long is the mother blue whale? (80 feet; 20 × 4 = 80)

You will work multiplicative comparisons more formally in the coming months. This is just a simple introduction to get students familiar with the language and idea of multiplicative comparisons.

7 Wrap up today's activity by reminding students that when they update the Calendar Collector they need to update the record sheet as well from now on.

Activity 3

Sharing Observations & Computing Total Inches, Feet & Yards — Day 14

Look at the record sheet to see how student helpers have been filling it out. Look for opportunities to discuss where students could add more to the chart. For example, could they add an equivalent fraction? Could they express a mixed number as an improper fraction?

1 Begin by giving students some time to share observations about the Calendar Collector.

- Gather students in front of the Calendar Collector display.
- Give them a minute or so to study the yards with the 6-inch strips and the record sheet.
- Encourage them to look for patterns they may not have noticed before.
- Then, invite students to share observations.

> ***Student*** *Look! The day number is the same as the numerator in the feet column.*
>
> *Is that always true?*
>
> *I think so. Sometimes we wrote it as a mixed number so it doesn't look the same, but if we wrote it as a fraction, then it would always be true.*
>
> ***Teacher*** *Why do you think that is?*

2 Ask students if there is anything they would add to the record sheet to make the information more specific or detailed. Discuss their suggestions and record additional ideas.

> ***Students*** *I notice sometimes we have a whole number and a fraction and sometime we just have a fraction. There are times where we could have both, like, on day 11, we could write 11½ and 5 ½.*
>
> *We could add a few more for the yards column.*
>
> *The ones that we did write for the yards have equivalent fractions. ⅔ is the same as ⅓ and ⅜ is the same as ½.*

3 Have students turn to a partner to discuss their strategies for computing the number of inches for each day, and then invite students to share their strategies.

> ***Students*** *Just add 6 more to the last one. They go up by 6 each time.*
>
> *Or you can multiply the day by 6, like it says on the chart.*

4 Repeat step 3 with strategies for determining the number of feet there are each day. Encourage students to come up with of a variety of ways for thinking about these amounts.

CHALLENGE Also have students think and talk about how they would determine the number of yards.

> ***Students*** *You can think about the number of inches and then figure out how many feet that is.*
>
> *Each day you get another ½ a foot, so you can add ½ to the last number.*

I noticed a pattern where the number of feet is always half the number for the day. I think you can find half the day number to find out how many feet there are.

Teacher *These are great strategies. Let's use them to predict how many feet there will be in several days. How many feet do you think we will have on the 18th day? Or, even though we won't get to it, how about the 27th day?*

5 Wrap up today's discussion by letting students know that the work they are doing in this activity will help them when they work with fractions later in the year.

Activity 4

Completing the Inches, Feet & Yards Page — Day 18

1 Gather students in front of the Calendar Collector display. If the yard or record sheet is not up to date, have students help update them now.

2 Ask students to study the display quietly. Then ask them to share new observations or patterns they see, now that they are almost finished the month.

3 Then, explain that students will show what they have learned this month by completing a Number Corner Student Book page.

- Display a copy of the Inches, Feet & Yards page and ask students to find the corresponding page in their Number Corner Student Books.
- Read and clarify the instructions on the page as needed.

4 When students understand what to do, have them go to work. As students work, circulate around the room to make observations, answer questions, and provide differentiated instruction.

ELL Read questions aloud, sketch graphics, and provide examples to help ELL students understand the content of the questions.

SUPPORT Refer students to the Calendar Collector display to review inches, feet, and yards. Help students understand the two-part nature of item 7.

CHALLENGE If students finish ahead of time, have them solve other conversion problems, such as how many feet are in 53 inches and how many inches are in 6 ⅓ feet?

Note *If some students don't have time to complete the assignment during Number Corner, give them additional time during a designated seatwork period or during Work Places within the next day or two.*

5 As students finish their work, have them share and compare with a partner.

6 At the end of your Number Corner time today, collect the Number Corner Student Books. Review students' work to get a sense of their proficiency with several measurement standards.

7 Wrap up the activity by having students determine how many inches, feet, and yards they would have if they continued collecting 6 inches a day for 24 and 29 days.

September Computational Fluency

The Number Line & Splat!

Overview

This month's Computational Fluency features two activities: identifying and considering multiples of 2, 3, and 6 on a number line and playing a game called Splat! In the number line activities, students review factors and multiples, do count-arounds (i.e., count by a particular number), and record the multiples of 2, 3, and 6 on a number line. The game Splat! provides practice multiplying by 10 and by multiples of 10.

Skills & Concepts

- Demonstrate an understanding that a whole number is a multiple of each of its factors and determine whether a whole number between 1 and 100 is a multiple of a given 1-digit number (4.OA.4)
- Demonstrate an understanding that in a multi-digit number, each digit represents ten times what it represents in the place to its right (4.NBT.1)
- Multiply a 2-digit whole number by another 2-digit whole number using strategies based on place value and the properties of operations (4.NBT.5)
- Explain patterns in the number of zeroes in the product when multiplying by powers of 10 (5.NBT.2)
- Model with mathematics (4.MP.4)
- Look for and express regularity in repeated reasoning (4.MP.8)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Marking Multiples of 2, 3 & 6 on the Number Line	1, 7, 12		• Number Line Segments • Word Resource Card for *multiple*	• blue, green, and purple erasable pens or fine-tipped dry-erase markers
Activity 2 Introducing Splat!	4	**NCSB 6*** Splat! Grid **NCSB 7–9*** Splat! Record Sheets	• 2 spinner overlays	• two 5 ½" × 8 ½" pieces of colored copy paper (two halves of a letter-size sheet)
Activity 3 Playing Splat! with a Partner	10, 16		• spinner overlays, half-class set	
Activity 4 Looking Back at the Month	20		• Number Line Segments	

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

Vocabulary

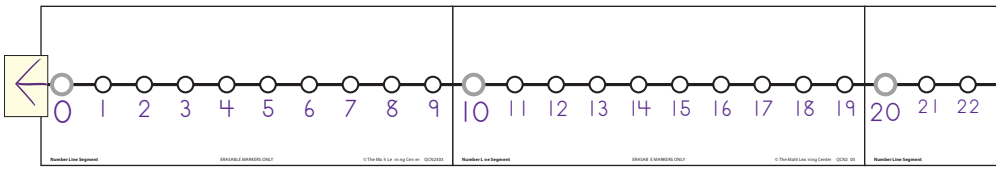
An asterisk [*] identifies those terms for which Word Resource Cards are available.

associative property of multiplication*
commutative property of multiplication*
computational fluency
factor*
horizontal
multiple*
product*
vertical

Preparation

Assemble your number line from the Number Line Segments, taking care to attach the panels in order so that there are 9 black dots between each pair of gray dots. Write numbers from 0 to 100 under each dot, beginning with a 0 under the first gray dot. (The last segment will have 100 under its gray dot and nine black dots without numbers.) You can add arrows with sticky notes to indicate that the number line extends indefinitely in both directions if you like.

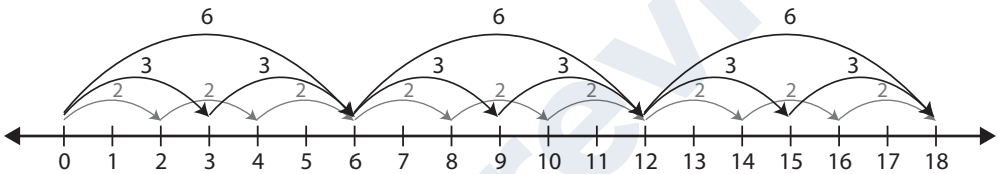
Post the number line where students can reach it on the wall designated for your Number Corner display; it should be positioned low enough that students can write on it during this workout.



If you can, play a game or round of Splat! before introducing it to the class.

Mathematical Background

In this workout, students use a number line to explore the multiples of 2, 3, and 6 in the range of 0 to 100. This work reviews multiplication facts, while allowing students to explore patterns with these multiples. Key ideas include why 6 has the fewest multiples, why 2 has the most multiples, and why some numbers are multiples of all three numbers (2, 3, and 6). When students realize, for example, that 3 has twice as many multiples as 6 and that there are two 3s within every 6, they are thinking deeply about multiplicative relationships as they also review multiplication facts. Students' work on the number line also solidifies their understanding of the relationship between factors and multiples.



Splat! extends students' review of multiplication facts while giving them the chances to make generalizations about the results of multiplying two multiples of 10 (e.g., 30 × 40 or 20 × 50) using the area model as a visual anchor. The more proficient students are at multiplying multiples of 10, the more competent they will be at estimating the results of, and performing, multi-digit multiplication. Students see that when multiplying by multiples of 10, they can factor the numbers and apply the associative property. For example, 70 times 90 can be thought of as (7 × 10) × (9 × 10). You can apply the associative property to rewrite the expression and find the product.

$$(7 \times 9) \times (10 \times 10) = 63 \times 100 = 6{,}300$$

Once students see that they can use their basic facts and what they know about multiplying by powers of ten, they can solve these problems with meaning and efficiency. By using the array model and the properties of multiplication, students understand why products of multiples of 10 have the number of 0s they do; the array also illustrates how the product of two relatively small numbers like 70 and 90 can be so large. Without the array model, these results can be confounding to students who are still accustomed to addition, in which the sum of two numbers is much closer to the numbers being added than products are to the two numbers being multiplied.

Key Questions

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

- What is a multiple?
- What is a factor?
- Is 37 a multiple of 2? 3? 6? Why or why not?
- Is 48 a multiple of 2? 3? 6? Why or why not?
- Which number has more multiples, 2 or 6? Why?
- What do you notice about the multiples of 6?
- What happens when you multiply a number by 10?
- What happens when you multiply a number by a multiply of 10?
- What happens when you multiply two multiples of 10?

Activity 1

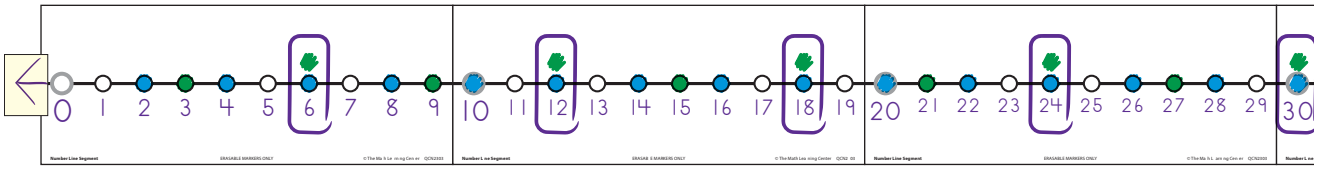
Marking Multiples of 2, 3 & 6 on the Number Line

Days 1, 7, 12

The first time you do this activity with multiples of 2, follow all the steps. When you repeat the activity for multiples of 3 and 6, you might want to briefly review the meaning of the word multiple *and then simply follow Steps 6–9. Use a blue pen for multiples of 2 and a green pen for multiples of 3 (if the dot has already been shaded, students will draw a green dot above the original dot). Students will draw a purple box around the numbers that are multiples of 6.*

Notes About This Activity

If possible, have students sit in a circle for this activity. If they cannot fit in one big circle, try having them sit in two circles, one inside the other.



The number line as it will appear after the third iteration of this activity, when multiples of 2, 3, and 6 have been marked.

1 Open today's activity by explaining what *computational fluency* means.

Explain that computational fluency the ability to solve number problems efficiently and accurately. If someone has computational fluency, it means they can add, subtract, multiply, and divide pretty quickly and get the right answer. Tell students that in this workout, they will play games and use number lines to develop their understanding of numbers, including whole numbers, fractions and decimals, and operations (adding, subtracting, multiplying and dividing).

2 Introduce the number line you prepared ahead of time.

- Tell students that for today's Computational Fluency activity, they will use the number line to think about certain sets of numbers that have some things in common.
- Direct students' attention to the number line posted on the wall.
- Ask them to study the number line quietly for a moment.

3 Ask students to share any observations they have about the number line so far.

> ***Students*** *The number line goes to 100.*
>
> *There are more black dots than gray dots.*
>
> *The gray dots go by tens and the black dots go in between.*

4 Then, ask the class to skip-count by 2s around the room, so that every member of the class says a multiple of 2.

Decide who will go first. If your students are not sitting in a circle, you may want to point to students when it is their turn.

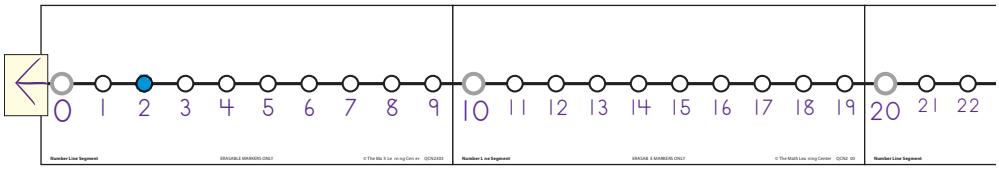
5 After the class has completed the count-around, clarify the term *multiple*.

> ***Teacher*** *When you were skip-counting by 2s, you said many multiples of 2. What is a multiple?*
>
> ***Students*** *When you multiply a number by another number you get a multiple. Like 2 times 5 is 10, so 10 is a multiple of 2.*
>
> *A multiple is a number that another number goes into evenly. I said 18. 2 goes into 18 exactly 9 times.*

You may want to display the Word Resource Card for *multiple* after your discussion.

6 Discuss multiples of 2 to prepare for marking them on the number line.

- Explain that today the class will mark the multiples of 2 on the number line by shading in the dot for each number that is a multiple of 2, using a blue pen.
- Shade in the dot for the number 2 as an example.



