3 BRIDGES IN MATHEMATICS

BRIDGES GRADE 3 SUPPLEMENT
CCSS Supplement Sets

Activities & Worksheets

Bridges Correlations to Common Core State Standards, Grade 3

Bridges in Mathematics Grade 3 Supplement
Common Core State Standards Sets

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Bridges in Mathematics Grade 3 Supplement
Common Core State Standards Sets

Introduction

The *Bridges Grade Three Supplement* is a collection of activities written to help teachers address the Common Core State Standards published in 2010. These materials are available for free as downloadable files on The Math Learning Center Web site at www.gotomlc.org/ccss. This supplement will continue to be refined and subsequent versions will also be available online at no charge.

The activities included here are designed to be used in place of selected sessions in *Bridges Grade Three* starting in Unit One. All of the activities are listed on pages 2–5 in the order in which they appear in the Supplement. They are listed in recommended teaching order on pages 6–8. On pages 9–24, you'll also find a set of sheets designed to replace the Planning Guides found at the beginning of Units 1, 3, 4, 5, 6, and 7 in the *Bridges Teacher's Guides*. These sheets show exactly how the Supplement activities fit into the flow of instruction. We suggest you insert these sheets into your *Bridges* guides so you can see at a glance when to teach the Supplement activities through the school year.

The majority of activities and worksheets in this supplement come in sets of three or more, providing several in-depth experiences around a particular grade level expectation or cluster of expectations. Many of the activities will take an hour of instructional time, though some are shorter, requiring 30–45 minutes.

Almost all of the activities are hands-on and require various math manipulatives and/or common classroom supplies. The blacklines needed to make any overheads, game materials, and/or student sheets are included after each activity. Some of the supplement sets in this collection include independent worksheets, designed to be completed by students in class or assigned as homework after related activities. See pages 25 & 26 for a complete list of materials required to teach the activities in each Supplement set.

Note Third grade standards not listed on pages 2–5 are adequately addressed in *Bridges* and/or *Number Corner* sessions. For a full correlation of *Bridges* Grade Three to the Common Core State Standards, see pages i–x.

Activities & Common Core State Standards

(Activities Listed in Order of Appearance in the Supplement)

SET A1 NUMBER & OPERATIONS: EQUAL EXPRESSIONS		
Page	**Name**	**Common Core State Standards**
A1.1	Activity 1: True or False?	3.OA 3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.
A1.7	Independent Worksheet 1: More Number Puzzles	3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers.
A1.9	Independent Worksheet 2: Expressions, Equations & Word Problems	3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations. 3.OA 8. Solve two-step word problems using the four operations.

SET A2 NUMBER & OPERATIONS: BASIC MULTIPLICATION & DIVISION		
Page	**Name**	**Common Core State Standards**
A2.1	Activity 1: Multiplying by 11	3.OA 1. Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.
A2.5	Activity 2: Multiplying by 12	3.OA 2. Interpret whole-number quotients of whole numbers.
A2.9	Independent Worksheet 1: Multiplying & Dividing on the Number Line	3.OA 3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.
A2.13	Independent Worksheet 2: Multiplying Odd & Even Numbers	3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers.
A2.17	Independent Worksheet 3: An Array of Fact Families	3.OA 5. Apply properties of operations as strategies to multiply and divide.
A2.19	Independent Worksheet 4: Fact Family Triangles	3.OA 6. Understand division as an unknown-factor problem.
A2.23	Independent Worksheet 5: Fact Families for the 10's	3.OA 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.
A2.25	Independent Worksheet 6: Multiplying by 11's & 12's	3.OA 8. Solve two-step word problems using the four operations.
A2.29	Independent Worksheet 7: Meet the 11's & 12's Families	3.OA 9. Identify arithmetic patterns, and explain them using properties of operations. 3.MD 7b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical
A2.31	Independent Worksheet 8: The Frog Jumping Contest	problems, and represent whole-number products as rectangular areas in mathematical reasoning. 3.MD 7c. Use area models to represent the distributive property in mathematical reasoning.

SET A3 NUMBER & OPERATIONS: MULTI-DIGIT ADDITION & SUBTRACTION		
Page	**Name**	**Common Core State Standards**
A3.1	Activity 1: Introducing the Standard Algorithm for Multi-Digit Addition	3.OA 8. Solve two-step word problems using the four operations. 3.NBT 1. Use place value understanding to round whole numbers to the
A3.7	Activity 2: Think before You Add	nearest 10 or 100.
A3.13	Activity 3: Introducing the Standard Algorithm for Multi-Digit Subtraction	3.NBT 2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relation-
A3.19	Activity 4: Think before You Subtract	ship between addition and subtraction.
A3.25	Activity 5: Round & Add	3.MD 1b. Solve word problems involving addition and subtraction of time
A3.29	Independent Worksheet 1: Third Grade Puzzlers	intervals in minutes.
A3.31	Independent Worksheet 2: In These United States	
A3.33	Independent Worksheet 3: Skill Practice	
A3.35	Independent Worksheet 4: Kilometers & Miles	

Activities & Common Core State Standards (cont.)

SET A5 NUMBER & OPERATIONS: FRACTIONS		
Page	**Name**	**Common Core State Standards**
A5.1	Activity 1: Fractions on a Double Number Line	3.NF 1. Understand a fraction 1⁄b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1⁄b.
A5.5	Independent Worksheet 1: The Broken Ruler, Part 1	
A5.7	Independent Worksheet 2: The Broken Ruler, Part 2	3.NF 2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.

SET A6 NUMBER & OPERATIONS: ESTIMATING TO ADD & SUBTRACT		
Page	**Name**	**Common Core State Standards**
A6.1	Independent Worksheet 1: Using Compatible Numbers to Estimate Answers	3.OA 8. Solve two-step word problems using the four operations.
A6.5	Independent Worksheet 2: Are These Answers Reasonable?	3.NBT 1. Use place value understanding to round whole numbers to the nearest 10 or 100.
A6.9	Independent Worksheet 3: Travel Miles	3.NBT 2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

SET A7 NUMBER & OPERATIONS: MULTIPLICATION BEYOND THE BASIC FACTS		
Page	**Name**	**Common Core State Standards**
A7.1	Activity 1: Multiplying Single Digits by Multiples of Ten	3.OA 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers.
A7.7	Independent Worksheet 1: Multiplying by Multiples of 10	3.NBT 3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 using strategies based on place value and properties of operations.
A7.9	Independent Worksheet 2: Sixty Seconds in a Minute	3.MD 1a. Tell and write time to the nearest minute and measure time intervals in minutes.
A7.11	Independent Worksheet 3: Hours to Minutes	3.MD 7b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
		3.MD 7c. Use area models to represent the distributive property in mathematical reasoning.

SET C2 GEOMETRY: TRIANGLES & MORE		
Page	**Name**	**Common Core State Standards**
C2.1	Activity 1: Start with a Point (DO NOT TEACH)	3.G 1a. Understand that shapes in different categories may share attributes, and that the shared attributes can define a larger category.
C2.9	Activity 2: Classifying Triangles	
C2.15	Activity 3: Measuring Circles (DO NOT TEACH)	
C2.21	Independent Worksheet 1: Points, Lines, Line Segments, Rays & Angles (DO NOT ASSIGN)	
C2.23	Independent Worksheet 2: Geometry Find & Measure (DO NOT ASSIGN)	
C2.25	Independent Worksheet 3: Name That Triangle!	
C2.27	Independent Worksheet 4: More Geoboard Triangles	

Activities & Common Core State Standards (cont.)

SET C4 GEOMETRY: QUADRILATERALS		
Page	**Name**	**Common Core State Standards**
C4.1	Activity 1: Sorting Quadrilaterals	3.MD 8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, and finding an unknown side length. Exhibit rectangles with the same perimeter and different areas or with the same area and different perimeters. 3.G 1. Understand that shapes in different categories may share attributes, and that the shared attributes can define a larger category. Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
C4.7	Activity 2: Guess My Quadrilateral	
C4.15	Activity 3: Writing Quadirlateral Riddles	
C4.19	Activity 4: Perimeters of Paper Quadrilaterals	
C4.25	Activity 5: Measuring Classroom Quadrilaterals	
C4.29	Independent Worksheet 1: Sorting & Identifying Quadrilaterals	
C4.31	Independent Worksheet 2: Classifying Quadrilaterals	
C4.33	Independent Worksheet 3: Perimeter Review	

SET D2 MEASUREMENT: AREA		
Page	**Name**	**Common Core State Standards**
D2.1	Activity 1: Measuring the Area of Paper Rectangles	3.MD 5. Recognize area as an attribute of plane figures and understand concepts of area measurement. 3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). 3.MD 7b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
D2.7	Activity 2: Finding Areas Large and Small	
D2.11	Independent Worksheet 1: Finding More Areas	

SET D3 MEASUREMENT: TELLING TIME		
Page	**Name**	**Common Core State Standards**
D3.1	Activity 1: Roll, Tell & Record the Time	3.MD 1a. Tell and write time to the nearest minute and measure time intervals in minutes.
D3.5	Independent Worksheet 1: Telling Time on Two Kinds of Clocks	
D3.7	Independent Worksheet 2: Annie's School Day	

SET D5 MEASUREMENT: AREA IN U.S. CUSTOMARY UNITS		
Page	**Name**	**Common Core State Standards**
D5.1	Activity 1: Measuring Area: U.S. Customary Units	3.MD 5. Recognize area as an attribute of plane figures and understand concepts of area measurement. 3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). 3.MD 7. Relate area to the operations of multiplication and addition.
D5.7	Activity 2: Rainbow Rectangles	
D5.11	Independent Worksheet 1: Estimating and Measuring Area in Square Inches	

SET D6 MEASUREMENT: AREA IN METRIC UNITS		
Page	**Name**	**Common Core State Standards**
D6.1	Activity 1: Metric Rectangles	3.MD 5. Recognize area as an attribute of plane figures and understand concepts of area measurement. 3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). 3.MD 7. Relate area to the operations of multiplication and addition.
D6.7	Activity 2: Ladybug Dream House	
D6.13	Independent Worksheet 1: Measuring Area in Metric Units	

Activities & Common Core State Standards (cont.)

SET E1 DATA ANALYSIS: GRAPHING		
Page	**Name**	**Common Core State Standards**
E1.1	Activity 1: Ice Cream Survey	3.MD 3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.
E1.7	Activity 2: Book Lovers' Survey	
E1.13	Activity 3: Under the Same Roof	
E1.19	Independent Worksheet 1: Pizza Survey	
E1.23	Independent Worksheet 2: The Pencil Survey	

Activities & Recommended Timings

(Activities Listed in Recommended Teaching Order)

Page	Set, Strand & Topic	Name	Recommended Timing
REPLACE SELECTED SESSIONS IN BRIDGES, UNIT 1			
E1.1	Set E1 Data Analysis: Graphs	Activity 1: Ice Cream Survey	Replaces Unit 1, Session 5 (appears at the end of the unit)
E1.7	Set E1 Data Analysis: Graphs	Activity 2: Book Lovers' Survey	Replaces Unit 1, Session 6 (appears after Set E1, Activity 1)
E1.13	Set E1 Data Analysis: Graphs	Independent Worksheet 1: Pizza Survey	Inserted as homework after Set E1, Activity 2
E1.19	Set E1 Data Analysis: Graphs	Activity 3: Under the Same Roof	Replaces Unit 1, Session 8 (appears after Set E1, Activity 2)
E1.23	Set E1 Data Analysis: Graphs	Independent Worksheet 2: The Pencil Survey	Inserted as homework after Set E1, Activity 3

Page	Set, Strand & Topic	Name	Recommended Timing
REPLACE AND ADD TO BRIDGES, UNIT 3			
C2.9	Set C2 Geometry: Triangles & More	Activity 2: Classifying Triangles	Replaces Unit 3, Session 5
C2.21	Set C2 Geometry: Triangles & More	Independent Worksheet 3: Name That Triangle!	Inserted as homework after Set C2, Activity 2
C4.1	Set C4 Geometry: Quadrilaterals	Activity 1: Sorting Quadrilaterals	Replaces Unit 3, Session 6
C2.27	Set C2 Geometry: Triangles & More	Independent Worksheet 4: More Geoboard Triangles	Inserted as homework after Set C4, Activity 1
C4.7	Set C4 Geometry: Quadrilaterals	Activity 2: Guess My Quadrilateral	Replaces Unit 3, Session 7
C4.29	Set C4 Geometry: Quadrilaterals	Independent Worksheet 1: Sorting & Classifying Quadrilaterals	Inserted as homework after Set C4, Activity 2
C4.15	Set C4 Geometry: Quadrilaterals	Activity 3: Writing Quadrilateral Riddles	Inserted after Set C4, Activity 2
C4.31	Set C4 Geometry: Quadrilaterals	Independent Worksheet 2: Classifying Quadrilaterals	Inserted as homework after Set C4, Activity 3
C4.19	Set C4 Geometry: Quadrilaterals	Activity 4: Perimeters of Paper Quadrilaterals	Replaces Unit 3, Session 13
C4.25	Set C4 Geometry: Quadrilaterals	Activity 5: Measuring Classroom Quadrilaterals	Replaces Unit 3, Session 14
C4.33	Set C4 Geometry: Quadrilaterals	Independent Worksheet 3: Perimeter Review	Inserted as homework after Set C4, Activity 5
D2.1	Set D2 Measurement: Area	Activity 1: Measuring the Area of Paper Rectangles	Inserted after Unit 3, Session 15
D2.7	Set D2 Measurement: Area	Activity 2: Finding Areas Large and Small	Inserted after Set D2, Activity 1
D2.11	Set D2 Measurement: Area	Independent Worksheet 1: Finding More Areas	Inserted as homework after Set D2, Activity 2

Activities & Recommended Timings (cont.)

REPLACE AND ADD TO SELECTED SESSIONS IN BRIDGES, UNIT 4			
Page	**Set, Strand & Topic**	**Name**	**Recommended Timing**
A2.9	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 1: Multiplying & Dividing on the Number Line	Inserted as homework after Unit 4, Session 6
A2.13	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 2: Multiplying Odd & Even Numbers	Inserted as homework after Unit 4, Session 8
A2.17	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 3: An Array of Fact Families	Inserted as homework after Unit 4, Session 18
A2.19	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 4: Fact Family Triangles	Inserted as homework after Unit 4, Session 19
A2.1	Set A2 Number & Operations: Basic Multiplication & Division	Activity 1: Multiplying by 11	Replaces Unit 4, Session 21
A2.5	Set A2 Number & Operations: Basic Multiplication & Division	Activity 2: Multiplying by 12	Replaces Unit 4, Session 22
A2.23	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 5: Fact Families for the 10's	Inserted as homework after Unit 4, Session 23
A1.1	Set A1 Number & Operations: Equal Expressions	Activity 1: True or False?	Inserted between Sessions 23 and 24 in Unit 4
A1.7	Set A1 Number & Operations: Equal Expressions	Independent Worksheet 1: More Number Puzzles	Inserted as homework after Set A1, Activity 1
D5.1	Set D5 Measurement: Area in U.S. Customary Units	Activity 1: Measuring Area in U.S. Customary Units	Appears at the end of Unit 4, after Session 24
D5.7	Set D5 Measurement: Area in U.S. Customary Units	Activity 2: Rainbow Rectangles	Appears at the end of Unit 4, after Set D5, Activity 1
D5.11	Set D5 Measurement: Area in U.S. Customary Units	Independent Worksheet 1: Estimating and Measuring Area in Square Inches	Inserted as homework after Set D5, Activity 2

REPLACE AND ADD TO SELECTED SESSIONS IN BRIDGES, UNIT 5			
Page	**Set, Strand & Topic**	**Name**	**Recommended Timing**
A2.25	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 6: Multiplying by 11's & 12's	Inserted as homework after Unit 5, Session 1
A3.1	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Activity 1: Introducing the Standard Algorithm for Multi-Digit Addition	Replaces Unit 5, Session 2
A2.29	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 7: Meet the 11's & 12's Families	Inserted as homework after Unit 5, Session 3
A2.31	Set A2 Number & Operations: Basic Multiplication & Division	Independent Worksheet 8: The Frog Jumping Contest	Inserted as homework after Unit 5, Session 6
A1.9	Set A1 Equal Expressions	Independent Worksheet 2: Expressions, Equations, and Word Problems	Inserted as homework after Unit 5, Session 8
A3.7	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Activity 2: Think before You Add	Replaces Unit 5, Session 9
A3.13	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Activity 3: Introducing the Standard Algorithm for Multi-Digit Subtraction	Replaces Unit 5, Session 14
A3.19	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Activity 4: Think before You Subtract	Replaces Unit 5, Session 18
A3.29	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Independent Worksheet 1: Third Grade Puzzlers	Inserted as homework after Set A3, Activity 4
A3.31	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Independent Worksheet 2: In These United States	Inserted as homework after Unit 5, Session 19

Activities & Recommended Timings (cont.)

Page	Set, Strand & Topic	Name	Recommended Timing
REPLACE SELECTED SESSIONS IN BRIDGES, UNIT 6			
A3.33	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Independent Worksheet 3: Skill Practice	Inserted as homework after Unit 6, Session 1
A3.35	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Independent Worksheet 4: Kilometers & Miles	Inserted as homework after Unit 6, Session 3
A5.1	Set A5 Number & Operations: Fractions	Activity 1: Fractions on a Double Number Line	Inserted between Sessions 14 and 15 in Unit 6
A5.5	Set A5 Number & Operations: Fractions	Independent Worksheet 1: The Broken Ruler, Part 1	Inserted as homework after Set A5, Activity 1
A5.7	Set A5 Number & Operations: Fractions	Independent Worksheet 2: The Broken Ruler, Part 2	Inserted as homework after Unit 6, Session 16

Page	Set, Strand & Topic	Name	Recommended Timing
REPLACE SELECTED CLOCKS, COINS & BILLS WORKOUTS IN APRIL AND MAY			
D3.1	Set D3 Measurement: Telling Time	Activity 1: Roll, Tell & Record the Time	Replace one of the Clocks, Coins & Bills workouts during April or May Number Corner with this activity.
D3.5	Set D3 Measurement: Telling Time	Independent Worksheet 1: Telling Time on Two Kinds of Clocks	Replace one of the Clocks, Coins & Bills workouts during April or May Number Corner with this worksheet or assign as homework.
D3.7	Set D3 Measurement: Telling Time	Independent Worksheet 2: Annie's School Day	See recommendation in the box directly above.

Page	Set, Strand & Topic	Name	Recommended Timing
REPLACE SELECTED SESSIONS IN BRIDGES, UNIT 7			
A3.25	Set A3 Number & Operations: Multi-Digit Addition & Subtraction	Activity 5: Round & Add	Inserted prior to Session 1 in Unit 7
A6.1	Set A6 Number & Operations: Estimating to Add & Subtract	Independent Worksheet 1: Using Compatible Numbers to Estimate Answers	Inserted prior to Session 1 in Unit 7
A6.5	Set A6 Number & Operations: Estimating to Add & Subtract	Independent Worksheet 2: Are These Answers Reasonable?	Inserted as homework after Unit 7, Session 1
A6.9	Set A6 Number & Operations: Estimating to Add & Subtract	Independent Worksheet 3: Travel Miles	Inserted as homework after Unit 7, Session 2
D6.1	Set D6 Measurement: Area in Metric Units	Activity 1: Metric Rectangles	Replaces Unit 7, Session 4
D6.7	Set D6 Measurement: Area in Metric Units	Activity 2: Ladybug Dream House	Replaces Unit 7, Session 5
D6.13	Set D6 Measurement: Area in Metric Units	Independent Worksheet 1: Measuring Area in Metric Units	Inserted as homework after Set D6, Activity 2
A7.1	Set A7 Number & Operations: Multiplication Beyond the Basic Facts	Activity 1: Multiplying Single Digits by Multiples of 10	Inserted between Sessions 14 and 15 in Unit 7
A7.7	Set A7 Number & Operations: Multiplication Beyond the Basic Facts	Independent Worksheet 1: Multiplying by Multiples of 10	Inserted as homework after Set A7, Activity 1
A7.9	Set A7 Number & Operations: Multiplication Beyond the Basic Facts	Independent Worksheet 2: Sixty Minutes in a Second	Inserted as homework after Unit 7, Session 16
A7.11	Set A7 Number & Operations: Multiplication Beyond the Basic Facts	Independent Worksheet 3: Hours to Minutes	Inserted as homework after Unit 7, Session 17

Unit One Planner (Bridges & CCSS Grade 3 Supp. Set E1)

Note Sessions 5, 6, 8, 10, 12, 13, and Home Connections 1, 2, and 3 have been omitted to make room for Supplement activities.

SESSION 1	SESSION 2	SESSION 3	SESSION 4	SESSION 7
Problems & Investigations Making People Glyphs	**Problems & Investigations** Sorting & Classifying People Glyphs	**Problems & Investigations** Graphing People Glyphs	**Problems & Investigations** Tile Growing Pattern **Homework** (REVIEW) Practice Book, pg. 7: Missing Numbers Fill-In	**Problems & Investigations** Cube Growing Patterns

SESSION 9	SESSION 11	SESSION 14	SESSION 15	SESSION 16
Problems & Investigations Using the Calculator to Find Patterns **Homework** (REVIEW) Practice Book, pg. 8: Name the Fraction	**Work Places** 1A Make the Sum 1B Growing Patterns* 1C Addition Facts Challenge 1D Calculator Patterns ***Work Sample**	**Problems & Investigations** Subtraction Table, Part 1: Zero, Counting Back, Doubles & Neighbors **Homework** (REVIEW) Practice Book, pg. 9: Related Addition & Subtraction Facts	**Problems & Investigations** Estimate, Measure & Compare Inches **Work Places 1E** Estimate, Measure & Compare Inches	**Problems & Investigations** Subtraction Table, Part 2: Half Facts, Take Away Tens & Run Away Ones **Work Places IF** Tens or Ones **Homework** (REVIEW) Practice Book, pg. 10: Fraction Fill-Ins

SESSION 17	SESSION 18	SESSION 19	SESSION 20	SUPPLEMENT
Problems & Investigations Subtraction Chart, Part 3: Up to Ten **Work Places 1G** Count & Compare Up to Ten (replaces 1A) **Homework** (REVIEW) Practice Book, pg. 11: Dollar Signs & Decimal Points	**Problems & Investigations** Subtraction Table, Part 4: Leftover Facts **Work Places**	**Assessment** Addition & Subtraction Story Problems **Work Places** **Homework** (REVIEW) Practice Book, pg. 12: Telling Time to the Hour Half Hour & Quarter Hour	**Problems & Investigations** Blast Off to Space **Work Places 1H** Blast Off to Space (replaces 1B)	**Supplement Set E1 Data Analysis: Graphs** Activity 1: Ice Cream Survey **Homework** (REVIEW) Practice Book, pg. 13: More Dollar Signs & Decimals

SUPPLEMENT	SUPPLEMENT			
Supplement Set E1 Data Analysis: Graphs Activity 2: Book Lover's Survey **Home Connection** Supp Set E1 Ind. Worksheet 1: Pizza Survey	**Supplement Set E1 Data Analysis: Graphs** Activity 3: Under the Same Roof **Home Connection** Supp Set E1 Ind. Worksheet 2: The Pencil Survey			

Unit Three Planner (Bridges & CCSS Grade 3 Supp. Sets C2, C4 & D2)

SESSION 1	SESSION 2	SESSION 3	SESSION 4	SUPPLEMENT
Problems & Investigations What We Know & Wonder about Geometry Work Places	**Problems & Investigations** Sorting & Classifying Shapes **Work Places** 3A Sort & Classify Shapes (replaces 2F) **Homework** Practice Book, pg. 47: Shape Sorting	**Problems & Investigations** Creating Tangrams **Homework** Practice Book, pg. 49: Dividing & Combining Shapes	**Problems & Investigations** Creating Polygons with angrams **Work Places** 3B Tangram Polygons (replaces 2G)	**Supplement Set C2 Geometry: Triangles & More** Activity 2: Classifying Triangles **Work Places** **Home Connection Supp Set C2 Ind. Worksheet 3:** Name That Triangle!
SUPPLEMENT	**SUPPLEMENT**	**SUPPLEMENT**	SESSION 8	SESSION 9
Supplement Set C4 Geometry: Quadrilaterals Activity 1: Sorting Quadrilaterals **Work Places** **Home Connection Supp Set C2 Ind. Worksheet 4:** More Geoboard Triangles	**Supplement Set C4 Geometry: Quadrilaterals** Activity 2: Guess My Quadrilateral **Work Places** **Home Connection Supp Set C4 Ind. Worksheet 1:** Sorting & Classifying Quadrilaterals	**Supplement Set C4 Geometry: Quadrilaterals** Activity 3: Writing Quadrilateral Riddles **Home Connection Supp Set C4 Ind. Worksheet 2:** Classifying Quadrilaterals	**Problems & Investigations** Making Regular & Irregular Toothpick Polygons	**Problems & Investigations** Sorting Toothpick Polygons by Angles **Work Places** 3C Geoboard Polygons (replaces 2H) **Homework** Practice Book, pg. 41: Right, Acute, & Obtuse Angles
SESSION 10	SESSION 11	SESSION 12	SESSION 15	SUPPLEMENT
Assessment Subtraction Fluency Checkup 3 **Work Places** **Home Connection 11** Centimeter Measure	**Problems & Investigations** Congruence on a Geoboard, part 1 of 2 **Homework** Practice Book, pg. 42: Parallel, Intersecting & Perpendicular Lines	**Problems & Investigations** Congruence on a Geoboard, part 2 of 2 Work Places **Homework** Practice Book, pg. 43: Angles & Sides Note: Sessions 13 & 14 have been omitted to make room for Supplement Activities.	**Assessment** Ten Objects in a Bag Constructed Response Assessment **Work Places** **Home Connection 12** Angles Search	**Supplement Set C4 Geometry: Quadrilaterals** Activity 4: Perimeters of Paper Quadrilaterals **Work Places** **Homework** Practice Book, pg. 55: Thinking about Triangles
SUPPLEMENT	**SUPPLEMENT**	**SUPPLEMENT**		
Supplement Set C4 Geometry: Quadrilaterals Activity 5: Measuring Classroom Quadrilaterals **Work Places** **Home Connection Supp Set C4 Ind. Worksheet 3:** Perimeter Review	**Supplement Set D2 Measurement: Area** Activity 1: Measuring the Area of Paper Rectangles **Homework** Practice Book, pg. 44: Perimeter Practice	**Supplement Set D2 Measurement: Area** Activity 2: Finding Areas Large & Small **Home Connection Supp Set D2 Ind. Worksheet 1:** Finding More Areas	**Note:** Consider using some of the following Practice Book pages as homework or seatwork over the next few weeks to provide more practice with perimeter: pg. 46: Finding the Perimeters of Quadrilaterals pg. 48: More Perimeter Practice pg. 50: Sandbox & Garden Problems pg. 54: Perimeters of Different Shapes pg. 60: Garden Patch Problems pg. 106: The 3rd Graders' Garden Plot	

Unit Four Planner (Bridges & CCSS Grade 3 Supp. Sets A1, A2 & D5)

SESSION 1	SESSION 2	SESSION 3	SESSION 4	SESSION 5
Problems & Investigations Groups of Things Assessment Multiplication & Division Pre-Assessment **Homework** (REVIEW) Practice Book, pg. 51: Adding 2-Digit Numbers	**Problems & Investigations** Multiples & Growing Patterns	**Problems & Investigations** Loops & Groups **Work Places 4A** Loops & Groups (replaces 2J) **Homework** (REVIEW) Practice Book, pg. 53: More Subtraction Problems	**Problems & Investigations** Adventures with Arrays	**Problems & Investigations** Constructing the Multiplication & Division Chart **Home Connection 13** Loops & Groups

SESSION 6	SESSION 7	SESSION 8	SESSION 9	SESSION 10
Problems & Investigations Patterns on the Multiplication & Division Chart **Home Connection Supp Set A2 Ind. Worksheet 1:** Multiplying & Dividing on the Number Line	**Problems & Investigations** Hidden Arrays **Work Sample** **Work Places 4B** Array Challenge (replaces 2K)	**Problems & Investigations** Cover Up **Work Places 4C** Cover Up (replaces 3A) **Home Connection Supp Set A2 Ind. Worksheet 2:** Multiplying Odd & Even Numbers	**Problems & Investigations** Pet Shop Story Problems **Work Sample**	**Problems & Investigations** Multiplication Table, part 1 of 3 (× 0, 1, 2, 5, and 10) **Home Connection 14** Array Challenge

SESSION 11	SESSION 12	SESSION 13	SESSION 14	SESSION 15
Assessment Multiplication Fluency Checkup 1 **Problems & Investigations** Introduction to Weight Measurement **Work Places 4D** Estimate, Measure & Compare Ounces & Pounds (replaces 3B)	**Problems & Investigations** Game Store Story Problems, part 1 of 3 **Homework** (REVIEW) Practice Book, pg. 61: Equal Jumps on the Number Line	**Problems & Investigations** Game Store Story Problems, part 2 of 3 **Work Sample** **Homework** (REVIEW) Practice Book, pg. 62: Multiplication Story Problems	**Problems & Investigations** Game Store Story Problems, part 3 of 3 **Work Places 4E** Solving Game Store Problems (replaces 3C) **Homework** (REVIEW) Practice Book, pg. 63: More Equal Jumps on the Number Line	**Problems & Investigations** Multiplication Table, part 2 of 3 (× 3, 4, and 6) **Home Connection 15** Weight Measures

SESSION 16	SESSION 17	SESSION 18	SESSION 19	SESSION 20
Problems & Investigations Count & Compare Multiplication **Work Places 4F** Count & Compare Multiplication (replaces 3D) **Homework** Practice Book, pg. 64: T-Shirts, Erasers & Marbles	**Problems & Investigations** Exploring Loops & Groups Results **Work Places** **Homework** (REVIEW) Practice Book, pg. 65: Multiplication Practice	**Problems & Investigations** Common Multiples on 0–99 Grids **Home Connection Supp Set A2 Ind. Worksheet 3:** An Array of Fact Families	**Problems & Investigations** Finding Factors for 24 & 36 **Home Connection Supp Set A2 Ind. Worksheet 4:** Fact Family Triangles	**Problems & Investigations** Multiplication Table, part 3 of 3 (× 7, 8, and 9) **Home Connection 16** Solving Multiplication Facts

Unit Four Planner (Bridges & CCSS Grade 3 Supp. Sets A1, A2 & D5) (cont.)

SUPPLEMENT	SUPPLEMENT	SESSION 23	SUPPLEMENT	SESSION 24
Supplement Set A2 Number & Operations: Basic × ÷ Activity 1: Multiplying by 11	**Supplement Set A2 Number & Operations: Basic × ÷** Activity 2: Multiplying by 12	**Problems & Investigations** Division Story Problems & Fact Families	**Supplement Set A1 Number & Operations: Equal Expressions** Activity 1: True or False?	**Assessment** Multiplication & Division Post-Assessment
Work Places 4G Scout Them Out (replaces 4A)	**Work Places 4H** Don't Break 100 (replaces 4B)	**Work Sample**	**Home Connection** Supp Set A1 Ind. Worksheet 1: More Number Puzzles	**Work Places**
		Home Connection Supp Set A2 Ind. Worksheet 5: Fact Families for the Tens		**Home Connection 17** Scout Them Out
Homework Practice Book, pg. 68: Seconds & Minutes	**Homework** Practice Book, pg. 69: Fact Families & Missing Numbers			

SUPPLEMENT	SUPPLEMENT			
Supplement Set D5 Measurement: Area in U.S. Customary Units Activity 1: Measuring Area: U.S. Customary Units	**Supplement Set D5 Measurement: Area in U.S. Customary Units** Activity 2: Rainbow Rectangles			
	Home Connection Supp Set D5 Ind. Worksheet 1: Estimating and Measuring Area in Square Inches			

Unit Five Planner (Bridges & CCSS Grade 3 Supp. Sets A1, A2, A3)

SESSION 1	SUPPLEMENT	SESSION 3	SESSION 4	SESSION 5
Assessment Working with Larger Numbers Pre-Assessment **Work Places**	**Supplement Set A3 Number & Operations: Multi-Digit Addition & Subtraction** Activity 1: Introducing the Standard Algorithm for Multi-Digit Addition	**Problems & Investigations** Make 200 **Work Places 5A** Make 200 (replaces 4C)	**Problems & Investigations** Round Ball Hundreds	**Problems & Investigations** Rounding Up Books **Home Connection 18** Multiplication Draw
Home Connection Supp Set A2 Ind. Worksheet 6: Multiplying by 11's & 12's		**Home Connection Supp Set A2 Ind. Worksheet 7:** Meet the 11's & 12's Families		**Homework** Practice Book, pgs. 85 & 86: Rounding to the Nearest 10 and Rounding to the Nearest 100

SESSION 6	SESSION 7	SESSION 8	SUPPLEMENT	SESSION 10
Problems & Investigations Sum It Up **Work Places 5B** Sum It Up (replaces 4D)	**Problems & Investigations** The 329th Friend How Many Tables? Part 1	**Problems & Investigations** The 329th Friend How Many Tables? Part 2 **Work Sample**	**Supplement Set A3 Number & Operations: Multi-Digit Addition & Subtraction** Activity 2: Think before You Add	**Problems & Investigations** Same Differences **Work Sample**
Home Connection Supp Set A2 Ind. Worksheet 8: The Frog Jumping Contest		**Home Connection Supp Set A1 Ind. Worksheet 2:** Expressions, Equations & Word Problems	**Work Places 5C** Estimate, Measure & Compare Grams (replaces 4E)	**Home Connection 19** Round Ball Hundreds

SESSION 11	SESSION 12	SESSION 13	SUPPLEMENT	SESSION 15
Problems & Investigations Which Makes the Most Sense? Subtraction **Work Sample** **Work Places** **Homework** Practice Book, pg. 93: Round & Subtract	**Problems & Investigations** Pick 2 Subtraction **Work Places 5D** Pick 2 Subtraction (replaces 4F)	**Problems & Investigations** Larger Numbers on a Line **Work Places 5E** Larger Numbers on a Line (replaces 4G) **Homework** Practice Book, pg. 94: Add to Find the Difference	**Supplement Set A3 Number & Operations: Multi-Digit Addition & Subtraction** Activity 3: Introducing the Standard Algorithm for Multi-Digit Subtraction	**Problems & Investigations** Quad Spin & Win **Work Places 5F** Quad Spin & Win (replaces 4H) **Home Connection 20** Make 200

SESSION 16	SESSION 17	SUPPLEMENT	SESSION 19	SESSION 20
Problems & Investigations About How Far? Travel Miles **Work Places** **Homework** Practice Book, pg. 96: Estimates & Exact Numbers	**Problems & Investigations** Solving Travel Miles Problems **Work Sample** **Work Places** **Homework** Practice Book, pg. 97: Place Value Four-Digit Numbers	**Supplement Set A3 Number & Operations: Multi-Digit Addition & Subtraction** Activity 4: Think before You Subtract **Home Connection Supp Set A3 Ind. Worksheet 1:** Third Grade Puzzlers	**Problems & Investigations** Roll & Subtract 1000 **Work Places 5H** Roll & Subtract 1000 (replaces 5B)	**Assessment** Working with Larger Numbers Post-Assessment **Work Places** **Home Connection 21** Travel Miles
		Work Places 5G Count & Compare Place Value (replaces 5A)	**Home Connection Supp Set A3 Ind. Worksheet 2:** In These United States	

Unit Six Planner (Bridges & CCSS Grade 3 Supp. Sets A3 & A5)

SESSION 1	SESSION 2	SESSION 3	SESSION 4	SESSION 5
Problems & Investigations Alexander, Who Used to Be Rich Last Sunday	**Assessment** Money, Fractions & Probability Pre-Assessment	**Problems & Investigations** Movies & Popcorn	**Problems & Investigations** Make Change	**Problems & Investigations** Fractions on a Geoboard Circle
Home Connection Supp Set A3 Ind. Worksheet 3: Skill Practice	**Work Places** **Homework** (REVIEW) Practice Book, pg. 50: Sandbox & Garden Problems	**Work Places** **Home Connection Supp Set A3 Ind. Worksheet 4:** Kilometers & Miles	**Work Places 6A** Make Change (replaces 5C)	**Home Connection 22** Movies & Popcorn

SESSION 6	SESSION 7	SESSION 8	SESSION 9	SESSION 10
Problems & Investigations Surveys & Fractions as Parts of Set **Homework** (REVIEW) Practice Book, pg. 99: Estimate before You Subtract	**Problems & Investigations** Pizza Fractions, Part 1 of 2	**Problems & Investigations** Pizza Fractions, Part 2 of 2 **Homework** (REVIEW) Practice Book, pg. 101: Using the Standard Algorithm to Add & Subtract	**Problems & Investigations** How Much Milk?	**Work Places 6B** Estimate, Measure & Compare Cups & Quarts (replaces 5D) **Home Connection 23** Quad Spin & Win

SESSION 11	SESSION 12	SESSION 13	SESSION 14	SUPPLEMENT
Problems & Investigations Making Windmill Star Quilt Blocks **Homework** (REVIEW) Practice Book, pg. 103: Fraction Fill & Compare	**Problems & Investigations** Exploring the Windmill Star Quilt Blocks **Homework** (REVIEW) Practice Book, pg. 108: Sandwich Fractions	**Problems & Investigations** Fractions on a Square Geoboard **Work Sample** **Homework** (REVIEW) Practice Book, pg. 115: Thinking about Fractions	**Problems & Investigations** Fractions on a Ruler **Work Sample**	**Supplement Set A5 Number & Operations: Fractions** Activity 1: Fractions on a Double Number Line **Home Connection Supp Set A5 Ind. Worksheet 1:** The Broken Ruler, Part 1

SESSION 15	SESSION 16	SESSION 17	SESSION 18	
Problems & Investigations Fraction Bingo **Work Places 6C** Fraction Bingo (replaces 5E) **Home Connection 24** Make a Gallon, Spill a Gallon	**Problems & Investigations** Sports Spinners Probability **Work Places 6D** Sports Spinners (replaces 5F) **Home Connection Supp Set A5 Ind. Worksheet 2:** The Broken Ruler, Part 2	**Problems & Investigations** Pull & Graph Probability **Work Places 6E** Pull & Graph **Homework** (REVIEW) Practice Book, pg. 112: Fractions on a Number Line	**Assessment** Money, Fractions & Probability Post-Assessment **Work Places** **Home Connection 25** Probability Spinners	

Note: Consider using some of the following Practice Book pages as homework or seatwork over the next few weeks to provide more practice with fractions on a number line and other fraction-related situations:
pg. 114: Fraction Problems
pg. 115: Thinking about Fractions
pg. 116: Fruit Fractions
pg. 117: Pizza Problems
pg. 125: Fractions of a Circle

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Unit Seven Planner (Bridges & CCSS Grade 3 Supp. Sets A3, A6, A7, D3 & D6)

Note Activity 1 and the two Independent Worksheets from Supplement Set D3 (Telling Time) can be used to replace several of the Coins, Clocks and Bills workouts during Number Corner in April and May.