- Then, ask students to share some ideas about multiples of 2 before shading in the rest on the number line.
  - » About how many multiples of 2 are there between 0 and 100?
  - » Are the multiples of 2 odd numbers, even numbers, or both odd and even numbers?
  - » Is 0 a multiple of 2? Why or why not? [It is, because $2 \times 0 = 0$.]
  - » (For multiples of 3 and 6) Will we need to mark any of the multiples we've already shown on the number line again? In other words, will any of the multiples of 2 also be multiples of 3? Will any of the multiples of 2 and 3 be multiples of 6? Will any multiples of 6 *not* be multiples of 2 or 3?

7 Explain the procedure for doing a count-around by 2s while a student shades in the multiples of 2 on the number line.

- Every student says a number as they go around the circle counting by 1s.
- Multiples of 2 get called out loudly while other numbers are whispered.
- All students need to watch and listen when it is not their turn, and to be ready when it is their turn.
- Tell students they will stop when they get to 100.
- Answer any questions students have.

8 Begin the count-around, and stop when students reach 100.

Pause every once in a while to:

- Change the student who is shading in the multiples.
- Ask students to share observations.
- Ask students how many multiples of 2 they have counted so far.

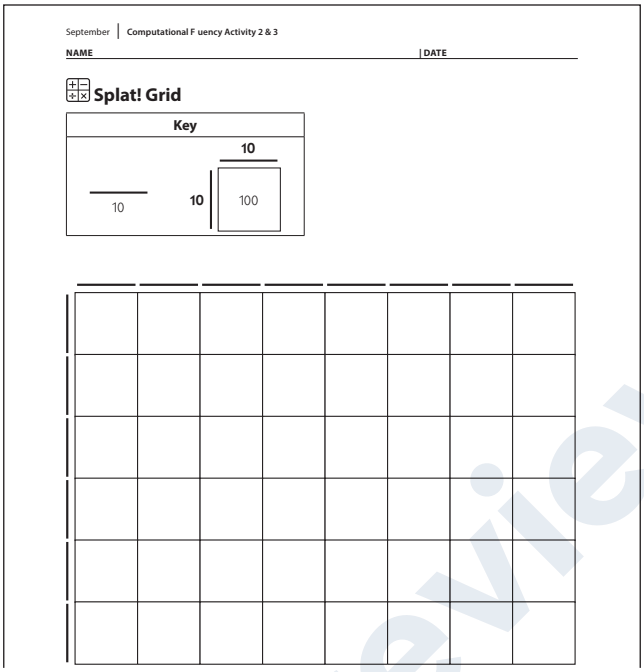
9 Conclude the activity by asking students to share some final observations and then letting them know that they will mark the multiples of 3 on the number line next week.

Activity 2

Introducing Splat! Day 4

1 Open today's activity by introducing the game Splat!.

- Tell students that they will play a new game called Splat! today.
- Display your copy of the Splat! Grid page.
- Give students a moment to look it over in silence.



2 Take a moment to review the information in the key, and then ask students to spend a few minutes determining the area of the entire grid.

SUPPORT/ELL Review how and why keys such as these are used, and share that they are sometimes called legends.

3 Invite students to share how they determined the area, and record their ideas symbolically: review how using associative and commutative properties can help them express 60 × 80 as 6 × 8 × 100, as shown in the dialog and visuals here.

> ***Students*** *The key says that each black line is equal to 10. The vertical side has 6 of those lines so that side is 60. The horizontal side has 8 lines, so that's 80.*
>
> *We thought about 6 times 8 times, because that's a lot like 60 times 80. That's 48, and we saw 48 squares there, but we know it has to be more than 48 because 60 is more than 48 and so is 80. So the answer can't be 48. Then we just were kind of confused.*
>
> *Oh, we know! We thought about 6 times 8 too: that makes 48 squares, like you said. Each small square is a 10-by-10. That means the area of each small square is 100. There are 48 small squares, so 48 times 100 is 4,800.*

Teacher *Sean and Tyrese said they should about 48 times 100, and I wrote that here. I want to show you another way to write an equation that describes what they, and many of the rest of you, did. There are different ways to write any number, and one way to write 60 is 6 times 10, and you can also write 80 as 8 times 10. Then, and we have done this before, when you're multiplying numbers, the commutative property lets us change the order of those numbers and the associative property lets us multiply them in different ways. So we see 6 times 8 and 10 times 10. That gives us 48 times 100, just like Sean and Tyrese said, and the product is 4,800.*

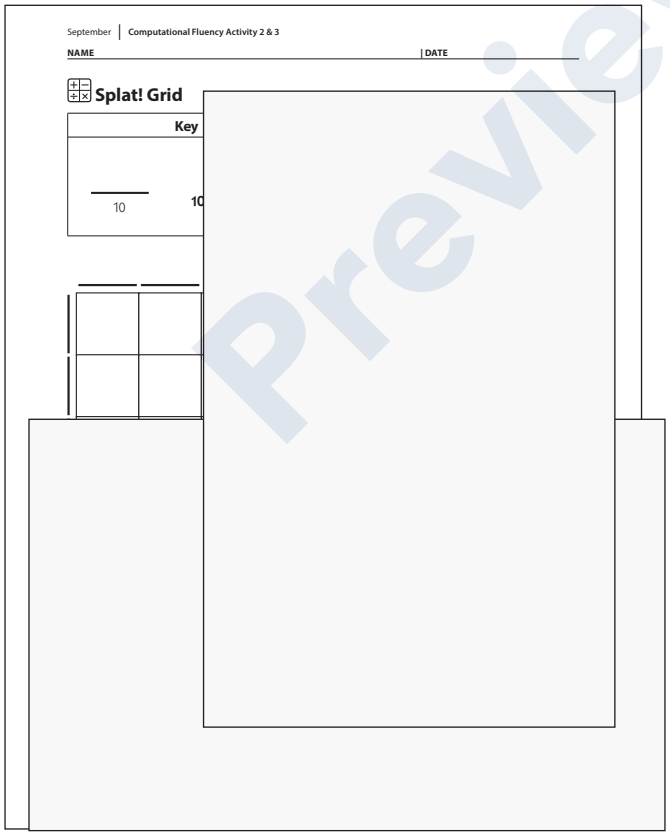
60×80

$60 \times 80 = 48 \times 100$
$= 4800$

$60 \times 80 = 6 \times 10 \times 8 \times 10$
$= 6 \times 8 \times 10 \times 10$
$= 48 \times 100$
$= 4800$

$6 \times 8 = 48$

4 Use two sheets of copy paper to cover the grid so that a 20-by-20 square remains in the top corner, and ask students to determine the total area of the squares that are showing.



5 Invite a few students to share how they found the area, and record equations that show their thinking.

Students *I just know 20 times 20 is 400. [20 × 20 = 400]*

I did 2 times 2 times 100 because it was a 2-by-2 square and each square is worth 100. [2 × 2 × 100 = 400]

6 Repeat Steps 4 and 5 with a 40-by-50 rectangle and then a 50-by-70 rectangle.

7 Ask students to make some generalizations about how to find the area of any square or rectangle on the grid.

> ***Students*** *When you look at the rectangle, you see the number of squares on each side. You can multiply those together and then multiply that by 100 because each small square has an area of 100.*
>
> *Right, the 50-by-70 rectangle looks like a 5-by-7 array, so you can multiply 5-by-7 and then multiply that by 100.*

8 Then, display your copy of the Splat! Record Sheet, and explain that students will use what they just discussed as they play Splat! as a class against you. Have students turn to the Splat! Grid and the Splat Record Sheet in their own Number Corner Student Books.

9 Explain how to play Splat!, and then play a game against the students, eliciting participation from the whole class as you play.

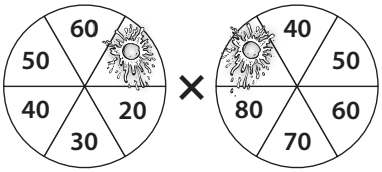
- Teams (or players) take turns spinning the two spinners.
- Teams multiply their two numbers and record the product. They can use the Splat! Grid to help determine the products.
  - » If a team spins a splat (broken egg), they get a 0 for that turn.
  - » If a team spins two splats in a single turn, they get a 0 for the entire round. This is called Splat!
  - » If a team thinks that the other team multiplied incorrectly, they can challenge them. If the team did multiply incorrectly, they lose their points for that turn.
- Each team gets 4 turns to spin, multiply, and record the product. Each group of 4 turns is a single round.
- After each round, teams add their products from their 4 turns and record the sum.
- After 2 rounds, teams (or players) add their sums from both rounds. Whoever has the higher sum wins the game.

> ***Teacher*** *You can go first. I need a volunteer to come up and spin the spinners.*
>
> ***Student*** *OK. I got a 30 and a 60.*
>
> ***Teacher*** *Turn to a partner and figure out 30 times 60.*
>
> ***Students*** *It's 1,800.*
>
> *We did 3 times 6 times 100.*
>
> *We did 30 times 6 times 10.*
>
> *We did 3 times 60 times 10.*
>
> ***Teacher*** *Those are all great ways to find the product. Record 1,800 under Turn 1. Now it's my turn. I got a 50 and a splat. Who remembers what that means?*
>
> ***Student*** *You get a 0 for this turn!*
>
> ***Teacher*** *Right. It's your turn again. We each take 3 more turns and then we'll figure out our scores for Round 1.*

September | Computational F uency Activity 2 & 3

NAME | DATE

Splat! Record Sheet 1



Game 1

	Player 1					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1	1,800	2,500	1,500	3,600	9,400	
Round 2	2,000	0	4,200	800	7,000	
				Game Total	16,400	

	Player 2					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1	0	3,000	2,400	1,000	6,400	
Round 2	4,000	2,500	Splat!	–	0	
				Game Total	6,400	

Player 1 won by 10,000 points

10 When you have finished both rounds of the game, conclude the activity by letting students know they will play Splat! with partners next week.

Activity 3

Playing Splat! with a Partner — Days 10 & 16

1 Open today's activity by letting students know they will play Splat! against a partner today.

2 Review the directions for Splat!

See step 9 of Activity 2.

3 Ask students to turn to a partner to summarize the directions.

4 Ask students if they have any questions. Then, determine partners, have students get their Student Books and one spinner overlay for each pair, and have them get started.

5 As students play, circulate around the room, making observations and offering differentiated instruction.

ELL Let ELL students know the real meaning a splat (the sound of paint hitting a surface). Help ELL students understand the directions for the game by playing a round with them, modeling each step and emphasizing what to do on their record sheets. Pair ELL students with supportive partners.

SUPPORT If students are having a hard time with the multiplication, have them practice by spinning and multiplying numbers before they play the game. Work with students so they see how to multiply multiples of 10 efficiently, as shown in Activity 2. Have students use the Splat! Grid as well.

CHALLENGE Use the following questions to engage students in thinking about the probability component of this game.

» If you don't spin any splats, what are the lowest and highest possible scores in any one turn? [800 and 4,800]

» If you don't spin any splats, what are the lowest and highest possible scores in any one round? [3,200 and 19,200]

» If you don't spin any splats, what are the lowest and highest possible scores in any one game? [6,400 and 38,400]

» What is the most likely product the get with these two spinners? [2400]

» What is the probability of getting Splat! in any one turn? [1/36]

6 At the end of Number Corner, have students clean up and put away materials. Conclude the activity by asking students to share any observations, insights, or tips they have for playing Splat!

Activity 4

Looking Back at the Month — Day 20

1 Open this activity by having students study the number line with the multiples of 2, 3, and 6 marked.

Ask students if they have any new observations, insights, or questions about what they see on the number line. Invite several students to share their comments. You may want to ask students the key questions listed in the beginning of this workout to provoke conversation.

> ***Students*** *There are not very many odd multiples of 2, 3, or 6.*
>
> *There are odd and even multiples of 3. 2 and 6 have only even multiples.*
>
> *There are more multiples of 2 than of 3 or 6.*
>
> *There are the fewest multiples of 6.*
>
> *I think that bigger numbers have fewer multiples.*

2 Then, invite students to think back over their experiences playing Splat! Ask them about the key mathematical ideas of the game by asking them what they learned when they played.

You may want to ask students the key questions listed in the beginning of this workout to spur on conversation.

> ***Students*** *I did not realize it was so easy to multiply big numbers. As long as they are multiples of 10, it is pretty easy to multiply them.*
>
> *The associative property never made sense to me until we played this game. Now I see how you can think about the multiplying the factors of the factors to make it easier. For example, in 60 times 80, you can multiply 6 times 8 times 10 times 10 because of the associative property.*
>
> *I thought about adding numbers in different ways too.*

3 Wrap up this activity and workout by letting students know that they will continue adding multiples to the number line in October and they will learn a new game.

Notes About This Activity

Use the last Computational Fluency activity for this month to review and extend the big mathematical ideas addressed in Activities 1–3.

September Problem Strings

Multiplication Models

Overview

Students explore multiplication models and strategies as they review and solidify their understanding of how problem strings work. The work they do with multiplication in these problem strings complements and extends the thinking and learning they are doing in other workouts.

Skills & Concepts

- Write a multiplication equation to represent a verbal statement of a multiplicative comparison (4.OA.1)
- Demonstrate an understanding that in a multi-digit number, each digit represents ten times what it represents in the place to its right (4.NBT.1)
- Multiply a 2-digit whole number by a 1- or 2-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)
- Write a simple expression to record calculations with numbers (5.OA.2)
- Model with mathematics (4.MP.4)
- Attend to precision (4.MP.6)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Problem String 1	11	**NCSB Appendix** Problem String Work Space **TM T4** Problem String Work Space	• Word Resource Card for *area*	
Activity 2 Problem String 2	13			
Activity 3 Problem String 3	19			

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.

area*
array*
associative property of multiplication*
equation*
product*
strategy

Preparation

You will do your first problem string; decide where in the classroom you will do it. It is ideal to have students sit in a discussion area so that they can sit close together in a circle or semi-circle; this arrangement nicely facilitates discussion among students. If such an arrangement is not possible in your classroom, you'll need to decide on an alternative. You'll also need plenty of space to write where all students can see. This can be on a whiteboard, document camera or projector, or on chart paper.

Mathematical Background

This month's activities get students accustomed to participating in problem strings, while deepening their understanding and use of multiplication models and strategies. You will build on the foundation established in third grade as you review and extend procedures for problem strings. Use this month to set high expectations for participation in strings, whether through sharing a strategy, asking questions, or using something learned during a string in a new context.

Mathematically, the strings this month explore doubling and halving, doubling and halving with the associative property, multiplying multiples of 10, and using the distributive property. You'll model students' strategies on arrays and number lines so that they can see why the strategies they are developing work the way they do.

The themes for these strings complement work students are doing in other workouts, helping students solidify and deepen their understanding of important ideas. For example, the doubling and halving students do in strings will help them with the second set of challenges in Solving Problems. What they learn as they play Splat!, this month's Computational Fluency game, will help them solve the problems they encounter with multiples of 10 in the final string.

Activity 1

Problem String 1 — Day 11

The write-up for this first string is extensive and includes quite a bit of sample dialog to give you a sense for how the discussion during a problem string should flow. All future strings, beginning with Activity 2 this month, are presented in table form for your convenience. Sample dialog associated with future strings is provided on the Bridges Educator site.

1 Gathering students in your discussion area with their Number Corner Student Books and a pencil, and tell them that they will have a Problems Strings workout as part of Number Corner.

2 Briefly explain how a problem string works.

- A problem string is a series of connected problems that students will solve and discuss one at a time.
- Strings often start out with an easier problem, and then the problems get harder as the string continues.
- The problems at the beginning of the string often help students solve the problems toward the end of the string.
- Solving the problems in a string involves thinking like a mathematician because the goal is to find efficient ways to solve the problem. Efficient strategies are quick and can be explained clearly and easily.
- There is a process the class will use to solve each problem, share strategies and answers, and discuss each other's thinking.
- Students will do their work in the back of their Number Corner Student Books. Show students a sample Problem String Work Space page.
- When students talk about their work, the teacher will usually represent their work for everyone to see.

You may want to invite students who have done problem strings before to comment on what they remember to help other students get a sense of how problem strings work. You can also assure students that what you are explaining will make much more sense when they are doing a string.

3 Introduce the Problem String Work Space pages in the Number Corner Student Books.

- Display the Problem String Work Space Teacher Master. This page is the same as the Problem String Work Space pages in the back of the Number Corner Student Books.
- Ask students to turn to the first Problem String Work Space page in the back of their Number Corner Student Books.
- Explain that each time they do a problem string in Number Corner, they will use these pages to show their work.
- When starting a new string, students should always find the next unused Problem String Work Space page and write the date right way.

Key Questions

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

- What do you know that could help you solve this problem?
- What strategy could you use?
- How can you show your thinking?
- What model could you use to show your thinking?
- How can solving one problem in a string help you solve another problem, later in the string?
- What is the big idea of this string?
- How can your work with this string help you with other problems?

Notes About This Activity

Today you will deliver the problem string:

5×8
10×8
10×16
5×16
15×16
30×8
4×60

This string will elicit thinking about what happens when one factor is doubled and the other is halved. Represent student thinking on arrays.

4 Introduce the first string by establishing the context and writing the first problem.

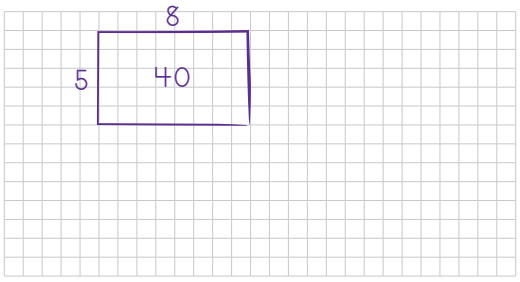
> ***Teacher*** *Yesterday, at my friend's school, some fifth graders were planning a school garden. They were planning where to plant some flowers for butterflies, and they outlined a 5-by-8-foot plot. To know how many seeds they need for the flowers, they have to figure out the area of the plot, how many square feet are in the plot. What is the area of the plot?*

- Write the problem 5 × 8 in the top left corner of the work space on your display copy of the Problem String Work Space page.
- Review the term *area* using the Word Resource Card.
- Ask students to solve the problem in their student books and to put their thumb up in front of their chest when they have an answer. If necessary, briefly explain that you want them to put up their thumbs instead of their hands in the air because it is much less disruptive to other people who are still working.
- Tell students that if they just know they answer, they don't need to show any work, but remind them that you will ask them to show their thinking in other problems.

5 When you see several thumbs up, invite a few students to share the answer and then describe how they figured it out. Draw a quick sketch of an array to model the problem.

As you have students share, be very explicit about your process. Explain that the way you are asking students to share is very deliberate and what you will expect them to do every time they do a string.

> ***Teacher*** *I see lots of thumbs up. Who can tell us what the area of the plot was?*
>
> ***Huang*** *I got 40.*
>
> ***Troy*** *Me too.*
>
> ***Teacher*** *Did anyone get an answer that was different than 40 square feet? No? OK, how did you get 40?*
>
> ***Huang*** *I just knew it.*
>
> ***Teacher*** *Please put your thumb up if you just knew what 5 × 8 is. It's OK to say you just knew it. I'll record that on an array. You might use this model as the problems get bigger.*



6 Stay in context as you write and explain the next problem, 10 × 8. Repeat the process of having students solve the problem quietly, put up their thumbs when they are done, and calling on a few students for their answers and then how they solved the problem.

Teacher *When they bought the seeds, the students found that the seeds came in very big bags, so they could plant a much larger plot. If they made it a 10-by-8 plot instead, how many square feet would they have to plant their seeds?*

Continue to be explicit about the steps of a string. Continue to represent their strategies on the array. You can add on to the array you started in step 5. Ask students to make connections between the first two problems.

Teacher *It sounds like a lot of people got the same answer: 80 square feet. How did you figure that out?*

Students *I just knew it.*

Because 8 times 10 is 80—10 times are easy.

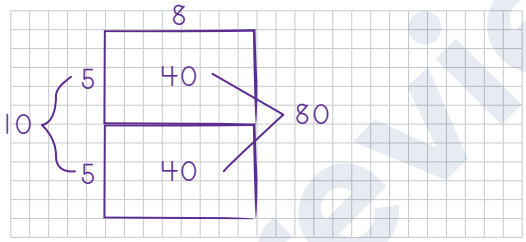
I doubled the last problem.

Teacher *What do you mean?*

Jade *Well, the last problem was 5 × 8. This one is 10 × 8. So, the problem is similar, except the 5 doubled to 10. So, the answer doubles too.*

Teacher *Can we add on to the array we made before to show that doubling? What do we do?*

Jade *It was the 5 that doubled, so make another 5 by 8 array under and connected to the first one. Now you have two 5s, which is 10, so the array is a 10 by 8.*



Teacher *So, let's think about what just happened. You all solved a problem. Then, several people shared their answers. Then, people shared how they got the answer. That's part of the routine of doing strings. You'll see what else we do with the next problems. Does anyone have a question so far?*

7 Repeat step 6 with the next problem, 10 × 16, being careful to continue with the context of the problems. (The students expand the plot to a 10-by-16.)

Remind students that when mathematicians solve problems, they are looking for efficient ways to solve them. When students share how they solved the problem, build discussion about the strategies students used.

Students *This one doubles from the last one too!*

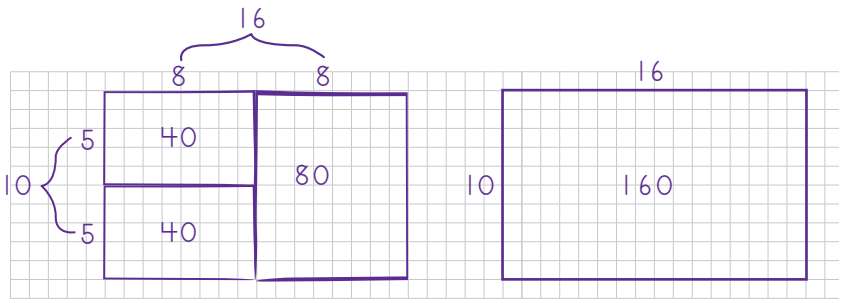
But it was the factor on the other side. Last time, 5 doubled to 10 This time, the 10 stayed the same and the 8 doubled.

We doubled it again!

The product doubles no matter which factor doubles.

As long as it is just one factor that doubles.

Right. If one factor doubles, the product doubles.



8 Repeat step 6 with the next problem, 5 × 16. Elicit discussion about the relationship between 5 × 16 and the previous problems. Continue to stay in context.

Students *This one is half as much as the last one!*

Because 5 is half of 10. So, when one factor is split in half, then the product is too.

Teacher *Can you show us what you mean on an array? How can we change the 10 by 16 array into a 5 by 16 array?*

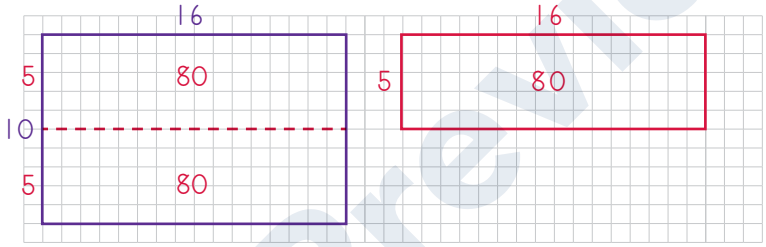
Students *Split it in half.*

You have to split the 10; split it horizontally.

That will give you a 5 by 16 array.

The product is 80 because 80 is half of 160.

That's easier than doing 16 times 5. You can just cut 10 times 16 in half!



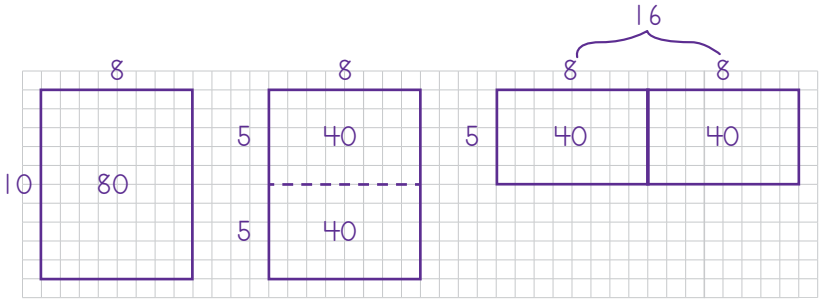
Students *Wait, this one is the same as 8 times 10.*

What do you mean?

The answer. Eight times 10 is 80 and so is 5 times 16.

Teacher *How can that be? They are not the same array.*

Student *I know but you can make an 8 by 10 array into a 5 by 16 array. Draw an 8 by 10 array and split the 10 in half. Then you have two 5 by 8 arrays. Then, move one of the arrays up so you double the 8. You never change the product, just the shape of the array.*



Teacher *Can anyone explain what she just showed us? If you are not clear on what just happened, listen carefully. We might see this again in another problem.*

9 Repeat step 6 with the next 3 problems: 15 × 16, 30 × 8, and 60 × 4. Build discussion about the doubling and halving relationship of these problems.

Continue modeling the double-half relationship for these problems as shown in step 8. At this point, it is OK to move away from the context established earlier in the string and just focus on the numbers.

> ***Teacher*** *So, I'm hearing you notice that the answers are the same. Can anyone explain why that is? Why is 15 times 16 the same as 30 times 8? Those look like really different problems to me.*
>
> ***Students*** *They are different, but they have the same answer.*
>
> *Before we saw that when one factor doubles, the answer doubles and when one factor is cut in half, the answer is too. But, now, we have one factor that doubles and the other gets cut in half, so the answer is the same.*
>
> *Right. Thirty is twice as much as 15, and 8 is half of 16.*
>
> ***Teacher*** *But why does that make the products the same?*
>
> ***Students*** *If you just doubled one side, the product would double. But, when you cut the other side in half, the product gets cut in half, which makes it the same. It's kind of like they balance each other.*
>
> ***Teacher*** *Does anyone have a question about what they just said? Can anyone explain it in their own words?*

10 Ask students to summarize a big idea that came out of doing this string.

11 Wrap up the string by recognizing students for their participation. Let them know that as they do more strings in the future, they will become more familiar with the process, which will help them learn and think a lot about numbers.

Activity 2

Problem String 2 — Day 13

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.
- Give students an opportunity to ask any questions they have about problem strings.

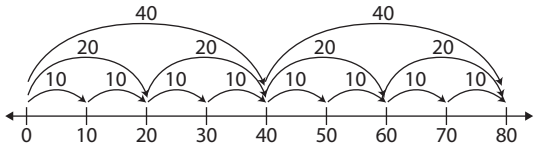
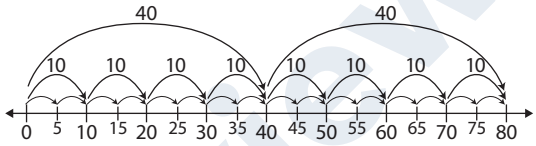
2 Ask students to turn to the next unused Problem String Work Space page in the back of their Number Corner Student Books. Have them write today's date at the top.

3 Deliver the problem string shown in this table, presenting each problem in context and modeling students' strategies on a number line and with equations that make the associative property explicit. (Follow the procedure outlined in step 2 of Activity 1.)

Notes About This Activity

Today's string builds on the doubling and halving work students did in the first string and extends to working with and talking about the associative property. Model student work on a number line, as this will help illustrate the associative property. Students do not need to show work on a number line, but they should see how their work connects to what you represent on the number line.