SUPPLEMENT	SUPPLEMENT	SESSION 1	SESSION 2	SESSION 3
Supplement Set A3 Number & Operations: Multi-Digit Addition & Subtraction Activity 5: Round & Add **Homework** Practice Book, pg. 91: Rounding to the Nearest Ten, Hundred & Thousand	**Supplement Set A6 Number & Operations: Estimating to Add & Subtract** Independent Worksheet 1: Using Compatible Numbers to Estimate Answers **Homework** Practice Book, pg. 95: Rounding Review	**Problems & Investigations** Buried Treasure **Home Connection** **Supp Set A6 Ind. Worksheet 2:** Are These Answers Reasonable?	**Assessment** Geometry, Multiplication & Data Analysis Pre-Assessment **Work Places** **Home Connection** **Supp Set A6 Ind. Worksheet 3:** Travel Miles	**Problems & Investigations** Faces of Mystery **Note:** Sessions 4 & 5 have been omitted to make room for Supplement Activities.

SESSION 6	SESSION 7	SESSION 8	SESSION 9	SUPPLEMENT
Problems & Investigations Exploring Nets of Cubes and Cones **Homework** (REVIEW) Practice Book, pg. 111: True or False?	**Problems & Investigations** Geoblock Architecture **Work Places 7A** Geoblock Architecture (replaces 5H)	**Problems & Investigations** Surface Area **Homework** (REVIEW) Practice Book, pg. 113: Working with Equations	**Problems & Investigations** Estimate, Measure & Compare Milliliters & Liters **Work Places 7B** Estimate, Measure & Compare Milliliters & Liters (replaces 6B) **Home Connection 27** Quick Facts Multiplication	**Supplement Set D6 Measurement: Area in Metric Units** Activity 1: Metric Rectangles

SUPPLEMENT	SESSION 12	SESSION 13	SESSION 14	SUPPLEMENT
Supplement Set D6 Measurement: Area in Metric Units Activity 2: Ladybug Dream House **Home Connection** **Supp Set D6 Ind. Worksheet 1:** Measuring Area in Metric Units **Note:** Sessions 11 & 12 have been omitted to make room for Supplement Activities.	**Problems & Investigations** Building Arrays for 1-by-2-Digit Multiplication Problems **Work Sample** **Homework** (REVIEW) Practice Book, pg. 119: Multiplication, Division & Perimeter Practice	**Problems & Investigations** Sketching Arrays for 1-by-2-Digit Multiplication Problems **Work Sample** **Homework** (REVIEW) Practice Book, pg. 121: Multiplying & Dividing	**Problems & Investigations** Mystery Arrays **Homework** (REVIEW) Practice Book, pg. 123: Operations Review Add, Subtract, Multiply & Divide	**Set A7 Number & Operations: Multiplication Beyond the Basic Facts** Activity 1: Multiplying Single Digits by Multiples of 10 **Home Connection** **Supp Set A7 Ind. Worksheet 1:** Multiplying by Multiples of 10

SESSION 15	SESSION 16	SESSION 17	SESSION 18	SESSION 18
Problems & Investigations Making Posters for 1-by-2-Digit Arrays **Work Sample** **Homework** Practice Book, pg. 124: Even More Multiplication Story Problems	**Problems & Investigations** Spin & Multiply **Work Places 7C** Spin & Multiply (replaces 6A) **Home Connection** **Supp Set A7 Ind. Worksheet 2:** Sixty Seconds in a Minute	**Problems & Investigations** Sharing 1-by-2-Digit Array Posters **Work Places** **Work Sample** **Home Connection** **Supp Set A7 Ind. Worksheet 3:** Hours to Minutes	**Problems & Investigations** Averaging Cubes **Homework** Practice Book, pg. 122: Larger Multiplication	**Problems & Investigations** Finding the Average Length of Our Feet **Homework** (REVIEW) Practice Book, pg. 133: Fraction Review

Unit Seven Planner (**Bridges & CCSS Grade 3 Supp. Sets A3, A6, A7, D3 & D6**) (cont.)

SESSION 20			
Assessment Geometry, Multiplication & Data Analysis Post-Assessment **Work Places** **Home Connection 29** Spin & Multiply			

Grade 3 CCSS Supplement Materials List

MANIPULATIVES	ITEM #	A1	A2	A3	A5	A6	A7	C2	C4	D2	D3	D5	D6	E1
Large base 10 area pieces (15 sets)*	USM		√	√						√				
Small base 10 area pieces (15 sets)**	PGT												√	
Geoboards & bands (1 per student)*	G15BSR or G15C							√	√					
Overhead Geoboard*	GBC							√	√					
6-sided dice (1 set that includes dice dotted 1-6 and dice numbered 5-10)*	D621			√							√			
Overhead large base ten pieces*	USMO		√											
Black linear units*	LU									√				
Magnetic base 10 pieces (1 set)*	USMMAGPA			√										
Color Tile (3 sets of 400)***	T400T											√		
Measuring Tapes, cm/in (half class set)*	MTC								√					
Student Clocks (half class set)*	DIALS										√			
Word Resource Cards*	BWRC							√	√			√		
Calculators (half class set)	T101 or T102												√	

All manipulatives available from Math Learning Center. Those items marked with one asterisk are included in the Grade 3 Bridges Grade Level Package.

** Borrow a class set of small base ten area pieces from a fourth or fifth grade teacher who is using Bridges in your building.

*** Borrow 3 sets of 400 color tile from a fourth or fifth grade teacher who is using Bridges in your building.

GENERAL MATERIALS (PROVIDED BY THE TEACHER)	A1	A2	A3	A5	A6	A7	C2	C4	D2	D3	D5	D6	E1
Overhead or document camera	√		√			√	√	√	√	√	√	√	√
Blank overhead transparencies if you are using an overhead projector rather than a doc camera	1		9			1	7	5	1	1	1	1	2
8.5" x 11" copy paper, sheets per student	6	23	15	4	9	4	15	11	3	5	7	7	11
8.5" x 11" pastel copy paper in 3–4 different colors									√		√		
8.5" x 11" lined or grid paper, sheets per student	1		4					2					
8.5" x 11" cardstock, individual sheets			15										
Chart paper									√	√			
12" x 18" drawing paper			√						√				
3" x 3" sticky notes									√				√
1 ½" x 2" sticky notes													√
Construction paper									√	√		√	√
Overhead pens (black, blue, red)	√		√			√			√				
Marking pens			√						√				
Crayons										√			√
Colored pencils for student use (blue, red)						√			√				
Glue sticks, class set													√
Scissors, class set				√	√		√	√	√				√
Rulers, class set						√		√	√	√	√	√	√
Yardstick(s)									√		√		
Paperclips				√					√				
Scotch Tape									√		√		
Blue Masking Tape									√				
4 Small Envelopes									√				

Grade 3 CCSS Supplement Materials List (cont.)

CHILDREN'S BOOKS (PROVIDED BY THE TEACHER)	A1	A2	A3	A5	A6	A7	C2	C4	D2	D3	D4	D5	D6	E1
Clocks and More Clocks by Pat Hutchins										Opt				
Book about families (See Supplement Set E1, p. E1.13 for recommended titles)														Opt

3 BRIDGES IN MATHEMATICS

GRADE 3 SUPPLEMENT

Set A1 Number & Operations: Equal Expressions

Includes

Skills & Concepts

★ determine whether two expressions are equal and use "=" to denote equality

★ apply strategies to compute multiplication facts to 10 × 10 and the related division facts

★ solve and create word problems that match multiplication or division equations

Bridges in Mathematics Grade 3 Supplement
Set A1 Numbers & Operations: Equal Expressions

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set A1 ★ Activity 1

ACTIVITY

True or False?

Overview
Students work together to evaluate a series of equations, reviewing the meaning of the equals sign in the process. Then they complete a related worksheet independently.

Skills & Concepts
★ determine whether two expressions are equal and use "=" to denote equality

★ apply strategies to compute multiplication facts to 10 × 10 and the related division facts

★ solve and create word problems that match multiplication or division equations

You'll need
★ True or False? (page A1.4, run one copy on a transparency)

★ Number Puzzles (pages A1.5 and A1.6, run a class set)

★ overhead pens

★ a piece of paper to mask portions of the overhead

★ Student Math Journals or 1 piece of lined or grid paper per student

Instructions for True or False?

1. Ask students to find the next available page in their journal and write the numbers 1–12 down the left-hand side of the page. Then display the top portion of the transparency and read the instructions with the class. Ask students to work in silence to give everyone a moment of private "think time", and then reveal the first equation. As soon as they've copied the first equation into their journal and labeled it with a T or and F, have them show the thumbs up sign. When most have finished, ask them to pair-share their responses and then call on volunteers to share their thinking with the class.

> **Set A1 Number & Operations: Equal Expressions Blackline** Run one copy on a transparency.
>
> **True or False?**
>
> - Copy each of the equations into your journal as your teacher shows them to you.
> - Write a T beside the equation if you think it's true and an F if you think it's false.
> - If there are any missing numbers, fill them in to make the equation true.
>
> **1** 10 = 2 × 5   True or False?

Students *I put false because I think that equation is backwards. You're supposed to put the answer after the equals sign, not before it.*
I put true because I don't think it matters. I think it's okay to switch things around.
I agree. 2 × 5 is 10 no matter what, even if it's backwards in that equation.
I wasn't really sure what to put. It does seem kind of backwards.

2. As students share, you may discover that some of them regard the equals sign as an "operator button," similar to the equals key on the calculator, or as a symbol used to separate the problem from its answer. A few may feel that writing the "answer" first is backwards. The equations on this overhead are in-

Activity 1 True or False? (cont.)

tended to review the idea that the equals sign stands between two expressions to indicate that they have the same value; they mean the same thing. 10 and 2 × 5 are, in fact expressions of equal value, and can be placed on either side of the equals sign.

3. Explain this idea to your students. One way to help them think appropriately about the equals sign is to read the sentence as, "10 is the same as 2 × 5" rather than "10 equals 2 × 5". It will be helpful if you use this language yourself and ask students to do so throughout the activity. After some discussion, circle the word "true" next to equation 1 on the overhead, and then reveal the next equation. Repeat the process described above. As students share their thinking, ask them to consider whether or not the expressions on either side of the equals sign have the same value.

4. Work through problems 3 through 8 in this fashion, marking the answers to each after students have shared their thinking. Problem h shows a "run-on sentence".

This (false) equation illustrates an error students frequently make in dealing with more than one operation. In this case, the root combination was 2 + 4 + 9. It's not unusual to see students carry an equivalence from a previous expression into a new expression with an additional operation. Take a little extra time to have students examine and discuss this equation. Some may argue that it's partly true because 2 + 4 = 6 and 6 + 9 = 15, while others will either be baffled by the equation or argue that it is false because 2 + 4 does not equal 6 + 9. Be sure they understand that it is incorrect.

5. Starting with problem 9, students will need to fill in a missing number to make the equation true. Problem 12 may spark some debate until students realize that there are many possible solutions, including the one shown below.

6. When the class has completed the overhead, give students each a copy of Number Puzzles. Review the instructions on both sheets with the class, and clarify as needed. When students understand what to do, let them go to work. Give assistance as needed, but encourage children to support one another in finding the solutions to these problems as they work.

Activity 1 True or False? (cont.)

NAME _____ DATE _____

Number Puzzles page 1 of 2

1 Read each of the equations below. If it is true, circle the T. If it is false, circle the F.

a $18 = 9 \times 2$ T   F   **e** $5 = 10 \div 2$ T   F

b $6 \times 10 = 12$ T   F   **f** $3 \times 2 = 12 \div 2$ T   F

c $2 \times 4 = 4 \times 2$ T   F   **g** $2 \times 3 = 6 \times 5 = 30$ T   F

d $2 \times 8 = 4 \times 4$ T   F   **h** $100 \div 2 = 25 \times 2$ T   F

2 Fill in the missing numbers to make each equation true.

a $16 = 4 \times \boxed{}$ **g** $25 \div 1 = \boxed{}$

b $2 \times \boxed{} = 4 \times 5$ **h** $60 = \boxed{} \times 6$

c $\boxed{} \times 10 = 30$ **i** $12 \div 3 = 6 \times \boxed{}$

d $12 \div 2 = \boxed{}$ **j** $18 \div 2 = \boxed{} \times 3$

e $20 \div \boxed{} = 4$ **k** $10 \times 10 = 50 \times \boxed{}$

f $\boxed{} \div 5 = 5$ **l** $10 \times 10 = 25 \times \boxed{}$

NAME _____ DATE _____

Number Puzzles page 2 of 2

3 Sara has 3 bags of shells. Each bag has 10 shells in it. Her brother Max has 5 bags of shells. Each bag has 6 shells in it.

Do Sara and Max have the same number of shells? _____

Use labeled sketches, numbers, and/or words to prove your answer.

4 Jan and Jess split 10 dollars evenly. Jody, Jamal, and Jasmin split 12 dollars evenly.

Did all the kids get the same amount of money? _____

Use labeled sketches, numbers, and/or words to prove your answer.

5 Write a word problem to go with each of the equations below.

a $3 \times 5 = 15$	**b** $20 \div 4 = 5$

INDEPENDENT WORKSHEET

Use Set A1 Independent Worksheets 1 and 2 to provide students with more practice determining whether two expressions are equal, using "=" to denote equality, applying strategies to compute multiplication and related division facts, and solving and creating word problems that match multiplication and division expressions and equations.

True or False?

- Copy each of the equations into your journal as your teacher shows them to you.
- Write a T beside the equation if you think it's true and an F if you think it's false.
- If there are any missing numbers, fill them in to make the equation true.

1 $10 = 2 \times 5$ .... True or False?

2 $3 \times 4 = 4 \times 3$ .... True or False?

3 $4 \times 5 = 10 \times 3$ .... True or False?

4 $2 \times 6 = 3 \times 4$ .... True or False?

5 $15 \div 3 = 2 \times 4$ .... True or False?

6 $2 \times 2 = 10 \div 2$ .... True or False?

7 $10 \div 2 = 15 \div 3$ .... True or False?

8 $2 + 4 = 6 + 9 = 15$ .... True or False?

9 $14 = 2 \times \boxed{}$

10 $12 \div 2 = 2 \times \boxed{}$

11 $1 \times \boxed{} = 14 \div 2$

12 $2 \times \boxed{} = \boxed{}$

Number Puzzles page 1 of 2

1 Read each of the equations below. If it is true, circle the T. If it is false, circle the F.

a $18 = 9 \times 2$ T   F   **e** $5 = 10 \div 2$ T   F

b $6 \times 10 = 12$ T   F   **f** $3 \times 2 = 12 \div 2$ T   F

c $2 \times 4 = 4 \times 2$ T   F   **g** $2 \times 3 = 6 \times 5 = 30$ T   F

d $2 \times 8 = 4 \times 4$ T   F   **h** $100 \div 2 = 25 \times 2$ T   F

2 Fill in the missing numbers to make each equation true.

a $16 = 4 \times \boxed{}$ **g** $25 \div 1 = \boxed{}$

b $2 \times \boxed{} = 4 \times 5$ **h** $60 = \boxed{} \times 6$

c $\boxed{} \times 10 = 30$ **i** $36 \div 3 = 6 \times \boxed{}$

d $12 \div 2 = \boxed{}$ **j** $18 \div 2 = \boxed{} \times 3$

e $20 \div \boxed{} = 4$ **k** $10 \times 10 = 50 \times \boxed{}$

f $\boxed{} \div 5 = 5$ **l** $10 \times 10 = 25 \times \boxed{}$

NAME _____   DATE _____

Number Puzzles page 2 of 2

3 Sara has 3 bags of shells. Each bag has 10 shells in it. Her brother Max has 5 bags of shells. Each bag has 6 shells in it.

Do Sara and Max have the same number of shells? _____

Use labeled sketches, numbers, and/or words to prove your answer.

4 Jan and Jess split 10 dollars evenly. Jody, Jamal, and Jasmin split 12 dollars evenly.

Did all the kids get the same amount of money? _____

Use labeled sketches, numbers, and/or words to prove your answer.

5 Write a word problem to go with each of the equations below.

a $3 \times 5 = 15$	**b** $20 \div 4 = 5$

NAME _____   DATE _____
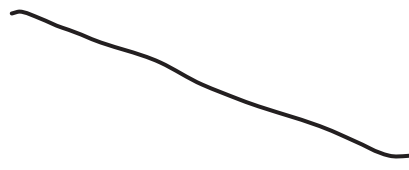
Set A1 ★ Independent Worksheet 1

More Number Puzzles

1 Draw a line from each expression on the left to the matching expression on the right.

example 3×5 5×1

a 6×10 2×8

b $20 \div 4$ $30 \div 2$

c 16×1 2×4

d $24 \div 3$ 15×2

e 6×4 8×3

f 6×5 2×30

2 Write an equal (=), greater than (>), or less than (<) sign in the circles to make each equation true.

example $2 \times 5 \;\bigcirc\!\!\!< \; 3 \times 4$

a $12 \div 4 \;\bigcirc\; 3 \times 1$ **b** $5 \times 1 \;\bigcirc\; 12 \div 3$ **c** $8 \times 2 \;\bigcirc\; 4 \times 4$

d $25 \div 5 \;\bigcirc\; 4 \times 2$ **e** $8 \times 4 \;\bigcirc\; 12 \times 2$ **f** $20 \div 2 \;\bigcirc\; 3 \times 5$

3 Dani says you can show the solution to $2 \times 5 \times 3$ with one equation:
$2 \times 5 = 10 \times 3 = 30$

Maya says you have to use two equations: $2 \times 5 = 10$, $10 \times 3 = 30$

Which girl is correct? _____   Explain your answer.

(Continued on back.)

Independent Worksheet 1 More Number Puzzles (cont.)

4 Andy had 30 marbles. He gave half of his marbles to his 3 cousins. His 3 cousins divided the marbles equally.

Jan had 48 marbles. She gave half of her marbles to her 4 cousins. Her 4 cousins divided the marbles equally.

Whose cousins got more marbles, Andy's cousins or Jan's cousins? _____

Use labeled sketches, numbers, and/or words to prove your answer.

5 Circle the expression that best represents this problem. Then find the answer. Show your work.

Tim went to the pet store. He saw 3 cages of mice. There were 4 mice in each cage. He also saw 2 cages of hamsters. There were 6 hamsters in each cage. How many animals did Tim see in all?

$(3 \times 2) + (6 \times 4)$ $(3 \times 4) + (2 \times 6)$ $(4 \times 1) + (2 \times 3)$

CHALLENGE

6 Use the digits 0–9 each just one time. Write them in the boxes below. Make each multiplication problem correct.

0   1   2   3   4   5   6   7   8   9

NAME _____   DATE _____

Set A1 ★ Independent Worksheet 2

| INDEPENDENT WORKSHEET |

Expressions, Equations & Word Problems

1 Read each of the equations below. If it is true, circle the T. If it is false, circle the F.

a $12 = 24 \div 3$ T   F   **d** $7 \times 3 = 3 \times 7$ T   F

b $4 \times 6 = 12 \times 2$ T   F   **e** $32 \div 8 = 3 \times 2$ T   F

c $5 \times 3 = 15 \div 3$ T   F

2 Circle the expression that best represents each word problem below. Then find the answer.

a Jason had 15 carrots. He divided them equally among his 3 rabbits.

   15×3 $15 + 3$ $15 - 3$ $15 \div 3$

Each rabbit got _____ carrots.

b Sara had 3 dogs. She gave them each 6 dog treats. How many treats did she give them in all?

   3×6 $18 \div 3$ $3 + 6$ $6 - 3$

Sara gave her dogs _____ treats in all.

| CHALLENGE |

c Jenny was making a fruit plate. She had 6 apples and 7 pears. She cut each piece of fruit into 8 slices. How many slices of fruit did Jenny cut altogether?

$6 \times 7 \times 8$ $(6 \times 8) + (7 \times 8)$ $(7 \times 8) - (6 \times 8)$

Jenny cut _____ slices of fruit altogether?   (Continued on back.)

Independent Worksheet 2 Expressions, Equations & Word Problems (cont.)

3 Write a word problem to match each of the expressions below. Then find the answer.

a 24 × 2

The answer is _____.

b 25 ÷ 5

The answer is _____.

CHALLENGE

c (4 × 5) + (3 × 7)

The answer is _____.

4 Use the digits 0–9 each just one time. Write them in the boxes below. Make each multiplication problem correct.

0   1   2   3   4   5   6   7   8   9

$$\begin{array}{c} \boxed{} \\ \times\ \boxed{} \\ \hline \boxed{2}\,\boxed{4} \end{array} \qquad \begin{array}{c} \boxed{3} \\ \times\ \boxed{} \\ \hline \boxed{1}\,\boxed{} \end{array} \qquad \begin{array}{c} \boxed{3} \\ \times\ \boxed{} \\ \hline \boxed{2}\,\boxed{} \end{array} \qquad \begin{array}{c} \boxed{} \\ \times\ \boxed{2} \\ \hline \boxed{}\,\boxed{0} \end{array} \qquad \begin{array}{c} \boxed{} \\ \times\ \boxed{5} \\ \hline \boxed{3}\,\boxed{} \end{array}$$

BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set A2 Number & Operations: Basic Multiplication & Division

Includes

Skills & Concepts

★ use multiplication arrays to solve problems

★ apply commutative, associative, distributive, identity, and zero properties to solve multiplication problems

★ recall basic multiplication facts through 12 × 12 and the corresponding division facts

★ multiply any number from 11 to 19 by single-digit numbers using the distributive property and appropriate place value concepts

★ solve and create word problems that match multiplication or division equations

★ analyze the result of multiplying odd and even numbers has on the outcome

Bridges in Mathematics Grade 3 Supplement
Set A2 Numbers & Operations: Basic Multiplication & Division

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set A2 ★ Activity 1

ACTIVITY

Multiplying by 11

Overview
Students explore various strategies for multiplying by 11, and then they complete a related worksheet.

Skills & Concepts
★ use multiplication arrays to solve problems

★ apply commutative, associative, distributive, identity, and zero properties to solve multiplication problems

You'll need
★ Multiplying by 11 (page A2.4, class set)

★ overhead base 10 pieces

★ base 10 pieces (1 set for every pair of students)

Instructions for Multiplying by 11

1. Tell students you are going to show them a multiplication problem. Ask them to think privately about the answer and give the thumbs up signal when they have it. Then write 2×11 on the board or overhead. When most thumbs are up, have students pair-share their solutions and strategies, and then invite volunteers to share with the class.

> **Olivia** I got 22. I know that 2×10 is 20, and so 2×11 would just be 2 more. That's 22.

> **Tag** I added $11 + 11$. It's 22.

> **Hayley** I already know my 11's from my big sister. You just get 2 of the same number, so 2×11 is 22.

2. Now give each pair of students a set of base 10 pieces. Explain that you're going to show them another multiplication problem. This time, you want them to work together to build it with the pieces, even if they already know the answer. Write 3×11 on the board and give them a minute to work. Most likely, some will finish much more quickly than others. Invite some of the early finishers to the overhead to share their strategies.

> **Teacher** Trevon, you and Thayne really finished quickly. Would you two be willing to come up to the overhead to show us how you built 3×11?

> **Trevon** First we started using the little squares. We were going to make 3 piles of 11. But then we saw that we could use the strips, so we did it like this.

> **Thayne** You can see the answer is 33 because it's 10, 20, 30, and then 3 more.

> **Dani** The same thing happened with us! We were starting to make a 3×11 rectangle and then we saw that we could use the strips instead of having to make the whole thing with little squares.

Activity 1 Multiplying by 11 (cont.)

> **Angelica**   *See? It's still a 3 × 11, but it's way quicker to make it with the strips. Then you don't have to put 33 little squares together.*

3. If none of your students share a strategy that involves using the 10-strips instead of individual units, show it yourself. Then ask student pairs to use the strategy to build 4 × 11 and 5 × 11 arrays.
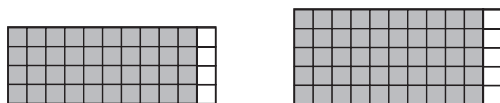
4. List all the combinations you've covered so far, including 1 × 11. Ask students to supply the answer for each as you list it. What observations can they make about these facts?

$$1 \times 11 = 11$$
$$2 \times 11 = 22$$
$$3 \times 11 = 33$$
$$4 \times 11 = 44$$
$$5 \times 11 = 55$$

> **Students**   *It's like Hayley said! The answer is just 2 of the same number every time.*
> *Every answer is 11 more, like 22 + 11 is 33, and 33 + 11 is 44.*
> *It's kind of like counting by 10's.*

5. Write 9 × 11, 10 × 11, and 11 × 11 on the board. Ask students to make conjectures about the answers based on the observations they just shared.

> **Students**   *9 × 11 will be 99 for sure.*
> *10 × 11 will probably be 101, or maybe 111.*
> *Maybe 11 × 11 will be 1111. That one's hard.*

6. Now ask student pairs to build all 3 combinations. Encourage them to trade for mats when possible; otherwise, they'll soon run out of strips.

9 × 11   10 × 11   11 × 11 (Ramon's way)   11 × 11 (Jade's way)
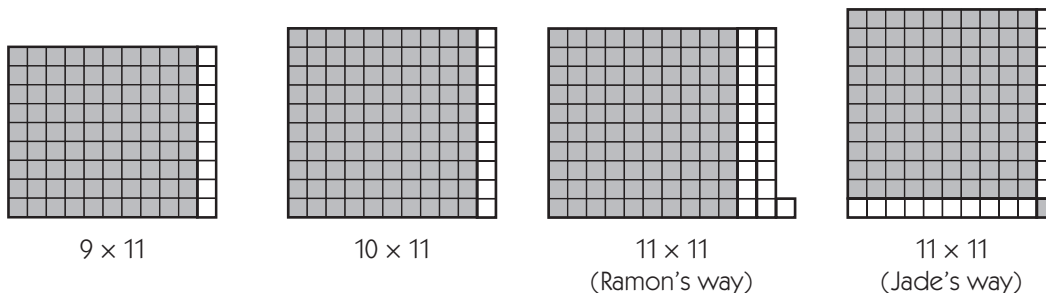
You may see a variety of strategies, especially for 11 × 11. Invite volunteers to share their thinking at the overhead.

Activity 1 Multiplying by 11 (cont.)

> ***Ramon*** *After we did 10 × 11, we just added on 1 more strip and 1 more little square. In all, it made 121.*
>
> ***Jade*** *We decided to make an 11 by 11 array. It worked really great because you can make it into a square. It takes a mat, 2 strips, and a unit, so that's 121.*

7. Give each student a copy of Multiplying by 11. Review the sheet together. Encourage students to share and compare their strategies and solutions as they work and when they're finished.

NAME _____   DATE _____

Multiplying by 11

1 Solve the problems below. Use your base 10 pieces to help if you want.

$3 \times 11 =$ _____ $11 \times 5 =$ _____ $7 \times 11 =$ _____

4	6	10	11	11	2
× 11	× 11	× 11	× 8	× 9	× 11
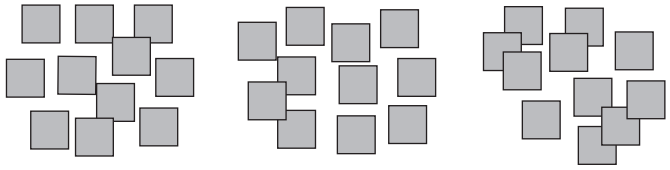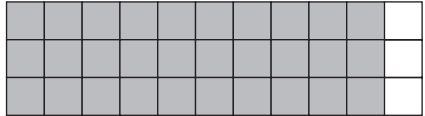
2 Zack used his base 10 pieces to build this picture of 3×11. Jon used his base 10 pieces to build it a different way.

Zack's Way	Jon's Way

a Write a number sentence below the picture in each box to show the total number of units.

b Which way do you like better? Why?

3 Jenna is starting a sticker book. There are 5 rows of stickers on each page, and each row has 11 stickers. So far, she's filled 2 pages. How many stickers is that in all?

Use numbers, pictures, and/or words to solve the problem. Show all of your work on the back of this sheet.

Set A2 ★ Activity 2

ACTIVITY

Multiplying by 12

Overview

Students explore various strategies for multiplying by 12, and then complete a related worksheet.

Skills & Concepts

★ use multiplication arrays to solve problems

★ apply commutative, associative, distributive, identity, and zero properties to solve multiplication problems

You'll need

★ Multiplying by 12 (page A2.8, class set)

★ overhead base 10 pieces

★ base 10 pieces (1 set for every pair of students)

Instructions for Multiplying by 12

1. Tell students you are going to show them a multiplication problem. Ask them to think privately about the answer and give the thumbs up signal when they have it. Then write 2 × 12 on the board or overhead. When most thumbs are up, have students pair-share their solutions and strategies, and then invite volunteers to share with the class.

> **Casey** *I got 24. I know that 2 × 10 is 20, and then it's 4 more for the 2 × 2.*

> **Rosa** *I added 12 + 12. It's 24.*

2. Now give each pair of students a set of base 10 pieces. Explain that you're going to show them another multiplication problem. This time, you want them to work together to build it with the pieces, even if they already know the answer. Write 3 × 12 on the board and give them a minute to work. Most likely, some will finish much more quickly than others. Invite some of the early finishers to the overhead to share their strategies.

> **Teacher** *Brisa, you and Angelica finished very quickly. Would you two be willing to come up to the overhead to show us how you built 3 × 12?*

> **Brisa** *First we started using the little squares. We were going to make 3 piles of 12. But then we saw that we could use the strips, so we did it like this.*

> **Angelica** *You can see the answer is 36 because it's 10, 20, 30, and then 6 more.*

> **Ray** *That's what we got too. We were starting to make a 3 × 12 rectangle and then we saw that we could use the strips instead of having to make the whole thing with little squares.*
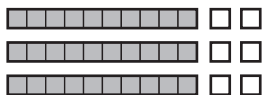
Activity 2 Multiplying by 12 (cont.)

> ***Austin*** *See? It's still a 3 × 12, but it's way quicker to make it with the strips. Then you don't have to put 36 little squares together.*

3. If none of your students share a strategy that involves using the 10-strips instead of individual units, show it yourself. Then ask student pairs to use the strategy to build 4 × 12 and 5 × 12 arrays.
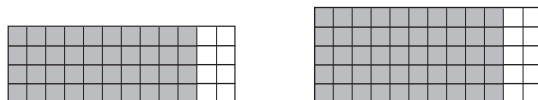
4. List all the combinations you've covered so far, including 1 × 12. Ask students to supply the answers as you write each. What observations can they make about these facts?

$$1 \times 12 = 12$$
$$2 \times 12 = 24$$
$$3 \times 12 = 36$$
$$4 \times 12 = 48$$
$$5 \times 12 = 60$$

> ***Students*** *It adds 12 more each time because 12 + 12 is 24, and 24 + 12 is 36.*
> *Every answer starts with the same number, like 1 × 12 is 12, 2 × 12 is 24, 3 × 12 is 36. It works until you get up to 5 × 12.*
> *All the answers are even numbers.*

5. Continue to have students build the 12's facts up through 12 × 12. Ask them to predict the answer before they build each combination. List them on the board as you go so that students can see the entire set when you're finished.

6. Now have students brainstorm a list of things that come in 12's. Record their ideas on the whiteboard next to the list of facts.

$1 \times 12 = 12$ $7 \times 12 = 84$	Things that come in 12's	
$2 \times 12 = 24$ $8 \times 12 = 96$	• eggs	• numbers on the clock
$3 \times 12 = 36$ $9 \times 12 = 108$	• donuts	• months in the year
$4 \times 12 = 48$ $10 \times 12 = 120$	• inches on a ruler	• new pencils
$5 \times 12 = 60$ $11 \times 12 = 132$	• cookies	• anything in a dozen
$6 \times 12 = 72$ $12 \times 12 = 144$		

Activity 2 Multiplying by 12 (cont.)

7. Pose some related story problems. Ask students to listen carefully and give the thumbs up sign when they have the answer. Here are a few examples:

• Jaret's dad bought 3 dozen eggs at the store yesterday. How many eggs was that in all?

• Mrs. Benson bought 120 new pencils for her third graders. There were 12 in each box. How many boxes did she buy?

• Lateva's sister is 48" tall. How many feet is that?

• Mr. Hernandez made 84 cookies for the bake sale. He put them in bags of a dozen. How many bags did he have when he was finished?

• The gym teacher went to the sporting goods store to buy 3 dozen tennis balls. The store was having a special—2 extra balls with every dozen. How many balls did she have in her bag when she left the store?

8. Give each student a copy of Multiplying by 12. Review the sheet together. Encourage students to share and compare their strategies and solutions as they work and when they're finished.

INDEPENDENT WORKSHEET

See Set A2 Independent Worksheets 1–8 for more multiplication practice.

NAME _____   DATE _____

Multiplying by 12

1 Solve the problems below. Use your base 10 pieces to help if you want.

$4 \times 12 =$ _____ $12 \times 2 =$ _____ $5 \times 12 =$ _____

$$\begin{array}{r} 3 \\ \times\ 12 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ \times\ 12 \\ \hline \end{array} \qquad \begin{array}{r} 8 \\ \times\ 12 \\ \hline \end{array} \qquad \begin{array}{r} 12 \\ \times\ 7 \\ \hline \end{array}$$

2 Use numbers, pictures, and/or words to solve each of the problems below. Show all of your work. Use the back of this sheet if you need more room.

a Mrs. Green bought granola bars for the third grade field trip. There were 12 bars in a box. She bought 6 boxes and then found 4 more bars in her cupboard at school. How many bars did she have in all?

b There were 34 students in Mrs. Green's class. Were there enough granola bars for each of them to have 2?

c Mr. Lee got 8 dozen pencils from the office. So far, he's given each of his third graders 3 pencils. He has 27 students. How many pencils does he still have left?
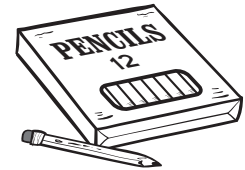
CHALLENGE

3 Write your own story problem about 12's on another piece of paper. Solve it and then tape a flap over your work. Give it to someone else in your class to solve.

NAME _____   DATE _____

Set A2 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Multiplying & Dividing on the Number Line
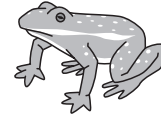
1 Marina the Frog says you can solve 3×5 on a number line. She says if you start at zero and take 3 equal jumps of 5, you will land on the answer. Here is her picture.

a Did Marina get the right answer to the problem?

b Why did she start at 0 instead of 1?

2 Marina made another number line picture.
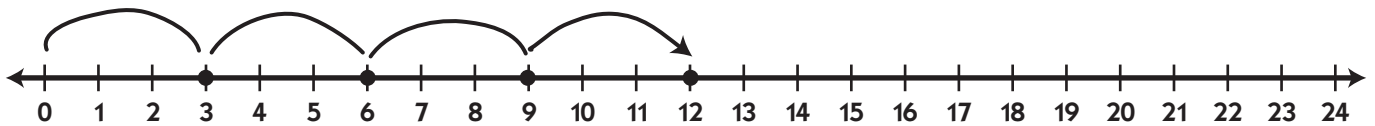
a Which multiplication problem is she trying to solve? (circle one)

2×3 4×4 4×3 2×6

b Why did you circle that one?

3 Here is another number line picture from Marina.

a Write a multiplication equation to go with Marina's picture.

_____ $\times$ _____ $=$ _____

(Continued on back.)

Independent Worksheet 1 Multiplying & Dividing on the Number Line (cont.)

4 Draw on the number lines below to show and solve multiplication problems a, b, and c.

a 3 × 4 = _____

```
←——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——→
   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
```

b 5 × 2 = _____

```
←——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——→
   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
```

c 3 × 7 = _____

```
←——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——→
   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
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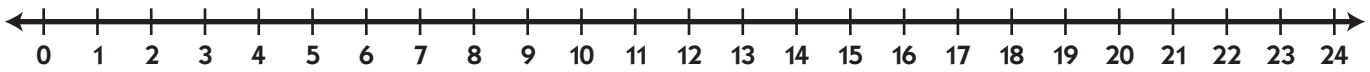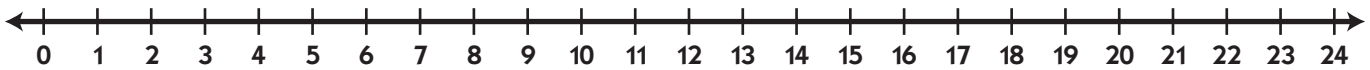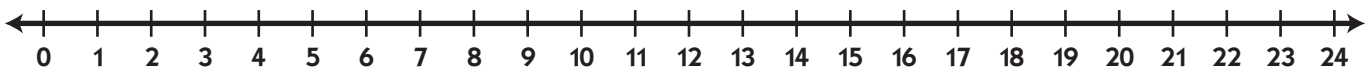
5 Catalina the Cat said, "I tried your idea, Marina. It doesn't work. Here is my picture. I know that 6 × 2 is 12, but I got 13 with your idea!"