Problem String 2

Problems	Sample Strategies & Recording	Connections
This morning, the second and third grade classes went outside to play a game. They were in one long line, and every 10th kid was holding a flag. If there were 8 flags, and no kids beyond the eighth flag, how many kids were lined up for the game? 8×10	 $8 \times 10 = 80$ $4 \times 20 = 4 \times 2 \times 10 = (4 \times 2) \times 10 = 8 \times 10 = 80$ $2 \times 40 = 2 \times 4 \times 10 = (2 \times 4) \times 10 = 8 \times 10 = 80$	Modeling the problems on the same number line helps students see the relationships among them. For example, when they take bigger jumps, they also take fewer jumps (because the total, 80, remains constant). **Big Idea** If the number of jumps doubles, the size of the jumps is cut in half.
Then, the game changed. This time every 20th kid had a flag and there were only 4 flags. How many kids are there now? 4×20		
Then, the game changed. This time every 40th kid had a flag and there were only 2 flags. How many kids are there now? 2×40		
16×5	Students may see that this problem relates to the very first problem, 8×10. The 8 is doubled to make 16 and the 10 is halved to make 5. This means the product is the same: 80.  $8 \times 10 = 8 \times 2 \times 5 = (8 \times 2) \times 5 = 8 \times (2 \times 5) = (5 \times 8) \times 2$ $16 \times 5 = \quad 8 \times 10 = \quad 40 \times 2$	Students will see that 32×5 is twice as much as the last problem, and then 16×10 is equivalent to 32×5 because of doubling and halving. **CHALLENGE** If most of the class is comfortable with these two ideas, focus the discussion on breaking down the problems with the associative property. **SUPPORT** If students are uncertain about these ideas, focus the discussion on doubling and halving.
32×5	Because 32 is twice as much as 16, 32×5 is 2 times greater than 16×5 (the previous problem). Therefore, the product is 160 (80×2). $32 \times 5 = 2 \times 16 \times 5 = 2 \times (16 \times 5) = 2 \times 80 = 160$	
16×10	Because 16 is half of 32 and 10 is 5 doubled, the product of 16×10 is equal to the product of 32×5.	

4 Wrap up the string by introducing or reviewing the associative property.

> ***Teacher*** *When I wrote these equations, I used parentheses to show which numbers we decided to multiply first. Changing the way you group numbers in order to multiply them does not change the product. We call that the associative property. But you can make the problem easier to solve—and you certainly did that today—by thinking carefully about how you want to group the numbers to multiply them.*

Activity 3

Problem String 3 — Day 19

If you think students would benefit from using closed arrays, cut the following arrays from graph paper: 3 by 6, 3 by 60, 3 by 61, and 3 by 59. Use these arrays to model student work.

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.
- Give students an opportunity to ask any questions they have about problem strings.
- Let them know that today's string will build on what they already know and extend their thinking about multiplication.

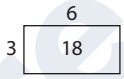
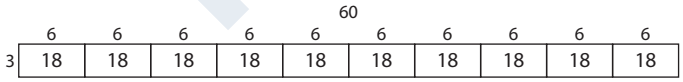
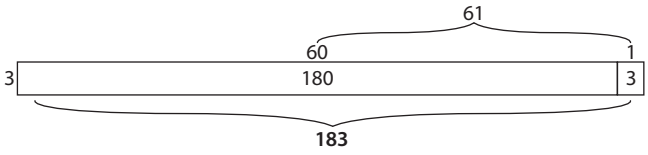
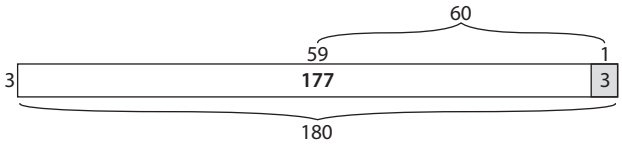
2 Ask students to turn to the next unused Problem String Work Space page in the back of their Number Corner Student Books. Have them write today's date at the top.

3 Deliver the problem string shown in this table, presenting each problem in context and modeling students' strategies on an open array and with equations that make the associative property explicit. (Follow the procedure outlined in step 2 of Activity 1.)

Notes About This Activity

Today's string is designed to help students develop efficient strategies for using partial products to multiply with larger numbers, especially when one factor is near a multiple of 10.

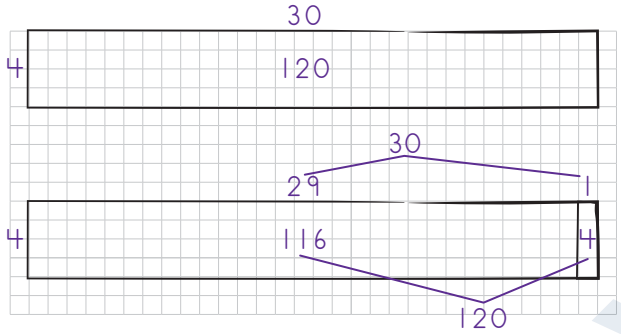
Problem String 3

Problems	Sample Strategies & Recording	Connections
3 × 6	 3 × 6 = 18 Many students will know right away that the product is 18. Sketch an open array anyway and let them know they can use it to solve some of the problems that follow.	Recording equations to go with the arrays as shown here helps students see that the associative property is at work when they multiply by a multiple of 10. In this case, to solve 3 × 60, they can express 60 as 6 × 10, and then multiply 6 × 3 to get 18 and then multiply 18 by 10 to get 180. Showing the relationship between the 3-by-6 and 3-by-60 array helps students understand why this works. **Big Idea** To multiply by a multiple of 10, you can express the multiple of 10 as the product of 10 and some number and then perform the multiplication.
3 × 60	Some students will add 60 three times. Others will relate the problem to 3 × 6.  3 × 60 = 3 × 6 × 10 = (3 × 6) × 10 = 18 × 10 = 180 **SUPPORT** If you are using the graph paper arrays, slide the 3-by-6 array along the 3-by-60 array, marking each iteration with a line to divide the 3-by-60 array into 10 equal 3-by-6 arrays.	
3 × 61	 3 × 61 = 3 × (60 + 1) = (3 × 60) + (3 × 1) = 180 + 3 = 183	In these problems, students use the product of 3 × 60 (see above) and the distributive property. Again, using the array to show the relationship between each problem and 3 × 60 helps students see why this strategy makes sense. **Big Idea** Using easier combinations (like 3 × 60) and applying the distributive property can be an efficient way to multiply numbers, especially when one factor is close to a multiple of 10.
3 × 59	 3 × 59 = 3 × (60 – 1) = (3 × 60) – (3 × 1) = 180 – 3 = 177	
4 × 59	See below.	

4 Wrap up the string with the final problem, 4 × 29. Let students know that strings often end with a problem that looks different from the rest of the string but which gives them the chance to apply what they did earlier in the string.

5 After students have solved the problem in their books, invite a few students to share their thinking. Look for a student who used 4 × 30 to solve 4 × 29.

> ***Ashlee*** *At first I thought I would add 29 four times, but I didn't want to do that. Then, I realized that 4 times 29 is really near 4 times 30, just like 3 times 59 was almost 3 times 60. So I did 4 times 30 and got 120. Then I took away one group of 4 and got 116.*
>
> ***Teacher*** *Does this show your work?*



4 × 29 = (4 × 30) − (4 × 1)
4 × 29 = 120 − 4
4 × 29 = 116

> ***Ashlee*** *Yeah.*
>
> ***Teacher*** *Who has a question about this strategy? Did anyone else think about it like this? If you didn't, do you think you could on another problem?*

Note Because the Problem String Work Space pages have grids on them, students might count out the squares to create arrays for these multiplication problems. If students want to create rougher sketches of the arrays, that is perfectly fine. Encourage them to label the dimensions and areas to make their work clear.

6 Close the activity by reminding students about how important it is to ask questions during a problem string, and invite them to ask questions of each other in October's Problem String activities to help understand their classmates' strategies.

September Solving Problems

One-Step Multiplication Problems

Overview

The Solving Problems workout this month features two sets of problems. Students solve the problems and then discuss their solutions in pairs and as a class. For each problem, they paraphrase the question they are being asked to answer, identify the pertinent information in the problem, show their work, and state the answer in the form of a complete sentence. In addition to basic problem-solving skills, the mathematical content focuses mainly on one-step multiplication problems, including multiplication in the context of calculating area. This focus reviews skills and concepts developed in third grade and extends to fourth grade level work.

Skills & Concepts

- Solve one-step story problems using multiplication and write equations with a letter standing for the unknown quantity to represent those problems (supports 3.OA)
- Assess the reasonableness of answers to one-step story problems using mental computation, as well as rounding and other estimation strategies (supports 3.OA)
- Write a multiplication equation to represent a verbal statement of a multiplicative comparison (4.OA.1)
- Solve story problems involving a multiplicative comparison using multiplication or division (4.OA.2)
- Find all factor pairs for a whole number between 1 and 100 (4.OA.4)
- Multiply a 1- or 2-digit whole number by a 1-digit whole number using strategies based on place value and the properties of operations (4.NBT.5)
- Multiply two 2-digit numbers 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)
- Make sense of problems and persevere in solving them (4.MP.1)
- Construct viable arguments and critique the reasoning of others (4.MP.3)

Materials

Activities	Day	Copies	Kit Materials	Classroom Materials
Activity 1 Introducing Solving Problems & Solving Megan's Marbles Problem	2	**NCSB 10*** Megan's Marbles, Page 1		
Activity 2 Discussing Megan's Marbles & Solving a Related Problem	5	**NCSB 10–11*** Megan's Marbles, Pages 1 & 2		
Activity 3 Solving Xavier's Garden Problem	15	**NCSB 12*** Xavier's Garden, Page 1	• colored tiles or any other manipulative that can be arranged in an array (half-class set)	
Activity 4 Discussing Xavier's Garden Problem	17	**NCSB 12–13*** Xavier's Garden, Pages 1 & 2		

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

Preparation

Between Activities 1 and 2 and Activities 3 and 4, look at students' work and decide which students should share. See more guidelines in Activities 2 and 4.

Mathematical Background

While all Number Corner workouts elicit and emphasize use of the CCSS Mathematical Practice Standards, the Solving Problems workouts provide particularly rich opportunities for students to apply the practices. A main emphasis will be on communication as the class engages in dialog throughout the problem-solving experience. Students will hone their communication skills as they share their ideas, have opportunities to question and critique each other, and present their work in various stages. Please refer to the Number Corner Introduction for more information about how the Solving Problems workouts, and Number Corner in general, address the Common Core State Standards for Mathematical Practice.

Generally, the Solving Problems workout is designed to help students learn to read a problem carefully, restate the question, identify the relevant information, identify and use effective strategies, and communicate their thinking to others using numbers, words, and labeled sketches. Each month features a set of problems designed to highlight a particular math focus as well as basic problem-solving skills such as the use of sketches, organized lists, patterns, logical reasoning, working backward, and guess and check. In addition to developing a repertoire of strategies, students work together to develop and use their own guidelines for effective written communication. Activities have been planned so that one day, teachers can introduce new problems and then ask students to share and compare their strategies and solutions a few days later.

This month's Solving Problems workout focuses on one-step multiplication story problems. In the first set of problems, students consider the meaning of the phrase "times as" and its relevance to multiplication as they figure out how many marbles people have in their collections. For example, Megan has 14 marbles, while Patrick has 9 times as many marbles as Megan. Working with problems such as these illustrates the meaning of "times" in multiplication problems in a powerful way. In the discussion about their strategies, the number line comes up as a model for solving problems with "times as" scenarios, serving to emphasize the idea that multiplication is about considering the relationship between products and factors. Is the product twice as many? Four times as many? Nine times as many? Later in the month, students see the relationship between finding area and finding the product of a multiplication problem. In these problems, the array is emphasized as a useful tool as students determine different dimensions or factors for certain areas or products.

Key Questions

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

- What is the problem asking?
- What information in the problem will help you figure it out?
- Can you draw a picture of the problem?
- Can you write an equation for this problem?
- Can you make an estimate?
- Is your answer reasonable?
- How can you check your work after you have solved the problem?
- Can you write a story problem that uses the same math skills and concepts?

Activity 1

Introducing Solving Problems & Solving Megan's Marbles Problem — Day 2

1 Introduce the Solving Problems workout.

- Ask students what problem solving means to them.
- Give them a moment to think quietly, and then invite several students to share their ideas.

> ***Students*** *It's figuring out a problem. Not just the answer, but what the problem is all about.*
>
> *It makes me think of story problems or story problems.*
>
> *Solving problems makes my head hurt.*
>
> *When I try to solve a story problem, I am not always sure if I have the right answer.*
>
> *Sometimes problems are about plus or minus or times, and sometimes they are more like puzzles you have to figure out.*

- Tell students they are about to do their first Solving Problems workout.

- In the Solving Problems workouts, students will think carefully about how to solve different kinds of problems, of which some are story problems and some are more like puzzles.
- Students will discuss their strategies for solving the problems, and they will also learn how to make sure their answers are correct, or at least reasonable.

2 Display your copy of the Megan's Marbles Student Book page, cover all but the first two parts of the problem, and invite a student to read the problem aloud.

September | **Solving Problems Activity 1 & 2**

NAME | **DATE**

Megan's Marbles page 1 of 2

1 Megan is starting a marble collection. She has 14 marbles. Her friend Patrick has been collecting marbles for a long time. If Patrick has 9 times as many marbles as Megan, how many marbles does Patrick have?

a What is this problem asking you to figure out?

b Underline any information in the problem that will help you find the answer.

3 Ask students to turn to a partner and talk about what the problem is asking them to figure out. Then, invite a few pairs to share their ideas.

If students jump right to figuring out the problem, refocus their attention on what the question is asking and what information in the problem that will help them figure it out.

Students *It's asking what 9 times 14 is.*

We need to figure out how many marbles Patrick has.

How many more marbles he has than Megan?

No, just how many he has.

How do we do that?

Teacher *The question does ask how many marbles Patrick has. What information in the problem could help you figure out how many marbles Patrick has?*

Mei *He has 9 times as many marbles as Megan.*

Teacher *I am going to underline that part. What else is useful?*

Lola *Megan has 14 marbles. You need to know that so you know what to multiply by 14.*

Teacher *I will underline that too.*

Takumi *Megan has 14 and Patrick has 9 times what Megan has, so Patrick has 9 times 14 marbles.*

Teacher *Is that what the question is asking you to figure out? Can someone put the question in their own words?*

Corey *If Megan has 14 marbles and Patrick has 9 times as many marbles as Megan, how many marbles does Patrick have?*

Teacher *I will write that down for 1a.*

4 Then, display part c and ask students what the question means. Help students sort out any parts of the question they do not understand.

c Write an equation for the problem. Use a letter to stand for the unknown quantity.

Students *We need to write an equation.*

I get that but I am not sure about the unknown quantity part.

I think we write 14 × 9 because that is what the problem is asking us to find.

Teacher *Do people agree? If we write 14 × 9 is that an equation?*

Students *We can start there but I don't think we're done. We don't have the answer.*

But we don't know the answer.

Maybe we can put something to stand in for the answer until we figure it out.

Like a letter or a symbol.

Teacher *What should I add to 14 × 9?*

Students *First an equal sign. Then, something else.*

Last year we used letters, like a *or* n.

Let's use m *to stand for marbles since that's what the problem is about.*

Teacher *OK, so we have 14 × 9 =* m. *Is that an equation?*

Students *Yes. It has an equal sign and that makes it an equation.*

Teacher *The rest of the question says use a letter for the unknown quantity. Even if you are not sure what that means, do you think we did that?*

Students *Well, we used a letter. We used m for the part we didn't know.*

I think unknown quantity is a fancy way of saying that. Unknown could mean the part we don't know.

Teacher *Great. And quantity means amount. So, you did use a letter for the unknown quantity because you used the letter* m *for the amount you don't know yet. That's exactly what the question asked you to do. I heard some great problem-solving skills. You used the parts you did understand to help you figure out the parts you did not understand.*

5 Then, ask students to find the Megan's Marbles page in their Number Corner Student Books and get ready to work on the problem in pairs.

- Have them underline the parts of the question that you have underlined on the display copy.
- If you have not already done so, write an equation for part c and have students copy that as well.
- If you have time, you can also have students copy what you have written for 1a.
- Have students turn to a partner and begin thinking and talking about how they would solve the problem. Encourage them to think about what strategies they would use and what they might put on their paper to show their thinking.

6 Give students a few minutes to solve the problem with their partner.

- Invite students to ask any questions before they get started, and answer those questions.
- Remind them to show their work.
- Let them know how much time they will have to work.

7 As students work, circulate around the room, making observations, answering questions, and offering differentiated instruction.

ELL/SUPPORT Although you just spent time discussing the problem, check with students to make sure they understand what the question is asking. Help ELL students with vocabulary such as *marble* or *collection*. Emphasize that the words "times as many" mean that they will need to use multiplication.

CHALLENGE If students determine the answer immediately, showing adequate work and writing a sentence, invite them to figure out a related problem, such as "Patrick's friend Elyse has 4 times as many marbles as Patrick. How many marbles does Elyse have?" or "Conrad has 378 marbles. How many times as many marbles as Patrick does he have?" You can also write an equation for them and have them come up with a story problem for the equation.

8 As students finish the problem, have them check their work. Encourage them to think about whether or not their answer is reasonable.

9 Wrap up this activity by letting students know they will discuss their work in a few days. If they did not finish the problem, have them finish it before the next Solving Problems activity on Day 5.

Activity 2

Discussing Megan's Marbles & Solving a Related Problem — Day 5

Look over students' work from Day 2. Look for any students who used skip-counting on a number line to show their thinking. If no students did this, introduce the strategy yourself. Look for two or three other student pairs who you want to share their work. Look for students who worked through confusion to a viable strategy and reasonable answer and students who solved the problem efficiently and showed their strategy clearly.

1 Begin by telling students that they will first discuss their work on the Megan's Marbles problem they solved last time, and then they will work on a new problem.

2 Display your copy of Megan's Marbles, page 1 from the Number Corner Student Book and ask students to make an estimate for the problem.

3 Have students find their work in their own Number Corner Student Books and compare their estimate to their actual answer.

Remind them that estimating and other mental math strategies are a great way to determine if their answer if correct or at least reasonable.

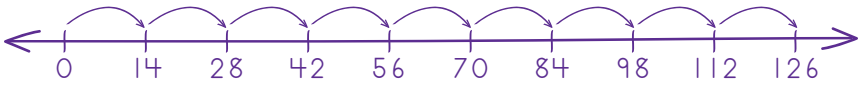
4 Then, let students know that you looked at their work and would like them to talk as a class about how they solved the problem. Before you begin, review some guidelines for sharing as a group and then answer any questions students have about these expectations.

- Several students, but not all, will share how they solved the problem.
- Each pair of students who shares will have a chance to explain and show their work.
- The rest of the class will have a chance to ask questions about how they solved the problem.
- Then, the teacher will ask other students to summarize what the pair of students did.
- Then, another pair of students will present.
- As more students share, the dialog will grow and the class will collect and compare the strategies shared.
- All students are responsible for being respectful listeners and for trying to understand their classmates' work. If they do not understand what other students did or why, they should ask a question.

5 Invite the first pair of students you selected to display their work under a document camera (or recreate their solution on the whiteboard) and explain to their classmates how they solved the problem.

> ***Brandon*** *We underlined "times as" as important words. Last year, when we solved problems with "times as" in them, we used a number line.*
>
> ***Gabrielle*** *So, we sketched an open number line.*

> ***Brandon*** *And skip-counted by 14s.*
>
> ***Gabrielle*** *We did that 9 times because Patrick has 9 times as many marbles as Megan, and she has 14 marbles.*



> ***Brandon*** *We got 126 marbles. Patrick has 126 marbles.*
>
> ***Teacher*** *Does anyone have a question about their work?*
>
> ***Craig*** *Why did you skip-count by 14 and not 9?*
>
> ***Gabrielle*** *Because Megan had 14 marbles and Patrick had 9 times that, so we put 14 on our number line and then kept going up by 14 until we could see 9 groups of 14. If you count starting at 0, we went up by 14 nine times.*
>
> ***Teacher*** *That shows their understanding of the question really well, but what if they did skip-count by 9s? Would they have gotten the same answer?*
>
> ***Ashley*** *As long as they skip-counted by 9s 14 times. Nine times 14 is the same as 14 times 9.*
>
> ***Teacher*** *Did anyone else skip-count on a number line?*
>
> ***Students*** *We did.*
>
> ***Teacher*** *The number line is a nice model for showing the idea of "times as" many. You can see how they thought about 14 on the number line 9 times. Before we hear from someone else, who can summarize their work for us? If you are not sure you can explain what they did, this is a good time to ask a question.*

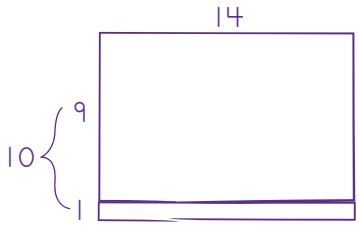
6 After the first pair of students has presented, and the class has discussed their strategy, invite a few more pairs to share their work, following the same routine outlined in step 4.

As more pairs share, encourage students to think about which strategies they would like to use on another problem. Encourage students to think about the strategy that is most efficient for them at this time. Also, continue to elicit participation from students who are not sharing their work.

> ***Teacher*** *Let's hear from another pair.*
>
> ***Dolores*** *OK. The last group was really thinking about the problem of 9 times as many marbles. We thought about it kind of differently. Since we had the equation $14 \times 9 = m$, we thought about the fastest way for us to multiply 14 times 9.*
>
> ***Talia*** *We realized that we could use what we know about multiplying by 9. If you have to multiply by 9, you can just multiply the other number by 10 and then subtract the other number.*

Alex *What?*

Dolores *We can show you what we did with an array. So, here's a 9 by 14 array, right? If we add another strip, it's a 10 by 14 array.*

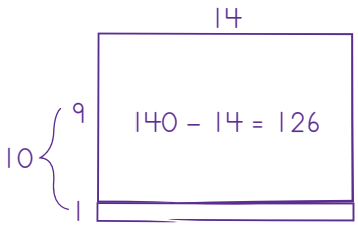


Talia *That was easy for us to solve. 10 times 14 is 140.*

Dolores *So, 10 times 14 is just one more 14 than 9 times 14. So we take 14 away from 140 and that's 126, just like the other group got.*

Talia *It's like we are subtracting that strip that we added on before.*

Teacher *Thanks for showing us what you did on the array. Here are some equations that also show what you did. Does anyone need more help clarifying their strategy? Does anyone have a question or comment about it?*



$$\begin{array}{r} 10 \times 14 = 140 \\ -\ 1 \times 14 = 14 \\ \hline 9 \times 14 = 126 \end{array}$$

Student F *That was a fast way to solve the problem, but I don't get what it has to do with the marbles and Patrick having 9 times as many as Megan.*

Dolores *So, in our array, you can think about one row of marbles as Megan's marbles. Then, every time we add another row, we are multiplying it by something else. It's twice as many, or 3 times, or 9 times as many. So, if we split our array into 9 rows of 14, you would see how 126 is 9 times 14 or 9 times as many as 14.*

Teacher *Great question and great explanation. Thanks for bringing us back to the problem. We've seen a couple of really effective strategies so far. Who thinks they could use the number line strategy on another problem? And who thinks they could use what they know about multiplying by 10 to multiply by 9 on another problem?*

7 After discussing a few strategies, close the session by explaining that they will repeat this process of solving a problem and then discussing it later in future Solving Problems workouts.

8 If you have time, review the second page of Megan's Marbles together as a class and then give students time to solve the problem, using one of the strategies shared by their classmates today.

If you are out of time, you can assign this page for homework or revisit it at another time.

Activity 3

Solving Xavier's Garden Problem — Day 15

1 Open today's activity by letting students know that today they will work on a new problem.

2 Introduce today's problem.

- Display your copy of the Xavier's Garden Student Book page.
- Cover all but the first two parts of the problem.
- Explain that this problem involves multiplication and some logical reasoning.
- Invite a student to read the problem aloud.

September | Solving Problems Activity 3 & 4

NAME | DATE

Xavier's Garden page 1 of 2

1 Xavier has 48 vegetable plants. Each plant needs one square foot of space to grow. If Xavier makes a rectangular garden for his plants, what are some possible dimensions for his garden so all 48 plants will have enough room to grow?

a What is this problem asking you to figure out?

b Underline any information in the problem that will help you find the answer.

3 Then, ask students to turn to a partner to discuss what the question is asking them to figure out. Invite students to share their thinking. Record accurate student ideas for everyone to see.

> ***Students*** *We need to think about how big Xavier's garden can be.*
>
> *Each plant needs one square foot of space. So we need 48 square feet of space.*
>
> *We need to figure out how to make a rectangle for all 48 plants.*
>
> *Is 48 square feet the area?*
>
> *I think so. We need to figure out the sides.*
>
> *Something times something is 48?*

4 Ask student what information in the problem will help them answer the question, and underline these parts on the display copy.

5 Then, have students find the Xavier's Garden page in their own Number Corner Student Books as you reveal the rest of the page on the display copy. Have students underline the important parts of the question in their books, just as you did on the display copy.

6 Then, ask students to think about 1c. Why is the equation for this problem different from the equation they wrote for the Megan's Marbles problem?

> ***Students*** *We only know one number. How can we write an equation with only one number?*
>
> *Is it 48 times something?*
>
> *No. Before we said 48 was the area. We need to find the sides or the dimensions.*
>
> *I think we say something times something is 48.*

Notes About This Activity

Today's problem is designed to have many entry points for students. Some students may come up with only one or two sets of dimensions for Xavier's garden, while other students will find them all. Some students will benefit from reviewing the dimensions and area, factors and products, while other students will be challenged by thinking about the problem in more literal terms, for example by considering those dimensions that are actually the most logical for Xavier's garden. This activity provides ample opportunities for informal assessment of how students approach and solve math problems.

The other day we used letters for what we didn't know. Can we use two letters?

Like a times b equals 48?

Teacher *Great discussion. I like how you thought back to what we did the other day. You're right. In this equation there are two things that are unknown. You have to find the dimensions for Xavier's garden, so you can absolutely say a times b equals 48. You could also connect it to what you know about area and say the length times width equals 48, so an equation could be $l \times w = 48$.*

7 Then, ask students to get ready to work on the problem in pairs.

- Have them underline the parts of the question that you have underlined on the display copy.
- If you have time, you can also have students copy what you have written for 1a.
- Have students turn to a partner and begin thinking and talking about how they would solve the problem. Encourage them to think about what strategies they would use and what they might put on their paper to show their thinking.

8 Give students a few minutes to solve the problem with their partner.

- Invite students to ask any questions before they get started, and answer those questions.
- Remind them to show their work.
- Let them know how much time they will have to work.

9 As students work, circulate around the room, making observations, answering questions, and offering differentiated instruction.

ELL/SUPPORT Ask students what they do understand about the question. Have them draw sketches that will help them understand the question and lead them to possible solutions. As students draw sketches of gardens, review the vocabulary terms *dimension* and *area*. Once students find one possible garden, challenge them to find another. As students find more gardens, help them see why gardens with different dimensions can have the same area.

CHALLENGE If students determine all of the answers immediately, showing adequate work and writing a sentence, discuss with them which garden Xavier would actually want to build. What would influence his decision? Would he prefer a garden that is more rectangular or less rectangular? Why? Then, invite students to write a story problem that involves the same mathematical challenge. You can also have them get started on the challenge problem of page 2 of Xavier's Garden.

10 As students finish the problem, have them check their work.

11 Wrap up this activity by letting students know they will discuss their work they next time they do a Solving Problems activity in a few days. If students did not finish the problem, have them finish it before the next Solving Problems activity on Day 17.

Activity 4

Discussing Xavier's Garden Problem — Day 17

Look over students' work from Day 15. Decide which student pairs you want to share. You may want to start with pairs that only found a few of the possible dimensions and then add more students until all of the possible dimensions are listed. Include students who found relationships between dimensions. If students did not see these relationships, try to elicit awareness of these relationships in your discussion.