```
←——+——+——+——●——+——●——+——●——+——●——+——●——+——●——+——+——+——+——+——+——+——+——+——+——+——→
   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
```
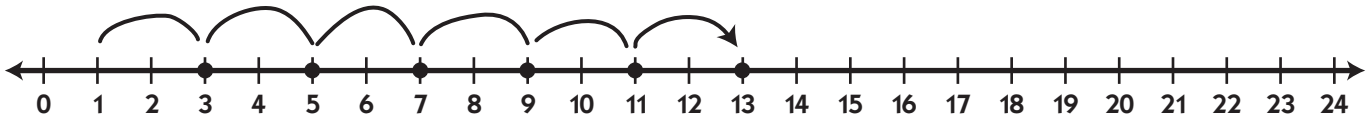
a Why did Catalina get the wrong answer to 2 × 6 with her picture?

b Use the number line to solve this word problem. Then write an equation to match. DJ Jumpy Frog started at zero. He made 6 jumps of 3. What number did he land on?
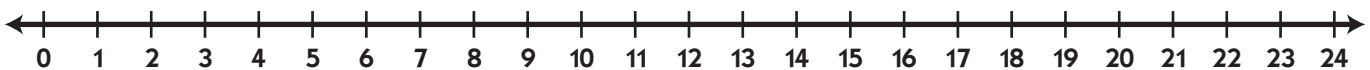
```
←——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——+——→
   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
```

_____ × _____ = _____   (Continued on next page.)

NAME _____ DATE _____

Independent Worksheet 1 Multiplying & Dividing on the Number Line (cont.)

6 DJ Jumpy Frog says you can also use the number line to show and solve division problems. He says to solve $14 \div 2$, you start at 14. Then you take equal hops of 2 all the way back to 0. If you count the number of hops, you get the answer.
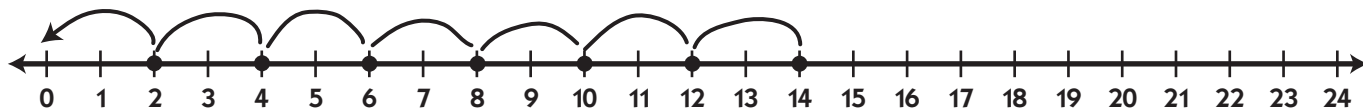
a How many hops did it take DJ to get back to 0?

b Did he get the right answer to $14 \div 2$?

c Why did he take hops of 2 instead of 3?

7 Here is another number line picture from DJ.
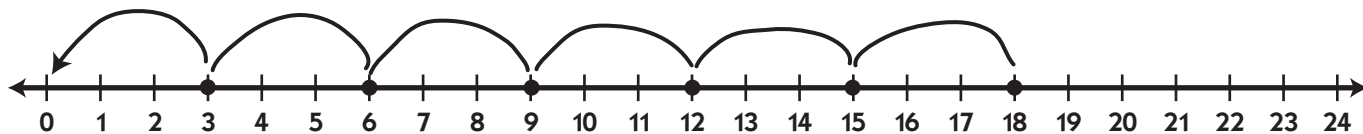
a Write a division equation to go with DJ's picture.

_____ ÷ _____ = _____

8 Use the number lines below to show and solve division problems a and b.

a $12 \div 3 =$ _____
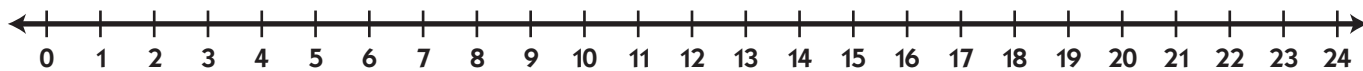
b $24 \div 4 =$ _____
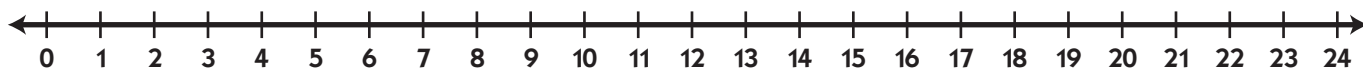
NAME _____ DATE _____

Set A2 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

Multiplying Odd & Even Numbers

1 Get a friend or family member to play a game with you. Decide now who will play for even numbers and who will play for odd numbers.

Even Numbers _____   Odd Numbers _____
        Partner A   Partner B

- Get two dice dotted or numbered 1, 2, 3, 4, 5, 6.
- Roll the dice and multiply the 2 numbers.
- Write a multiplication equation on the chart below to show what you rolled.
- If the product is even, Player A gets 1 point. If the product is odd, Player B gets 1 point.
- Take turns rolling the dice you fill all the lines on this page and the next.
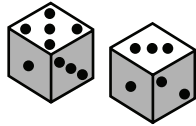
Example $3 \times 5 = 15$ 15 is an odd number, so Partner B scores 1 point.

	MULTIPLICATION SENTENCE	EVEN PRODUCT	ODD PRODUCT
Ex	$3 \times 5 = 15$		X
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Independent Worksheet 2 Multiplying Odd & Even Numbers (cont.)

	MULTIPLICATION SENTENCE	EVEN PRODUCT	ODD PRODUCT
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
	Total Score		

2 Who won the game?

3 Do you think this is a fair game? Why or why not?

Independent Worksheet 2 Multiplying Odd & Even Numbers (cont.)

4 Fill in the multiplication table below. Some of the products are already filled in for you.

×	1	2	3	4	5	6
1		2				
2						12
3			9			
4	4					
5		10				
6					30	

5 After you fill in the whole chart, color the boxes with even products yellow. Color the boxes with odd products red.

6 Are there more even or odd products? _____

7 What happens when you multiply an even number times an even number? Use numbers, labeled sketches, and words to show.

8 What happens when you multiply an odd number times an odd number? Use numbers, labeled sketches, and words to show.

9 What happens when you multiply an odd number times an even number? Use numbers, labeled sketches, and words to show.

NAME _____   DATE _____
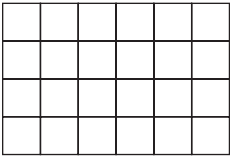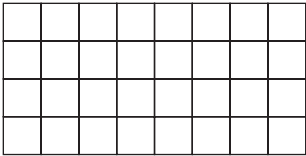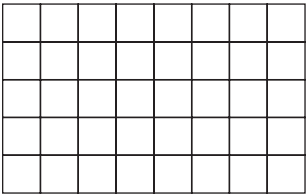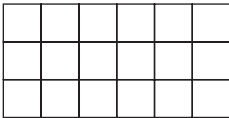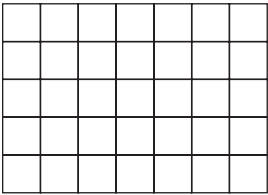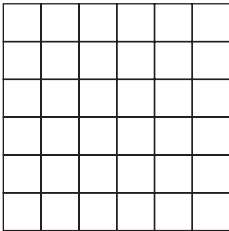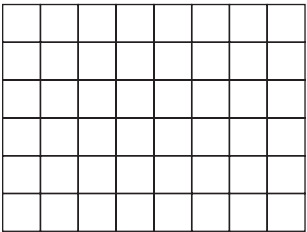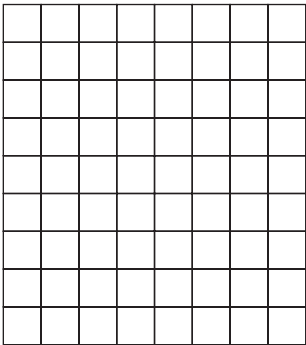
Set A2 ★ Independent Worksheet 3

An Array of Fact Families

Write the fact family for each array. The first one has been done for you.

example	1
$4 \times 6 = 24$ $6 \times 4 = 24$ $24 \div 6 = 4$ $24 \div 4 = 6$	
2	**3**
4	**5**
6	**7**

(Continued on back.)

Independent Worksheet 3 An Array of Fact Families (cont.)

8

9

10

11

12

13

14

15

Set A2 Number & Operations: Basic Multiplication & Division Blackline Use anytime after Set A2 Activities 1 & 2. Run a class set..
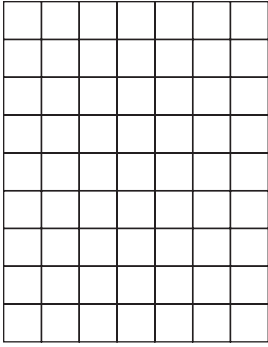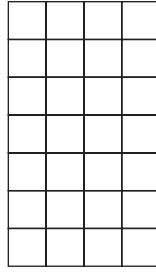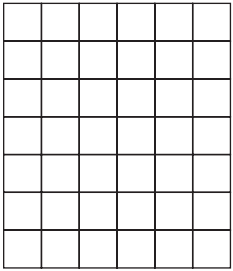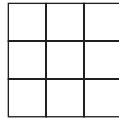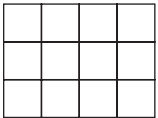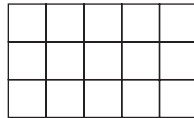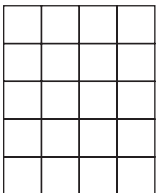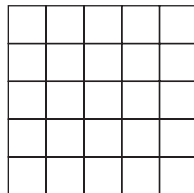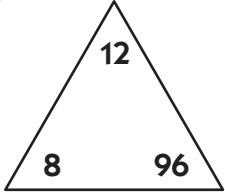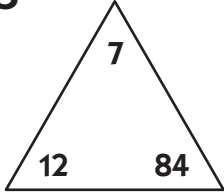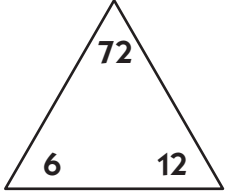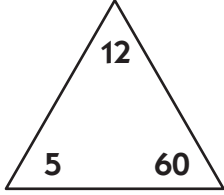
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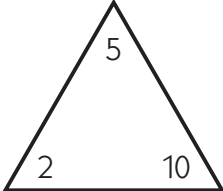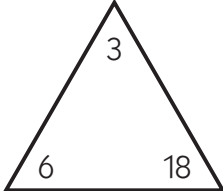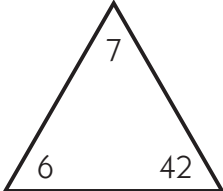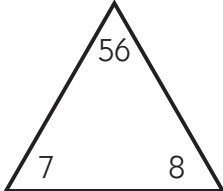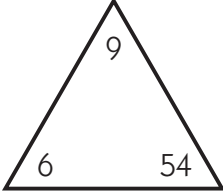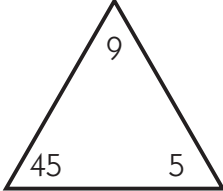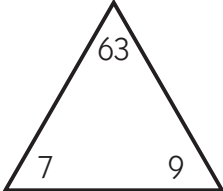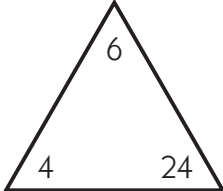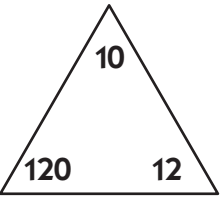
Set A2 ★ Independent Worksheet 4

INDEPENDENT WORKSHEET

Fact Family Triangles
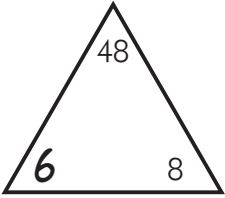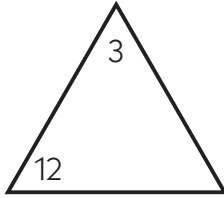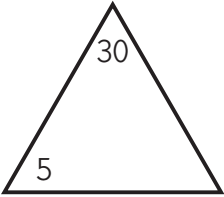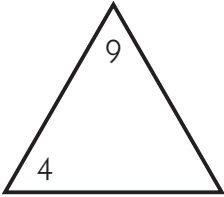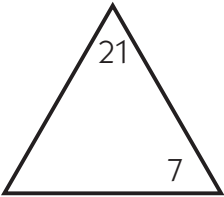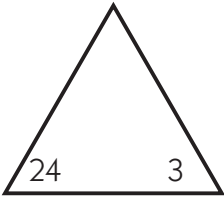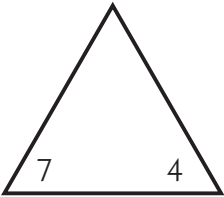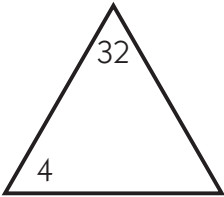
1 2 × 4 and 4 × 2 are 8. 8 ÷ 2 = 4 and 8 ÷ 4 = 2. Can you see how 2, 4, and 8 are related? That's why they're called a fact family. Each of the triangles below shows a fact family. Write 2 multiplication and 2 division facts for each family. The first one has been done for you.
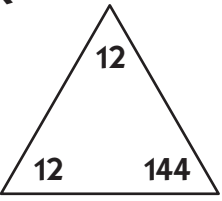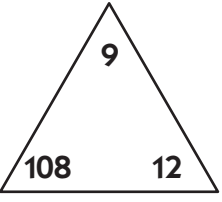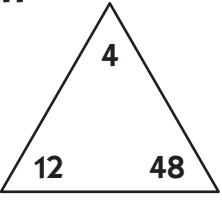
example	a
5 / 2 / 10 — $2 \times 5 = 10$ / $5 \times 2 = 10$ / $10 \div 2 = 5$ / $10 \div 5 = 2$	3 / 6 / 18
b 7 / 6 / 42	**c** 56 / 7 / 8
d 9 / 6 / 54	**e** 9 / 45 / 5
f 63 / 7 / 9	**g** 6 / 4 / 24

(Continued on back.)
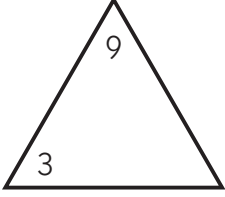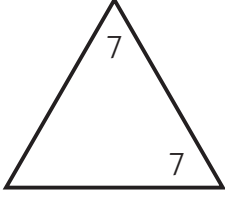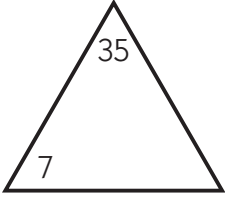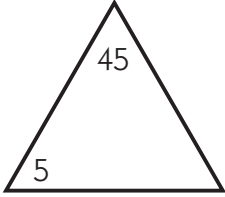
Independent Worksheet 4 Fact Family Triangles (cont.)

2 Several Fact Families went to the amusement park. One member of each family got lost. Write in the missing member of each family. The first one has been done for you.

example	**a**
48 / 6 / 8	3 / 12
Write in 6 because 6 × 8 = 48	Hint: 3 times what equals 12?
b	**c**
30 / 5	9 / 4
d	**e**
21 / 7	24 / 3
f	**g**
7 / 4	32 / 4

(Continued on next page.)

Independent Worksheet 4 Fact Family Triangles (cont.)

h	i
9 3	7 7

j	k
35 7	45 5

CHALLENGE

3 Nine of the fact families whose members are all less than 100 have "twins" or two family members that are the same number. One of these families is $6 \times 6 = 36$ and $36 \div 6 = 6$ Another is $3 \times 3 = 9$ and $9 \div 3 = 3$ List the other fact families whose members are less than 100 that have twins. One of these families has triplets–which one?

NAME _____   DATE _____

Set A2 ★ Independent Worksheet 5
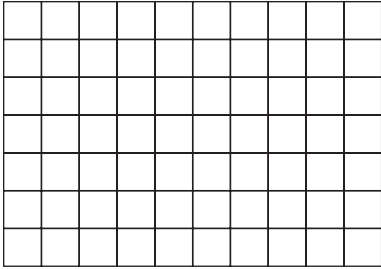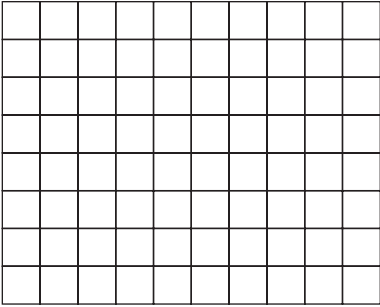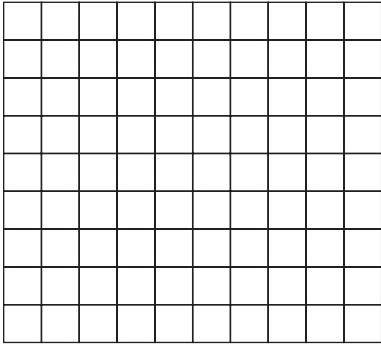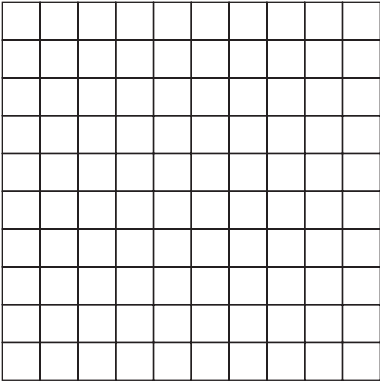
Fact Families for the 10's

Write the fact family for each array. The first one has been done for you.

example	a
$1 \times 10 = 10$ $10 \times 1 = 10$ $10 \div 1 = 10$ $10 \div 10 = 1$	
b	**c**
d	**e**

(Continued on back.)

Independent Worksheet 5 Fact Families for the 10's (cont.)

f	g
h	i

2 Describe the pattern for multiplying any number by 10.

⚡ **CHALLENGE**

3 Describe the pattern for multiplying any number by 100.

4 Describe the pattern for multiplying any number by 1000.

NAME _____   DATE _____

Set A2 ★ Independent Worksheet 6

Multiplying by 11's & 12's

1 Sam and Terra built some multiplication arrays with base 10 pieces. For each of their arrays:
• label the dimensions.
• write 2 different number sentences to show how many units there are.

example	a
11 4 Number sentences $11 + 11 + 11 + 11 = 44$ $4 \times 11 = 44$	 Number sentences
b Number sentences	**c** Number sentences

(Continued on back.)

Independent Worksheet 6 Multiplying by 11's & 12's (cont.)

2 Holly and Micah used dimes and pennies to show some multiplication facts. Write a multiplication sentence to show how much money is shown in each arrangement.

example	**a**
Multiplication sentence $2 \times 12 ¢ = 24 ¢$	Multiplication sentence
b	**c**
Multiplication sentence	Multiplication sentence
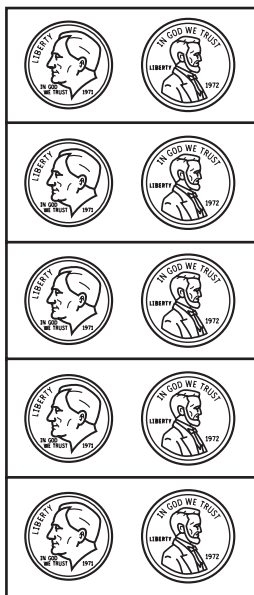
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Independent Worksheet 6 Multiplying by 11's & 12's (cont.)

3 Use dimes and pennies or base 10 pieces to build each of the multiplication facts below. Sketch and label your work.

a $7 \times 11 =$ _____	**b** $4 \times 12 =$ _____

4 Use numbers, pictures, and/or words to solve each of the problems below. Show all of your work. Attach another piece of paper if you need more room.

a King School is holding a bake sale. Jose's mom brought 2 dozen chocolate chip cookies, and Jana's dad brought 3 dozen peanut butter cookies. The helpers took the cookies out of their bags and put them on plates. They put 10 on every plate. How many plates did they need?

b Siri was helping his mom plant a garden. They planted 7 rows of lettuce. Four of the rows had 11 lettuce plants. Three of the rows had 12 lettuce plants. How many lettuce plants did they plant in all?

NAME _____   DATE _____
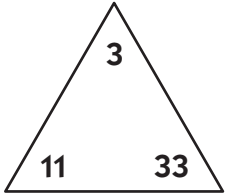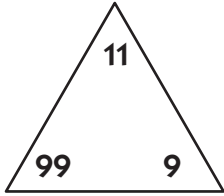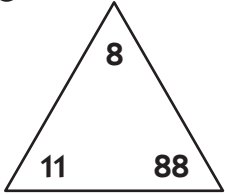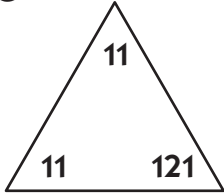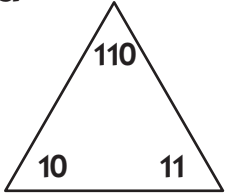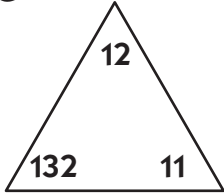
Set A2 ★ Independent Worksheet 7

INDEPENDENT WORKSHEET

Meet the 11's & 12's Families

1 Write 2 multiplication and 2 division facts for each family. The first one has been done for you.

example	**a**
3 / 11 \ 33 $3 \times 11 = 33$ $11 \times 3 = 33$ $33 \div 3 = 11$ $33 \div 11 = 3$	11 / 99 \ 9
b 8 / 11 \ 88	**c** 11 / 11 \ 121
d 110 / 10 \ 11	**e** 12 / 132 \ 11
f 12 / 8 \ 96	**g** 7 / 12 \ 84
h 72 / 6 \ 12	**i** 12 / 5 \ 60

(Continued on back.)

Independent Worksheet 7   Meet the 11's & 12's Families (cont.)

j	k
 10 120 12	 12 12 144
l	m
 9 108 12	 4 12 48

2 Fill in the multiplication and division tables below. Some of the answers have been filled in for you.

×	2	5	7	3	1	4	8	6	10	11	9	12
11	22					44					99	

÷	55	88	132	22	77	121	11	33	99	44	110	66
11		8					1					6

×	2	5	7	3	1	4	8	6	10	11	9	12
12		60			12				120			

÷	60	12	120	24	96	108	36	144	48	84	132	72
12		1		2						7		

NAME _____   DATE _____

Set A2 ★ Independent Worksheet 8

The Frog Jumping Contest

Today is the big frog jumping contest! Help Marina, DJ, and the other frogs solve some jumping problems.

• Use numbers, words, and/or labeled sketches to solve the problems.
• Show all your work.
• Write your answer on the line.
• Write an equation to match the problem.

1 Marina's first jump was 6 feet long. There are 12 inches in a foot. How many inches did she jump?

Marina jumped _____ inches.

Matching equation: _____
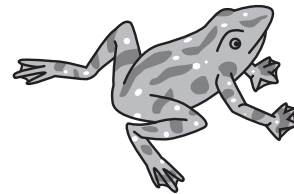
2 DJ's first jump was 2 yards long. There are 36 inches in a yard. How many inches did he jump?

DJ jumped _____ inches.
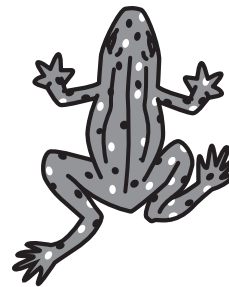
Matching equation: _____

3 Hooper's first jump was 84 inches long. How many feet did he jump?

Hooper jumped _____ feet.

Matching equation: _____
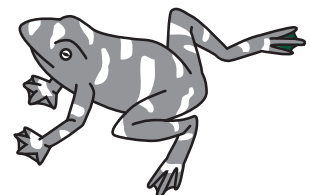
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Independent Worksheet 8 The Frog Jumping Contest (cont.)

4 In the second round, DJ jumped 4 feet. Hooper jumped 65 inches. Which frog jumped farther? How many inches farther did that frog jump?

_____ jumped _____ inches farther.

Matching equation(s) _____

5 On the multi-jump event, Marina took 4 hops. Each hop was 6 feet long. How many feet did she jump in all? Use the number line to show this problem and find the answer.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
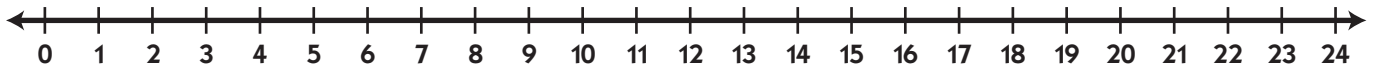
Marina jumped _____ feet in all.

Matching equation _____

6 On the multi-jump event, Hooper jumped 24 feet in all. He did it in 3 equal jumps. How many feet long was each of the 3 jumps? Use the number line to show this problem and find the answer.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
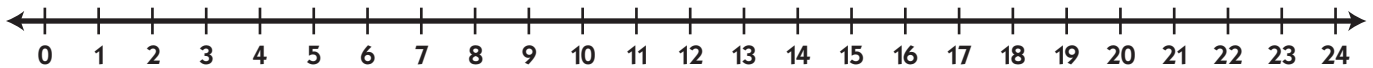
Each of the 3 jumps was _____ feet long.

Matching equation _____

7 In the third round, DJ jumped 3 yards. There are 36 inches in a yard. How many inches did he jump?

DJ jumped _____ inches.

Matching Equation _____

(Continued on next page.)

NAME _____   DATE _____

Independent Worksheet 8 The Frog Jumping Contest (cont.)

8 Write your own word problem to match each of the expressions below. Solve your own problems.

a 12×12

_____

_____

_____

Answer: _____

b $36 \div 12$

_____

_____

_____

Answer: _____

BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set A3 Number & Operations: Multi-Digit Addition & Subtraction

Includes

Skills & Concepts

★ fluently add and subtract whole numbers accurately using the standard regrouping algorithms

★ solve contextual problems involving addition and subtraction of whole numbers and justify the solutions

★ fluently add and subtract whole numbers using the standard regrouping algorithms

★ estimate sums and differences to approximate solutions to problems and determine reasonableness of answers

★ solve single- and multi-step word problems involving addition and subtraction of whole numbers and verify the solutions

★ round whole numbers through 10,000 to the nearest ten, hundred, and thousand

Bridges in Mathematics Grade 3 Supplement
Set A3 Numbers & Operations: Multi-Digit Addition & Subtraction

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set A3 ★ Activity 1

ACTIVITY

Introducing the Standard Algorithm for Multi-Digit Addition

Overview
Students work in pairs to solve a triple-digit addition story problem. They share their strategies with the entire class while the teacher records each method in the form of a poster. The teacher then presents the standard algorithm and has the whole class practice using it to solve a variety of 3-digit addition problems.

Skills & Concepts
★ fluently add whole numbers accurately using the standard regrouping algorithm

★ solve contextual problems involving adding of whole numbers and justify the solutions

★ estimate sums to predict solutions to problems or determine reasonableness of answers

★ determine the question(s) to be answered given a problem situation

★ represent a problem situation using words, numbers, pictures, physical objects, or symbols

You'll need
★ Three-Digit Problems (page A3.6, run one copy on a transparency, optional class set on paper)

★ Student Math Journals or 1 piece of lined or grid paper per student

★ magnetic base ten pieces

★ set of base ten pieces for each pair of students

★ 3–4 blank overhead transparencies

★ 4–5 pieces of 12″ × 18″ white paper

★ marking pens

★ a piece of paper to mask portions of the overhead

Instructions for Introducing the Standard Algorithm for Multi-Digit Addition

1. Display only the first word problem on the overhead, covering the rest of the transparency with a piece of scratch paper. Read the problem out loud with the class and ask students to restate the question in their own words. Work with their input to underline any information that will help solve the problem. Then ask students to pair-share estimates, and call on a few volunteers to share their thinking with the class.

> **Set A2 Number & Operations: Multi-Digit Addition & Subtraction** Run one copy on a transparency. Optional, run a class set on paper.
>
> Name _____   Date _____
>
> **Three-Digit Problems**
>
> **1** The Scouts are collecting canned food to donate to the Food Bank in their town. Last Saturday, they collected 175 cans. This Saturday, they collected 168 cans. How many cans have they collected in all?

2. Have students work in pairs to solve the problem. Ask them to record all of their work, along with the solution, in their own journal. Explain that since they are working in pairs, you'd like everyone to record at least two different ways to solve the problem. Remind them that they can use sketches and numbers, and that the base 10 pieces are available as well. Circulate to observe and talk with students as they're working. Pass out blank overheads to at least 3 students, each of whom has used a different strategy, and ask them to copy their work onto the transparency to present to the class.

Activity 1 Introducing the Standard Algorithm for Multi-Digit Addition (cont.)

3. When most pairs are finished, ask the students you selected to share their solutions and explain their strategies at the overhead. Record each strategy on a separate piece of 12" x 18" drawing paper labeled with the student's name. Ask the contributing students to work with the rest of the class to name their strategies.

Jamal's Front-End Method

175
+ 168

100 + 100 = 200
70 + 60 = 130
5 + 8 = 13

200
130
+13
343 cans

Rhonda's Number Line Method

175
+ 168

100 + 25 + 25 = 150
150 + 18 = 168
If you start at 175 and hop up the line 168, you get to 343, so it's 343 cans.

Jenny's Sketch, Add & Count Method

175
+ 168

200 + 70 = 270
270, 280, 290, 300, 310, 320,
330, 335, 340, 343 cans

Sara's Make a Ten Fact Method

175
+ 168

Take 5 from 168 to make 175 into 180.

Then you have 180 + 163.

180 + 160 = 340
340 + 3 = 343 cans

Darryl's Start with the 1's Method

1 1
175
+ 168
343 cans

5 + 8 = 13
You have to move the 10 in the 13 over to the 10's column.

10 + 70 + 60 = 140
You have to move the 100 in 140 over to the 100's column.

100 + 100 + 100 = 300

4. Acknowledge everyone's strategies. If none of the students shared the standard algorithm, contribute it to the collection yourself by creating a poster similar to Darryl's above as students watch. Then explain that the class will revisit all of these strategies and possibly others in upcoming sessions. For now, however, you're going to focus on the method that starts with the 1s. This strategy is often called the regrouping method, and it's used by many adults for solving multi-digit addition problems.

Activity 1 Introducing the Standard Algorithm for Multi-Digit Addition (cont.)

5. Model the algorithm step-by-step with magnetic base 10 pieces at the whiteboard. First, record 257+169 on the board. Ask students to pair-share estimates, and then have several volunteers share their estimates and reasoning with the class. Next, draw and label a 3-column place value frame as shown below, and build both numbers with the magnetic base 10 pieces.
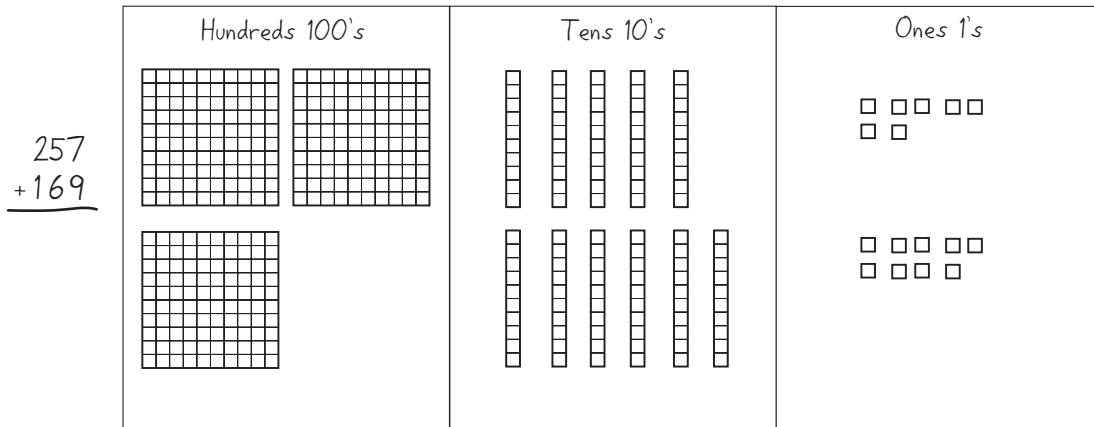
Hundreds 100's	Tens 10's	Ones 1's

$$\begin{array}{r} 257 \\ +169 \\ \hline \end{array}$$

6. Explain that this strategy starts from the back end of the number rather than the front end, with the 1s instead of the 100s. Ask students to add 7 + 9 mentally. Next, combine the units to confirm that the total is 16. Trade ten of the units in for a strip and move the strip over to the 10's column. Then record your action in numeric form. Ask students to explain what you've done so far. Why did you trade some of the units for a strip and move it over? Why did you write a 6 in the one's place and then record a 1 over the 5 in the ten's place?

Hundreds 100's	Tens 10's	Ones 1's

$$\begin{array}{r} 1 \\ 257 \\ +169 \\ \hline 6 \end{array}$$
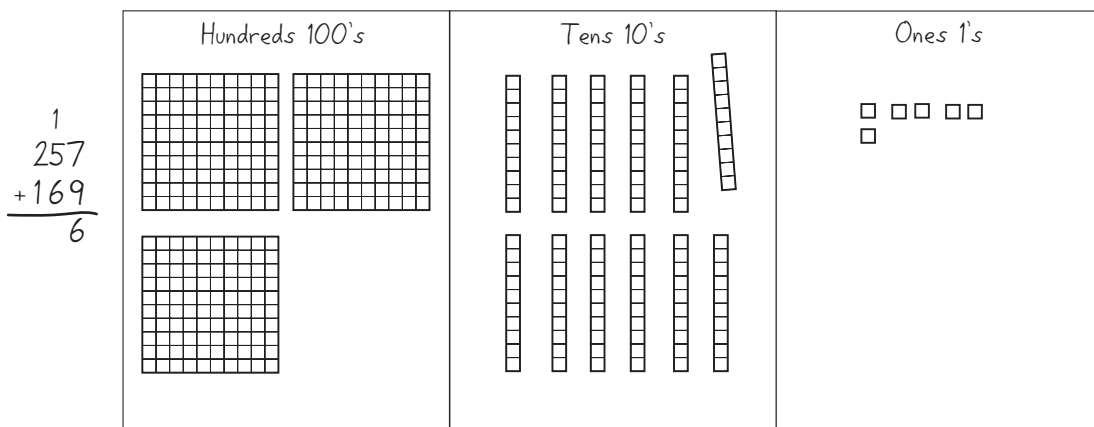
Students *Every time you get 10 in the 1's place, you have to move it over.*
It's kind of like when we played that game with 5's, remember? Every time we got 5 units, we had to trade them in for a strip and move it over. This is with tens instead.
You can't keep 16 in the 1's column.
If you just write down 16 below the line, you'll get an answer that's really big, like 3,116 or something like that. It won't make sense.

7. Ask students to take a careful look at the strips. What quantities do they see in each row? Then have them read the numbers in the ten's column. The digits are 1, 5, and 6. Is that really what's being added? Why or why not?

Activity 1 Introducing the Standard Algorithm for Multi-Digit Addition (cont.)

> ***Students*** *It looks like you're adding 1 + 5 + 6, but it's really 10 + 50 + 60.*
> *You can see what you're really adding if you look at the strips.*
> *You can also just tell if you look at where the numbers are. They're in the ten's place. They're tens, not ones.*

8. Ask students to add 10 + 50 + 60 mentally and report the results. Then combine the strips to confirm that the total is 120, and trade in 10 of the strips for a mat. Move the mat to the 100's column. Explain that the trading you're doing is called regrouping, because you're regrouping 1s into 10s, and 10s into 100s. Record the action, and then add up the hundreds to complete the problem. Does the answer make sense? Why or why not?
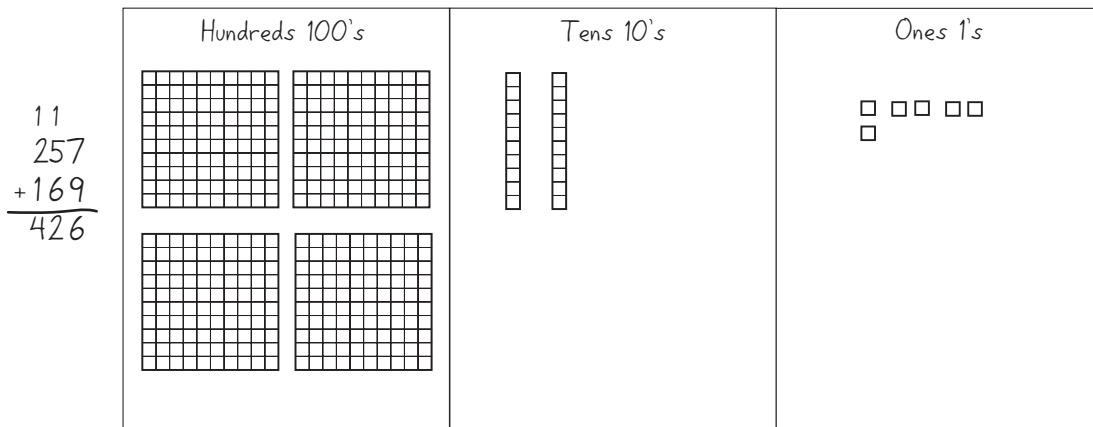
9. Erase the problem and remove the pieces from the three-column frame as helpers distribute base 10 pieces to every student pair. Repeat Steps 5 through 8 with the combinations below. Have students model each action with their base 10 pieces as you work with the magnetic pieces at the board and record each step with numbers. Have children estimate a solution to each problem and explain their estimates before using the pieces to find the answer.

$$
\begin{array}{r} 126 \\ + 137 \\ \hline \end{array}
\qquad
\begin{array}{r} 148 \\ + 162 \\ \hline \end{array}
$$

10. Then ask students to put their base 10 pieces aside for a few minutes. Repeat Steps 5 through 8 with the combinations below. Explain that you'll work with the base 10 pieces at the board while they record your actions with numbers in their journals. Have a volunteer come up to the board to do the recording while you work with the pieces. Continue to discuss the actions you're taking, in terms of regrouping 1s and 10s.

$$
\begin{array}{r} 259 \\ + 261 \\ \hline \end{array}
\qquad
\begin{array}{r} 108 \\ + 294 \\ \hline \end{array}
$$

11. If time remains, display the rest of the Three-Digit Problems overhead. Have students choose and solve one or more of the problems in their journals, using the regrouping strategy you shared today. Circulate as they work to identify students who will probably need more support to develop proficiency with this strategy. Encourage students to use their base 10 pieces if necessary.

Activity 1 Introducing the Standard Algorithm for Multi-Digit Addition (cont.)

Set A2 Number & Operations: Multi-Digit Addition & Subtraction Run one copy on a transparency. Optional, run a class set on paper.

Name _____ Date _____

Three-Digit Problems

1 The Scouts are collecting canned food to donate to the Food Bank in their town. Last Saturday, they collected 175 cans. This Saturday, they collected 168 cans. How many cans have they collected in all?

Choose and solve one or more of the problems below. Use the regrouping strategy.

2 The third graders did a play last week. They did one show for the other kids in the school, and one show for their families. 238 people came to the first show. 154 people came to the second show. How many people in all watched the show?

3 There are 137 kindergartners, 139 first graders, and 153 second graders at Wood Primary School. How many students are there in all?

$$\begin{array}{c} 329 \\ +\ 217 \\ \hline \end{array} \qquad \begin{array}{c} 258 \\ +\ 171 \\ \hline \end{array} \qquad \begin{array}{c} 105 \\ +165 \\ \hline \end{array} \qquad \begin{array}{c} 243 \\ +\ 158 \\ \hline \end{array} \qquad \begin{array}{c} 187 \\ +211 \\ \hline \end{array}$$

Extension

• Give each student a copy of Three-Digit Problems and ask them to complete all the problems. Have them work directly on the sheet instead of working in their journals. Give them time to complete any unfinished problems during a seat work period, or have them take the sheet home to complete and bring back to school.

⋯⋯⋯

Note *Save the strategy charts from today for the next activity. Encourage students to use the standard algorithm for addition when applicable as you teach Sessions 3–8 in Unit 5.*

⋯⋯⋯

NAME _____   DATE _____

Three-Digit Problems

1 The Scouts are collecting canned food to donate to the Food Bank in their town. Last Saturday, they collected 175 cans. This Saturday, they collected 168 cans. How many cans have they collected in all?

Choose and solve one or more of the problems below. Use the regrouping strategy.

2 The third graders did a play last week. They did one show for the other kids in the school, and one show for their families. 238 people came to the first show. 154 people came to the second show. How many people in all watched the show?

3 There are 137 kindergartners, 139 first graders, and 153 second graders at Wood Primary School. How many students are there in all?

329	258	105	243	187
+ 217	+ 171	+165	+ 158	+211

Set A3 ★ Activity 2

ACTIVITY

Think before You Add

Overview