1 Open today's activity by letting students know that they will share and discuss their work on the Xavier's Garden problem and, if there is time, they will work on another problem.

2 Display your copy of Xavier's Garden, Page 1 as students find their work in their own Number Corner Student Books, and then review the problem.

3 Let students know that you looked at their work and are looking forward to hearing them share their thinking with the class. Review guidelines for sharing. Ask students to share what they remember about the procedure for sharing.

If anything is left off the list below, add it yourself.

- Several students, but not all, will share how they solved the problem.
- Each pair of students who shares will have a chance to explain and show their work.
- The rest of the class will have a chance to ask questions about how they solved the problem.
- Then, the teacher will ask other students to summarize what the pair of students did.
- Then, another pair of students will present.
- As more students share, the dialog will grow and the class will collect and compare the strategies shared.
- All students are responsible for being respectful listeners and for trying to understand their classmates' work. If they do not understand what other students did or why, they should ask a question.

4 Invite the student pairs you selected to share. As each pair shares, build discussion to extend students' thinking and understanding of area, factors and products, multiplication strategies, and problem-solving in general.

> ***Marquis*** *In the beginning, we weren't sure how to get started, so we just drew some pictures of gardens and tried to figure out what the dimensions would be.*
>
> ***Jake*** *We tried a bunch of different numbers, trying to get close to 48.*
>
> ***Teacher*** *What do you mean, you tried a bunch of numbers?*
>
> ***Marquis*** *Multiplied. We started with 8 and multiplied 8 by 5. That was too small. Then 6. That worked. Eight times 6 is 48.*
>
> ***Teacher*** *Does anyone know a name for the strategy these two tried? Can anyone explain what they did?*
>
> ***Claire*** *I don't know the name but they guessed a bunch of numbers to see what would work.*
>
> ***Teacher*** *And that's pretty much the name of the strategy. Guess and check is a strategy. They made guesses about numbers and then checked to see if they worked. Eventually, they came up with dimensions that worked. Let's hear from another pair who used a different strategy.*

Imani *We tried to use what we know about numbers that could go into 48.*

Juan *Right. We knew 5 would not go in because 48 does not end in 5 or 0. We thought 4 would probably go in, so we skip-counted by 4s.*

Imani *We got that idea from the last problem. We skip-counted by 4s 12 times and got 48. So one garden could be 4 by 12.*

Juan *We knew that if 4 went into 48, then 2 would too because 2 goes into everything 4 goes into. We skip-counted by 2 and found out that 2 times 24 equals 48. So we got two more gardens, 4 by 12 and 2 by 24.*

Emily *Did you have to skip-count by 2s? What if you just doubled 12?*

Imani *Wait, why would we do that?*

Emily *Because in every group of 4 there are two 2s, so there are twice as many 2s in 48 as there are 4s. So if there are 12 4s, then there are 24 2s.*

Teacher *So far we have 6 by 8, 4 by 12, and 2 by 24. Do we have all of the possible dimensions? Did anyone find another set of dimensions that could work?*

Paloma *We did. We started with one garden and then used those dimensions to find more.*

Keiko *We started with 6 by 8. Then, we knew that we could cut one side in half and double the other side to get more dimensions.*

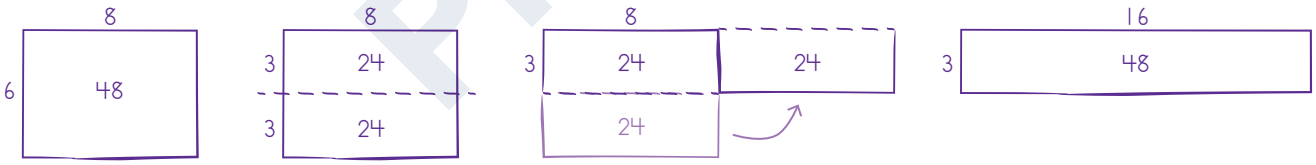
Paloma *So we cut 6 in half and doubled 8. That gave us a 3 by 16 garden.*

Jalen *How did you know that would work?*

Paloma *Last year we learned that when you double one factor and cut the other in half, your product stays the same.*

Kiara *But we are talking about dimensions and area, not factors and products.*

Keiko *Well, those are really the same. You multiply two dimensions to get the area. You multiply two factors to get the product. I'll show you on an array so you can see.*



Paloma *If we cut the 6 by 8 in half and move it over here, the array becomes a 3 by 16. The area didn't change, just the sides, so 6 times 8 equals 3 times 16.*

5 After a few students pairs have shared, ask students if they have all of the possible dimensions for an area of 48 square feet and how they know when they have all of the dimensions.

Make a vertical list of all the factor pairs to help students see relationships between the pairs. Use the relationships to see if there are any other factor pairs that have not been accounted for.

Teacher *Do we have all of the possible whole number dimensions for Xavier's garden?*

Students *I think so.*

I can't think of anything else that goes into 48.

We have 2 by 24, 4 by 12, 6 by 8, and 3 by 16. What about 8 by 6?

That's the same as 6 by 8, just rotated.

What about 1 by 48? We forgot the easiest one!

Teacher *Let's make an organized list. I'll start with 1 by 48. Then, 2 by 24, 3 by 16, 4 by 12, and 6 by 8. Does anyone notice anything when we list them this way?*

Students *I see that doubling and halving thing.*

One doubles to 2 and 48 halves to 24.

Two doubles to 4 and 24 halves to 12.

What if we double 3 and halve 16?

Then you get 6 and 8. We have that already.

What about 8 by 6?

That's the same thing, just rotated.

Teacher *So, we have been calling these numbers dimensions because we are talking about Xavier's garden, but does anyone remember another term for these pairs of numbers?*

Dylan *Factor pairs?*

Teacher *That's right. All of the numbers we have up here are factors of 48, and when we put two factors that multiply to 48 together, we call them factor pairs.*

6 After sharing and discussing student work and exploring the factors of 48, recognize students for their participation in the discussion. Remind students that if they did not get to share their work, they still made important contributions to the discussion and they will have more opportunities to share work as the year continues.

7 If you have any time left, have students work on any unfinished Solving Problems pages for September, either page 2 of Megan's Marbles or the Xavier's Garden challenge problem.

You may want to differentiate by encouraging students to choose to appropriate level of challenge. The Xavier's Garden challenge problem is a multi-step problem that extends work you did today, while Page 2 of Megan's Marbles is a more straightforward multiplication story problem.

September Assessment

Baseline Assessment

Overview

During the second or third week of school, students spend two consecutive Number Corner periods completing a written assessment instead of doing workouts. This Baseline Assessment helps the teacher gauge students' current levels with key skills that were to have been mastered in third grade.

Skills & Concepts

- Interpret products of whole numbers (3.OA.1)
- Interpret quotients of whole numbers (3.OA.2)
- Solve multiplication and division story problems with products and dividends to 100 (3.OA.3)
- Solve for the unknown in a multiplication or division equation involving 3 whole numbers (3.OA.4)
- Multiply using properties of operations (3.OA.5)
- Solve division problems by finding an unknown factor (3.OA.6)
- Recall from memory all products of two 1-digit numbers (3.OA.7)
- Solve two-step word problems using the 4 operations (3.OA.8)
- Fluently add and subtract with sums and minuends to 1000 (3.NBT.2)
- Multiply whole numbers from 1–9 by multiples of 10 from 10–90 using strategies based on place value and properties of operations (3.NBT.3)
- Place fractions in their correct positions on a number line (3.NF.2)
- Compare two fractions with the same numerator (3.NF.3d)
- Find the area of a rectangle by multiplying its side lengths (3.MD 7b)
- Use the area model for multiplication to illustrate the distributive property (3.MD.7c)
- Generate data by measuring lengths to the nearest half or fourth of an inch; make a line plot to display the data (3.MD.4)

Materials

Assessments	Day	Copies	Kit Materials	Classroom Materials
Baseline Assessment, Part 1 Completing Pages 1–3	8	**TM T5–T7** Baseline Assessment, pages 1–3		• scratch paper
Baseline Assessment, Part 2 Completing Pages 4–6	9	**TM T8–T10** Baseline Assessment, pages 4–6		• scratch paper • rulers marked in inches, class set • colored pencils for student use

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

Preparation

Look over the assessment so you are familiar with the content.

Vocabulary

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

area*
centimeter (cm)*
data*
distance
divide*
equation*
estimation
fraction*
inch (in.)*
length
line plot*
measure
multiply*
number line*
rectangle*
rounding*

Mathematical Background

The Baseline Assessment gives you an opportunity to gauge incoming students' proficiency with essential skills for numeracy, geometry, measurement, and fractions that should have been mastered in third grade. After conducting this assessment, you will be in a better position to plan daily instruction and make the minute-to-minute instructional decisions required for effective teaching. On the basis of students' strengths and weaknesses, you might decide to emphasize certain aspects of Number Corner instruction while minimizing others, and you will have at least some of the information needed to pitch questions and prompts at levels appropriate to different students. The Baseline Assessment might also be considered an early warning system. While it is risky to make hard-and-fast judgments about incoming fourth-graders, you will want to keep a close eye on students who are unable to perform more than a few of the assessment tasks, as some of these children may emerge as candidates for special services this year if they haven't been identified already.

Baseline Assessment, Part 1

Completing Pages 1–3 — Day 8

1 Open the session by explaining what a baseline assessment is and describing how you would like students to work on the baseline assessment they will start today during Number Corner and complete on the next day.

Explain that a baseline assessment is a way of finding out where everyone is in math at the very start of the school year. The problems involve skills they studied last year in third grade. The assessment will help you and the students see what they still remember and what they may need to review or study again this year. It will help you do a better job of teaching because you'll see more clearly what each student already knows, and what they still need to work on.

Explain that you would like students to do the following things as they work on the baseline assessment:

- Listen carefully to the instructions for each problem.
- Stay with the class; don't move ahead to the next problem until instructed to do so.
- 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.

2 Display your copies of the first page of the Baseline Assessment, and give each student a copy of the first three pages of the assessment.

- Give students a few moments to quietly examine all of the pages as you place a small stack of scratch paper at each table or near each cluster of desks for their use.
- Using your copy of the first page, show students where to write their name and date at the top of the page.
- Have students look at the first half of the first page and ask them not to begin working until you ask them to.
- Explain that they will have one minute to solve these 20 multiplication problems.
- Tell students not to worry if they cannot solve them all in one minute. Reassure them that this is just one way for them to demonstrate what they know about multiplication.
- Encourage students to solve the problems out of order if they wish; they can skip around and find the problems they know first.

Assessment Guide

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

- When everyone is ready, have students begin. Give them one minute to complete the 20 multiplication facts in item 1.

3 After one minute has passed, have students put down their pencils and relax for a moment.

4 Then, explain that they will have the rest of the Number Corner time to work on the rest of page 1, as well as pages 2 and 3.

- Display pages 2 and 3, one at a time.
- Give students time to read the items.
- Clarify the instructions and items as needed.
- Tell students not to worry if they don't finish all three pages today; they will have more time on another day.

5 When everyone is ready, have students begin.

- 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.

ELL If necessary, read questions aloud for ELL students and help them interpret what the questions are asking.

SUPPORT Apart from the first item, this assessment does not need to be timed. If you have students who are unable to complete the assessment in the given amount of time, you can give them additional time to complete it later, perhaps during choice time or a seatwork period.

Baseline Assessment, Part 2

Completing Pages 4–6 — Day 9

1 Open today's activity by helping students prepare to complete the rest of the Baseline Assessment.

- Let them know they will complete the rest of the Baseline Assessment today.
- Make sure each student has a a colored pencil, a ruler marked in inches, and a piece of scratch paper.
- Give each student a copy of pages 4–6 of the assessment, and display your copy of page 4.

6 Give students a few moments to examine both pages quietly, and then review the pages together as a class.

7 Answer any questions students have and then give students the rest of the period to complete both pages.

- 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.

ELL If necessary, read questions aloud for ELL students and help them interpret what the questions are asking.

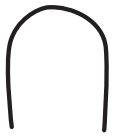
SUPPORT These three pages of the assessment do not need to be timed. If you have students who are unable to complete the assessment in the given amount of time, you can give them additional time to complete it later, perhaps during choice time or a seatwork period.