In this activity, students consider the following questions: Is it always most efficient and effective to use the standard algorithm for multi-digit addition? What kinds of combinations are best solved with the algorithm? What kinds of combinations are better solved using other strategies?

Skills & Concepts

★ fluently add whole numbers accurately using the standard regrouping algorithm

★ estimate sums to predict solutions to problems or determine reasonableness of answers

★ identify strategies that can be used to solve a problem, select and use one or more appropriate strategies to solve the problem, and justify the selection

★ explain why a specific problem-solving strategy was used to determine a solution

You'll need

★ Think Before You Add (page A3.10, run one copy on a transparency)

★ Addition Strategies (pages A3.11–A3.12, run a class set)

★ Addition Strategy Posters (see Advance Preparation)

★ Student Math Journals or 1 piece of lined or grid paper per student

★ piece of paper to mask parts of the overhead

★ overhead pen

Advance Preparation Post the Addition Strategy Posters from Set A3, Activity 1 in a location where all the students can see them easily. If you didn't make a poster for the standard algorithm during Activity 1, make one now and include it in the collection you post.

Instructions for Think Before You Add

1. Start by reviewing the Addition Strategy Posters with the class. Explain that you're going to revisit these strategies today, and possibly generate some more.

2. Now tell students in a minute, you're going to show them an addition problem at the overhead, and ask them to solve it mentally. Let them know that they can use any of the strategies on the posters, or think of a different method. Then display the first problem on the overhead, keeping the rest covered for now. Ask students to think privately about the problem and raise their hand when they have the answer.

Think Before You Add

1   25
       + 26
       ‾‾‾‾

3. When most of the students have raised their hands, call on several to share their solutions and explain their strategies to the class. Record each strategy at the overhead as students share, and label them using the names from the posters. Work with input from the class to label any new strategies shared. (You may also want to make posters for these later.)

Activity 2 Think Before You Add (cont.)

Ariel *First I tried the regrouping way, but it was too hard to remember the numbers in my head. So I just went 20 and 20 is 40, and then it's 11 more so the answer is 51.*

Beckett *I thought it was pretty easy to start with the ones. I went 5 plus 6 is 11. Put down the 1 and carry a 10. Then 10 and 20 and 20 makes 50, so I got 51.*

Maria *I know 25 and 25 is 50, right? So the answer is 51 because 26 is one more than 25.*

Set A3 Number & Operations: Multi-Digit Addition & Subtraction Blackline

Think Before You Add

$$
\begin{array}{ll}
1 & \quad 25 \\
 & +\ 26
\end{array}
$$

$20 + 20 = 40$
$5 + 6 = 11$
$40 + 11 = 51$
(Front-End)

$$
\begin{array}{r}
1\ \ \\
25 \\
+26 \\
\hline
51
\end{array}
$$
(Start with the 1's)

$25 + 25 = 50$
$50 + 1 = 100$

4. Repeat Steps 2 and 3 with the next two problems on the overhead (49 + 35 and 64 + 27). Encourage students to debate and discuss the strategies they're choosing. Some may feel that the front-end strategy is easiest for solving the problems in their heads, while others may prefer the standard algorithm.

Students *It's too hard to keep the numbers in your head with regrouping.*
The regrouping way is easy for me!
I think regrouping is easier when you're writing stuff down, because you don't have to write as much. When you do the adding in your head, it's easier to start with the tens, because you don't have to remember what you put down and what you carried over.

5. Show the fourth problem, 199 + 199, and ask students if they can solve it in their heads. Some may say they can't because the numbers are too big. Give them a minute to think about it. Chances are, at least one student will volunteer a strategy that makes use of landmark numbers (i.e., 10, 25, 50, 100) as shown on the chart below. If not, share it yourself. Then work with student input to solve the problem using regrouping and then the front-end method. Which of the three strategies is easiest? Why?

$$
\begin{array}{ll}
4 & \quad 199 \\
 & +\ 199
\end{array}
$$

$200 + 200 = 400$
$400 - 2 = 398$
(Landmark Numbers)

$$
\begin{array}{r}
1\ 1\ \\
199 \\
+199 \\
\hline
398
\end{array}
$$
(Regrouping)

$100 + 100 = 200$
$90 + 90 = 180$
$9 + 9 = 18$
(Front End)

$$
\begin{array}{r}
200 \\
180 \\
+\ \ 18 \\
\hline
398
\end{array}
$$

6. Show the last problem, 967 + 475, on the overhead, and ask students if they can work it in their heads. Why or why not? Most students will probably agree that the numbers are too big to tackle the addition mentally. Ask them to pair-share estimates, and then work the problem twice in their journals, once using the regrouping method and once with a front-end strategy. Have them share and compare their work with the people sitting next to them to be sure they have the correct answers. Then talk with the group about both methods. Which seemed easier? Which seemed most efficient? Why?

7. Work with the class to make some generalizations about the different addition strategies they've used to solve the problems on the overhead. Is the standard algorithm always the quickest and easiest? What about the front-end strategy? When does it work best to use a make ten or landmark number strategy? Record some of their thoughts on a piece of chart paper.

Activity 2 Think Before You Add (cont.)

Which addition strategies work best?

- Regrouping is good for adding 3-digit numbers.
- Front-ending is good for adding 2-digit numbers in your head.
- When you're adding 3-digit numbers, regrouping is faster and easier than front-ending. You don't have to write as much.
- Use rounding if you're adding numbers like 25 + 26 or 199 + 199. Then it's really easy to get the answer in your head.
- You don't always have to use the same strategy. Think about what will work the best for the numbers.

8. Hand out a copy of Addition Strategies to each student and give children the rest of the math period to work the problems. If some students still need support in solving multi-digit addition problems, you may want to meet with a small group while the rest of the class works independently.

Think Before You Add

1
$$\begin{array}{r} 25 \\ + \ 26 \\ \hline \end{array}$$

_____

2
$$\begin{array}{r} 49 \\ + \ 35 \\ \hline \end{array}$$

_____

3
$$\begin{array}{r} 64 \\ + \ 27 \\ \hline \end{array}$$

_____

4
$$\begin{array}{r} 199 \\ + \ 199 \\ \hline \end{array}$$

_____

5
$$\begin{array}{r} 967 \\ + \ 475 \\ \hline \end{array}$$

NAME _____   DATE _____

Addition Strategies page 1 of 2

1 Use the regouping strategy to solve each problem. Then solve it a different way. Label your strategy. Circle the strategy that seemed quicker and easier.

	REGROUPING	DIFFERENT
example $\quad$ 25 $+\ $ 26 $\overline{}$	$\overset{1}{}$ $\quad$ 25 $+\ $ 26 $\overline{}$ $\quad$ 51	25 + 25 = 50 50 + 1 = 51 Landmark Numbers
a $\quad$ 51 + 29 =		
b $\quad$ 198 $+\ $ 56 $\overline{}$		
c $\quad$ 348 + 578 =		
d $\quad$ 34 $\quad$ 56 $+\ $ 29 $\overline{}$		

NAME _____   DATE _____

Addition Strategies page 2 of 2

2 Fill in the bubble to show the best estimate for each problem.

a		b	
348 + 352	○ 600 ○ 650 ○ 700 ○ 750	298 + 245	○ 350 ○ 400 ○ 450 ○ 500
c		d	
369 + 528	○ 750 ○ 800 ○ 850 ○ 900	457 233 + 169	○ 750 ○ 800 ○ 850 ○ 900

e Circle the strategy that seems to help most for estimating.

Regrouping   Front-Ending   Using Landmark Numbers

3 Mrs. Gonzales bought 5 t-shirts at the mall. Each t-shirt cost $9.99. She also had to pay a $3.99 tax for all the shirts. How much did she pay altogether? Use the strategy that seems best. Explain how you arrived at your answer and show any work below.

Set A3 ★ Activity 3

Introducing the Standard Algorithm for Multi-Digit Subtraction

Overview
Students work in pairs to solve a triple-digit subtraction story problem. They share their strategies with the entire class while the teacher records each method in the form of a poster. The teacher then presents the standard algorithm and has the whole class practice using it to solve a variety of 3-digit subtraction problems.

Skills & Concepts
★ fluently subtract whole numbers accurately using the standard regrouping algorithm

★ solve contextual problems involving subtraction and justify the solutions

★ estimate differences to predict solutions to problems or determine reasonableness of answers

★ determine the question(s) to be answered given a problem situation

★ represent a problem situation using words, numbers, pictures, physical objects, or symbols

You'll need
★ More three-Digit Problems (page A3.18, run one copy on a transparency, optional class set on copy paper)

★ More Three-digit Problems (page A3.18, class set, optional)

★ Student Math Journals or 1 piece of lined or grid paper per student

★ magnetic base ten pieces

★ set of base ten pieces for each pair of students

★ 4–5 blank overhead transparencies

★ 5–6 pieces of 12″ × 18″ white drawing or construction paper

★ marking pens

★ a piece of paper to mask portions of the overhead

Instructions for Introducing the Standard Algorithm for Multi-Digit Subtraction

1. Display only the first word problem on the overhead, covering the rest of the transparency with a piece of scratch paper. Read the problem out loud with the class and ask students to restate the question in their own words. Work with their input to underline any information that will help solve the problem. Then ask students to pair-share estimates, and call on a few volunteers to share their thinking with the class.

Name _____ Date _____

More Three-Digit Problems

1 Lexi's book has 327 pages. She has read 118 pages so far. How many pages does she have left to read?

2. Have students work in pairs to solve the problem. Ask them to record all of their work, along with the solution, in their own journal. Explain that since they are working in pairs, you'd like everyone to record at least two different ways to solve the problem. Remind them that they can use sketches and numbers, and that the base 10 pieces are available as well. Circulate to observe and talk with students as they're working. Pass out blank overheads to at least 4 students, each of whom has used a different strategy, and ask them to copy their work onto the transparency to present to the class.

Activity 3 Introducing the Standard Algorithm for Multi-Digit Subtraction (cont.)

3. When most pairs are finished, ask the students you selected to share their solutions and explain their strategies at the overhead. Record each strategy on a separate piece of 12˝ x 18˝ drawing paper labeled with the student's name. Ask the contributing students to work with the rest of the class to name their strategies.

David's Same Difference Method

$$327$$
$$-118$$

Add 2 to each number to make the problem easier.

327 + 2 = 329
118 + 2 = 120

$$329$$
$$-120$$
$$\overline{209}$$ pages

Lupe's Number Line Method

$$327$$
$$-118$$

+2   +80   +100   +27
118 120   200   300   327

2 + 80 + 100 = 182

$$182$$
$$+27$$
$$\overline{209}$$ pages
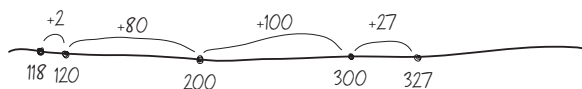
Jason's Sketch, Cross-Out & Count Method

$$327$$
$$-118$$

1. Sketch 327.
2. Cross out 100.
3. Cross out a 10.
4. Split up the other 10 into 1's and cross out 8 of them.
5. Count what's left. 209 pages.

Ryan's Negative Number Method

$$327$$
$$-118$$

300 – 100 = 200
20 – 10 = 10
7 – 8 = -1

200 + 10 – 1 = 209 pages

Shari's Start with the 1's Method

$$3\overset{1}{\cancel{2}}17$$
$$-118$$
$$\overline{209}$$ pages

If you don't use negative numbers, you can't do 7 – 8. Move a 10 over from the 10's column and split it into 1's. Now you have 17 there.

17 – 8 = 9
10 – 10 = 0
300 – 100 = 200
200 + 9 = 209 pages

4. Acknowledge everyone's strategies. If none of the students shared the standard algorithm, contribute it to the collection yourself by creating a poster similar to Shari's above as students watch. Then explain that the class will revisit all of these strategies and possibly others in upcoming sessions. For now, however, you're going to focus on the method that starts with the 1s. This strategy is often called the regrouping method, and it's used by many adults for solving multi-digit subtraction problems.

Activity 3 Introducing the Standard Algorithm for Multi-Digit Subtraction (cont.)

5. Model the algorithm step-by-step with magnetic base 10 pieces at the whiteboard. First, record 386–169 on the board. Ask students to pair-share estimates, and then have several volunteers share their estimates and reasoning with the class. Next, draw and label a 3-column place value frame as shown below, and build 386 with the magnetic base 10 pieces.
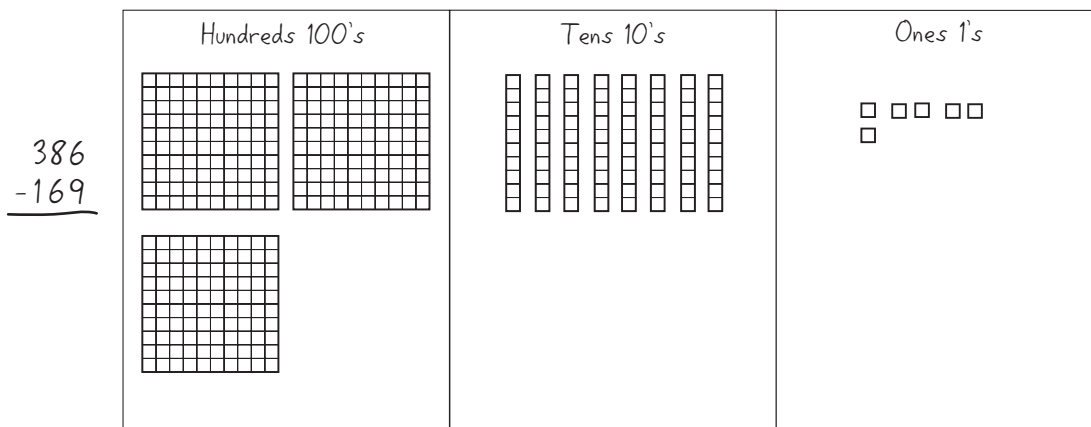
Hundreds 100's	Tens 10's	Ones 1's

$$386$$
$$-169$$

6. Explain that this strategy starts from the back end of the number rather than the front end, with the 1s instead of the 100s. Ask students to consider the answer to 6 – 9. Some may say it's not possible to subtract 9 from 6. Others may volunteer an answer of negative 3, and some may believe the answer is 3. If negative numbers come up in the discussion, explain that this strategy doesn't permit the use of negative numbers. If some students are convinced that the answer is 3, have students each hold up 6 fingers. Is it possible to subtract 9 from this collection?

7. As students watch, move one of the strips over to the 1's column and exchange it for ten 1s to create a collection of 16. Ask students to compute the answer to 16 – 9 mentally, and then remove 9 of the units to confirm their answer. Record your action in numeric form. Ask students to explain what you've done so far. Why did you move a strip over and exchange it for ten 1s? Why did you change 6 to 16? Why did you cross out the 8 and write a 7 above that number?

Hundreds 100's	Tens 10's	Ones 1's

$$\begin{array}{r} 7 \\ 3\cancel{8}6 \\ -169 \\ \hline 7 \end{array}$$
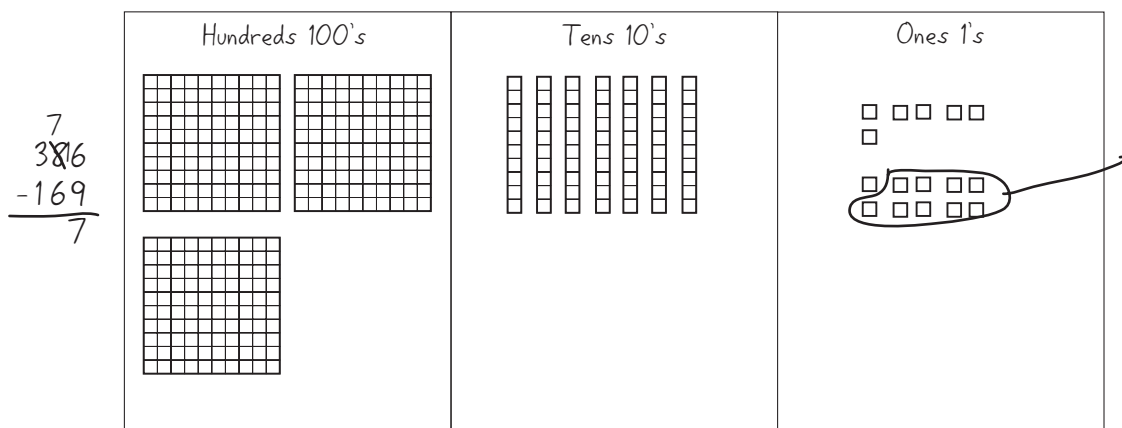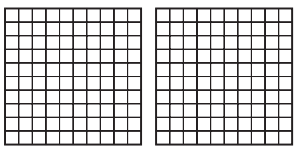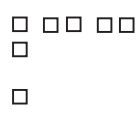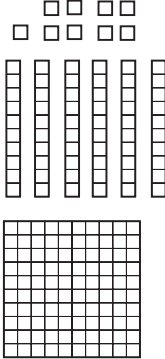
Students *You took one of the strips and put it into 1s because you didn't have enough.*
You can't do 6 – 9 with this way, so you had to get more 1s in the 1's place.
You got 10 more, so that was 16, and then you took 9 away. That left 7.
The 8 got crossed out because you took one of the strips and turned it into 1s.

Activity 3 Introducing the Standard Algorithm for Multi-Digit Subtraction (cont.)

> ***Students***   *Writing the little 1 by the 6 makes it into 16. It's like moving a strip over.*
> *We still have 7 strips, so we can take away 6 of them.*

8. Work with input from the class to remove 6 strips and a mat from the collection. Record each action as you go. Then ask students if the process and the answer make sense. Why or why not?

9. Erase the problem and remove the pieces from the three-column frame as helpers distribute base 10 pieces to every student pair. Repeat Steps 5 through 8 with the combinations below. Have students model each action with their base 10 pieces as you work with the magnetic pieces at the board and record each step with numbers. Have children estimate a solution to each problem and explain their estimates before using the pieces to find the answer.

$$
\begin{array}{r} 324 \\ -137 \\ \hline \end{array}
\qquad
\begin{array}{r} 215 \\ -148 \\ \hline \end{array}
\qquad
\begin{array}{r} 203 \\ -76 \\ \hline \end{array}
$$

10. Then ask students to put their base 10 pieces aside for a few minutes. Repeat Steps 5 through 8 with the combinations below. Explain that you'll work with the base 10 pieces at the board while they record your actions with numbers in their journals. Have a volunteer come up to the board to do the recording while you work with the pieces. Continue to discuss the actions you're taking, in terms of regrouping 1s and 10s.

$$
\begin{array}{r} 300 \\ -137 \\ \hline \end{array}
\qquad
\begin{array}{r} 305 \\ -84 \\ \hline \end{array}
$$

11. If time remains, display the rest of the More Three-Digit Problems overhead. Have students choose and solve one or more of the problems in their journals, using the regrouping strategy you shared today. Circulate as they work to identify students who will probably need more support to develop proficiency with this strategy. Encourage students to use their base 10 pieces if necessary.

Activity 3 Introducing the Standard Algorithm for Multi-Digit Subtraction (cont.)

Name _____   Date _____

More Three-Digit Problems

1 Lexi's book has 327 pages. She has read 118 pages so far. How many pages does she have left to read?

Choose and solve one or more of the problems below. Use the regrouping strategy.

2 King School is having a Read-a-Thon. The kids in Mr. Bell's class set a goal of 350 books. They still have to read 184 books to reach their goal. How many books have they read so far?

3 There were 123 books on the shelf. Some kids got books off the shelf to read. Now there are 77 books on the shelf. How many books did the kids take?

333	239	304	400	422
– 218	– 171	– 165	– 278	– 273

Extension

- Give each student a copy of Three-Digit Problems and ask them to complete all the problems. Have them work directly on the sheet instead of working in their journals. Give them time to complete any unfinished problems during a seat work period, or have them take the sheet home to complete and bring back to school.

....

Note *Save the strategy charts from today for the next activity. Encourage students to use the standard algorithm for subtraction when applicable as you teach Sessions 15–17 in Unit 5.*

....

INDEPENDENT WORKSHEETS

See Set A3 Independent Worksheets 1–3 for more practice using the standard algorithm to solve multi-digit addition and subtraction problems.

NAME _____   DATE _____

More Three-Digit Problems

1 Lexi's book has 327 pages. She has read 118 pages so far. How many pages does she have left to read?

Choose and solve one or more of the problems below. Use the regrouping strategy.

2 King School is having a Read-a-Thon. The kids in Mr. Bell's class set a goal of 350 books. They still have to read 184 books to reach their goal. How many books have they read so far?

3 There were 123 books on the shelf. Some kids got books off the shelf to read. Now there are 77 books on the shelf. How many books did the kids take?

$$
\begin{array}{ccccc}
333 & 239 & 304 & 400 & 422 \\
-\,218 & -\,171 & -\,165 & -\,278 & -\,273 \\
\hline
\end{array}
$$

Set A3 ★ Activity 4

ACTIVITY

Think Before You Subtract

Overview
In this activity, students consider the following questions: Is it always most efficient and effective to use the standard algorithm for multi-digit subtraction? What kinds of combinations are best solved with the algorithm? What kinds of combinations are better solved using other strategies?

Skills & Concepts
★ fluently subtract whole numbers accurately using the standard regrouping algorithm

★ estimate differences to predict solutions to problems or determine reasonableness of answers

★ identify strategies that can be used to solve a problem, select and use one or more appropriate strategies to solve the problem, and justify the selection

★ explain why a specific problem-solving strategy was used to determine a solution

You'll need
★ Think Before You Subtract (page A3.22, run one copy on a transparency)

★ Subtraction Strategies (pages A3.23 and A3.24, run a class set)

★ Subtraction Strategy Posters (see Advance Preparation)

★ Student Math Journals

★ piece of paper to mask parts of the overhead

★ overhead pen

....

Advance Preparation Post the Subtraction Strategy Posters from Set A3, Activity 3 in a location where all the students can see them easily. If you didn't make a poster for the standard algorithm during Set A3, Activity 3, make one now and include it in the collection you post.

....

Instructions for Think Before You Subtract

1. Start by reviewing the Subtraction Strategy Posters with the class. Explain that you're going to revisit these strategies today, and possibly generate some more.

2. Now tell students in a minute, you're going to show them a subtraction problem at the overhead, and ask them to solve it mentally. Let them know that they can use any of the strategies on the posters, or think of a different method. Then display the first problem on the overhead, keeping the rest covered for now. Ask students to think privately about the problem and raise their hand when they have the answer.

Set A3 Number & Operations: Multi-Digit Addition & Subtraction Blackline

Think Before You Subtract

1   62
           – 29

3. When most of the students have raised their hands, call on several to share their solutions and explain their strategies to the class. Record each strategy at the overhead as students share, and label them using the names from the posters. Work with input from the class to label any new strategies shared. (You may also want to make posters for these later.)

Activity 4 Think Before You Subtract (cont.)

> **Alexi** *First I tried the regrouping way, but it was too hard to remember the numbers in my head. Then I saw if I added 1 to each number, it made the problem really easy. 63 – 30 is 33.*

> **Macgregor** *The negative number way is the easiest for me. Just do 60 – 20 is 40, then 2 – 9 is negative 7. 40 – 7 is 33.*

> **Shanda** *First I took the 20 away. That left 42, but 42 – 9 is too hard, so I took away 2 first. That left 40, and 40 – 7 is 33.*

Set A3 Number & Operations: Multi-Digit Addition & Subtraction Blackline

Think Before You Subtract

		$62 + 1 = 63$	$60 - 20 = 40$	$62 - 20 = 42$
1	62	$29 + 1 = 30$	$2 - 9 = {}^-7$	$42 - 2 = 40$
	$-\ 29$	$63 - 30 = 33$	$40 - 7 = 33$	$40 - 7 = 33$
		(Same Difference)	(Negative Numbers)	(One Piece at a Time)

---

4. Repeat Steps 2 and 3 with the next two problems on the overhead (70 – 35 and 85 – 27). Encourage students to debate and discuss the strategies they're choosing. Chances are, most will use methods that start from the front end, though a few may use regrouping.

> **Students** *On 70 – 35, I just remembered that 35 + 35 makes 70, so the answer is 35.*
> *I did the number line in my head for that one. First you go up 5, and then 30 more to get up to 70, so the answer is 35.*
> *I got stuck on 85 – 27 for a minute, but then I saw I could make it easier by adding 3 to each number. If you do that, it's just 88 – 30, and that's 58.*
> *I did regrouping on that one. I just moved over a 10 in my mind, so I got 15 – 7 over in the 1's column. Then 70 – 20 is 50, so the answer is 58.*
> *I think it's way too hard to remember the numbers in your head like you have to do with regrouping.*
> *I used negative numbers. 80 – 20 is 60 and 5 – 7 is negative 2. 60 – 2 is 58.*

5. Show the fourth problem, 202 – 149, and ask students if they can solve it in their heads. Give them a minute to think about it, and then call on volunteers to share their thinking with the class. Chances are, at least a few students will use the same difference strategy, or perhaps the number line method. Some may use landmark numbers, in that 202 – 48 is very close to 200 – 50. After at least 2 different strategies have been shared, work with student input to solve the problem using regrouping. Which of the strategies seems easiest? Why?

		$202 + 2 = 204$	Hop 2 to get to 150.	
4	202	$148 + 2 = 150$	Then hop 50 and 2	$\cancel{20}^{1}\cancel{0}^{9}{}^{1}2$
	$-\ 148$	$204 - 150 = 54$	more to get to 202.	$-\ 148$
		(Same Difference)	$2 + 50 + 2 = 54$	54
			(Number Line)	(Regrouping)

6. Show the last problem, 2,503 – 1,765, on the overhead, and ask students if they can work it in their heads. Why or why not? Some students may think that it's too big to tackle mentally, while others may be eager to try. Ask them to pair-share estimates, and then work the problem twice in their journals, once using the regrouping method and once with a different strategy of their choosing. Have them share

Activity 4 Think Before You Subtract (cont.)

and compare their work with the people sitting next to them to be sure they have the correct answers. Then talk with the group about both methods. Which seemed easier? Which seemed most efficient? Why?

7. Work with the class to make some generalizations about the different addition strategies they've used to solve the problems on the overhead. Is the standard algorithm always the quickest and easiest? What about the same differences strategy? When does it work best to use a number line strategy? Record some of their thoughts on a piece of chart paper.

Which subtraction strategies work best?

- Regrouping is good for subtracting 3- and 4-digit numbers.
- Regrouping is a lot of work sometimes. You should check to see if there's a faster way.
- Sometimes the number line strategy is easier, if the numbers aren't really, really big.
- Look to see if you can change both of the numbers to make the problem easier. If the bottom number is close to 20, 30, 40, or any other tens number, it might work.
- The negative number strategy is fast and easy even with big numbers if you understand itm but you have to be careful.