Teacher Masters

GRADE 4 – SEPTEMBER

NUMBER® CORNER

Ancient Egyptian Numeration Chart

Ancient Egyptian Numerals		Modern Numerals
	staff	**1**
	**heel bone**	**10**
	**scroll**	**100**
	**lotus flower**	**1,000**
	**bent finger**	**10,000**
	**tadpole**	**100,000**
	**astonished person**	**1,000,000**

Six-Inch Strips

6 inches

6 inches

6 inches

6 inches

6 inches

6 inches

6 inches

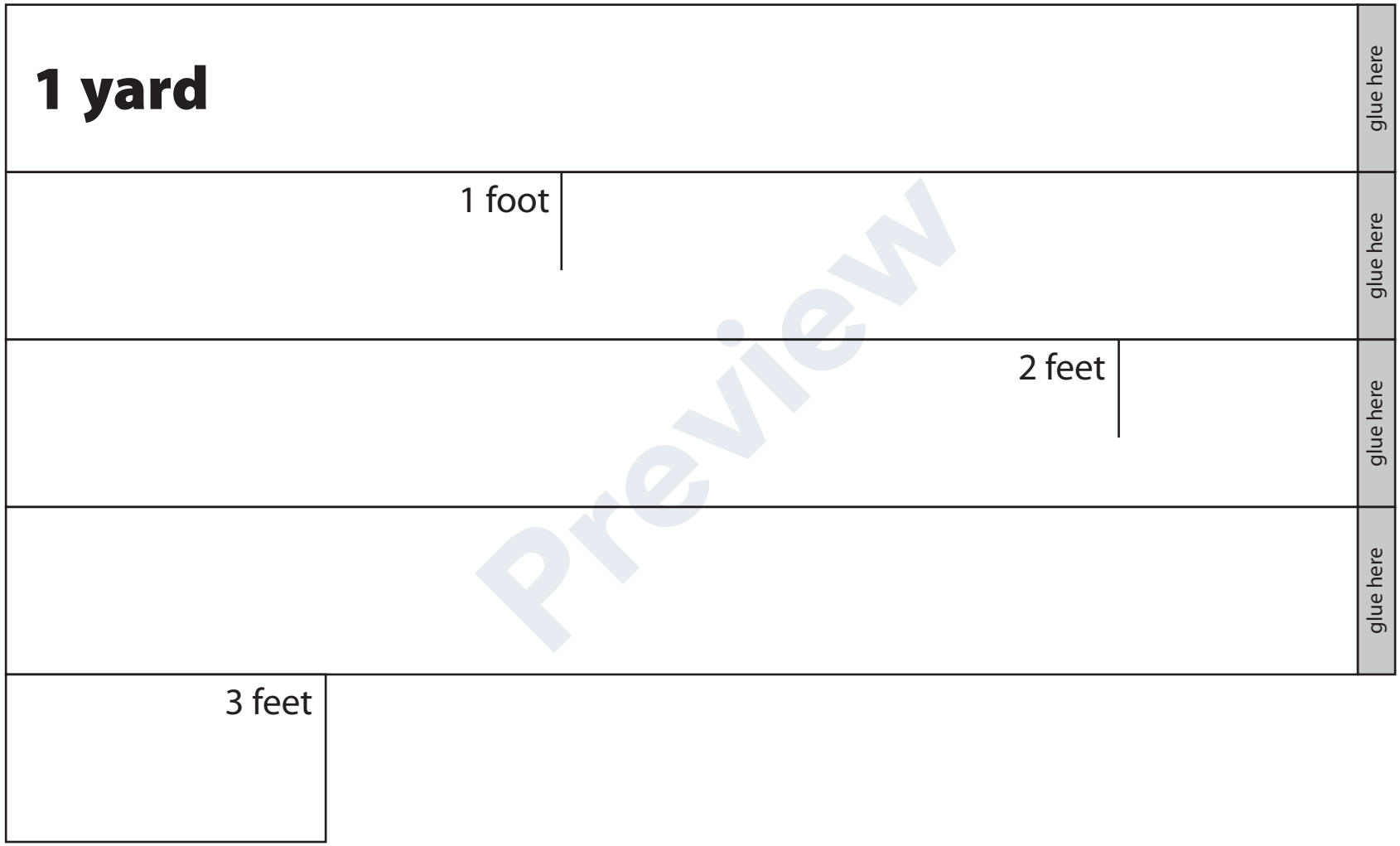
6 inches

6 inches

6 inches

Yard Strips

Cut, glue, and post each yard as needed through the month.



Problem String Work Space

NAME | **DATE**

Baseline Assessment page 1 of 6

1 Solve as many of these multiplication problems as you can in one minute.

8	7	4	6	5	4	8
× 3	× 2	× 4	× 6	× 5	× 7	× 1
0	9	5	6	3	6	6
× 4	× 7	× 7	× 5	× 4	× 8	× 7
10	9	4	7	7	9	
× 6	× 6	× 6	× 7	× 8	× 9	

2 Write a story problem for the following equation: $6 \times 7 = 42$

3 Write a story problem for the following equation: $40 \div 5 = 8$

(continued on next page)

NAME | **DATE**

Baseline Assessment page 2 of 6

4 Add these two numbers. Use numbers, pictures, or words to help solve the equation and show your thinking.

367 + 434 = _____

5 Subtract these two numbers. Use numbers, pictures, or words to help solve the equation and show your thinking.

904 – 768 = _____

6 Kiara and her dad made 72 cookies for the bake sale. They divided all of the cookies evenly onto 9 plates. How many cookies were there on each plate? Show your thinking using numbers, words, or sketches.

(continued on next page)

NAME | **DATE**

Baseline Assessment page 3 of 6

7 The kids in the After-School Club are going to the Children's Museum. There are 45 kids, and each car holds 5 kids. How many cars will they need to take all 45 kids to the museum? Show your thinking using numbers, words, or sketches.

8 Mei has to multiply $4 \times 9 \times 5$. She says she will multiply 4×5 first to get 20, and then multiply 20 by 9 because it's an easy way to solve the problem. Jessica says Mei has to multiply 4×9 first because that is the order of the numbers in the problem. Who do you agree with, Mei or Jessica? Why?

9 Carlos had $482. He got $108 for taking care of the neighbor's house while they were on vacation. He is trying to save up $750.

a How much more money does Carlos need to have $750? Show your thinking using numbers, words, or labeled sketches.

b Is your answer reasonable? Use estimation or rounding to explain why.

(continued on next page)

NAME | **DATE**

Baseline Assessment page 4 of 6

10 Fill in the missing number in each equation.

a ____ × 6 = 36

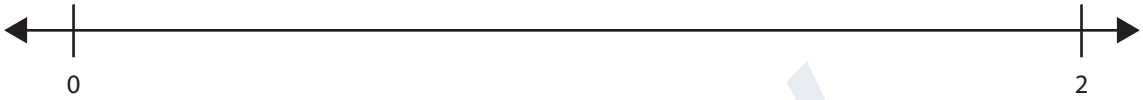
b ____ = 7 × 7

c 54 ÷ ____ = 9

d ____ ÷ 4 = 10

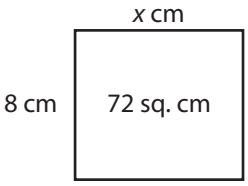
11 Put the following fractions in the right places on the number line:

$\frac{7}{4}$ $1\frac{7}{8}$ $\frac{5}{6}$ $\frac{2}{4}$ $\frac{6}{6}$ $1\frac{1}{4}$ $\frac{4}{3}$ $\frac{1}{8}$



12 Sketch a number line, and use it to show why $\frac{1}{3}$ is less than $\frac{1}{2}$.

13 The rectangle below has an area of 72 square centimeters. What is the length of the side marked with an *x*? Show your work.

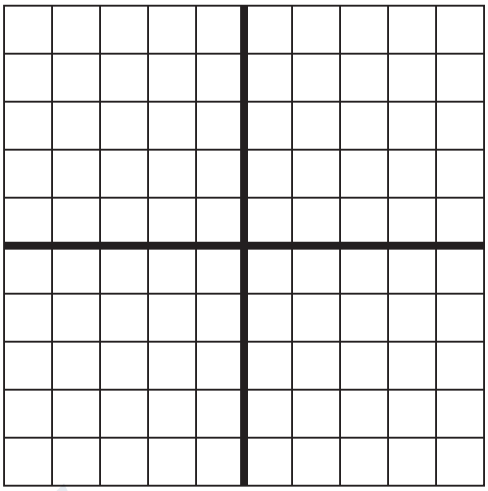


(continued on next page)

NAME | **DATE**

Baseline Assessment page 5 of 6

14 Color in this grid to show 6 × 8. Then answer the questions.



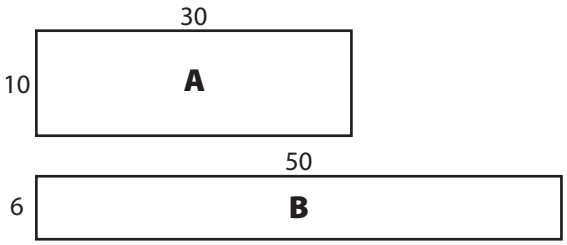
a Write and solve an equation to show the area of the grid you just colored in.

b Mark *all* the statements that are true about the grid.

- ◯ You colored in exactly half the entire grid.
- ◯ The area of the entire grid is 10 × 10.
- ◯ 6 × 8 = (6 × 5) + (6 × 3)
- ◯ The part you colored in is less than half the area of the whole grid.

15 Which has a bigger area, Rectangle A or Rectangle B? How do you know?

- Use numbers, labeled sketches, or words to explain.
- Find the area of each rectangle, and include that information in your explanation.

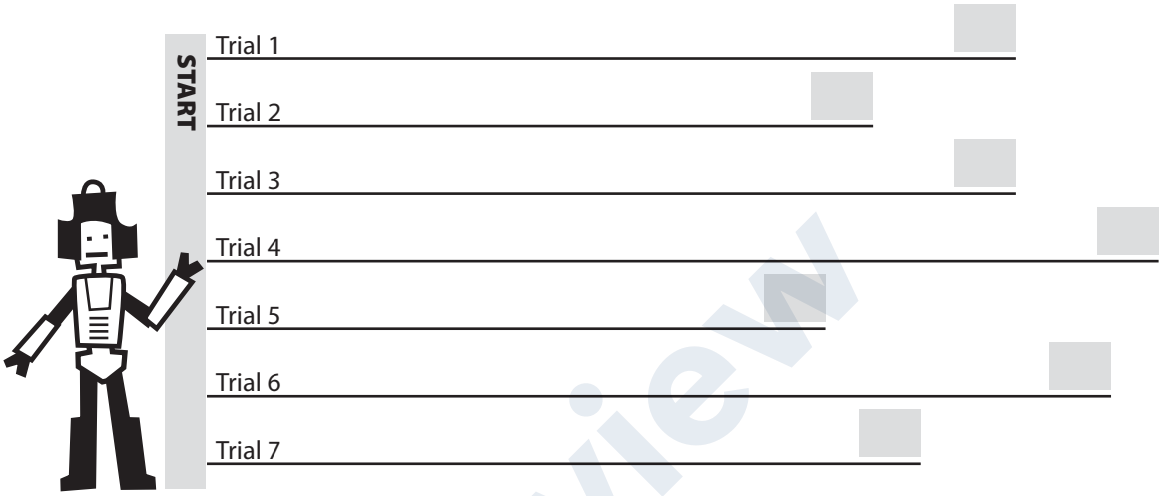


NAME | **DATE**

Baseline Assessment page 6 of 6

16 Daniel has a tiny wind-up robot. One day, he decided to try an experiment with his toy. He wound up the little robot, put it on the floor, and measured to see how far it could walk before it fell over. He did this 7 times.

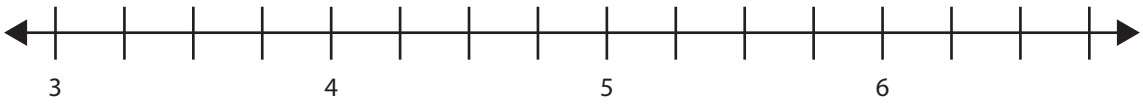
a The lines below show how far Daniel's wind-up toy walked each time before it fell over. Measure each line to the nearest $\frac{1}{4}$ of an inch, and write the distance in the box at the end of the line.



b Complete the line plot below to show Daniel's data. Remember to:

- Label all of the marks along the line.
- Write a label below the line to tell what the numbers mean.
- Enter the data.
- Give your line plot a title to tell what it's about.

_____
Title



_____

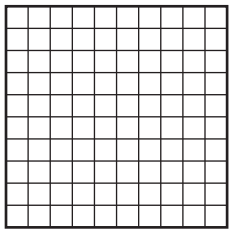
Student Book

GRADE 4 – SEPTEMBER

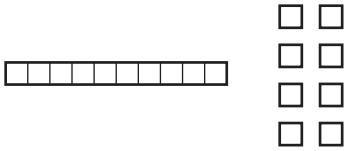
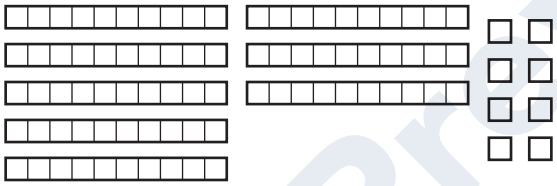
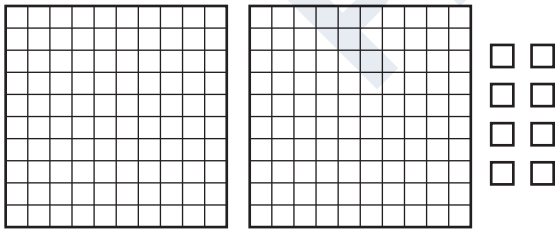
NUMBER® CORNER

NAME | **DATE**

Comparing Numeration Systems

Base Ten Pieces	Modern Numerals	Ancient Egyptian Numerals
	1	staff
	10	 heel bone
	100	 scroll

1 Write the modern numerals and the Egyptian numerals to match each set of base ten pieces.

Base Ten Pieces	Modern Numerals	Ancient Egyptian Numerals
		
		
		

2 How are our modern numbers like the Egyptian numbers? How are they different? Which system would you rather use every day? Why?

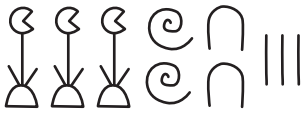
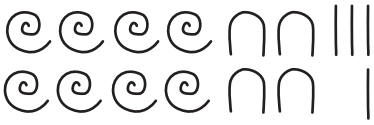
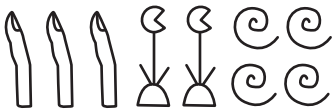
NAME | **DATE**

Expanded Form

Ancient Egyptian Numerals	Modern Numerals
staff	1
 heel bone	10
 scroll	100
 lotus flower	1,000

Ancient Egyptian Numerals	Modern Numerals
 bent finger	10,000
 tadpole	100,000
 astonished person	1,000,000

The ancient Egyptian system of numerals is additive. Once you learn the symbols, all you have to do is add their values together. Write an addition equation in modern numbers to show the value of each of these ancient numbers. In the last box, draw your own Egyptian number and then have a classmate write an equation to show its value.