- You don't always have to use the same strategy. Think about what will work best for the numbers.

8. Hand out a copy of Subtraction Strategies to each student and give children the rest of the math period to work the problems. If some students still need support in solving multi-digit addition problems, you may want to meet with a small group while the rest of the class works independently.

Note Ask students to either use the standard algorithm for subtraction during Bridges Unit 5, Session 19, or generate and justify more efficient and effective alternatives. When you conduct the Unit 5 Post-Assessment during Session 20, tell students very explicitly that you expect them to solve problems 1-4 using two different methods, one of which must be the standard algorithm.

With minor changes to the instructions, Support Activities 7–8, 11, and 14–15 at the back of the Number Corner Blacklines can be used to help students who need more time to develop proficiency with the standard algorithms for addition and subtraction.

INDEPENDENT WORKSHEET

Use Set A3 Independent Worksheets 1–3 to provide students with more practice using the standard algorithm to solve multi-digit addition and subtraction problems.

Think Before You Subtract

1
$$\begin{array}{r} 62 \\ -\ 29 \\ \hline \end{array}$$

_____

2
$$\begin{array}{r} 70 \\ -\ 35 \\ \hline \end{array}$$

_____

3
$$\begin{array}{r} 85 \\ -\ 27 \\ \hline \end{array}$$

_____

4
$$\begin{array}{r} 202 \\ -\ 148 \\ \hline \end{array}$$

_____

5
$$\begin{array}{r} 2{,}503 \\ -\ 1{,}765 \\ \hline \end{array}$$

NAME _____   DATE _____

Subtraction Strategies page 1 of 2

1 Use the regouping strategy to solve each problem. Then solve it a different way. Label your strategy. Circle the strategy that seemed quicker and easier.

	REGROUPING	DIFFERENT
example 200 $-\ 137$	$\overset{9}{\cancel{200}}^{1\ \ 1}$ $-\ 137$ $\overline{63}$	$200 + 3 = 203$ $137 + 3 = 140$ $203 - 140 = 63$ Same Differences
a $75 - 24 =$		
b 243 $-\ 129$		
c $512 - 339 =$		
d $2{,}452$ $-\ 1{,}199$		

NAME _____   DATE _____

Subtraction Strategies page 2 of 2

2 Fill in the bubble to show the best estimate for each problem.

a		b	
63 – 28	○ 30 ○ 35 ○ 40 ○ 45	303 – 245	○ 50 ○ 60 ○ 75 ○ 100

c What strategy or strategies are you using to make your estimates?.

3 For each problem below, underline the information you need to solve the problem. Then solve it. Use the strategy that works best for you.

a Lara has 153 baseball cards. How many more baseball cards does she need to have 218 baseball cards in all?

b Juan had 235 pennies. He gave some to his little sister. Now he has 149 pennies left. How many pennies did he give to his sister?

Set A3 ★ Activity 5

ACTIVITY

Round & Add

Overview
Round & Add teaches students how to round to the nearest thousand and provides practice with adding multidigit numbers. The teacher plays the game with the whole class, and may then make it available to students to play in pairs during Work Places.

Skills & Concepts
★ round whole numbers through 10,000 to the nearest thousand

★ fluently add whole numbers accurately using the standard regrouping algorithm

★ estimate sums to predict solutions to problems or determine reasonableness of answers

You'll need
★ Open Number Line (page A3.28, run 1 copy on a transparency)

★ a blank transparency

★ 4 dice, 2 marked 0–5 and 2 marked 4–9

★ overhead pens in black, red, and blue

★ Student Math Journals or 1 piece of lined or grid paper per student

Instructions for Round & Add
In the game of Round & Add, two teams (or two players) take turns rolling four dice, arranging the four digits, and rounding the resulting number to the nearest thousand. Each number is recorded on a number line marked in multiples of 1000, and the multiple to which the number rounds circled in one team's color. Once a multiple has been claimed, it can't be used again. When all the multiples of 1000 have been claimed, players use the rounded numbers to predict who will win, and then add their actual scores to confirm their predictions.

1. Place the Open Number Line on display at the overhead. Note with students that there are no numbers posted at either end, so you're free to set up the line any way you want. Then label the dot at the far left with a 0 and the dot at the far right with 10,000. Next, ask students for suggestions about how to label the 9 marks in between. This question may spark some interesting discussion, but students will likely agree after a few minutes that because there are 9 evenly spaced marks, they should be labeled with consecutive multiples to 1,000. After you have labeled all the points as shown below, place a blank transparency over the sheet to prevent the ink from smearing.

2. Explain that you're going to play a game similar to Round Ball Hundreds today. You will play as the red team, and have the class play as the blue team. The teams will take turns rolling 4 dice, arranging the digits, and rounding the number to the nearest 1000. Both teams will add their numbers at the end of the game, and the team with the higher score will win.

3. Write the number 5,687 at the board. Tell students that to round a 4-digit number to the nearest thousand, they have to look at the digit in the hundreds place. If the digit indicates a number less than 500, the 4-digit number rounds down. It it's 500 or more, the number rounds up. Does this number round up

Activity 5 Round & Add (cont.)

to 6,000 or down to 5,000? Have students pair-share their thinking. Then invite volunteers to share their reasoning with the class.

> **Students** *5,687 is closer to 6,000.*
> *Yep, there's a 6 in the hundreds place, so it rounds up.*
> *687 is way bigger than 500, so this number goes up, not down.*

4. Repeat Step 3 with several other numbers if necessary. Then begin the game by asking a volunteer to roll all of the dice for you. Record the four numbers at the board. If you get a 10, record it as a 0. Share your thinking about how to arrange these digits to form the number that will round to the highest multiple of 1000. Once you've made a decision, record the number where it belongs on the number line, and then circle the multiple to 1000 to which it rounds. Be sure to mark your results in red and the class's results in blue so that you can tell the difference as the game proceeds.
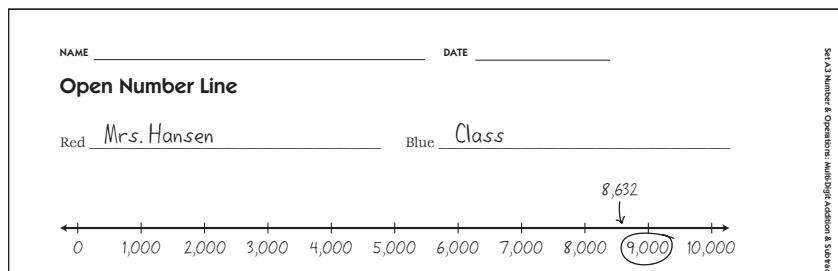
5. Now have a volunteer roll for the class and write the 4 digits on the whiteboard. If the class rolls a 10, have the volunteer record it as a 0. Ask students to talk in small groups about how they want to arrange the 4 digits. Remind them that they'll need to arrange the digits to form a number that rounds to a multiple different from the multiple you've just claimed. Then have them discuss their options as a class. When they've decided, mark the number on the line and circle the multiple to which it rounds.

6. Continue taking turns until all the multiples have been claimed by one team or the other. If either you or the class rolls 4 digits that cannot be arranged to form a number that rounds to an unclaimed multiple of 1000, the turn is lost. Either team can decide to use just 3 of the dice whenever the players decide they want to claim the 0.

7. After all the multiples on the line have been circled, have students predict which team will have the higher score. Is it necessary to add up all the numbers actually rolled by each team to make an accurate prediction? Why or why not?

> **Students** *I think we'll win because we got three of the highest numbers.*
> *You got to circle six of the numbers, but one of them was the zero.*
> *If you just add 7 + 8 + 10 that's 25. It's like 25,000. That's higher than your top three numbers put together because 4 + 6 is 10. Then add 9 and you only get 19, for 19,000.*

Activity 5 Round & Add (cont.)
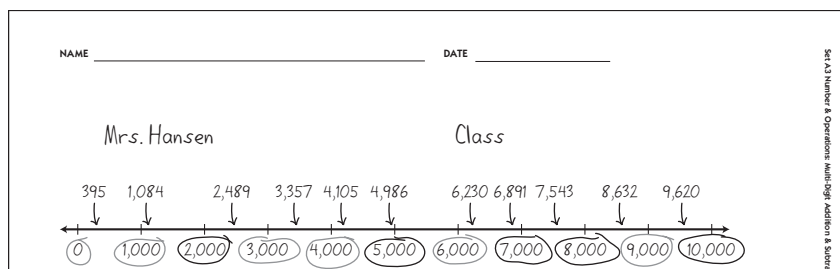
Teacher Do you think it's possible to make a pretty accurate prediction without actually adding all the numbers we rolled?

Students Sure!
It's way easier to add up numbers like 2,000 and 5,000 than those other numbers.

Teacher Would you bet your next recess on your prediction?

Students No way! Let's add up the numbers to be sure!

8. Ask students to take out their journals. Explain that you're going to have half of them add your actual scores and half of them add theirs to be sure of the winner. Which addition strategy will work best in this situation—regrouping, front-ending, using landmark numbers, or some other method? Why?

Students Can we use our calculators?
If we can't use calculators, we should use regrouping. Those numbers are way too big for front-ending.

9. Have them go to work and compare their answers with neighbors to check for accuracy. The team with the higher actual score wins.

Extensions
- Play the game again another day with your class. Give students each a copy of the Open Number Line and have them record at their desks as you do so at the overhead.
- Introduce a slightly different version in which the team that is able to get its actual and rounded totals to match most closely wins. This version encourages students to pay very close attention to how they arrange the 4 digits they roll each time. For instance, 4, 2, 1, and 9 can be arranged to form a variety of 4-digit numbers, including 9,421 and 9,124. Both round to 9,000 but in this version of the game 9,124 is the better choice because it's closer to 9,000. This is an advantage when the goal is to have the total of the rounded numbers match the total of the actual numbers as closely as possible.
- Place paper copies of page A3.32, colored pencils, and dice in a tub and make the game available to students to play during Work Places.

INDEPENDENT WORKSHEET

Use Set A3 Independent Worksheet 4 to provide students with more practice rounding and estimating.

NAME _____ DATE _____

Open Number Line

Red _____ Blue _____

Set A3 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Third Grade Puzzlers

Use regrouping to solve all the problems on this sheet and the next two. Show your work for each problem.

1 Five of the third grade classes are planning to attend a play performance. The five different classes have 34, 29, 31, 26 and 27 students in them. Each play performance can hold up to 140 students. Will all students fit into one performance, or will they need to attend two performances?

2 Carlos, a third grader, owns 61 baseball cards. At lunchtime, he traded 36 of his cards for 1 card featuring Cal Ripkin Jr. How many cards does he have now?

3 The third grade robotics team has 179 points. In order to place in the top 3 teams, they'll need a score of 325 or more. How many more points do they need to earn in order to rank in the top 3?

(Continued on the back.)

Independent Worksheet 1 Third Grade Puzzlers (cont.)

4 Rewrite each of the problems below in vertical form. Then use regrouping to solve the problems. Show all your work.

example 561 + 258 = $\begin{array}{r} {\scriptstyle 1} \\ 561 \\ +\,258 \\ \hline 819 \end{array}$	**a** 3451 + 387 =
b 4801 – 779 =	**c** 29 + 41 + 44 + 86 =
d 72 – 47 =	

5 The 3rd grade classes are collecting cans to raise money for a field trip to the zoo. This chart shows how many cans each class has collected so far.

Class	Number of Cans
Mrs. Haber's class	362 cans
Mr. Field's class	429 cans
Mrs. Jones' class	297 cans
Mr. Zigler's class	456 cans

a Mrs. Jones' class really wants to win. How many more cans do they need in order to tie with the 3rd place team? Show your work.

b How many more cans does Mrs. Jones' class need to collect in order to be in first place right now? Show your work.

NAME _____   DATE _____

Set A3 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

In These United States

Use regrouping to solve all the problems on this sheet and the next. Show your work for each one.

1 Texas, the second largest state, has 254 counties. In contrast, California, the third largest state, only has 58 counties. How many counties do they have altogether? Show your work below.

2 Solve the following problems. Show your work.

a 923 – 397	**b** 43 – 29 =	**c** 26 + 97 =
d 426 + 267	**e** 86 – 18 =	**f** 407 – 72 =

(Continued on the back.)

Independent Worksheet 2 In These United States (cont.)

3 The Astrodome in Houston, Texas, holds 62,439 football fans. Find two or more Texas towns whose entire populations could attend a football game together. How many seats would be left over? Show your work.

Town	Population
Deer Park	28,993
Del Rio	36,020
Eagle Pass	25,571
El Campo	10,884
Gainesville	16,569
Groves	15,006
Hereford	14,472
Iowa Park	6,175
Jasper	7,531
Kingsville	24,740

CHALLENGE ICON

4 In 2005, the United States population was 296,410,404 Texas had the second highest population in the U.S. with 22,859,968 people   How many people in the U.S. did *not* live in Texas?

Set A3 ★ Independent Worksheet 3

INDEPENDENT WORKSHEET

Skill Practice

1 Use regrouping to solve all the problems on this sheet and the next. Show your work.

a What is the sum of 529, 6, and 34?	
b 42,921 − 24,473 =	**c** 472 + 329 =
d 921 − 756	**e** 9 + 41 + 34 + 16 =

2 Sara is only allowed to spend 5 hours a week watching television. Look at the chart to see how much she has used so far this week. How much time does she have left to watch television this weekend?

Day	Time
Monday	45 minutes
Tuesday	60 minutes
Wednesday	90 minutes
Thursday	45 minutes
Friday	30 minutes

(Continued on the back.)

Independent Worksheet 3 Skill Practice (cont.)

3 Brendan needs to mail a 12-page letter to his friend in Texas. It costs $1.38 to mail all 12 sheets together. A 6-page letter costs 68¢ to mail. A 4-page letter costs 45¢ to mail. Envelopes costs 3¢ each   What is the least expensive way to mail his 12 pages?

NAME _____ DATE _____

Set A3 ★ Independent Worksheet 4

INDEPENDENT WORKSHEET

Kilometers & Miles

1 What is 6,780 rounded to the nearest thousand? Fill in the bubble to show.

○ 5,000   ○ 6,000   ○ 7,000   ○ 8,000

2 What is 4,438 rounded to the nearest thousand? Fill in the bubble to show.

○ 4,000   ○ 5,000   ○ 7,000   ○ 8,000

3 It is 4,991 kilometers from Vancouver, BC, to Montreal. What is 4,991 rounded to the nearest thousand?

○ 4,000   ○ 5,000   ○ 41,000   ○ 49,000

4 People in Canada measure long distances in kilometers instead of miles. Tera and her family drove from Tucker to Dry Creek last weekend. About how many kilometers did they drive? Fill in the bubble to show the best estimate.
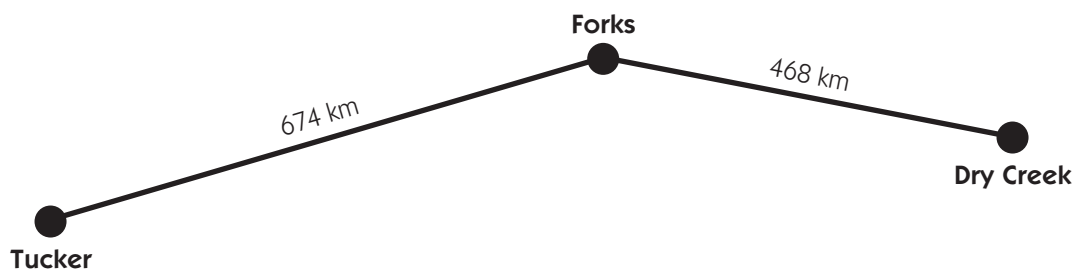
○ 1,050 kilometers   ○ 1,100 kilometers   ○ 1,150 kilometers

5 It is 1,164 kilometers from Vancouver, BC to Edmonton. What is 1,164 rounded to the nearest thousand? Fill in the answer below.

1,164 kilometers rounded to the nearest thousand is _____.

(Continued on back.)

Independent Worksheet 4 Kilometers & Miles (cont.)

6 A kilometer is shorter than a mile. One kilometer is about half a mile.

a If Tera walks 2 kilometers a day, how many kilometers does she walk in one week (7 days)? Show your work.

b About how many miles does Tera walk in a week? Use numbers, words, and/or sketches to explain your answer.

c Tera's mom runs 4 kilometers a day. About how many miles does she run in a week? Use numbers, words, and/or sketches to explain your answer.

7 Tera and her family are driving 200 kilometers to the beach. They have 80 kilometers left to go.

a Circle the equations you could use to find out how far they have already driven.

$200 - \boxed{} = 80$ $80 - 20 = \boxed{}$ $200 - 100 = \boxed{}$ $200 - 80 = \boxed{}$

b How many kilometers have they already driven?

8 The family stopped at a fruit stand on their way to the beach. They got 5 kilograms of apples and 2 kilograms of berries. A kilogram is about the same as 2 pounds.

a About how many pounds of apples did the family get? Fill in the bubble to show.

◯ 5 pounds   ◯ 8 pounds   ◯ 10 pounds   ◯ 20 pounds

b About how many pounds of berries did the family get? _____

3 BRIDGES IN MATHEMATICS

GRADE 3 SUPPLEMENT

Set A5 Number & Operations: Fractions

Includes

Skills & Concepts

★ represent fractions as distances on a number line

★ solve problems that involve comparing and ordering fractions by using models

★ identify equivalent fractions using models, including the number line

★ add common fractions with like denominators

★ identify fractions of an inch on a ruler

Bridges in Mathematics Grade 3 Supplement
Set A5 Numbers & Operations: Fractions

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set A5 ★ Activity 1

Fractions on a Double Number Line

Overview

Students create a double number line marked with 0 and 1 on one side, and fractions on the other. Then they name and locate points along the line, including ½, ¼, and ¾.

Skills & Concepts

★ represent fractions as distances on a number line

★ solve problems that involve comparing and ordering fractions by using models

★ identify equivalent fractions using models, including the number line

★ add common fractions with like denominators

You'll need

★ Double Number Line (page A5.4, run a half-class set on cardstock, cut in half)

★ scissors

★ a paperclip for each student

Instructions for Fractions on a Double Number Line

1. Give each student a copy of the Double Number Line. Ask them to cut it out along the heavy lines and fold it in half lengthwise.
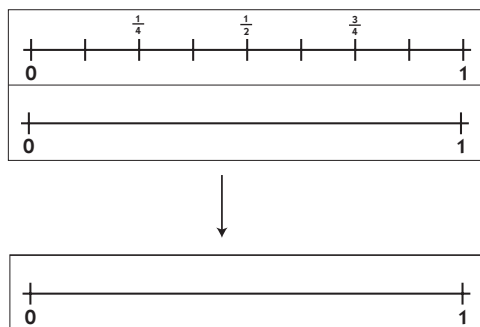
2. Ask students to pair-share any mathematical observations they can make about their Double Number Lines, and then ask volunteers to share their thinking with the class.

> **Students** *It looks kind of like a ruler.*
> *It's like a giant inch or something, with 0 at one end and 1 at the other.*
> *There are fractions on the other side: $^1/_4$, $^1/_2$, and $^3/_4$.*
> *Some of the marks don't have any numbers.*
> *The mark in the middle says $^1/_2$. That's because it's halfway between the 0 and the 1.*
> *When you turn it over, the numbers are still right-side up, but there's only a 0 and a 1.*

Activity 1 Fractions on a Double Number Line (cont.)

3. Give students each a paperclip, and ask them to slide the clip down over the fold. Working with the side marked only with 0 and 1, have them slide the paperclip along the fold until they think they've gone exactly halfway. Then have them flip the line over to check. Did the clip land on the mark labeled with the fraction $\frac{1}{2}$?
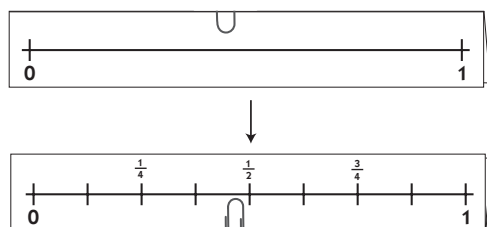
Lateva *Almost! I almost got it exactly. I'm going to turn it over and try again to see if I can get the paperclip to land right on the $\frac{1}{2}$ mark.*

Give students a minute to experiment. Can they develop strategies for getting the paperclip to land exactly on the $\frac{1}{2}$ mark without peeking? Then ask them to slide their paperclip one-fourth of the way along the unmarked line. Can they come up with some strategies for getting the clip to land on or very near the mark labeled with $\frac{1}{4}$?

Thayne *I just moved my clip what I thought was halfway down the line and then cut that in half. I got pretty close.*

4. Now talk with students about the marks that haven't yet been labeled with fractions. How would they label some of those marks? Give them a few moments to pair-share ideas and then call on volunteers to share their thinking with the class. Encourage them to explain their thinking.

Olivia *It should say $\frac{1}{8}$ on that first mark.*

Teacher *How are you thinking about that, Olivia?*

Olivia *Well, the line is divided into 8 parts, right? So each one is one-eighth.*

Hector *We said the next one would be $\frac{2}{8}$ because that's the same as $\frac{1}{4}$, plus what Olivia said. It goes $\frac{1}{8}$, $\frac{2}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, and you just keep going that way.*

Twilight *You could also put $\frac{2}{4}$ right under where it says $\frac{1}{2}$, because $\frac{2}{4}$ comes between $\frac{1}{4}$ and $\frac{3}{4}$.*

5. After some discussion, make a sketch of the line on the board and work with input from the class to label each of the marks. Then have students label each of the marks on their own number lines.
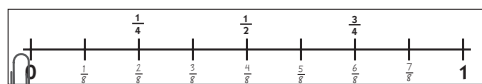
6. Now ask them to turn their number line back over to the unmarked side. Challenge them to slide their paperclip three-fourths of the way along the line, and then ask them to check the other side. How close did they come to hitting the mark labeled $\frac{3}{4}$? Ask them to share some of their strategies.

Activity 1 Fractions on a Double Number Line (cont.)

7. Repeat step 6 with some of the following fractions. (Vary these as needed to meet the needs of your students.)

- $\frac{1}{8}$
- $\frac{6}{8}$
- $\frac{3}{8}$
- $\frac{1}{4} + \frac{1}{4}$
- $\frac{1}{8} + \frac{1}{8}$

Extensions

- Pose story problems such as the ones below and ask students to enact them by moving their paper-clip along the unmarked side of their number line. After each, have them turn their number line over to see how close they came to hitting the mark.
- I ran $\frac{1}{4}$ of a mile. Then I took a rest and ran another $\frac{1}{4}$ of a mile. How far did I go in all?
- I had 1 whole fruit strip. I ate half of it. How much did I have left?
- Sam's brother gave him 1 whole piece of licorice. He ate $\frac{1}{4}$ of it and saved the rest for later. How much did he have left?
- We walked $\frac{2}{8}$ of a mile and then another $\frac{1}{8}$ of a mile. How far did we go in all?

INDEPENDENT WORKSHEET

See Set A5 Independent Worksheets 1 and 2 for more practice locating and naming fractions on a number line, including halves and fourths.

Double Number Line

$\frac{3}{4}$ $\frac{1}{2}$ $\frac{1}{4}$

1   0

1   0

$\frac{3}{4}$ $\frac{1}{2}$ $\frac{1}{4}$

1   0

1   0

NAME _____   DATE _____

Set A5 ★ Independent Worksheet 1

The Broken Ruler, Part 1

1 Find, mark, and label the measurements on the rulers below. The first one has been done for you.

example $4\frac{1}{2}$ inches
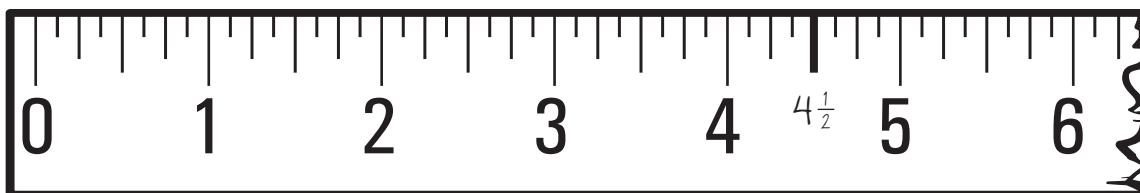
a $3\frac{1}{2}$ inches
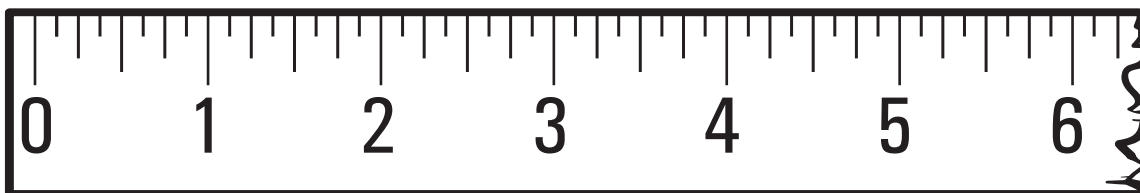
b $1\frac{1}{2}$ inches
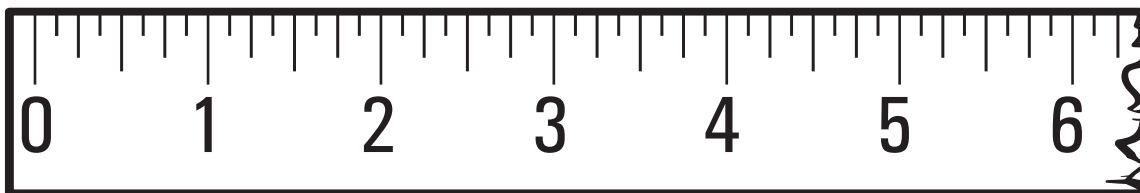
c $5\frac{3}{4}$ inches
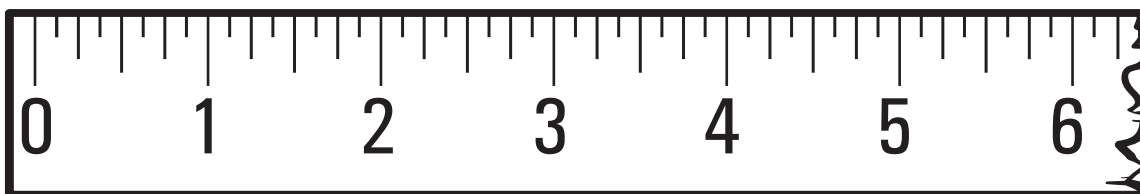
(Continued on back.)

Independent Worksheet 1   The Broken Ruler, Part 1 (cont.)

d $2\frac{1}{4}$ inches
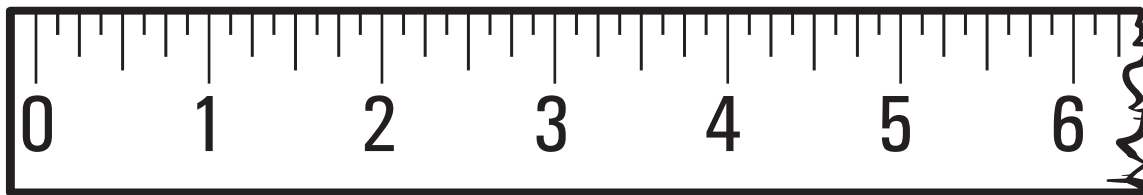
e $4\frac{1}{4}$ inches
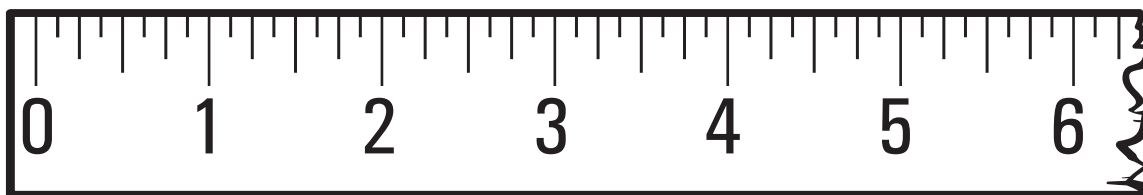
2 Share your work with a partner. Does he or she agree with each of the marks you made on the rulers? If not, decide who's correct and fix your work.

CHALLENGE

3 What other fractions do you know? Mark and label them on this ruler.
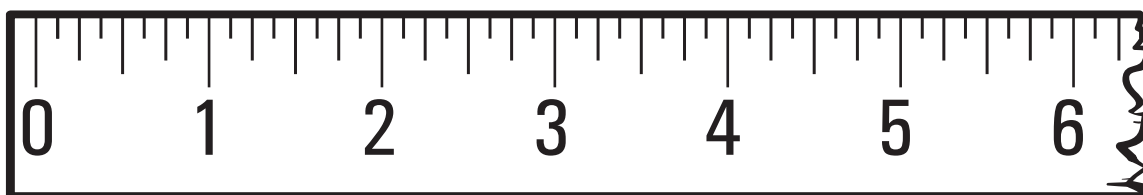
NAME _____   DATE _____

Set A5 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

The Broken Ruler, Part 2

1 These rulers have been broken at both ends so they fit on the page. Find, mark, and label the measurements on each. The first one has been done for you.

example $8\frac{1}{2}$ inches
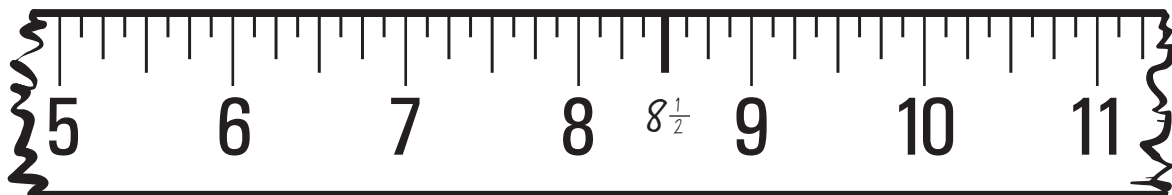
a $6\frac{1}{2}$ inches
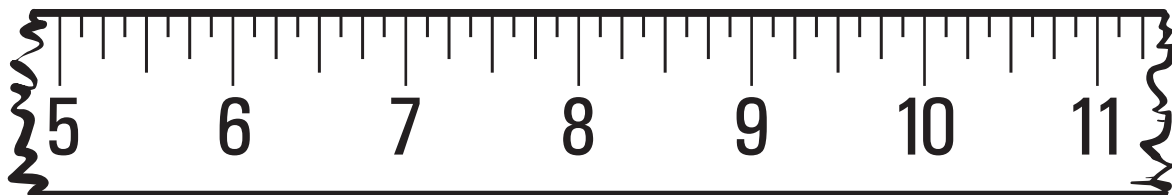
b $9\frac{3}{4}$ inches
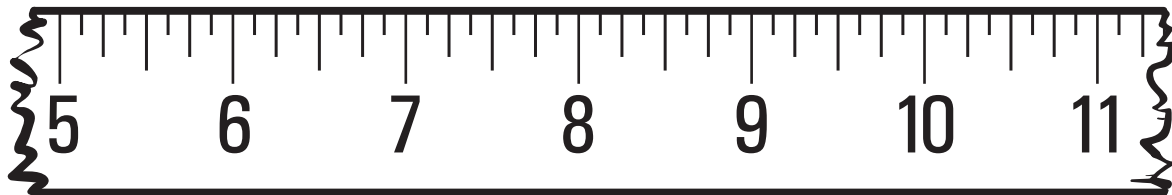
c $8\frac{1}{4}$ inches
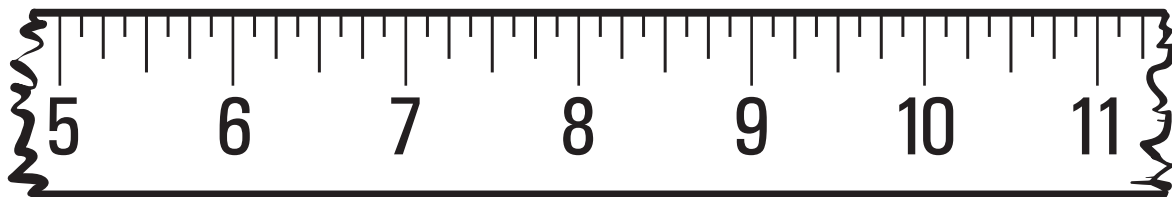
(Continued on back.)

Independent Worksheet 2   The Broken Ruler, Part 2 (cont.)

d $10\frac{1}{4}$ inches
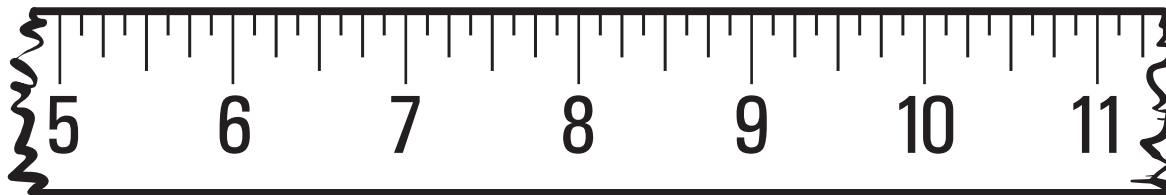
e $7\frac{3}{4}$ inches
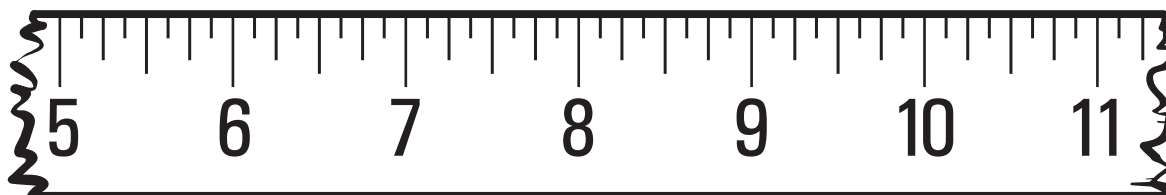
2 Share your work with a partner. Does he or she agree with each of the marks you made on the rulers? If not, decide who's correct and fix your work.

CHALLENGE

3 What other fractions do you know? Mark and label them on this ruler.

BRIDGES IN MATHEMATICS 3
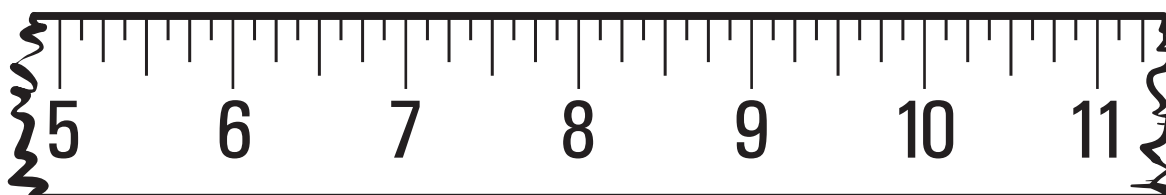
GRADE 3 SUPPLEMENT

Set A6 Number & Operations: Estimating to Add & Subtract

Includes

Skills & Concepts

★ solve contextual problems involving addition and subtraction of whole numbers and justify the solutions

★ estimate sums and differences to predict solutions to problems or determine reasonableness of answers

★ analyze and evaluate whether a solution is reasonable, is mathematically correct, and answers the question

Bridges in Mathematics Grade 3 Supplement
Set A6 Numbers & Operations: Estimating to Add & Subtract

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

NAME _____ DATE _____

Set A6 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Using Compatible Numbers to Estimate Answers

Mathematicians sometimes estimate answers to addition and subtraction problems by using *compatible numbers*. Compatible numbers are numbers that work well together. If a pair of numbers is easy to add or subtract, those numbers are *compatible.* For example:

Tonio collects sports cards. He has 17 football cards and 26 baseball cards. *About* how many cards does he have in all? *About* how many more baseball than football cards does he have?

17 is close to 15
26 is close to 25
15 + 25 = 40, so he has about 40 cards in all.
25 − 15 = 10, so he has about 10 more baseball than football cards.

1 Use compatible numbers to estimate the answer to each problem below. To use this estimation strategy, change the actual numbers to *compatible* numbers. The first two are done for you.

addition example 397 + 198	**subtraction example** 252 – 126
397 is close to __400__.	252 is close to __250__.
198 is close to __200__.	126 is close to __125__.
__400__ + __200__ = __600__,	__250__ − __125__ = __125__,
so the answer is about __600__.	so the answer is about __125__.
a 149 + 148	**b** 481 – 138
149 is close to _____.	481 is close to _____.
148 is close to _____.	138 is close to _____.
_____ + _____ = _____,	_____ − _____ = _____,
so the answer is about _____.	so the answer is about _____.

(Continued on back.)

Independent Worksheet 1 Using Compatible Numbers to Estimate Answers (cont.)

C 529 + 398 529 is close to _____. 398 is close to _____. _____ + _____ = _____, so the answer is about _____.	**d** 652 − 249 652 is close to _____. 249 is close to _____. _____ − _____ = _____, so the answer is about _____.

2 Use compatible numbers to estimate the answer to each problem below. Show your work.

a Sam and Sara are on vacation with their mom. They live in Seattle, Washington, and they're driving to Disneyland in California. The first day, they drove 172 miles to Portland, Oregon, and stopped for lunch. After they'd gone another 296 miles, they stopped for gas. *About* how many miles had they driven so far?

b They stopped in Ashland, Oregon to spend the night. It cost them $74.99, including tax, to stay in a motel. Dinner cost $24.97 for the three of them. Breakfast the next morning cost $14.99. *About* how much money did they spend while they were in Ashland?

c After breakfast, their mom said, "We're going to stop near Sacramento for lunch. That's 295 miles from here." When they stopped for gas that morning they still had 147 miles left to go. *About* how many miles had they driven so far?

(Continued on next page.)

Independent Worksheet 1 Using Compatible Numbers to Estimate Answers (cont.)

d Sam and Sara took $7.00 into the store at the gas station to buy snacks. They got some juice for $2.99 and a bag of pretzels for $1.49. Then Sara said, "Hey look! Let's get 3 oranges too. They only cost 49¢ each." *About* how much change did they get back after they paid for the juice, pretzels, and oranges?

e When they got back into the car their mom said, "The odometer on our car said 28,103 miles when we started. Now it says 28,601 miles. *About* how far have we driven so far?"(An odometer tells us how far we have driven altogether.)

f Sara looked at the map and said, "We have 424 miles left to go until we get to Disneyland." Her mom said, "We're going to stop for lunch near Merced, which is 127 miles from here. *About* how much farther will we have to go after that?"

NAME _____   DATE _____

Set A6 ★ Independent Worksheet 2
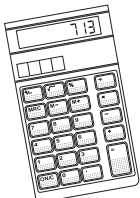
INDEPENDENT WORKSHEET

Are These Answers Reasonable?
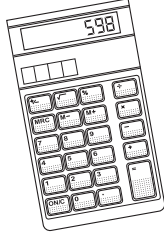
Compatible numbers are numbers that work well together. If a pair of numbers is easy to add or subtract, those numbers are *compatible*. You can check to see if answers to problems are reasonable by changing the actual numbers to compatible numbers.

Use compatible numbers to decide whether or not the answer to each problem below is reasonable or not. Be sure to explain your answer each time.

Question	Is this answer reasonable? Why or why not?
example Ty used a calculator to add 598 and 349. Here's the answer he got: 795	It's not reasonable because 598 is close to 600 and 349 is close to 350. 600 + 350 = 950, so 795 is way off.
1 Abby used a calculator to add 203, 449, and 152. Here's the answer she got: 804	
2 Miguel used a calculator to find the difference between 1,203 and 598. Here's the answer he got: 713	

(Conintued on back.)

Independent Worksheet 2 Are These Answers Reasonable? (cont.)

Question	Is this answer reasonable? Why or why not?
3 Keiko used a calculator to add 749 and 498. Then she subtracted 649. Here's the final answer she got: 598	
4 Mr. Gordon went to the store to buy some fruit. Here's his sales slip. Thriftee Mart Peaches $1.99 Grapes $2.03 Apples $1.49 Bananas $1.52 Total $9.28	
5 Mrs. Chan went to an office supply store in Oregon where there is no sales tax. She bought 6 boxes of markers for $3.99 a box, 1 box of pencil grips for $4.99, 10 boxes of pencils for $.99 each, and an electric pencil sharpener for $13.99. She gave the lady at the check stand three 20-dollar bills and got back $7.18 in change.	

Independent Worksheet 2 Are These Answers Reasonable? (cont.)

6 We have 4 elementary schools in our town, 2 middle schools, and 1 high school. The chart below shows how many students there are at each school.

Name of School	Number of Students
King Elementary	514
Lincoln Elementary	413
Garfield Elementary	226
Adams Elementary	399
Madison Middle School	598
Jefferson Middle School	603
Grant High School	1,012

a The town newsletter said that there are 32 more students at King and Lincoln than there are at Garfield and Adams. Is this a reasonable statement? Why or why not?

b My brother said that if you add the number of students at both the middle schools, there are about 200 more kids at the middle schools than there are at the high school. Is this a reasonable estimate? Why or why not?

c *About* how many students are there in all 7 schools put together? Use compatible numbers to help make your estimate. Show your work below.

NAME _____   DATE _____

Set A6 ★ Independent Worksheet 3

INDEPENDENT WORKSHEET

Travel Miles

Compatible numbers are numbers that work well together. If a pair of numbers is easy to add or subtract, those numbers are *compatible*. When you're solving problems, you can check to see if your answers are reasonable by changing the actual numbers to compatible numbers.

The chart below shows the travel miles between several cities in the U.S. Use the information on this chart to solve the problems on the following pages.

U.S. Cities	Denver	Houston	Orlando	Nashville	Philadelphia	San Francisco
Denver		875 miles	1,858 miles	1,023 miles	1,575 miles	956 miles
Houston	875 miles		960 miles	663 miles	1,336 miles	1,647 miles
Orlando	1,858 miles	960 miles		686 miles	992 miles	2,887 miles
Nashville	1,023 miles	663 miles	686 miles		681 miles	1,969 miles
Philadelphia	1,575 miles	1,336 miles	992 miles	681 miles		2,526 miles
San Francisco	956 miles	1,647 miles	2,887 miles	1,969 miles	2,526 miles	

(Continued on next page.)

Independent Worksheet 3 Travel Miles (cont)

1 Use the chart of travel miles on the previous page to solve the problems below. For each one, show your work. Then use compatible numbers to explain why your answer is reasonable The first one is done for you.

Question	My Work	My answer is reasonable because
example Mr. Buck and Ms. Penny both live in Houston and work for a video game company. On Monday, Mr. Buck flew to Orlando and Ms. Penny flew to San Francisco for business meetings. How much farther did Ms. Penny travel than Mr. Buck?	$$\begin{array}{r} 1{,}\overset{5}{\cancel{6}}47 \\ -\ 960 \\ \hline 687 \end{array}$$ Ms. Penny traveled 687 miles farther than Mr. Buck.	My answer is reasonable because 1,647 is close to 1,650 and 960 is close to 950. 1,650 – 950 = 700. My answer is 687, and that's really close to 700.
a Anna's family lives in Houston. They're trying to decide whether to go to Nashville or Orlando for a vacation next summer. Which city is farther from Houston? How much farther is it?		
b Mrs. Polanco has to fly from San Francisco to Denver and back home again in October. She has to fly from San Francisco to Orlando and back home again in November. How much farther does she have to fly in November than in October?		

Independent Worksheet 3   Travel Miles (cont)

Question	My Work	My answer is reasonable because
c How much farther is it to fly from San Francisco to Philadephia and back, than to fly from Denver to Houston to Orlando and then back to Denver?		
d The Houston Astros are flying from Houston to San Francisco to play a baseball game with the Giants on Friday. Next, they're flying from San Francisco to Denver to play a game with the Colorado Rockies. After that, they have to fly from Denver to Philadelphia to play the Phillies. Then they're flying from Philadelphia back home to Houston. How many miles do they have to travel in all?		

2 Plan an imaginary trip. You can start in any city you want and fly to as many places as you want, but your travel miles have to total between 9,000 and 10,000 miles, including the return trip to your starting city. Show your travel plan on the back of this page and prove that your mileage isn't less than 9,000 or more than 10,000 miles in all.

BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set A7 Number & Operations: Multiplication Beyond the Basic Facts

Includes

Skills & Concepts

★ use basic number combinations to compute related multiplication problems that involve multiples of 10

★ recall equivalencies associated with time: 60 seconds in a minute

Bridges in Mathematics Grade 3 Supplement
Set A7 Numbers & Operations: Multiplication Beyond the Basic Facts

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set A7 ★ Activity 1

ACTIVITY

Multiplying Single Digits by Multiples of Ten

Overview
Students make sketches to investigate and make generalizations about multiplying single digits by multiples of ten. Then they complete a related worksheet independently.

Skills & Concepts
★ use basic number combinations to compute related multiplication problems that involve multiples of 10

You'll need
★ Explore Six (page A7.4, run 1 copy on a transparency and a class set on paper)

★ Explore More (page A7.5, run a class set)

★ Set A7 Independent Worksheet 1 (page A7.6, run a class set)

★ overhead pens in red, blue, and black

★ red, blue, and regular pencils for students

Instructions for Multiplying Single Digits by Multiples of Ten
1. Give students each a copy of Explore Six, and display the transparency at the overhead. Review the instructions and discuss the example at the top of the sheet with the class. Do the first problem together. Use your red overhead pen to label the dimensions of the rectangle, and have students use their red pencils to do so on their own sheets. Use your blue pen to fill in the rectangle with ten strips and ask students to do the same on their sheets. Have students count the strips to determine the area of the rectangle and write a matching multiplication equation.

Activity 1 Multiplying Single Digits by Multiples of Ten (cont.)

2. When students understand what to do, have them work on the sheet independently. Give assistance as needed. Encourage them to share and compare their answers with neighbors as they finish.

3. When most students have finished the sheet, reconvene the class. Ask children to pair-share any mathematical observations they can make about the worksheet. Here are some questions you might pose to spark their thinking:

- Did you notice any patterns in your answers?
- Did the sheet seem easy or challenging?
- What was easy (or challenging) for you about these problems?

4. Call on volunteers to share their observations with the class. Chances are, some of your students will notice the relationship between the basic facts for 6 and multiplying 6 by multiples of 10. If this does not emerge during the discussion, write the combinations shown below on the board as students watch.

$$
\begin{array}{ll}
6 \times 1 = 6 & 6 \times 10 = 60 \\
6 \times 2 = 12 & 6 \times 20 = 120 \\
6 \times 3 = 18 & 6 \times 30 = 180 \\
6 \times 4 = 24 & 6 \times 40 = 240
\end{array}
$$

Then have them list the rest of the combinations in the series, through 6×10 and 6×100, as you record at the board. Here are some additional questions to pose:

- What do you notice about these pairs of combinations?
- Why does this pattern work the way it does?
- What happens to the value of each of the digits in the basic fact products when 6 is multiplied by a multiple of 10? Why?
- Would this pattern work with a different single-digit number? Why or why not?

5. Give students each a copy of Explore More. This sheet asks them to further explore the relationship between basic facts and multiplying by multiples of 10 by choosing a single-digit number between 4 and 9 (other than 6) to investigate. Review the instructions on the sheet with the class. Clarify and model as needed. Advise students to draw the missing dimension for each rectangle in red, and the rectangle on each grid in with regular pencil. Have them continue to use their blue pencils to fill in the rectangles with ten strips, but don't insist on it. Some students may develop more efficient strategies, such as skip counting (i.e., $5 \times 40 = 200$ because it's 40, 80, 120, 160, 200).

6. When students understand what to do, let them go to work. Give assistance as needed, and encourage children to share their discoveries with one another as they work. As they finish, have students start working Set A7 Independent Worksheet 1, Multiplying by Multiples of 10. Unfinished work can be sent home to be completed or assigned as seatwork at another time.

Activity 1 Multiplying Single Digits by Multiples of Ten (cont.)

Set A7 Number & Operations: Multiplication Beyond the Basic Facts Blackline Run a class set.

NAME _____ DATE _____

Explore More

1 Choose a number between 4 and 9 (not 6) to multiply by 10 and multiples of 10. Draw the missing dimensions and the area of each rectangle. Write a multiplication equation to match.

a

b

c

d

2 Use the information above to help complete these equations.

_____ × 50 = _____   _____ × 60 = _____   _____ × 70 = _____

_____ × 80 = _____   _____ × 90 = _____   _____ × 100 = _____

Set A7 Number & Operations: Multiplication Beyond the Basic Facts Blackline Run a class set.

NAME _____ DATE _____

Set 7A ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Multiplying by Multiples of 10

1 Solve theses problems in your head. Write the answers.

10	20	30	40	50	60	70
× 3	× 3	× 3	× 3	× 3	× 3	× 3

80	90	100	1,000	10,000	100,000
× 3	× 3	× 3	× 3	× 3	× 3

2 Explain how you figured out the answers to the problems above.

3 Solve these problems in your head. Write the answers.

10	20	30	40	50	60	70
× 4	× 5	× 7	× 2	× 5	× 4	× 5

80	90	20	30	60	70	80
× 4	× 5	× 8	× 9	× 8	× 2	× 5

40	30	50	60	50	70	70
× 4	× 6	× 5	× 9	× 8	× 4	× 5

CHALLENGE

900	400	800	600	700	800	800
× 9	× 12	× 9	× 12	× 11	× 8	× 12

INDEPENDENT WORKSHEET

Use Set A7 Independent Worksheets 2 and 3 to provide students with more practice multiplying single digit numbers by multiples of 10.

NAME _____   DATE _____

Explore Six

1 Label the dimensions and area of the rectangle on each grid. Write a multiplication equation to match.

example	
10 6 60	$6 \times 10 = 60$
a	
b	
c	

2 Use the information above to help solve these equations.

$6 \times 50 =$ _____ $6 \times 60 =$ _____ $6 \times 70 =$ _____

$6 \times 80 =$ _____ $6 \times 90 =$ _____ $6 \times 100 =$ _____
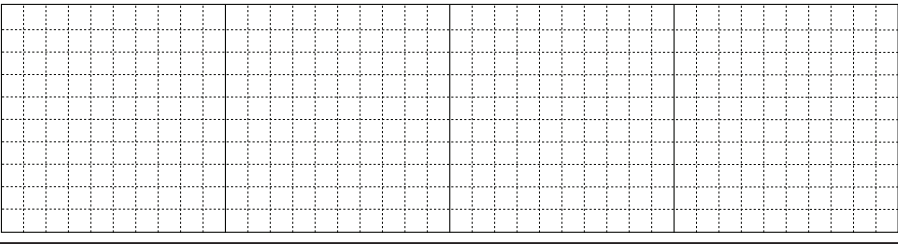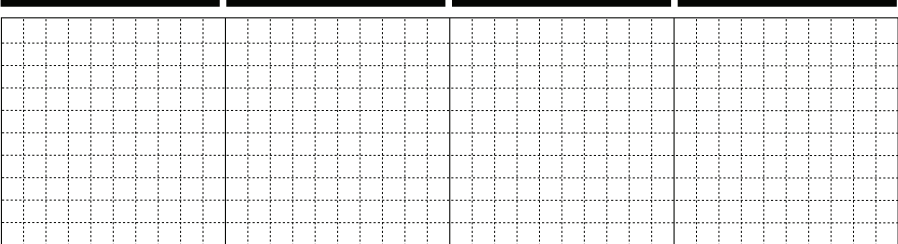
NAME _____   DATE _____

Explore More

1 Choose a number between 4 and 9 (not 6) to multiply by 10 and multiples of 10. Draw the missing dimensions and the area of each rectangle. Write a multiplication equation to match.

a

b

c

d

2 Use the information above to help complete these equations.

_____ × 50 = _____   _____ × 60 = _____   _____ × 70 = _____

_____ × 80 = _____   _____ × 90 = _____   _____ × 100 = _____

NAME _____   DATE _____

Set 7A ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Multiplying by Multiples of 10

1 Solve these problems in your head. Write the answers.

10	20	30	40	50	60	70
× 3	× 3	× 3	× 3	× 3	× 3	× 3

80	90	100	1,000	10,000	100,000
× 3	× 3	× 3	× 3	× 3	× 3

2 Jon says the problems above are easy. Do you agree with him? Why or why not?.

3 Solve these problems in your head. Write the answers.

10	20	30	40	50	60	70
× 4	× 5	× 7	× 2	× 5	× 4	× 5

80	90	20	30	60	70	80
× 4	× 5	× 8	× 9	× 8	× 2	× 5

40	30	50	60	50	70	70
× 4	× 6	× 5	× 9	× 8	× 4	× 5

CHALLENGE

900	400	800	600	700	800	800
× 9	× 12	× 9	× 12	× 11	× 8	× 12

NAME _____   DATE _____

Set A7 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

Sixty Seconds in a Minute

1 Fill in the tables below. Some of the answers have been filled in for you.

×	20	50	70	30	10	40	80	60	100	90
6	120					240				

×	2	5	7	3	1	4	8	6	10	9
60		300					480			

2 What do you notice about your answers?

3 There are 60 seconds in one minute.

a How many seconds are there in 3 minutes? _____

b How many seconds are there in 5 minutes? _____

c How many seconds are there in 10 minutes? _____

d How many seconds are there in 4 minutes? _____

e How many seconds are there in $1\frac{1}{2}$ minutes? Show your work.

There are _____ seconds in $1\frac{1}{2}$ minutes.

CHALLENGE

4 How many seconds are there in 1 hour? Show your work.

There are _____ seconds in 1 hour.

NAME _____   DATE _____

Set A7 ★ Independent Worksheet 3

Hours to Minutes

1 There are 60 minutes in a hour. Use that information to help solve the word problems below. For each problem
- Write an equation to match each problem and solve it.
- Write the answer on the line.

---

a James stayed at the After-School club for 2 hours on Tuesday. How many minutes was James at the After-School Club?

James was at the After-School Club on Tuesday for _____ minutes.

---

b Kara babysat her little cousin from 4:00 p.m. to 7:00 p.m. on Saturday. How many minutes did she babysit her little cousin?

Kara babysat her little cousin for _____ minutes.

---

c Carlos started his chores at 9:30 a.m. He finished at 11:30 a.m.. How many minutes did he spend doing his chores?

Carlos spent _____ minutes doing chores.

Independent Worksheet 3 Hours to Minutes (cont.)

---

2 Mrs. Ramos went out shopping at the time shown on the first clock. She came back at the time shown on the second clock.
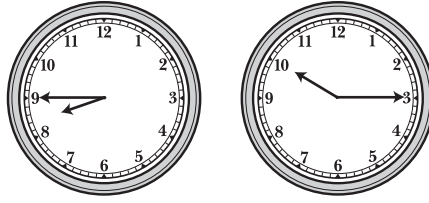
a How many hours was Mrs. Ramos out shopping? How did you figure it out?

b How many minutes was Mrs. Ramos out shopping? Use numbers, labeled sketches, and/or words to solve the problem. Show your work.

---

3 Fill in the lines with the missing numbers.

3 × 40 = _____   6 × 60 = _____   3 × 20 = _____

5 × 50 = _____   60 × _____ = 300   4 × _____ = 120

20 × _____ = 80   30 × _____ = 210   50 × _____ = 120

⚡ **CHALLENGE**

4 Are the expressions below equal? If they are, put an = sign in the space . If they aren't put ≠ in the space. (≠ means not equal).

30 × 60 _____ 2 × 90   40 × 3 _____ 20 × 4   60 × 4 _____ 80 × 3

GRADE 3 SUPPLEMENT

Set C2 Geometry: Triangles & More

Includes

Skills & Concepts

★ exemplify points, lines, line segments, rays, and angles

★ classify triangles by the length of their sides as either scalene, isosceles, or equilateral

★ classify triangles by the size of their angles as either acute, obtuse, or right

★ use appropriate tools to measure objects to the nearest half inch and nearest quarter inch

★ classify angles as either right, acute, or obtuse

★ identify the specific attributes of circles: center, radius, circumference, and diameter

Bridges in Mathematics Grade 3 Supplement
Set C2 Geometry: Triangles & More

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set C2 ★ Activity 1

ACTIVITY

Start with a Point

Overview
The teacher leads the class through a series of drawing tasks on a set of 4 overhead transparencies. As they progress from one task to the next, students construct and discuss points, line segments, lines, rays, and angles. Then students experiment with the idea that if you connect any 3 points, you get a triangle.

Skills & Concepts
★ exemplify points, lines, line segments, rays, and angles

★ use appropriate tools to measure objects to the nearest half inch and the nearest quarter inch

★ classify angles as either right, acute, or obtuse

You'll need
★ Start with a Point, (pages C2.5–C2.8, run a copy of each sheet on a transparency)

★ several sheets of unlined paper for each student (newsprint or copy paper is fine)

★ class set of rulers

★ a piece of paper to mask parts of the overhead.

Instructions for Start with a Point

1. Ask students to get their pencils and rulers out. Give them each 2 sheets of paper and have them label both with their name. Explain that they are going to follow a set of instructions to draw some geometric figures today.

2. Place the first transparency on display at the overhead. Mask all but the first drawing task. Read it with the students and give them a moment to complete the task.

> **Set C2 Geometry: Triangles & More Blackline** Run one copy on a transparency.
>
> **Start with a Point** page 1 of 4
>
> **1** Make a dot near the middle of your paper. Label it with the letter A.
>
> ●
> A
>
> This is *point A*.
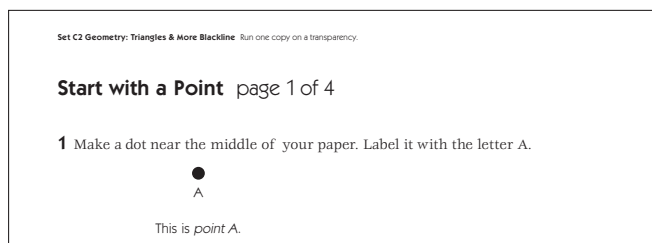
3. Show the example below Task 1. Discuss the fact that students have drawn what mathematicians call a point. A point is an exact location in space. Points are usually marked with letter names, and the point in task 1 is labeled A.

4. Now reveal the second drawing task. Read it with the class. Give students a minute to find, mark, and label point B exactly 3 ½" away from point A. Let them know that they can locate point B anywhere on their paper relative to point A: above, below, or to the side. The only requirement is that it be placed at a distance of 3 ½" from point A.

5. Show them the example of point B on the overhead. Does it match their drawing exactly? Why or why not?

Activity 1 Start with a Point (cont.)

> **Students** *Point B up there goes exactly sideways from point A. I made my point B going down from point A.*
> *I made point B going up from point A.*
> *It's still 3½" away. It's just in a different place than mine.*

Some of the students may realize that all possible choices for point B form a circle with A as its center.

6. Reveal the third drawing task. Read it with the class and give them a moment to connect points A and B on their papers. Then show the example below Task 3. Explain that the students have just constructed what mathematicians call a line segment. A line segment is part of a line. A line segment is named by using its two endpoints, so this one would be called line segment $\overline{AB}$. How is their line segment $\overline{AB}$ the same as the one on the overhead? How is it different?

> **Students** *My line segment AB goes up and down. That one goes across the paper.*
> *Mine goes diagonal.*
> *Mine goes kind of across but it's a little tipped.*
> *They are all straight though, and they are all 3 ½" long.*

7. Work your way through the drawing tasks and examples on the rest of sheet 1, as well as sheets 2–4 in a similar fashion. As you do so, guide students toward the following understandings:

- A line segment starts at one point and ends at another. Because it starts and stops, you can measure its length. When we draw a line on a piece of paper, it is actually just a line segment, or a part of a line.
- A line goes on and on forever in either direction. You cannot measure its length because it never stops. People show this by placing a small arrow at either end of a line segment, but you can't really draw a line, because a line is infinitely long.
- A ray is part of a line. It has one endpoint and goes on forever in one direction. It's kind of like the rays that shine out of a flashlight.
- Line segments, lines, and rays can all be named using the points that define them. A line segment with endpoints A and B is called line segment $\overline{AB}$. A line that runs through points A and B is called line $\overleftrightarrow{AB}$. A ray that has point A as an endpoint and runs through point B is called ray $\overrightarrow{AB}$.
- The markings above AB (↔, →, or —) indicate whether AB represents a line segment, line, or ray.

Activity 1 Start with a Point (cont.)

- An angle is formed when two rays meet at an endpoint. The endpoint is called the vertex of the angle. An angle can be named most easily using just the letter of the vertex. The first angle students draw will be angle C. The second angle they draw will be angle F.
- Angles can be acute, obtuse, or right. Ask students to identify what kinds of angles they draw, and note that angle C on the overhead is acute.

8. As you go, reassure students that it is fine if their drawings do not look identical to the ones on the overhead. In fact, if you show each example on the overhead after students complete the task above it, they will have an opportunity to see that there are many different ways to respond to the same prompt. Although everyone's line segment $\overleftrightarrow{CD}$ should be exactly $4\frac{1}{4}$ inches, some students' line segments may go vertically. Others may go horizontally or diagonally across the page.

Start with a Point page 1 of 4

1 Make a dot near the middle of your paper. Label it with the letter A.

●
A

This is *point A*.

2 Make another dot exactly $3\frac{1}{2}$ inches away from point A. Label this dot with the letter B.

●   ●
A   B

This is *point B*.

3 Use your ruler and pencil to connect points A and B.

●————————————●
A   B

This is *line segment $\overline{AB}$.* How long is this line segment?

4 Use your ruler to make line segment $\overline{AB}$ half an inch longer in both directions. Draw a little arrowhead at both ends. The little arrowheads show that the line that goes through points A and B could go on and on forever.

←●————————————●→
  A   B

This is *line $\overleftrightarrow{AB}$.* What is the difference between a line segment and a line?

Start with a Point page 2 of 4