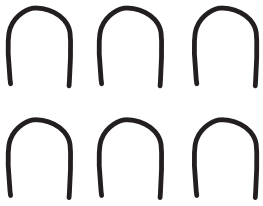
1  2000 + 400 + 30 + 6 = 2,436	**2** 
3 	**4** 
5 	**6** 
7 	**8**

NAME | DATE

Equations for Egyptian Numerals

Ancient Egyptian Numerals	Modern Numerals
staff	1
heel bone	10
scroll	100
lotus flower	1,000

ex



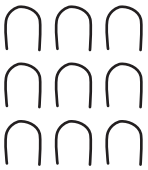
6 × 10 = 60

10 + 10 + 10 + 10 + 10 + 10 = 60

30 + 30 = 60

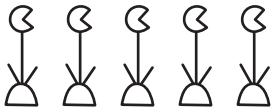
Use modern numbers to write at least three different equations for each Egyptian number.

1

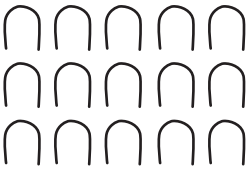


2

3



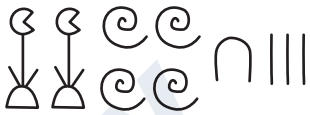
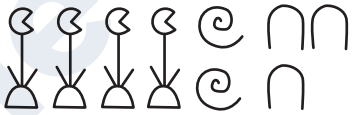
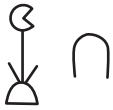
4



NAME | **DATE**

Cracking the Code

Fill in the boxes to complete the key and the table below. You'll need to use both modern and ancient Egyptian numerals.

Column 1		Column 2	
Ancient	Modern	Ancient	Modern
	32		2,413
	26		
			3,325
	204		3,006
			1,051
	650		

NAME | DATE

Inches, Feet & Yards

1 _____ inches are equal to 1 foot.

2 _____ feet are equal to 1 yard.

3 _____ inches are equal to 1 yard.

4 _____ inches are equal to $1\frac{1}{2}$ yard.

5 Which is most likely to be the height of a first grader?

○ 40 miles ○ 40 pounds ○ 40 inches ○ 40 feet

6 Which unit of measure would work best for measuring the distance from your classroom to the school office?

○ yards ○ inches ○ feet ○ miles

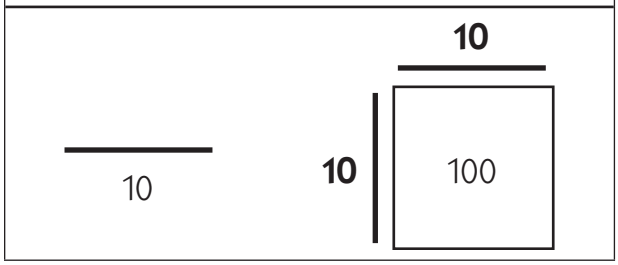
7 Freddy Frog jumped 9 inches more than Jimmy Junior in the frog-jumping contest. Jimmy Junior jumped 27 inches. How many feet did Freddy Frog jump? Use words, numbers, or labeled sketches to show how you got your answer.

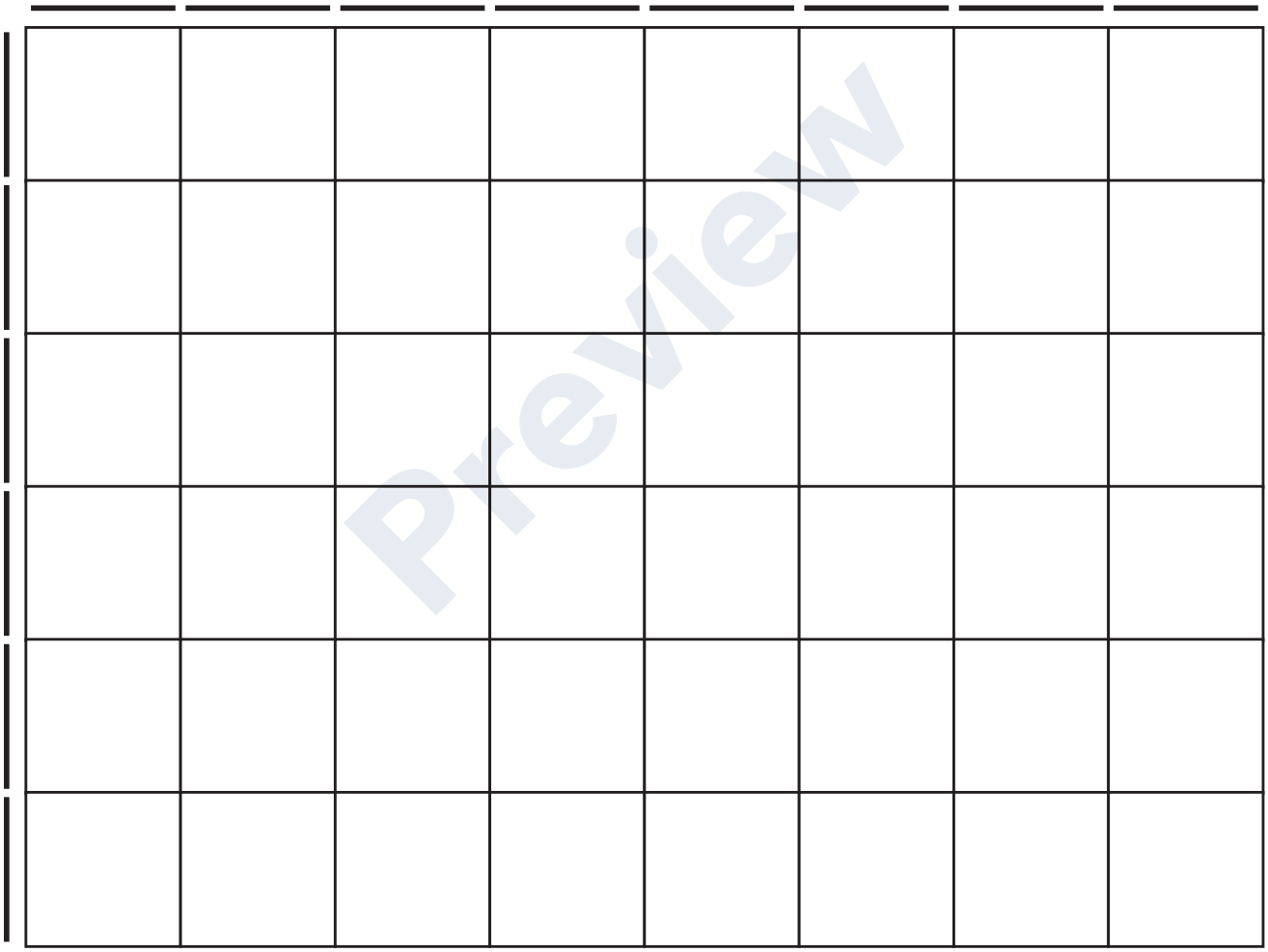
Freddy jumped _____ feet.

NAME | **DATE**

Splat! Grid

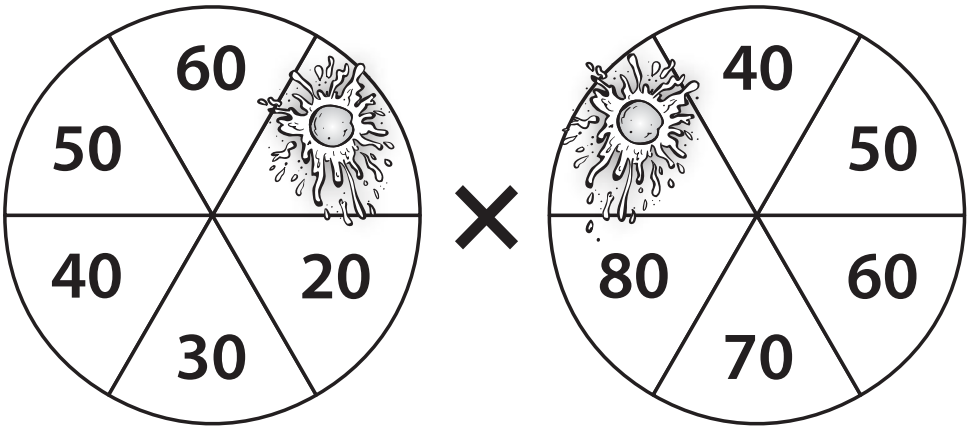
Key





NAME | **DATE**

Splat! Record Sheet 1



Game 1

	Player 1					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

	Player 2					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

Player _____ won by _____ points.

Game 2

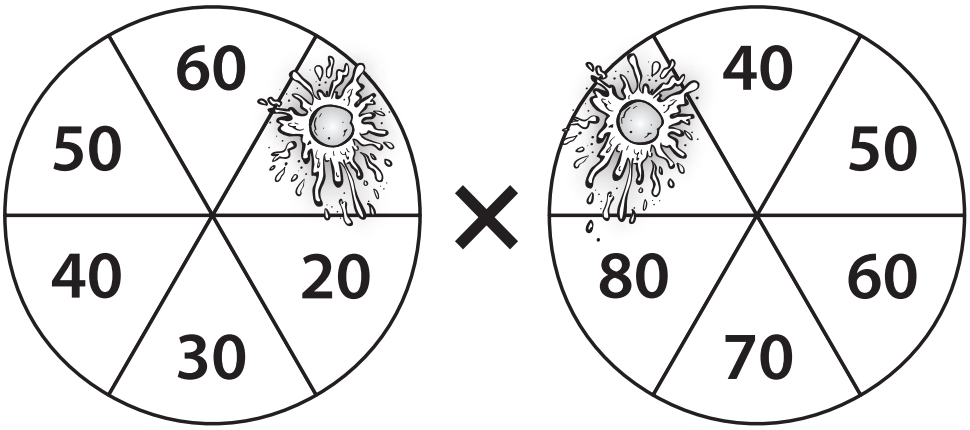
	Player 1					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

	Player 2					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

Player _____ won by _____ points.

NAME | **DATE**

Splat! Record Sheet 2



Game 1

	Player 1					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

	Player 2					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

Player _____ won by _____ points.

Game 2

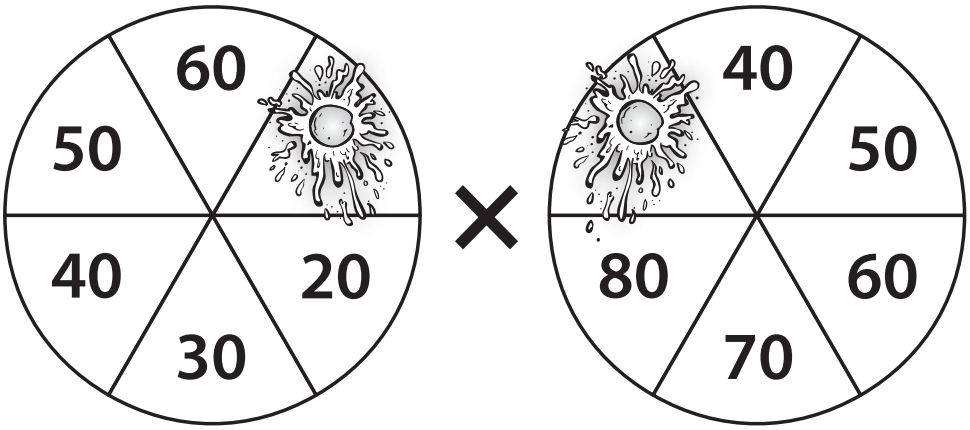
	Player 1					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

	Player 2					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

Player _____ won by _____ points.

NAME | **DATE**

Splat! Record Sheet 3



Game 1

	Player 1					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

	Player 2					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

Player _____ won by _____ points.

Game 2

	Player 1					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

	Player 2					
	Turn 1	Turn 2	Turn 3	Turn 4	Round Total	Work
Round 1						
Round 2						
				Game Total		

Player _____ won by _____ points.

NAME | DATE

Megan's Marbles page 1 of 2

1 Megan is starting a marble collection. She has 14 marbles. Her friend Patrick has been collecting marbles for a long time. If Patrick has 9 times as many marbles as Megan, how many marbles does Patrick have?

a What is this problem asking you to figure out?

b Underline any information in the problem that will help you find the answer.

c Write an equation for the problem. Use a letter to stand for the unknown quantity.

d Use this space to solve the problem. Show all your work including numbers, words, or labeled sketches. Write a complete sentence at the bottom of this page to show the answer.

NAME | DATE

Megan's Marbles page 2 of 2

2 After several weeks of collecting marbles, Megan has 12 times as many marbles as she did when she started. How many marbles does Megan have now?

a What is this problem asking you to figure out?

b Underline any information in the problem that will help you find the answer.

c Write an equation for the problem. Use a letter to stand for the unknown quantity.

d Use this space to solve the problem. Show all your work including numbers, words, or labeled sketches. Write a complete sentence at the bottom of this page to show the answer.

NAME | DATE

Xavier's Garden page 1 of 2

1 Xavier has 48 vegetable plants. Each plant needs one square foot of space to grow. If Xavier makes a rectangular garden for his plants, what are some possible dimensions for his garden so all 48 plants will have enough room to grow?

a What is this problem asking you to figure out?

b Underline any information in the problem that will help you find the answer.

c **CHALLENGE** Write an equation for the problem. Use letters to stand for the unknown quantities.

d Use this space to solve the problem. Show all your work including numbers, words, or labeled sketches. Write a complete sentence at the bottom of this page to show the answer.

NAME | DATE

Xavier's Garden page 2 of 2

2 **CHALLENGE** Xavier's friend Isabella has 3 times as many vegetables as Xavier. She also needs to build a new rectangular garden for her plants. What are some possible dimensions for Isabella's garden?

a What is this problem asking you to figure out?

b Underline any information in the problem that will help you find the answer.

c Write an equation for the problem. Use letters to stand for the unknown quantities.

d Use this space to solve the problem. Show all your work including numbers, words, or labeled sketches. Write a complete sentence at the bottom of this page to show the answer.