5 Turn your paper over. Draw and label *point C* near the middle of your paper.

●
C

6 Make a dot exactly $4\frac{1}{4}$ inches away from point C. Label it *point D*.

●   ●
C   D

7 Use your ruler and pencil to connect points C and D. Is this a line, or a line segment? How do you know?

●————————————————●
C   D

8 Make line segment $\overline{CD}$ go a quarter of an inch past point D. Draw a little arrowhead on that end.

●————————————————●→
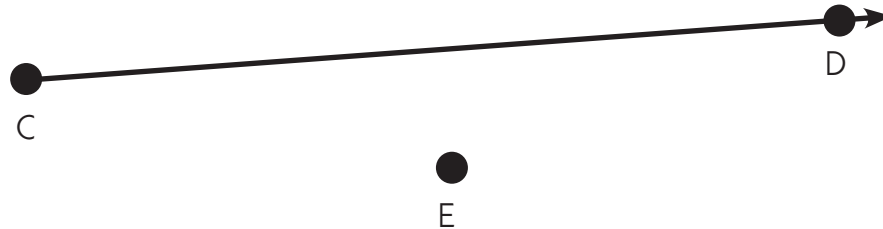C   D

This is *ray $\overrightarrow{CD}$.* A ray is part of a line. It has an endpoint (point C), but the little arrowhead shows it could go on and on forever through point D in the other direction. It's kind of like a ray of light coming from a flashlight.
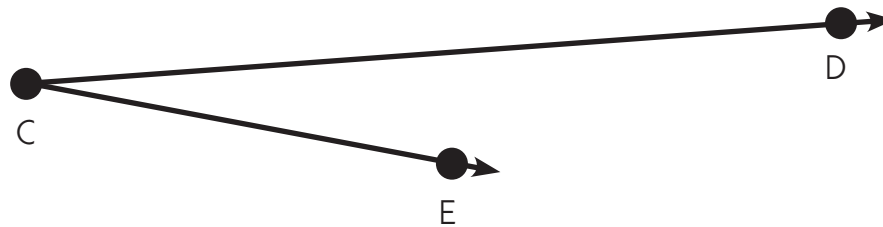
Activity 1 Start with a Point (cont.)

Start with a Point page 3 of 4

9 Now make a dot 2 ¼ inches away from point C. Make sure it doesn't land anywhere along line CD. Label it *point E*.

10 Use your ruler and pencil to draw ray $\overrightarrow{CE}$.

This is angle ∠C. Is your angle acute, obtuse, or right? How do you know?

11 Get another piece of paper. Draw and label:
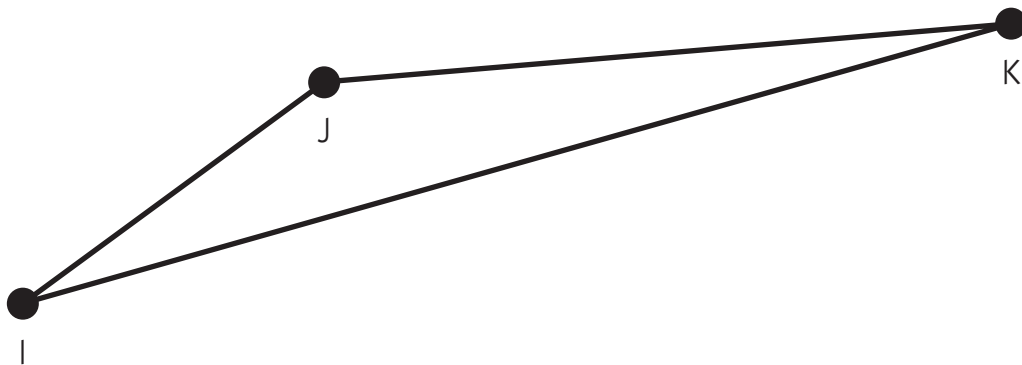- Point F
- Point G
- Point H (not along line FG)
- Ray $\overrightarrow{FG}$
- Ray $\overrightarrow{FH}$

What is the name of this figure?

Start with a Point page 4 of 4

12 Turn your paper over. Draw 3 points on the page. Make sure they don't all fall along the same line line. Label the *points I, J,* and *K*.

13 Use your ruler to draw line segments $\overline{IJ}$, $\overline{JK}$, and $\overline{KI}$. What is the name of this figure? How do you know?

14 Dave says that if you draw line segments between any 3 points, you will always get a triangle. Try Dave's idea at least 3 times. Does it always work? Can you find an example that doesn't work?

The last task on Sheet 4 invites students to try experimenting with the idea that you will always get a triangle if you connect 3 points with line segments. Ask them to discuss the idea and then try it for themselves. Encourage them to draw as many different examples as time allows. Does it always work? Do the triangles that result all look the same? Can they find an example that doesn't work? If you leave this as an open question, some students may continue to ponder and experiment for days to come. Some students may discover that if you locate all 3 points along the same line and connect them, you get a line segment rather than a triangle.

INDEPENDENT WORKSHEET

Use Set C2 Independent Worksheets 1 and 2 to provide students with more practice constructing and identifying points, line segments, lines, rays, and angles.

Start with a Point page 1 of 4

1 Make a dot near the middle of your paper. Label it with the letter A.

●
A

This is *point A.*

2 Make another dot exactly 3½ inches away from point A. Label this dot with the letter B.

●
A

●
B

This is *point B.*

3 Use your ruler and pencil to connect points A and B.

●————————————————————————●
A   B

This is *line segment $\overline{AB}$.* How long is this line segment?

4 Use your ruler to make line segment $\overline{AB}$ half an inch longer in both directions. Draw a little arrowhead at both ends. The little arrowheads show that the line that goes through points A and B could go on and on forever.

←———●————————————————————●———→
A   B

This is *line $\overleftrightarrow{AB}$.* What is the difference between a line segment and a line?

Start with a Point page 2 of 4

5 Turn your paper over. Draw and label *point C* near the middle of your paper.

C

6 Make a dot exactly 4¼ inches away from point C. Label it *point D*.

D

C

7 Use your ruler and pencil to connect points C and D. Is this a line, or a line segment? How do you know?

D

C

8 Make line segment $\overline{CD}$ go a quarter of an inch past point D. Draw a little arrowhead on that end.

D

C

This is *ray $\overrightarrow{CD}$*. A ray is part of a line. It has an endpoint (point C), but the little arrowhead shows it could go on and on forever through point D in the other direction. It's kind of like a ray of light coming from a flashlight.

Start with a Point page 3 of 4

9 Now make a dot 2 ¼ inches away from point C. Make sure it doesn't land any-where along line CD. Label it *point E.*

10 Use your ruler and pencil to draw ray $\overrightarrow{CE}$.

This is angle ∠C. Is your angle acute, obtuse, or right? How do you know?

11 Get another piece of paper. Draw and label:

• Point F

• Point G

• Point H (not along line FG)

• Ray $\overrightarrow{FG}$

• Ray $\overrightarrow{FH}$

What is the name of this figure?

Start with a Point page 4 of 4

12 Turn your paper over. Draw 3 points on the page. Make sure they don't all fall along the same line line. Label the *points I, J*, and *K*.

13 Use your ruler to draw line segments $\overline{IJ}$, $\overline{JK}$, and $\overline{KI}$. What is the name of this figure? How do you know?

14 Dave says that if you draw line segments between any 3 points, you will always get a triangle. Try Dave's idea at least 3 times. Does it always work? Can you find an example that doesn't work?

Set C2 ★ Activity 2

ACTIVITY

Classifying Triangles

Overview
Students build and record four different triangles on their geoboards. Then they classify their triangles, first by angle size and then by side length.

Skills & Concepts
★ classify triangles by the length of their sides as either scalene, isosceles, or equilateral

★ classify triangles by the size of their angles as either acute, obtuse, or right

★ use appropriate tools to measure objects to the nearest quarter inch

★ classify angles as either right, acute, or obtuse

You'll need
★ Triangles Record Sheet (page C2.13, class set plus a few extra and one copy on a transparency)

★ Types of Triangles (page C2.14, run one copy on a transparency)

★ overhead geoboard

★ class set of geoboards

★ rubber bands

★ class set of rulers

★ a piece of paper to mask parts of the overhead

★ Word Resource Cards: acute angle, obtuse angle, right angle (see Advance Preparation)

....

Advance Preparation Post the Word Resource Cards where all the students can see them clearly before you conduct this activity.

....

Instructions for Classifying Triangles
1. Ask students to get out their rulers and pencils. Then give them each a geoboard and a copy of the Triangles Record Sheet. Explain that they are going to make and record 4 different triangles today. Demonstrate by making a triangle on a geoboard at the overhead. If necessary, review any guidelines you have established with the class for handling the rubber bands carefully. Then copy your triangle onto the Triangles Record Sheet transparency. Solicit advice from students about how to do this carefully and accurately as you are working.

Set C2 Geometry: Triangles & More Blackline Run a class set plus a few extra and one on a transparency.
NAME Mr. Gonzalez   DATE May 18

Triangles Record Sheet

right angle
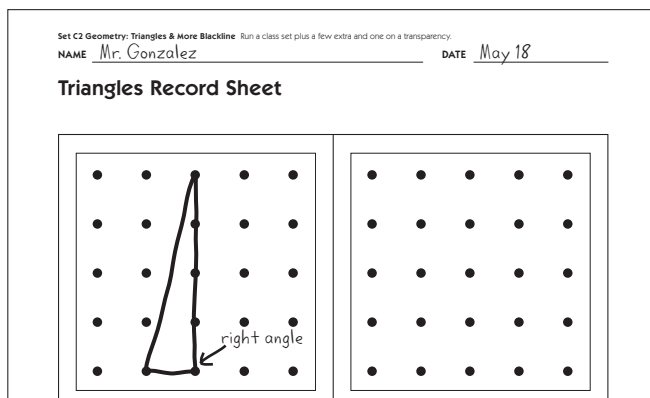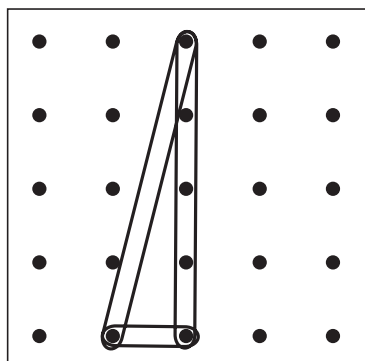
Activity 2 Classifying Triangles (cont.)

2. When students understand what to do, pass out the rubber bands and let them get started. Remind them to make 4 different triangles. Encourage them to make triangles that are different than the one you made, and different from the ones their neighbors are making. Circulate as they are working to talk with them about their triangles. What kinds of angles do they notice as they create their triangles? Can they point out acute, obtuse, and /or right angles in their work?

3. When most students have finished, reconvene the class. Explain that they are going discover and record the types of triangles they have just created. Show just the top portion of Types of Triangles at the overhead.
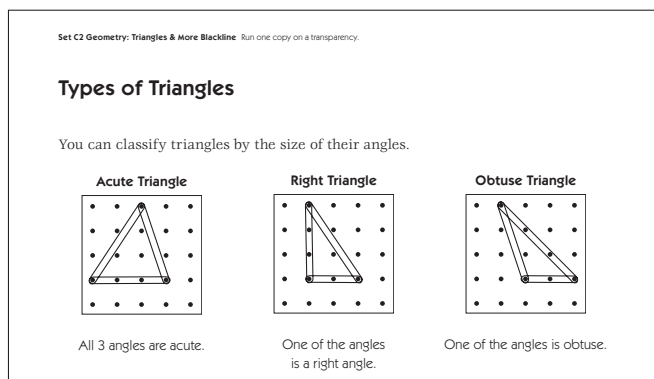
4. Read and discuss the information with the class. Ask volunteers to work with the support of the pictures on the Word Resource Cards to describe each type of angle. Then have volunteers mark and label the acute angles on the first triangle, the right angle on the second triangle, and the obtuse angle on the third triangle. Then ask the students to help you classify the triangle you made on your geoboard.

> **Teacher** *What kind of triangle did I make when I introduced this activity? I'll hold up my geoboard so you can see it while you look at the different types of triangles on the overhead. Pair-share with the person next to you, and raise your hand when you have an idea.*
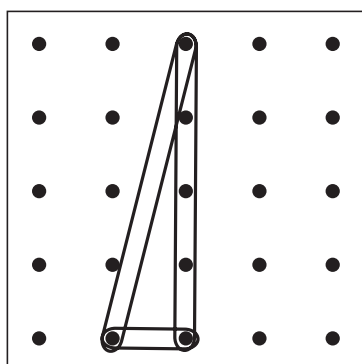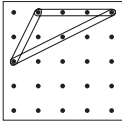
> **Students** *I think it's an acute triangle because it's really skinny.*
> *It's none of those because it doesn't look like any of them. None of the ones up there are that skinny.*
> *I think it might be a right triangle. I'm pretty sure that angle on the bottom is a right angle.*
> *Can we test it out? Let's see if a square pattern block will fit in that corner.*

You may have to help students understand that a triangle doesn't have to look exactly like the ones on the overhead to fit into one of the three categories. If necessary, build several more triangles on your board and have the students work together to classify them.

Activity 2 Classifying Triangles (cont.)

5. When students understand what to do, have them work in pairs to help each other classify the triangles on their record sheets by angle size, and mark and label the relevant triangles. Ask them to record the classification on the first line in the box below each triangle.

6. As students finish their work, have them talk with others nearby. If there are disagreements, encourage students to work together to resolve them. How can they be sure if an angle is acute, right, or obtuse?

7. When most students have finished, reconvene the class and display the other half of the Triangle Types overhead. Read and discuss the information with students.
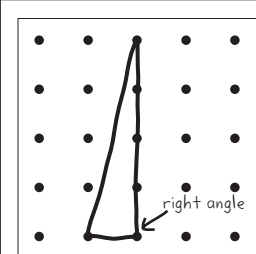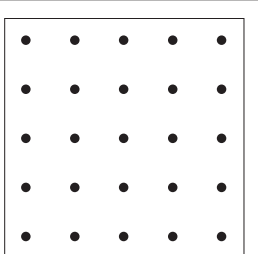
8. Ask students to help you classify the triangle you made on your geoboard by measuring each side length to the nearest quarter-inch. Remind them that a triangle doesn't have to look exactly like one of the examples on the overhead to fit one of the categories. When they have come to agreement, record the information on your record sheet.

9. Have students work in pairs to classify their own triangles by side length and record the information on their sheets. If time runs out, ask students to complete their sheets during a designated seatwork period the following day. Post the Triangle Types overhead for their reference.

10. A time allows, ask students to share and compare some of the triangles they made. Let them know that it is, in fact, impossible to create an equilateral triangle on this geoboard. If any of the students believe they have created an equilateral triangle, have them share it with the class, and work together to measure the sides to the nearest quarter-inch. While the side lengths may be very close, they will not be equal.

Activity 2 Classifying Triangles (cont.)
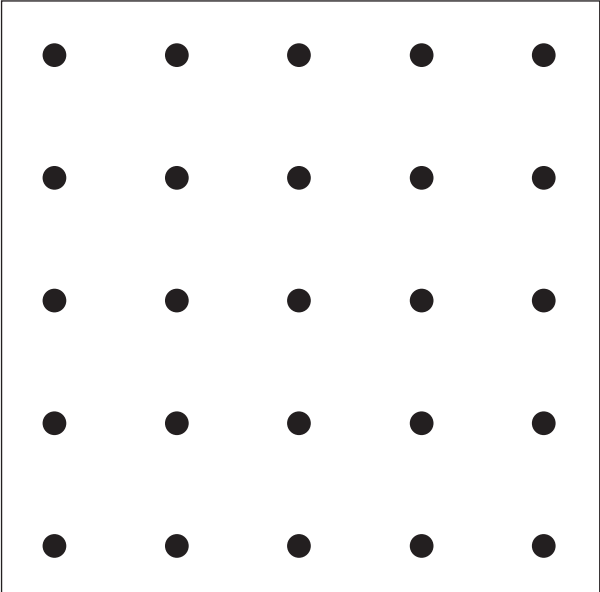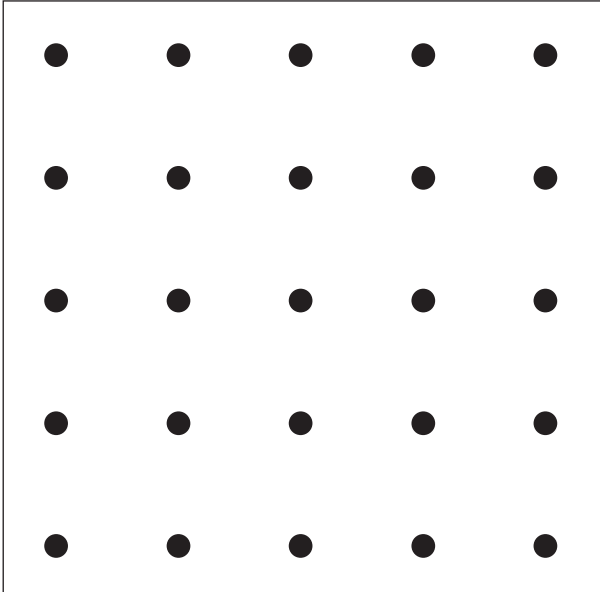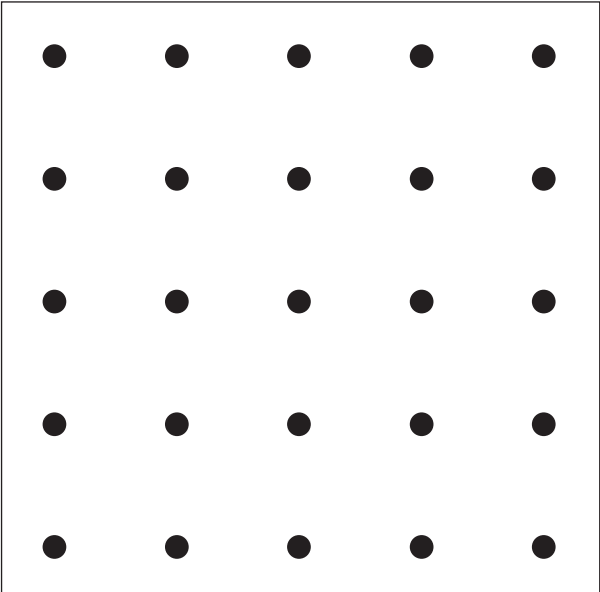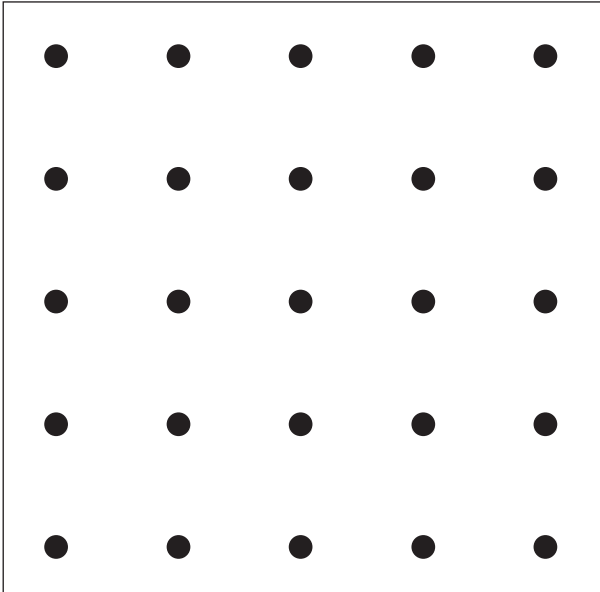
Use Set C2 Independent Worksheets 3 and 4 to provide students with more practice classifying triangles by angle size and side length.

NAME _____   DATE _____

Triangles Record Sheet

Types of Triangles

You can classify triangles by the size of their angles.
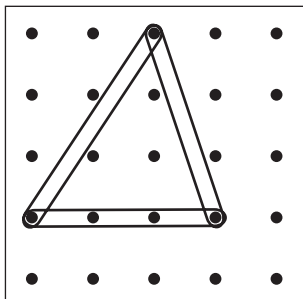
Acute Triangle	**Right Triangle**	**Obtuse Triangle**
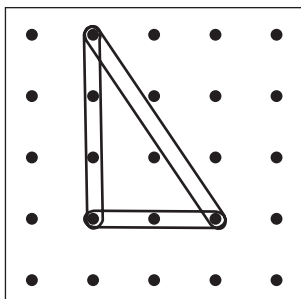
All 3 angles are acute.   One of the angles   One of the angles is obtuse.
                           is a right angle.

You can also classify triangles by the length of their sides.

Isosceles Triangle   **Scalene Triangle**   **Equilateral Triangle**

Each side is the same length.

Are any of the triangles you made on the geoboard equilaterals?

Can you make an equilateral triangle on a geoboard?

Two sides are the   Each side is a
same length.   different length.

Set C2 ★ Activity 3

Measuring Circles

Overview
Students share what they already know about circles. The teacher introduces a set of circle words, and works with input from the class to label a circle at the overhead. Students then measure the radius and diameter of several circles and share ideas about how these dimensions might relate to each other.

Skills & Concepts
★ identify the specific attributes of circles: center, radius, circumference, and diameter

★ exemplify points and line segments

★ use appropriate tools to measure to the nearest half inch

★ represent fractions that are greater than or equal to 1
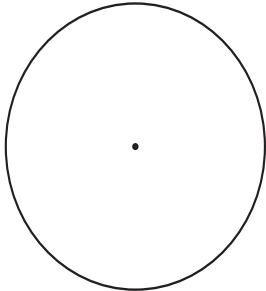
You'll need
★ A Circle (page C2.18, run one copy on a transparency)

★ Circles (page C2.19, run several copies and cut apart; each student will need one circle)

★ Circles to Label & Measure (page C2.20, run a class set)

★ class set of rulers

★ scissors and pencils

★ a piece of paper to mask parts of the overhead

★ 2 feet of string for each pair of students (optional)

Instructions for Measuring Circles

1. Place just the top portion of A Circle on display at the overhead. Ask students to pair-share anything they already know about this shape, and any observations they can make about it. Then call on volunteers to share their ideas with the class as you record at the overhead.

2. Reveal the first word on the vocabulary list at the bottom of the overhead: center. Ask students to explain where the center of the circle is and how they know. Is there any way they can prove that it is the center? After some discussion, give students each a copy of the circle. Explain that it is an exact copy of the one on the overhead. Ask them to work in pairs to see if the point that appears to be in the middle of this circle is actually in the middle.

Activity 3 Measuring Circles (cont.)

3. When they have had a few minutes to work, have students share their conclusions and strategies. Is the point actually at the center of the circle? What did they do to find out?

> **Students** *We cut out the circle and folded it in half. The point landed right on the fold, so we said it must be the center.*
>
> *We measured from the point to the edge of the circle. It was exactly an inch and a half on one side and then on the other side. That means the dot is right in the middle.*
>
> *We kept measuring from the point to different places on the circle. It was an inch and a half every time. It must be in the center.*

4. Affirm students' experiments and explanations by explaining that a circle is a set of points that are all the same distance from the center. Give students each a copy of Circles to Label & Measure. Label the center of your circle as students label the center of the top circle on their sheets.

5. Reveal the other vocabulary words at the bottom of the overhead one by one. As you show each one, read and discuss the word and its definition with the class. Challenge students to use what they already know about points and line segments to figure out how to construct and label these dimensions on their top circle. Provide as much support as needed, but encourage them to think for themselves.
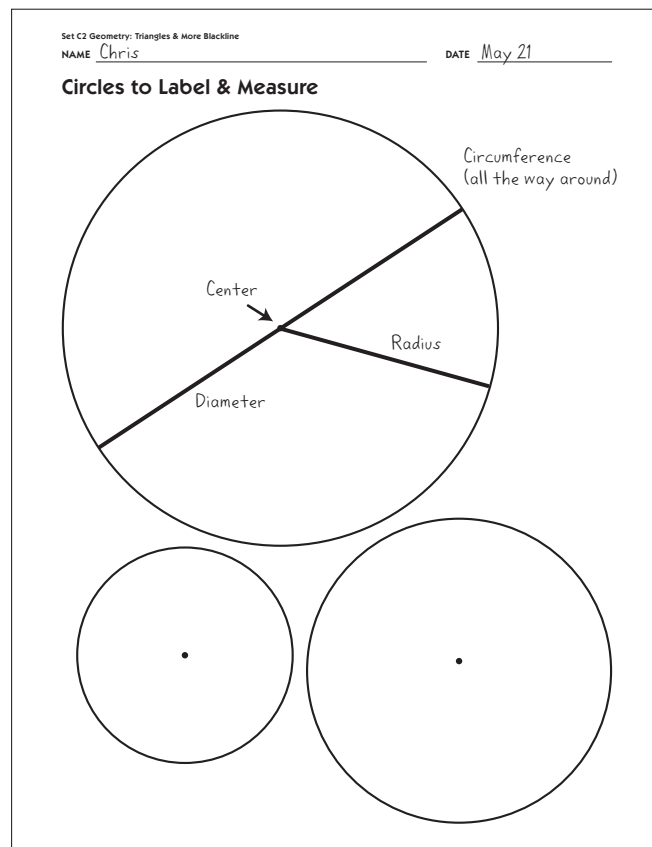
6. Have students use the inch side of their ruler to measure the radius and the diameter of the circle at the top of the page. Ask them to measure carefully to the nearest half-inch, and record the measurements on their sheets. How do the two measurements compare? Why?

Activity 3 Measuring Circles (cont.)

> ***Students*** *The diameter is 5 inches.*
> *The radius is 2 and a half inches.*
> *Two and a half is what you get if you cut 5 in half.*
> *The radius has to be half the diameter! The diameter goes all the way across the circle. The radius only goes halfway.*

7. Ask students to test any theories they develop about the relationship between the radius and diameter of the circle by marking and measuring both dimensions on the other two circles on their sheets. Is the length of the radius always exactly half the length of the diameter?

Extension

Give each pair of students a 2-foot length of string. Have them use it to measure the circumference of each circle. Advise them to start with the largest circle on their sheet and work their way down to the smallest. That way, they can keep cutting the length of the string down, and won't need more than the original length. Ask them to record the circumference of each circle on the sheet, and then reflect on their results. What do they notice? (If you try this for yourself, you will see that the circumference is just a little more than 3 times the diameter of every circle. This is a good, hands-on demonstration of the formula for the circumference of a circle, which can be expressed as either πd or $2\pi r$ where d is the diameter of the circle and r is the radius.

·· .

Note *The ratio of the circumference of a circle to its diameter is constant. That is, the ratio is the same no matter what size the circle is. This ratio is a bit more than 3, and is designated by the Greek letter* π.

·· .
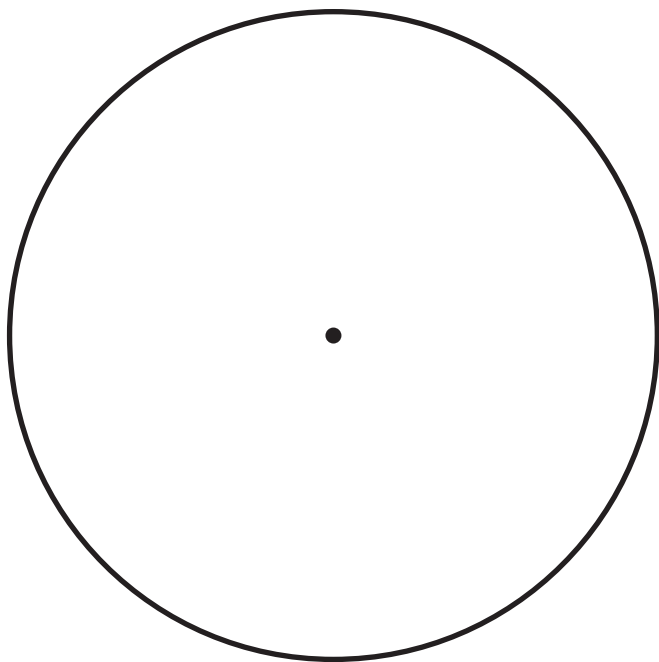
A Circle

Circle Words:

- Center–a point that is the same distance from all the points on a circle

- Radius—a line segment from the center of the circle to any point on the circle

- Diameter—a line segment that passes through the center of the circle and has endpoints on the circle

- Circumference—the distance around a circle

Circles
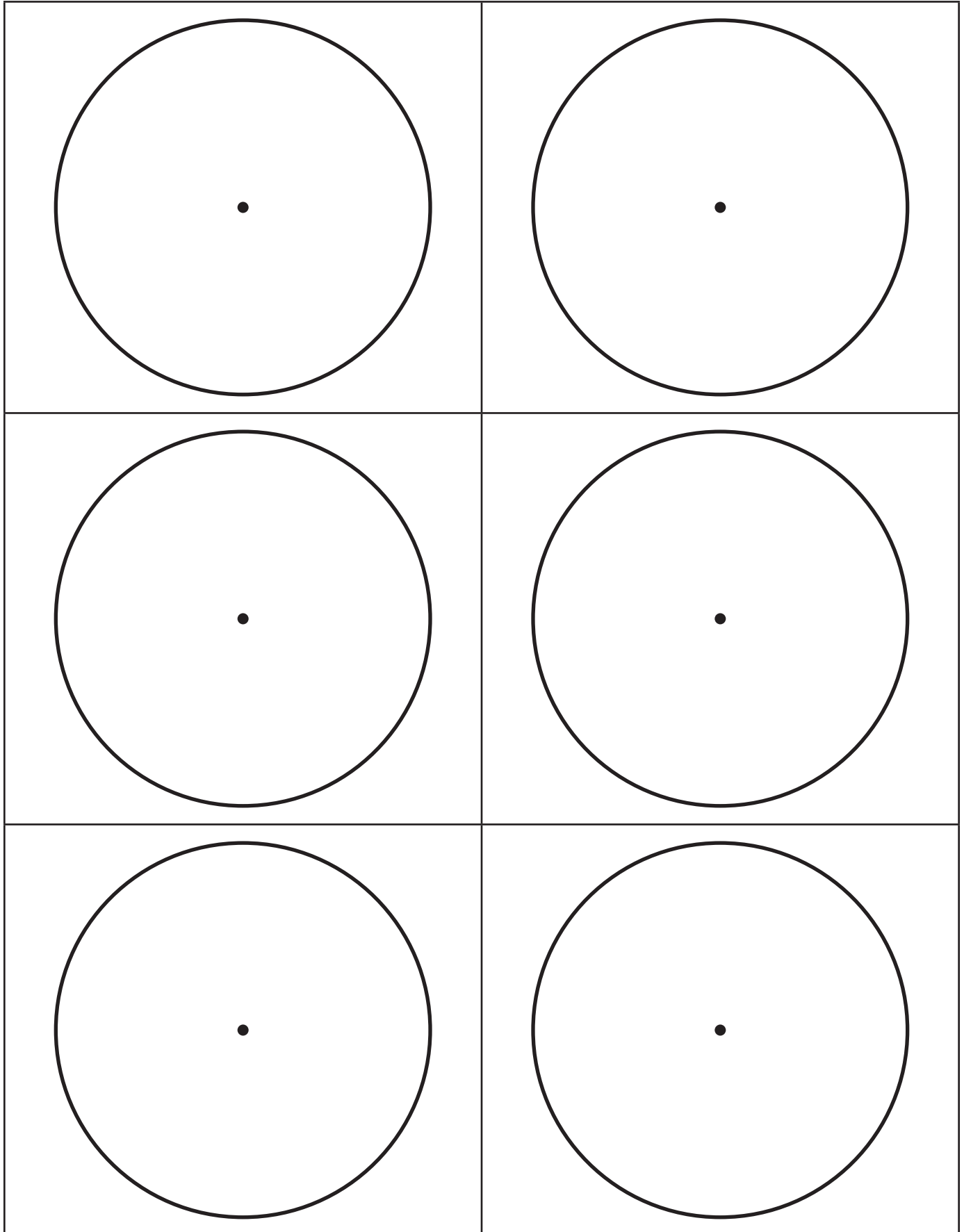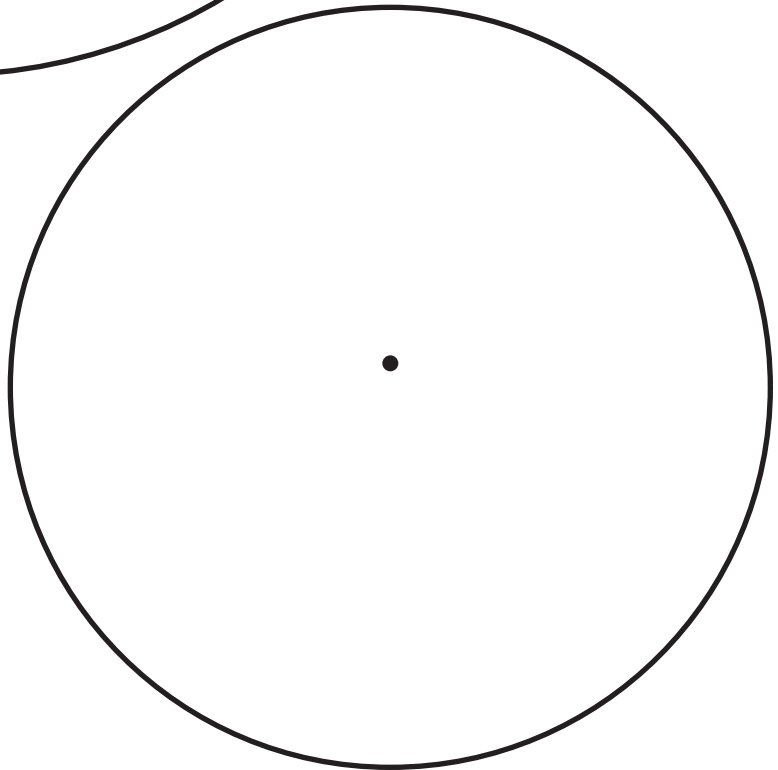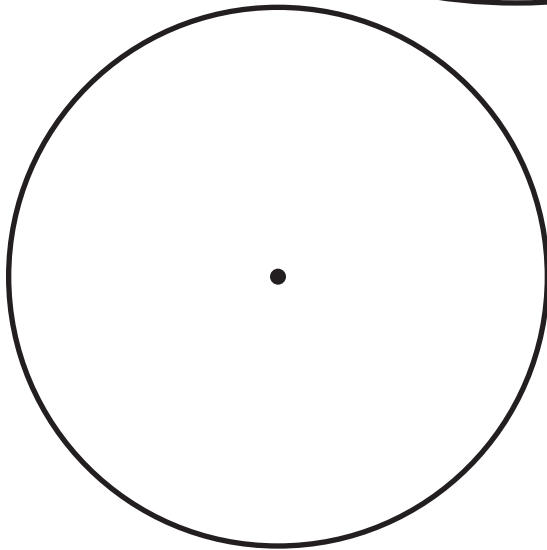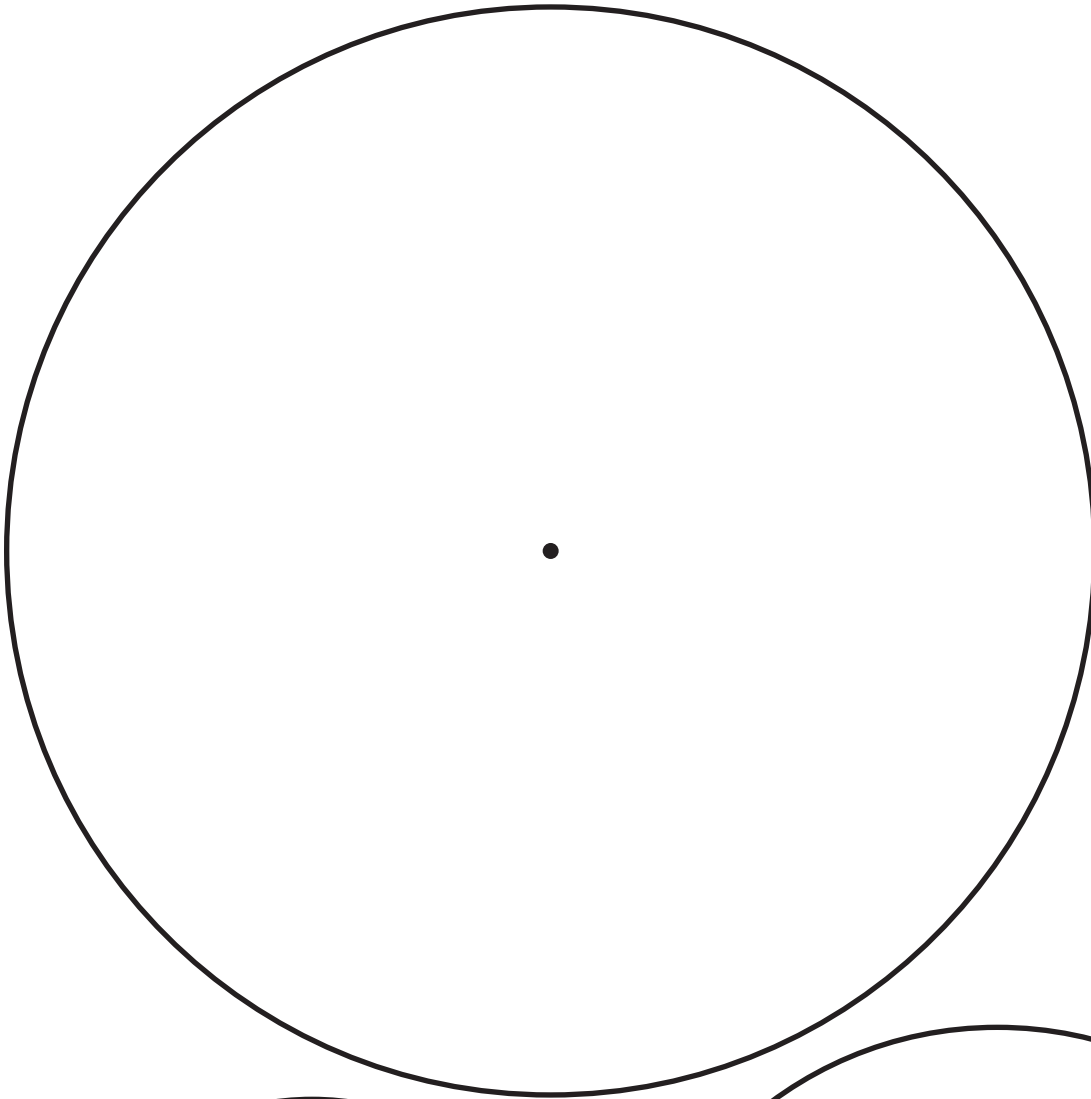
Circles to Label & Measure

NAME _____   DATE _____

Set C2 ★ Independent Worksheet 1

Points, Lines, Line Segments, Rays & Angles

1 Use this drawing to answer questions 1a, b, and c.

a This is a drawing of a (circle one)

line   line segment   ray   angle   point

b What do the arrows on either end mean?

c The name of this figure is (circle one)

$\overline{AB}$ $\overleftrightarrow{AB}$ $\overrightarrow{AB}$ $\angle AB$

2 Use your pencil, ruler, and Points C and D below. Draw line segment $\overline{CD}$.

a Why aren't there arrows at either end of your line segment?

b How long is $\overline{CD}$? (Measure it to the nearest quarter inch.)

c What is the difference between a line segment and a line?

(Continued on back.)

Independent Worksheet 1 Points, Lines, Line Segments, Rays & Angles (cont.)

3 Use this drawing to answer questions 3a and b.

a This is a drawing of a (circle one)

line   line segment   ray   angle   point

b The name of this figure is (circle one)

$\overline{EF}$ $\overleftrightarrow{EF}$ $\overrightarrow{EF}$ $\angle EF$

4 Use your pencil, ruler, and Points G, H, and I below.

- Draw ray GH.
- Draw ray GI

a The figure you just drew is a (circle one)

line   line segment   ray   angle   point

5 Look at points J, K, and L. If you make an angle by drawing ray KJ and ray KL, what kind of angle do you think you will get? (circle one)

acute angle   right angle   obtuse angle

Try it. Were you right?

NAME _____   DATE _____

Set C2 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

Geometry Find & Measure

1 Look at the figures on this page. Circle the
- lines in red.
- line segments in purple.
- rays in green.
- acute angles in blue.
- obtuse angles in orange
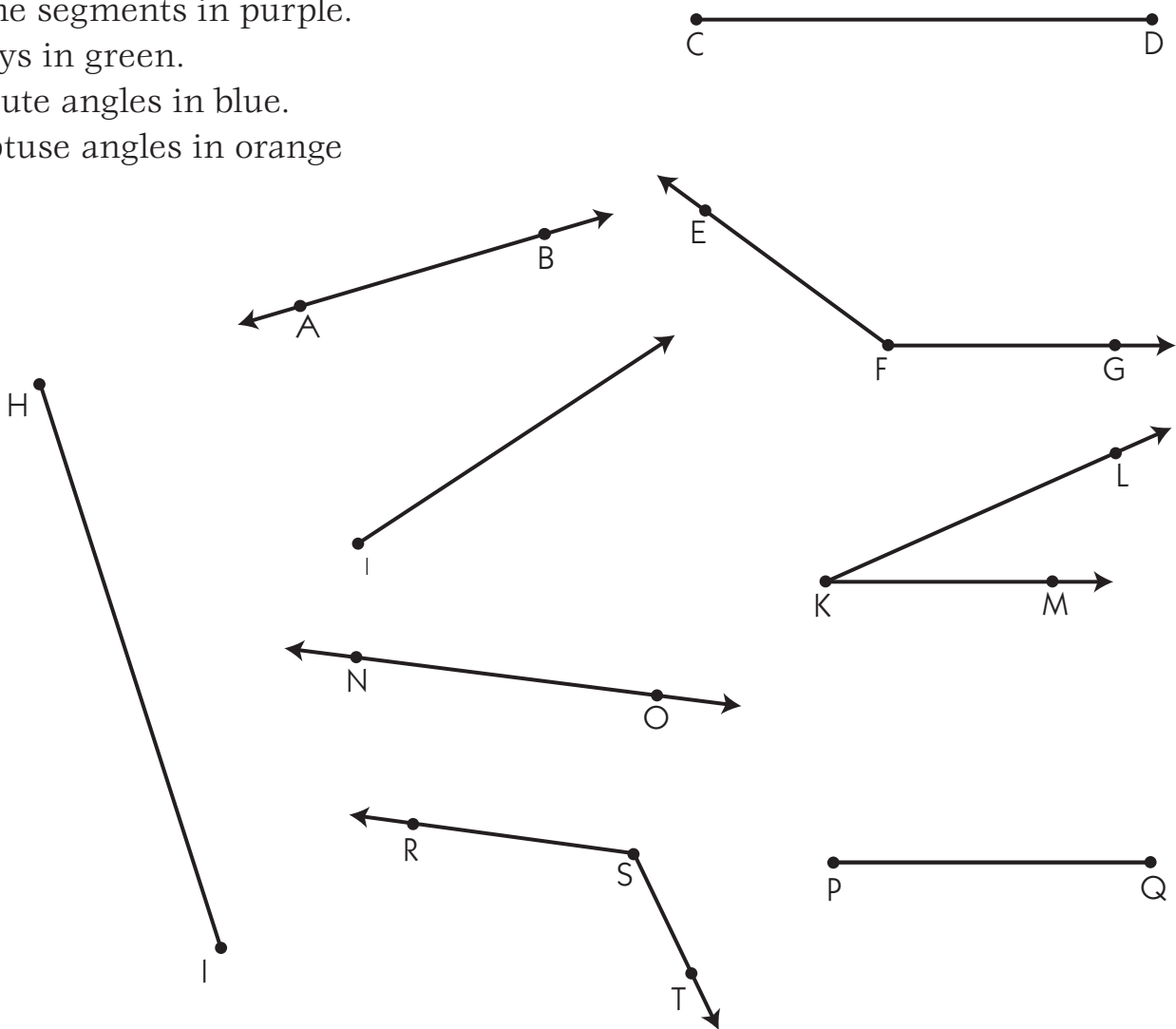
2 There are 3 line segments shown above. Measure each of them to the nearest quarter inch. Label each to show how long it is.

NAME _____   DATE _____

Set C2 ★ Independent Worksheet 3

Name That Triangle!

You can classify triangles by the size of their angles,

Acute Triangle	**Right Triangle**	**Obtuse Triangle**

acute angle

right angle

obtuse angle

All 3 angles are acute.   One of the angles is a right angle.   One of the angles is obtuse.

1 Look at the triangles in the box below. Color:
- the acute triangles green.
- the right triangles red.
- the obtuse triangles orange.

Hint Use the corner of a piece of paper, a tile, or a square pattern block to help test the angles. Some of these triangles might fool you!
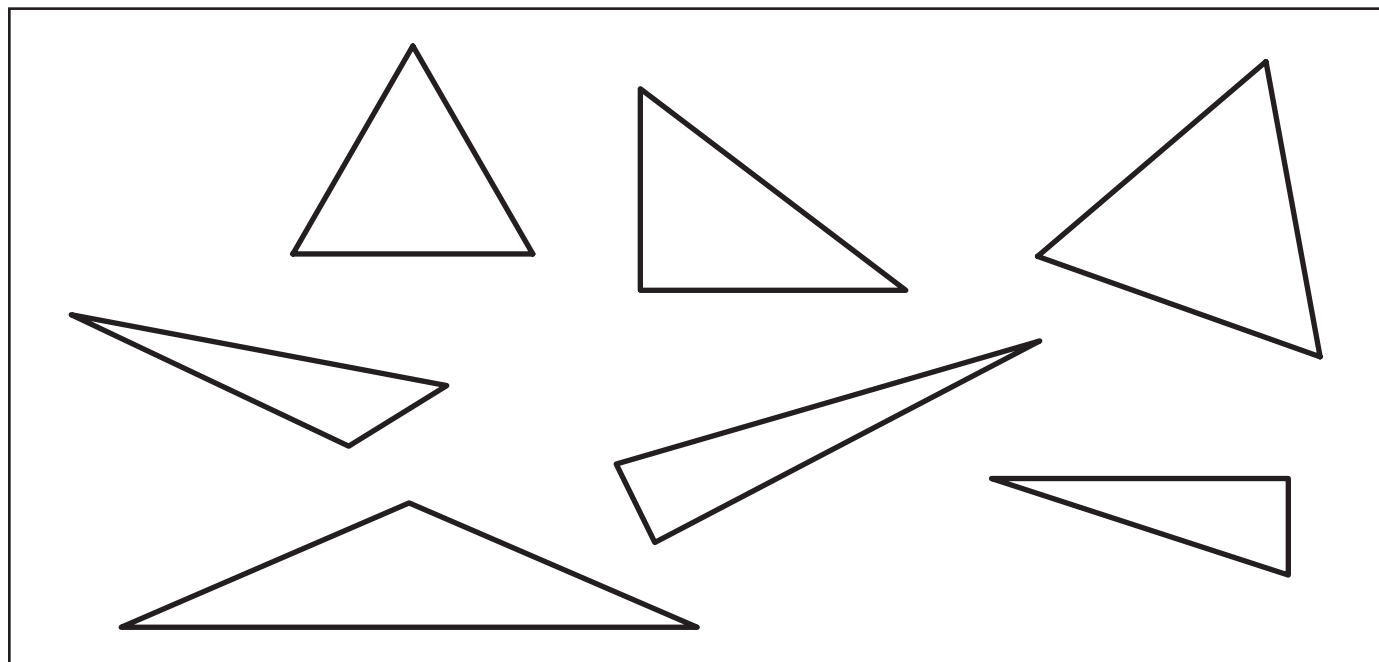
(Continued on back.)

Independent Worksheet 3 Name That Triangle! (cont.)

You can also classify triangles by the length of their sides.

Isosceles Triangle	Scalene Triangle	Equilateral Triangle

Two sides are the same length.

Each side is a different length.

All 3 sides are the same length.

Look at the triangles in the box below. Color:
• the isosceles triangles purple.
• the scalene triangles yellow.
• the equilateral triangles blue.

Hint If you are not sure whether the side lengths are equal or not, use your ruler to help. Measure to the nearest quarter inch.
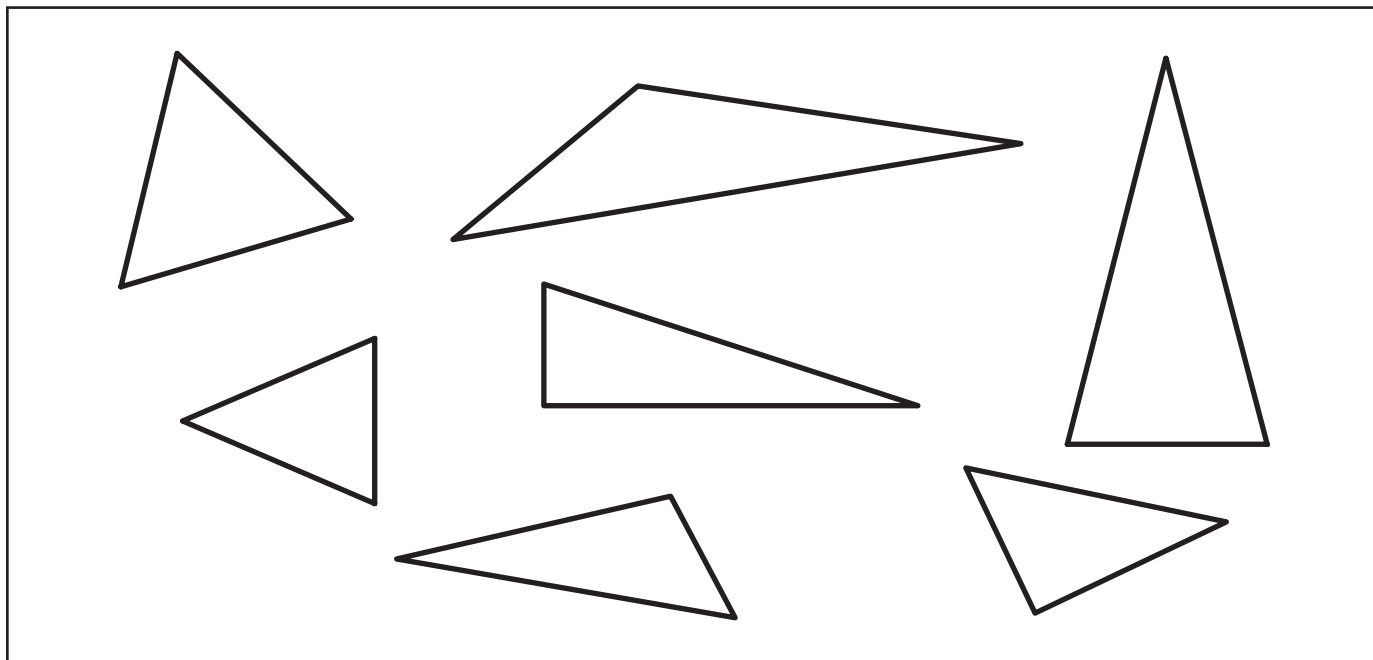
NAME _____   DATE _____

Set C2 ★ Independent Worksheet 4

More Geoboard Triangles

Remember that you can classify and describe triangles in two different ways:
- by the size of their angles

Acute Triangle
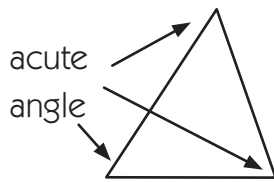
acute
angle

All 3 angles are acute.

Right Triangle
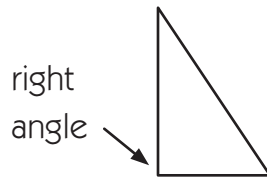
right
angle

One of the angles
is a right angle.

Obtuse Triangle
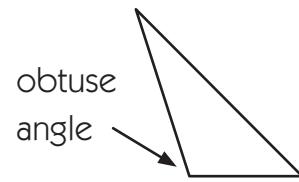
obtuse
angle

One of the angles is obtuse.

- by the length of their sides

Isosceles Triangle
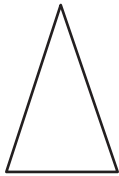
Two sides are the
same length.

Scalene Triangle
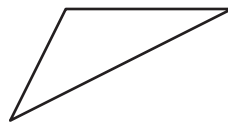
Each side is a
different length.

Equilateral Triangle
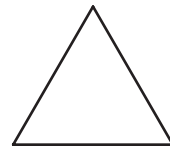
All 3 sides are
the same length.

1 Follow the instructions above each geoboard to draw some different triangles

Hint Build your triangles on a geoboard first. Then copy them onto the paper.

a A Right Triangle
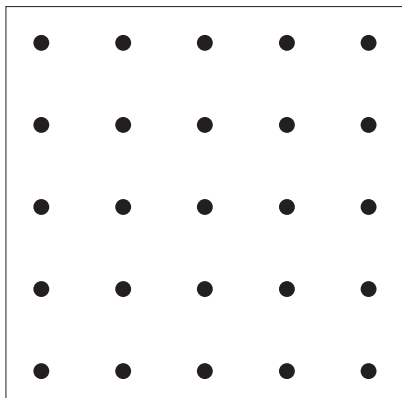
b An Isosceles Triangle
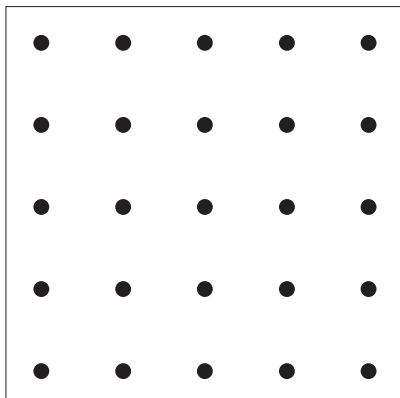
c An Acute Triangle
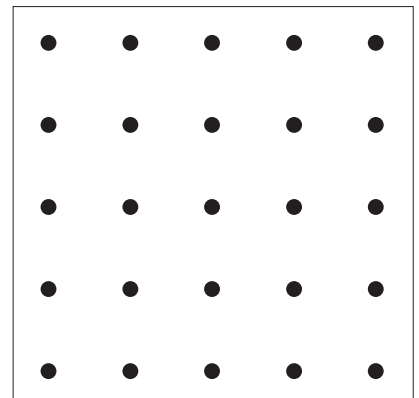
Independent Worksheet 4 More Geoboard Triangles (cont.)
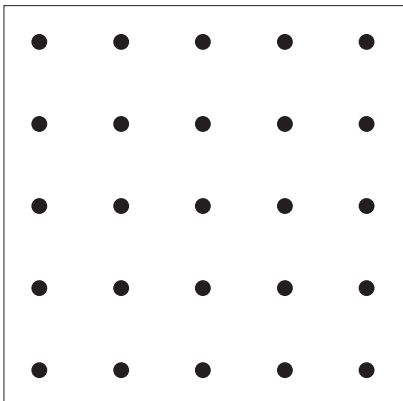
d An Obtuse Triangle
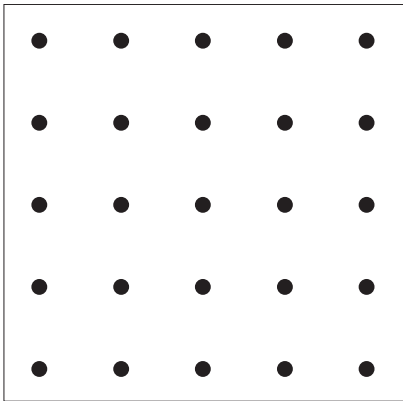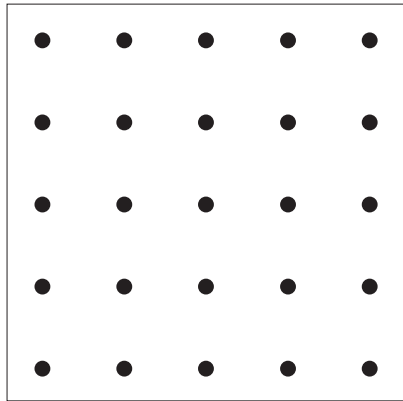
e A Scalene Triangle
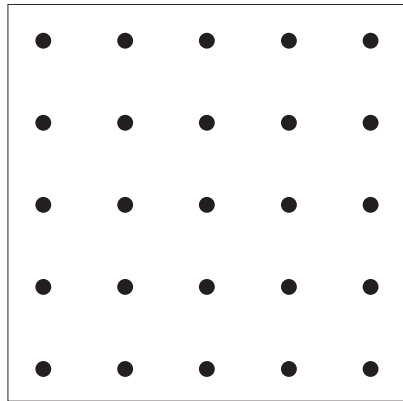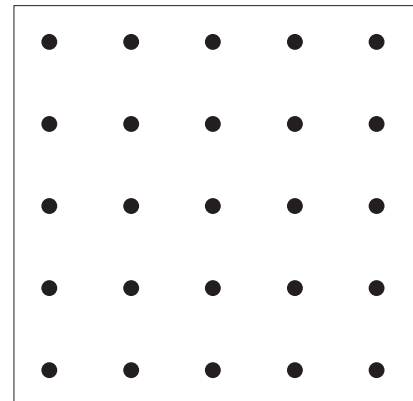
f A Right Triangle that is also Isosceles
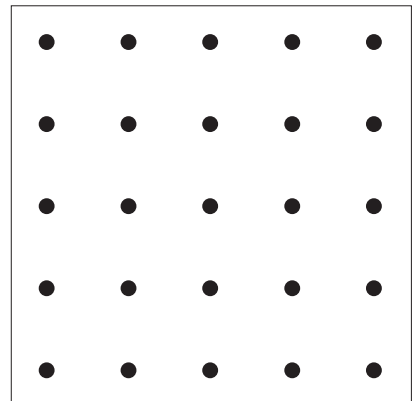
g A Right Triangle that is also Scalene
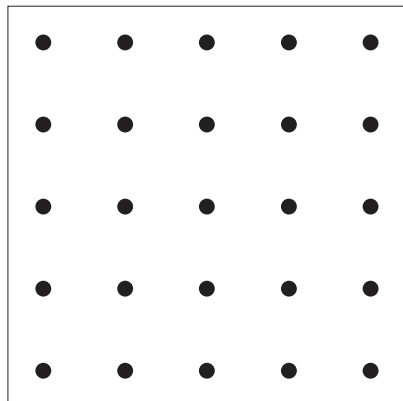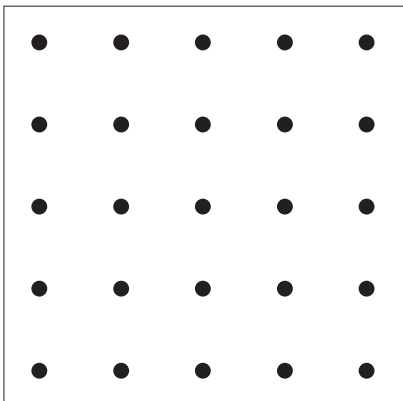
h An Acute Triangle that is also Scalene

i A Scalene Triangle that is also Obtuse

CHALLENGE

2 Dana says it is impossible to draw a right triangle that is also acute. Do you agree with her? Why or why not? Use the geoboards below to test your ideas.

BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set C4 Geometry: Quadrilaterals

Includes

Skills & Concepts

★   identify and sketch parallel, intersecting, and perpendicular lines and line segments

★   identify and sketch right angles

★   identify and describe special types of quadrilaterals

★   measure and calculate perimeters of quadrilaterals in U.S. Customary and metric units

★   choose appropriate measuring tools and units

★   solve single- and multi-step word problems involving perimeters of quadrilaterals and verify the solutions

Bridges in Mathematics Grade 3 Supplement
Set C4 Geometry: Quadrilaterals

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set C4 ★ Activity 1

ACTIVITY

Sorting Quadrilaterals

Overview
After reviewing the term quadrilateral, students each build on a geoboard and record 4 different quadrilaterals. Students then work in small groups to sort their quadrilaterals in a variety of ways.

Skills & Concepts
★ identify and describe special types of quadrilaterals

★ identify and sketch parallel and perpendicular lines

★ identify and sketch right angles

You'll need
★ Recording Quadrilaterals (page C4.5, run a display copy and a class set)

★ class set of geoboards and rubber bands

★ class set of rulers and scissors

★ 3″ × 3″ sticky notes

★ Word Resource Cards: acute angle, congruent, equilateral, line of symmetry, obtuse angle, parallelogram, parallel lines, perpendicular lines, quadrilateral, rectangle, rhombus, right angle, square, trapezoid

Instructions for Sorting Quadrilaterals

1. To start the activity, post the Word Resource Card for quadrilateral or place it under the document camera. Ask students to define the word. What is a quadrilateral? Do they remember from lessons earlier in the year? If not, can they use the pictures on the front of the card to help generate a definition?
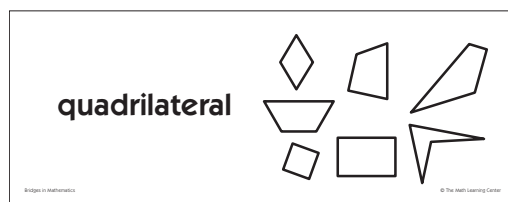
2. After some discussion, turn the card over and have a student volunteer read the definition to the class: A *quadrilateral* is a 4-sided polygon. Review the definition of a polygon (any closed 2-dimensional figure made up of 3 or more line segments), and then flip the quadrilateral card over so students can see the front again. Do all of the polygons shown on the card have 4 sides? What are the names of these figures? Have students pair-share ideas, and then call on volunteers to identify each of the shapes by name (from left to right, top to bottom, the shapes on the card are a rhombus, a quadrilateral, a quadrilateral, a trapezoid, a square, a rectangle, and a quadrilateral).

3. Post the Word Resource Cards for *rectangle*, *rhombus*, *square*, and *trapezoid* as students name these shapes. Finally, post the *parallelogram* card. Can students find an example of a parallelogram on the *quadrilateral* card? If not, remind them that a parallelogram is any quadrilateral with two pairs of parallel and congruent sides, and repeat the question.

> **Students** *Oh! I thought parallelograms were kind of like squished rectangles.*
> *Yeah, like the one in the tangrams we made. Remember?*
> *If it can be any shape with 2 pairs of parallel lines, does that mean a rectangle is a parallelogram?*

Activity 1 Sorting Quadrilaterals (cont.)

> **Students**   *I don't think so. That's weird.*
> *Maybe it's like how a square is a special kind of rectangle. Maybe a rectangle is a special kind of parallelogram.*
>
> **Teacher**   *Yes, you're right about that. Because it has 2 pairs of parallel lines, a rectangle is also a parallelogram. Can you find other examples of parallelograms on our quadrilateral card?*

4. Explain that over the next few days, students will learn more about the different types of quadrilaterals. Today, you're going to start by having them construct some quadrilaterals on a geoboard and record them on geoboard paper. Give students each a geoboard, some rubber bands, and a copy of the Recording Quadrilaterals sheet. Read the instructions at the top of the sheet together. Then model the process by making a quadrilateral on a geoboard and copying it onto the recording sheet as students watch. Challenge the children to construct and record 4 different types of quadrilaterals (e.g., a rhombus, a rectangle, a trapezoid, and a quadrilateral that is neither a trapezoid nor a parallelogram), and to make them different from the ones they see other students building. When they understand what to do, have them go to work.

5. As students are building and recording their quadrilaterals, build and record 3 more on your own sheet. Then post near your discussion circle the Word Resource cards for *acute angle*, *obtuse angle*, *right angle*, *congruent*, *equilateral*, *parallel lines*, *perpendicular lines*, and *line of symmetry*. As students finish, use your own sheet to show them how to cut their recording sheets into fourths. Have them put their name on the back of each quadrilateral they've made, set them in a stack on their desk, and join you in the discussion circle.

6. When most students have arrived at the circle, lay your own drawings out on the floor. Explain that in a few minutes, students will work in small teams to sort their drawings. Call on 3 children to help demonstrate the process. Have the 3 of them bring their drawings to the circle and lay them out alongside yours so that the four of you, along with the rest of the class, are looking at a collection of 16 quadrilaterals.
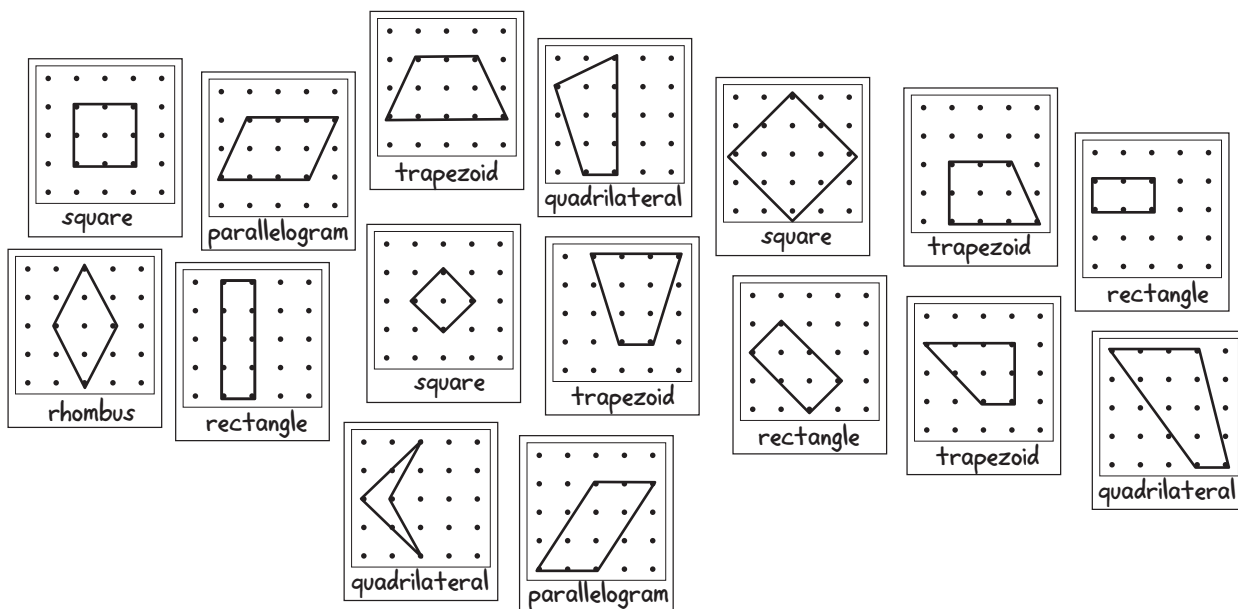
Activity 1 Sorting Quadrilaterals (cont.)

7. Now ask students around the circle to help brainstrorm ways these quadrilaterals might be sorted. Chances are, some students will suggest sorting the collection by type (e.g., squares, rhombuses, rectangles, trapezoids, parallelograms, and quadrilaterals); or rectangles and not rectangles; or trapezoids and not trapezoids; or even "weird" quadrilaterals and "regular" quadrilaterals. Others may focus on how the shapes are oriented, or their size, generating sorting categories such as tipped and straight, or tall and short, or large and amall. As the discussion unfolds, draw students' attention to the geometrical terms you have posted, and challenge them to use some of these words to think of additional ways to sort the shapes.

> **Teacher**   We've heard some interesting ideas so far. Let's look at the vocabulary cards I've posted. Would there be a way to use one or more of these to help us sort our quadrilaterals? Talk with the person next to you for a minute, and then let's hear some ideas.

> **Students**   We could sort them by their angles!
> Yeah, we could have ones with right angles and ones that don't have any right angles.
> Or we could do it by how many right angles they have. Like that weird trapezoid has 2 right angles.
> We could go by the ones that have parallel lines in them and the ones that don't.
> We could do perpendicular lines and not perpendicular lines, because some of them don't have any perpendicular lines at all.

8. Once a variety of sorting ideas has been shared, ask your three teammates to choose one. Then work with them to sort the collection of quadrilaterals accordingly as the other students watch. When you finish, point to each subset as the class names it.
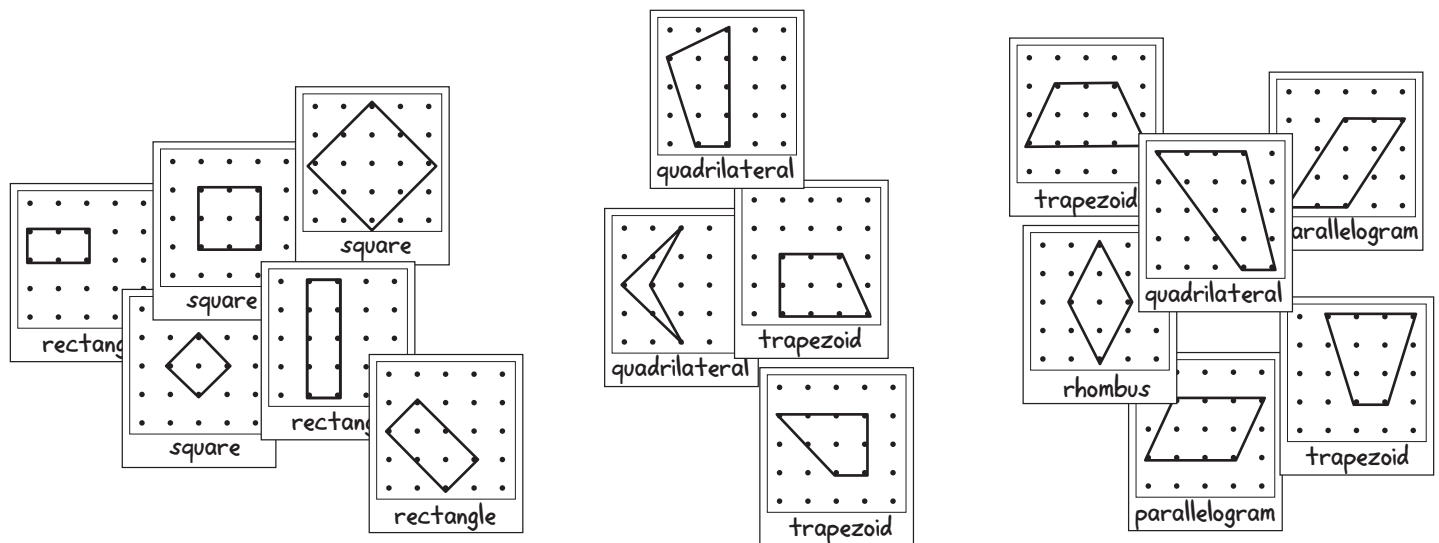
9. Explain to the class that they'll be working in teams of 3 or 4 at their tables to sort their quadrilaterals in just a few minutes. In order to get credit for each sorting idea, they will need to decide what to call each subset, raise their hands as a team, and name each subset as you come around and point to it.

Activity 1 Sorting Quadrilaterals (cont.)

10. Model this procedure with your team for the class. Push the quadrilaterals back together, and go through the whole process once or twice more, using a different attribute—one suggested by the children—each time. When most students understand what to do, send them out in groups of 3 or 4 to retrieve their quadrilaterals, find a place to work, and start sorting. As each team gets settled, give them a 3" × 3" sticky note "score card", on which you'll mark a point each time they sort their shapes in a new way.

11. Once the students go to work, watch for the hands to go up. Remind students that everyone on a team has to be raising his or her hand before you'll come over to see how they have sorted the shapes and give them a point. When you see that a team has completed a sort and all hands are raised, go over to them, point to each subset as they name it, and mark a point on their sticky note. Then have them push their shapes back together and sort them a different way.

⋯⋯

Note If you insist that every member of the team name the subsets as you point to them, students will work together better and there will be less likelihood that one or two children will take over. If you find that you can't keep pace as teams raise their hands to have their sorts checked, ask one or two of your students to be checkers as well.

⋯⋯

12. Continue the sorting activity for as long as time allows. Ideally, each team will have time to sort their quadrilaterals in 4–5 different ways or more. At the end of the period, ask each team to report how many points they got for sorting. Record their scores on the board. Then ask students to add the numbers to find out how many different ways the whole class found to sort quadrilaterals today.
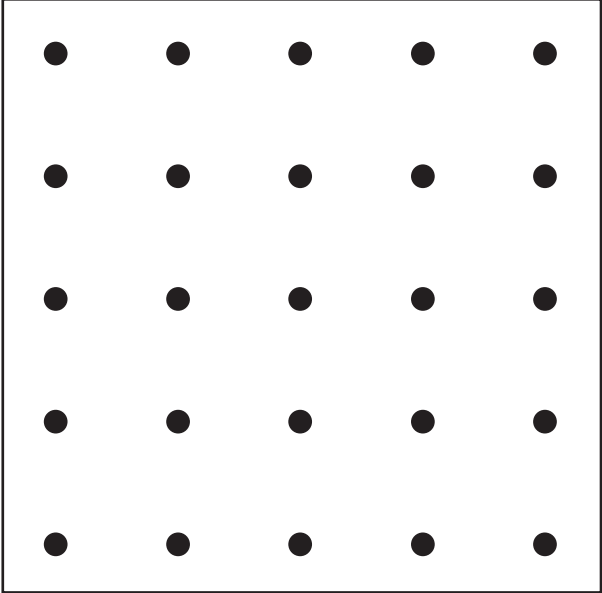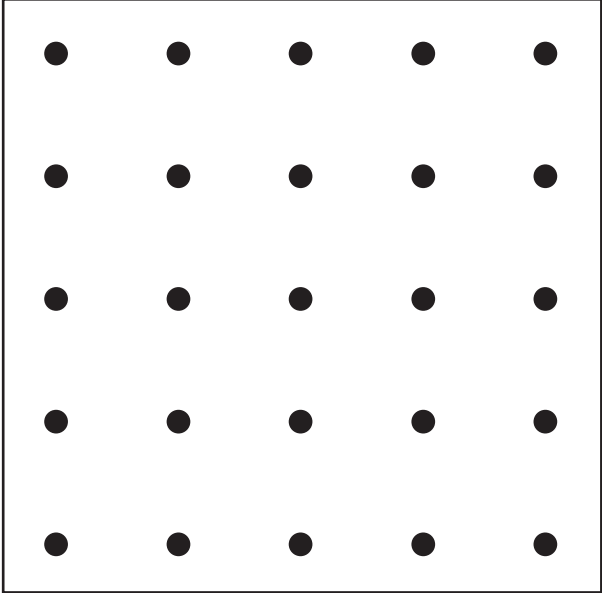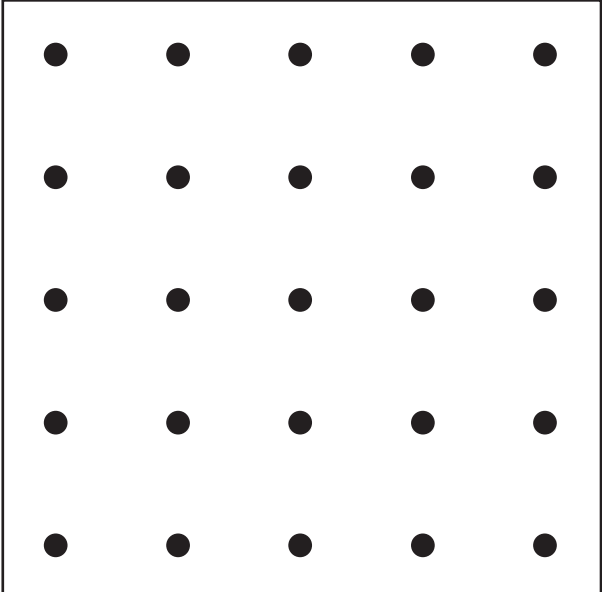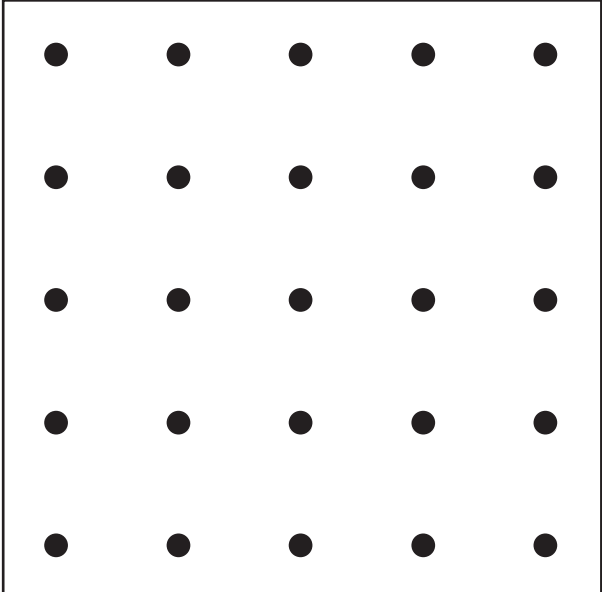
INDEPENDENT WORKSHEET

Use Set C4 Independent Worksheet 1 to provide students with more practice sorting quadrilaterals by their properties.

NAME _____   DATE _____

Recording Quadrilaterals

Make 4 different quadrilaterals on your geoboard. Draw each one below. Use a ruler to make the sides straight. Then label each quadrilateral with its name.

Set C4 ★ Activity 2

ACTIVITY

Guess My Quadrilateral

Overview

Before the lesson begines, students cut apart sheets supplied by the teacher to make their own sets of paper quadrilaterals. When everyone is ready, the teacher holds up an envelope containing one quadrilateral from the set—the "mystery quadrilateral." She then gives one clue at a time while children sort through their sets to find the quadrilaterals that match each clue. The clues go from general to more specific until all but the quadrilateral that matches the one in the envelope have been eliminated. This activity helps students see and understand some of the properties that distinguish one quadrilateral from another.

Skills & Concepts

★ identify and describe special types of quadrilaterals

★ identify properties of different quadrilaterals

★ measure and calculate perimeters of quadrilaterals

You'll need

★ Quadrilateral Cards (page C4.12, class set plus an extra)

★ Check Your Quadrilaterals (page C4.13, 1 display copy)

★ Guess My Quadrilateral Riddles (C4.14, one copy for display or overhead transparency)

★ 4 small envelopes (see Advance Preparation)

★ a small envelope or a paper clip for each student

★ scissors and rulers (class set)

★ Student Math Journals or lined paper

★ a piece of paper to mask portions of the display master

....

Advance Preparation Number the front of each of the 4 small envelopes with a numeral, 1–4. Cut apart one of the sheets of quadrilateral cards. Place Square C in the first envelope, Trapezoid A in the second, Parallelogram B in the third, and Rhombus A in the fourth. Seal the envelopes and recycle the rest of the cards.

....
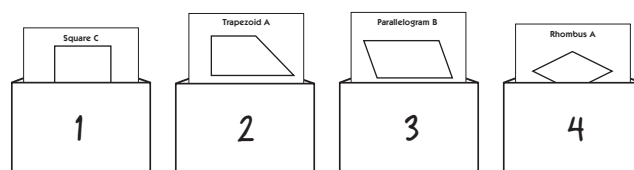
Instructions for Guess My Quadrilateral

1. Open today's session by asking students to write in their journals or on a piece of lined paper at least three things they learned about quadrilaterals during the previous activity. After they have had a few minutes to write, give them a minute to pair-share, and then call on a few volunteers to share their ideas with the class.

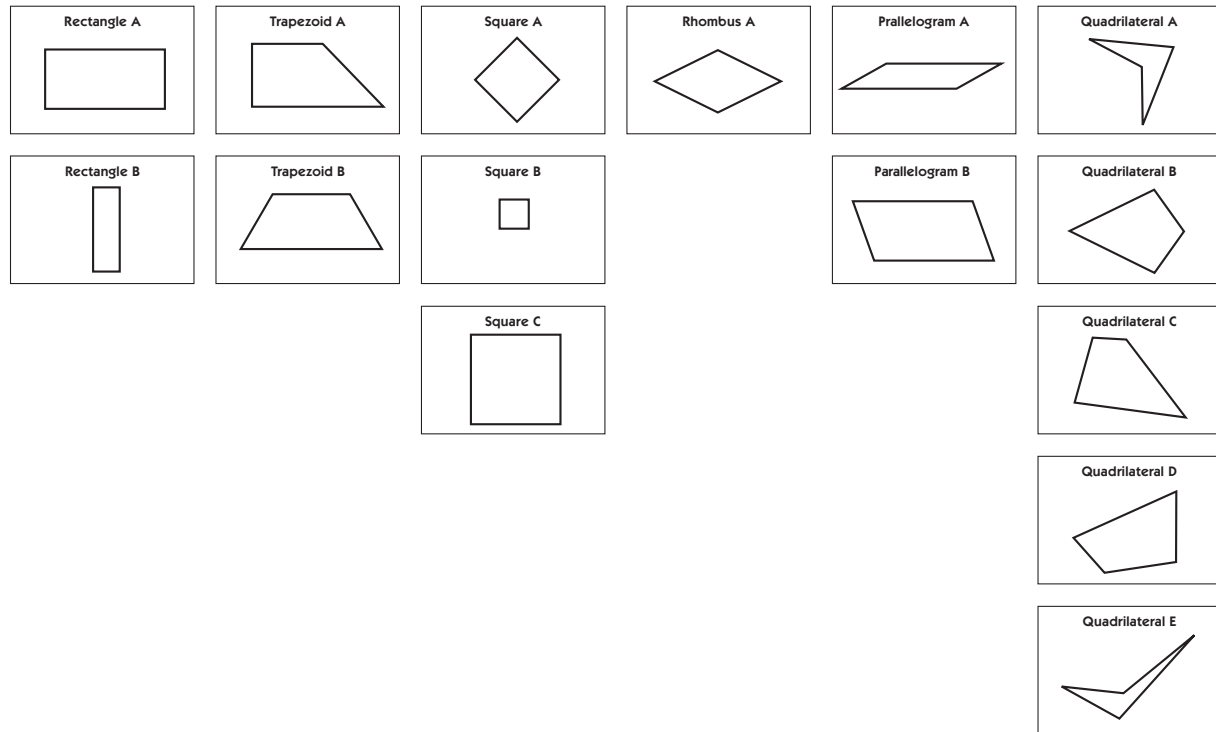> *Students* *A quadrilateral always has 4 sides.*
> *There are different kinds of quadrilaterals, like squares and rectangles and rhombuses.*
> *Some quadrilaterals are really weird, like the kind where none of the sides are parallel.*
> *Trapezoids only have 1 pair of parallel lines.*

Activity 2 Guess My Quadrilateral (cont.)

2. Explain that the class is going to do some more work with quadrilaterals today. Give students each a copy of the Quadrilateral Cards sheet. Ask them to cut the cards apart along the thin lines, and then sort the cards by type, rectangles in one group, trapezoids in another, and so on. Ask early finishers to help others nearby, or read silently until everyone in class has prepared his or her cards.

Rectangle A	Trapezoid A	Square A	Rhombus A	Prallelogram A	Quadrilateral A
Rectangle B	Trapezoid B	Square B		Parallelogram B	Quadrilateral B
	Square C				Quadrilateral C
					Quadrilateral D
					Quadrilateral E

3. Let students know that the class is going to play a sorting game with the cards they have prepared, but first they need to check their cards to make sure they are labeled correctly. Place a copy of Check Your Quadrilaterals on display with all but the first box masked. Read the definition of *quadrilateral* together. Do the shapes labeled as quadrilaterals in their set of cards match this definition? Have students pair-share their thoughts, and then call on a couple of volunteers to share with the class.

> **Students** *We said all the quadrilateral cards are okay because they all have 4 sides.*
> *But all the shapes on these cards are quadrilaterals because they all have 4 sides. Why don't they all say* quadrilateral *on the card?*
> *We said it's probably because the others are special kinds of quadrilaterals, like squares and stuff.*

4. Next, reveal the picture and definition of *trapezoid*. Read it with the class, and ask students to check their cards. Do the shapes labeled as trapezoids fit the definition? Are there any other cards in the set that should be labeled as trapezoids? Why or why not?

> **Students** *I think Quadrilateral D looks like a trapezoid.*
> *Yeah, it does, kind of, but none of the sides are parallel, so it can't be.*

5. Repeat the step above with each of the other four quadrilaterals on the display master. When students are satisfied that all the cards in the set are labeled accurately, show them the envelopes you have prepared. Explain that you cut up a sheet of cards before the lesson, and placed a different quadrilateral in each of the four envelopes. Now you are going to give the students a set of clues that will help them

Activity 2 Guess My Quadrilateral (cont.)

identify which quadrilateral you have hidden in the first envelope. You will show the clues one at a time at the overhead or document camera. Each time students get a new clue, they will be able to eliminate some of the cards from their sets until they only have one left. The one remaining will match the shape in Envelope 1 if they have followed the clues carefully enough.

6. Place Guess My Quadrilaterals Riddles on display with all of the clues hidden but the first. Read it with the class and ask them to set aside any cards that do not fit the clue.

> **Set C4 Geometry: Quadrilaterals Blackline** Run one copy for display or overhead transparency.
>
> ### Guess My Quadrilateral Riddles
>
> **Riddle 1**
> **1** My quadrilateral has 2 pairs of parallel sides.

Students *"My quadrilateral has 2 pairs of parallel sides."*
So we can keep the rectangles and squares, right?
That weird one that looks like an arrowhead doesn't have any pairs of parallel sides.
On those trapezoids, they just have one pair of parallel sides.
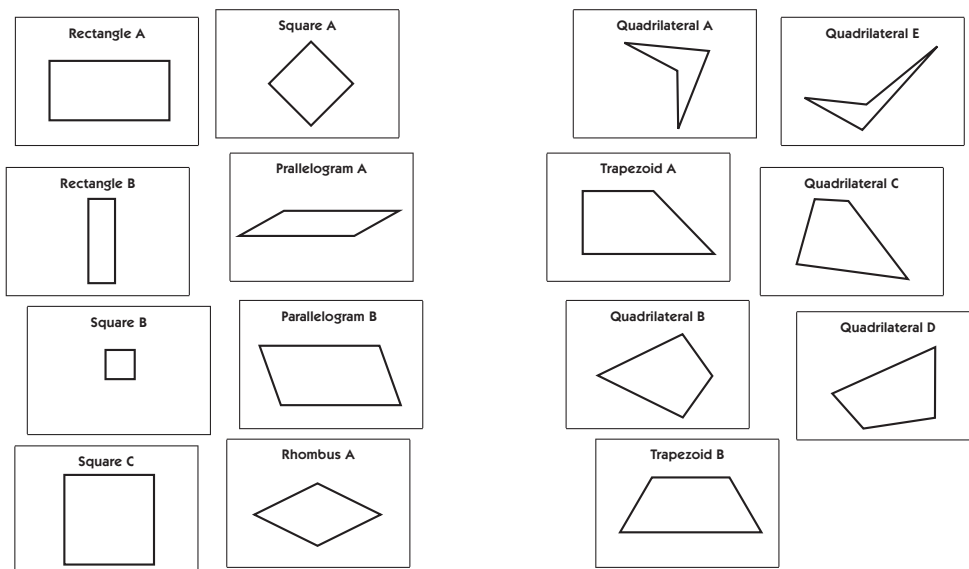
7. Once students have discarded the quadrilaterals that do not have 2 pairs of parallel sides, reveal the second clue.

> **Set C4 Geometry: Quadrilaterals Blackline** Run one copy for display or overhead transparency.
>
> ### Guess My Quadrilateral Riddles
>
> **Riddle 1**
> **1** My quadrilateral has 2 pairs of parallel sides.
> **2** My quadrilateral has 4 congruent sides.

Students *Okay, we can get rid of the rectangles and the parallelograms.*
We can get rid of everything but the squares!
Wait, what about the rhombus? It has sides all the same length.

Activity 2 Guess My Quadrilateral (cont.)

Square C

Square A

Square B

Rhombus A

Quadrilateral A

Quadrilateral E

Parallelogram B

Trapezoid A

Quadrilateral C

Rectangle B

Quadrilateral B

Quadrilateral D

Rectangle A

Trapezoid B

Prallelogram A
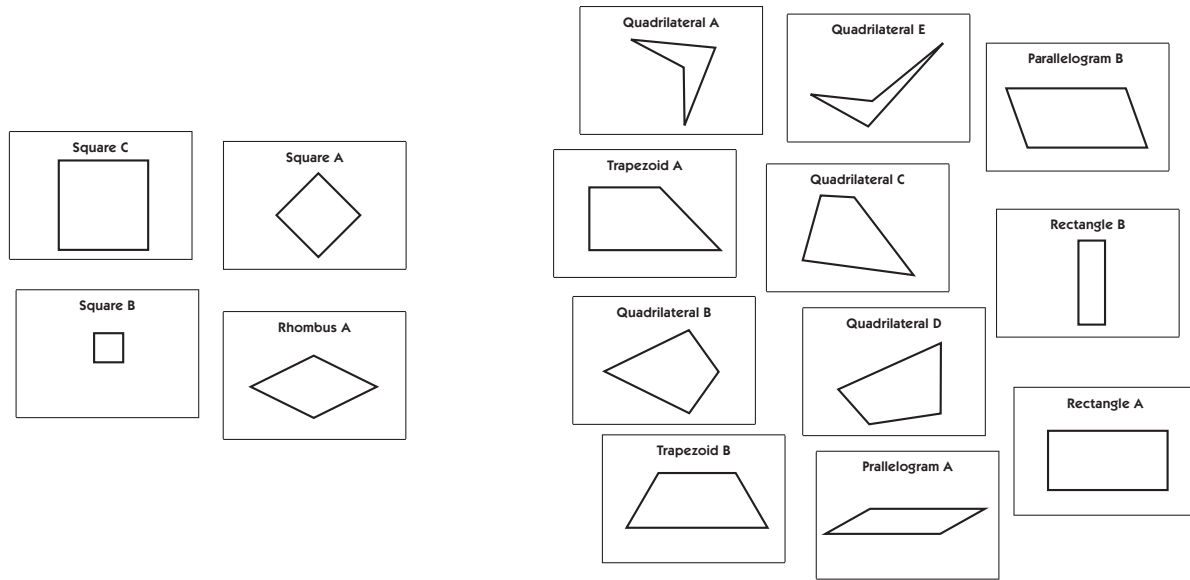
8. When students have set aside all the quadrilaterals except the ones that have 2 pairs of parallel sides and all 4 sides congruent, reveal the third clue.
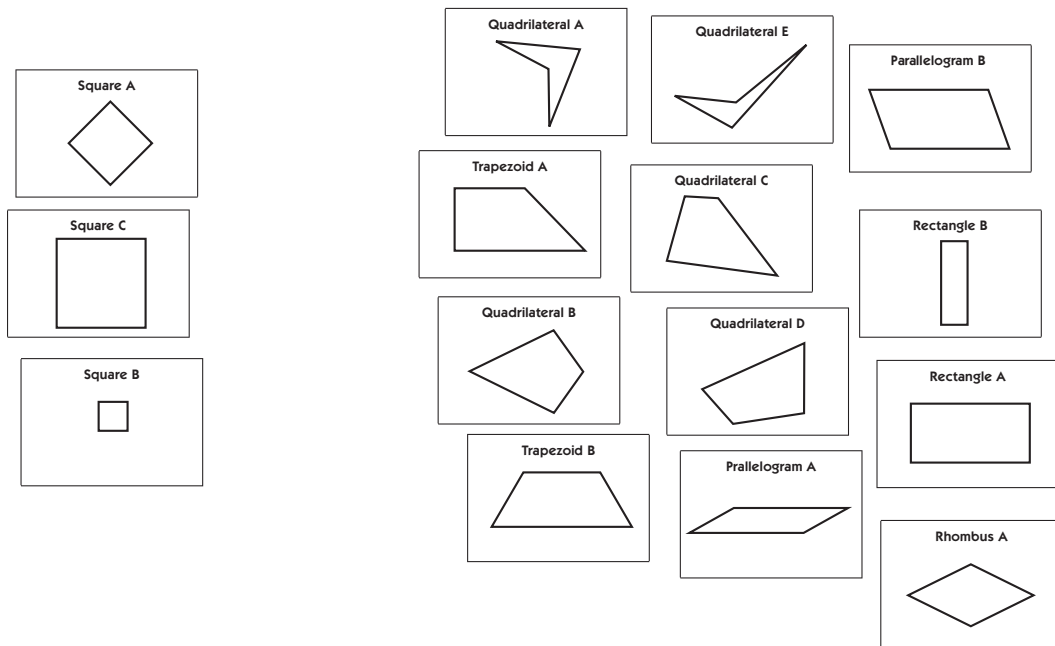
Set C4 Geometry: Quadrilaterals Blackline Run one copy for display or overhead transparency.

Guess My Quadrilateral Riddles

Riddle 1

1 My quadrilateral has 2 pairs of parallel sides.

2 My quadrilateral has 4 congruent sides.

3 My quadrilateral has 4 right angles.

Students *Oh my gosh, it has to be one of the squares. Only the squares have all right angles. The rhombus doesn't have any right angles!*

Square A

Square C

Square B

Quadrilateral A

Quadrilateral E

Parallelogram B

Trapezoid A

Quadrilateral C

Rectangle B

Quadrilateral B

Quadrilateral D

Rectangle A

Trapezoid B

Prallelogram A

Rhombus A

Activity 2 Guess My Quadrilateral (cont.)

9. When students have eliminated all but the squares, reveal the last clue.

Guess My Quadrilateral Riddles

Riddle 1
1 My quadrilateral has 2 pairs of parallel sides.
2 My quadrilateral has 4 congruent sides.
3 My quadrilateral has 4 right angles.
4 My quadrilateral has a perimeter of 12 centimeters.

> **Students** *It's one of the squares, but it has to be 12 centimeters around.
> I've got it! It's the big square, the one with the C!*

10. Before you open Envelope 1 to show the hidden shape (Square C), have students review all the clues one more time. Does Square C fit each and every clue? Are there any other shapes that do so as well? If not, open the envelope to show students what good detectives they have been. Then have them push all their cards back together in preparation for the next riddle.

11. Repeat steps 4–10 with the second riddle on the sheet, and then riddles 3 and 4. Children should discover that the shape in Envelope 2 is Trapezoid A. The shape in Envelope 3 is Parallelogram B, and the shape in Envelope 4 is Rhombus A.
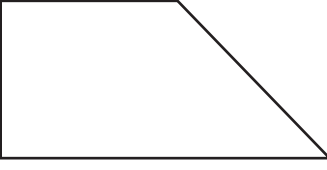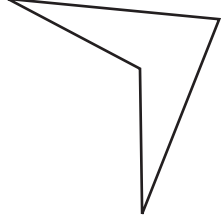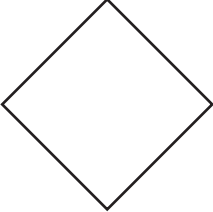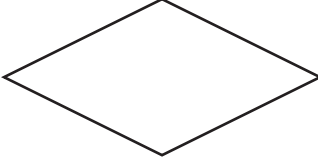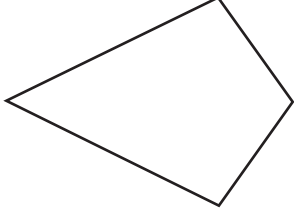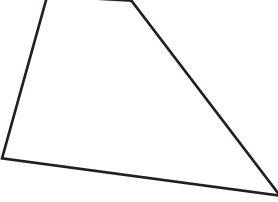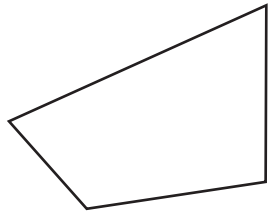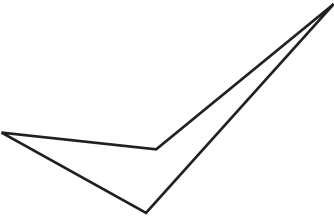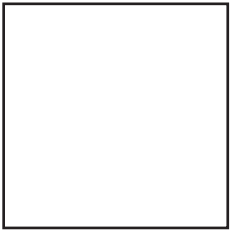
12. When the class has solved all 4 of the riddles, let them know that they will be writing their own riddles for classmates to solve during your next math class. In preparation for riddle-writing, have students each choose their favorite of the quadrilaterals in the set of cards. Ask them to draw that shape in their journals or on paper and write at least 3 mathematical observations about it. Challenge them to use *one* of the following terms correctly in each observation they write:

- right angles
- obtuse angles
- acute angles
- parallel sides
- congruent sides
- line(s) of symmetry

13. Finally, give students each a small envelope in which to store their quadrilateral cards for the next activity, or a paper clip to hold the set together.

Quadrilateral Cards

Cut cards apart on thin lines.

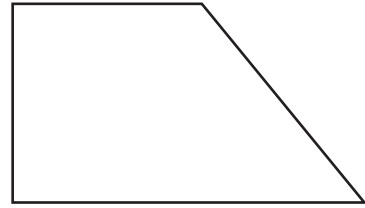| Rectangle A	Trapezoid A	Quadrilateral A
Square A	Rhombus A	Parallelogram A
Trapezoid B	Quadrilateral B	Square B
Parallelogram B	Quadrilateral C	Quadrilateral D
Rectangle B	Quadrilateral E	Square C

Check Your Quadrilaterals
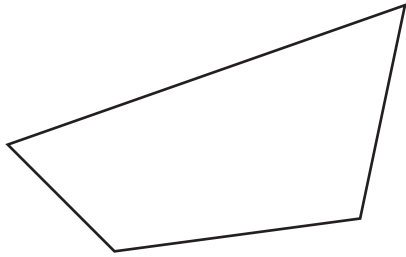
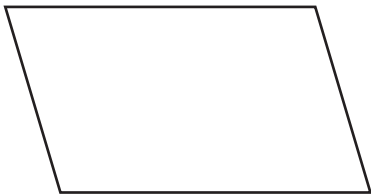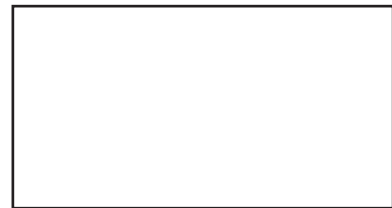## Quadrilateral
Any Polygon with 4 sides
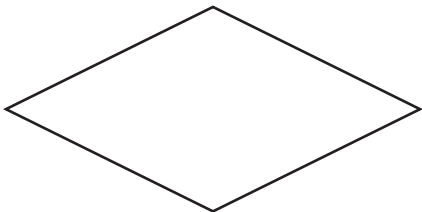
Trapezoid
A quadrilateral with exactly 1 pair of parallel sides

Parallelogram
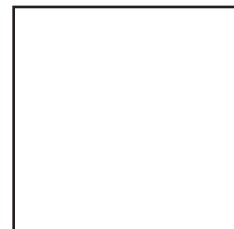A quadrilateral with 2 pairs of parallel sides opposite each other

Rectangle
A parallelogram with 4 right angles

Rhombus
A parallelogram with 4 congruent sides

Square
A parallelogram with 4 congruent sides **and** 4 right angles

Guess My Quadrilateral Riddles

Riddle 1

1 My quadrilateral has 2 pairs of parallel sides.

2 My quadrilateral has 4 congruent sides.

3 My quadrilateral has 4 right angles.

4 My quadrilateral has a perimeter of 12 centimeters.

Riddle 2

1 My quadrilateral is not a parallelogram. (Remember that any quadrilateral with 2 pairs of parallel sides is a parallelogram.)

2 My quadrilateral has exactly 1 pair of parallel sides.

3 My quadrilateral has more than 1 type of angle.

4 My quadrilateral has exactly 2 right angles.

Riddle 3

1 My quadrilateral is a parallelogram. (Remember that any quadrilateral with 2 pairs of parallel sides is a parallelogram.)

2 My quadrilateral does not have any line segments that are perpendicular to each other.

3 My quadrilateral does not have 4 congruent sides.

4 My quadrilateral has a perimeter of 12 centimeters.

Riddle 4

1 My quadrilateral has at least 1 line of symmetry.

2 My quadrilateral has 2 obtuse angles.

3 My quadrilateral has at least 1 pair of parallel sides.

**4** My quadrilateral has 4 congruent sides.

Set C4 ★ Activity 3

ACTIVITY

Writing Quadrilateral Riddles

Overview

Each student selects a quadrilateral from his or her collection of Quadrilateral cards and writes a series of clues that may be used to identify the shape. Students then solve one another's riddles. This activity provides a powerful opportunity to use the langage of geometry in the context of communicating accurately with others.
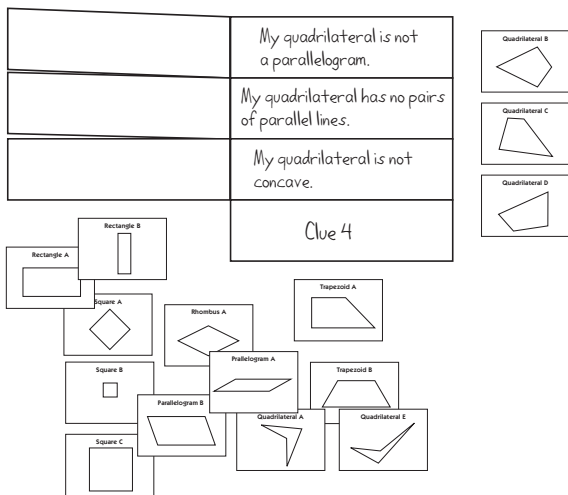
Skills & Concepts

★ identify and describe special types of quadrilaterals

★ identify properties of different quadrilaterals

★ identify right angles parallel, and perpendicular lines

You'll need

★ students' sets of Quadrilateral Cards from Set C4, Activity 2

★ writing paper

★ 9″ × 12″ white drawing paper (1 sheet per student)

★ several sheets of chart paper

★ marking pens and scotch tape

★ 3″ × 3″ sticky notes, 1 per student

★ Word Resource Cards: acute angle, congruent, equilateral, line of symmetry, obtuse angle, parallelogram, parallel lines, perpendicular lines, quadrilateral, rectangle, rhombus, right angle, square, trapezoid (see Advance Preparation)

Advance Preparation Post the Word Resource Cards in a pocket chart or on the wall before teaching this activity.

Instructions for Writing Quadrilateral Riddles

1. Tell students that they are going to write their own quadrilateral riddles today, similar to the ones you shared with them during the last activity. Have the class brainstorm a list of words they might need to know how to spell in addition to the ones on the Word Resource cards. List these on the board or a piece of chart paper.

> **Students** *We need words like sides and corners, and angles.*
> *You can tell how to spell angle from looking at the cards.*
> *Can we have symmetrical on the list?*
> *It seems like we have most of the other words we need, except maybe straight.*

> **Teacher** *We can add more words to the list later if you need them.*

Activity 3 Writing Quadrilateral Riddles (cont.)

2. Next, choose a shape from your collection of Quadrilateral Cards. Post it on the board and ask students to make as many observations about the shape as they can, using the Word Resource cards as a source of ideas. List their observations beside the shape itself. Work with input from the class to illustrate at least some of the observations so all the students can see and understand them.
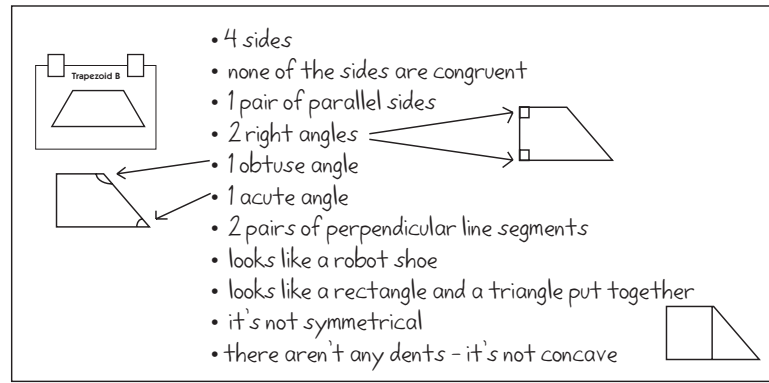
3. After you have listed students' observations, ask them to spread out all their Quadrilateral cards from the previous activity and take a good look at them. Are there any observations that are true only of the shape you have posted? If so, they would be "dead giveaways," or clues you would want to save for last in writing a riddle about the shape.

Students   *Trapezoid A is the only shape in our cards that has exactly 2 right angles.*
*Oh yeah! If you used that one for your first clue, people would know right away.*
It's the only one that really looks like a robot shoe.
I don't really see any other shapes that look like a rectangle and a triangle put together.
Oh, I get it. Like if you start with "none of the sides are congruent" there are still lots of shapes left, but if you start with "2 right angles" everyone will know after the first clue.

Teacher   *Let's circle the observations that are very specific to Trapezoid A. That way, we can remember not to use them first when we write our riddle.*
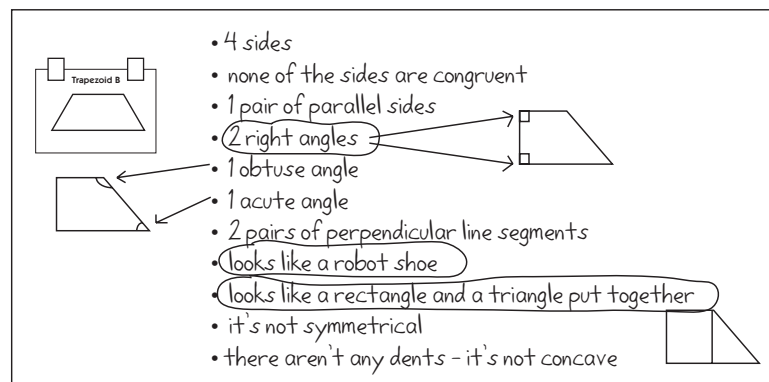
4. After you have circled the "dead giveaways," ask students which piece of information they might use for their first clue.

Activity 3 Writing Quadrilateral Riddles (cont.)

Teacher *If you were going to write a riddle about this trapezoid, which clue might you start with?*

Students *I'd say it has 4 sides.*
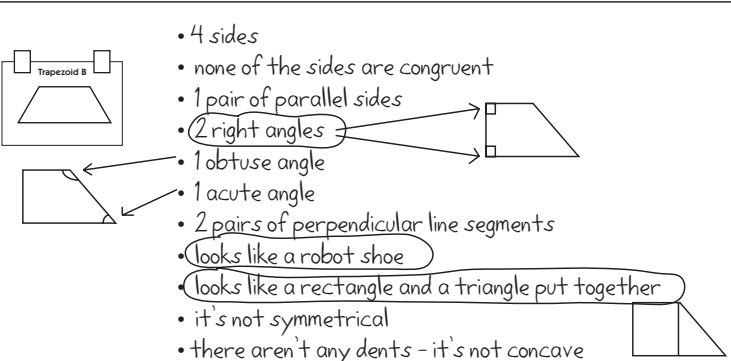*But they all have 4 sides. That wouldn't help you get rid of any of the shapes.*
We could start with not symmetrical. That would get rid of the rectangles and squares, but most of those weird quadrilaterals aren't symmetrical, so you'd still have some.

Ben *It's kind of like you have to tell something, but you don't want to give away too much right away.*

Teacher *That's right. You don't want to start with the information that will give your secret away too soon, but you do have to write something that your classmates will be able to figure out. If someone can go through your clues and narrow it down to just one shape at the end, you'll know you've written a successful riddle. Let's start with something that will help people eliminate some of the Quadrilateral Cards without knowing exactly which shape it is right away.*

Dara *Let's start with the one about not symmetrical. That's a good one because you can get rid of some of the shapes right away, but you still have to keep a bunch of them.*

5. After some discussion, work with input from the class to write a 4-clue riddle about the shape you have posted. Be sure students understand that the last clue *has* to be a dead giveaway; it has to enable other people to identify the mystery shape with complete assurance.

6. Have students test the riddle by sorting their Quadrilateral Cards according to the clues you have written. Is the last shape left in the collection actually the shape you started with? Is that shape the only one that fits all 4 clues? If not, how can you fix the clues so the riddle works?

7. Once you have modeled the riddle-writing procedure, review the steps:

- choose a quadrilateral from your set of cards
- write as many observations as you can about the quadrilateral
- circle any observations that are dead giveaways and save them for last
- use your observations to draft a riddle with 4 clues
- find a partner to test your riddle and see if it works

Activity 3 Writing Quadrilateral Riddles (cont.)

8. Once students understand what to do, have them go to work. As a few finish and test their riddles, pull the class back together and show them how to make a riddle booklet by folding a piece of drawing paper into eighths, unfolding the paper, and cutting along the folds on the left side to create 4 "doors" that can be opened one by one to reveal the clues in order. Then show them how to label the doors, write their clues behind the doors, write the answer on the back cover of the booklet, and cover it with a sticky note.
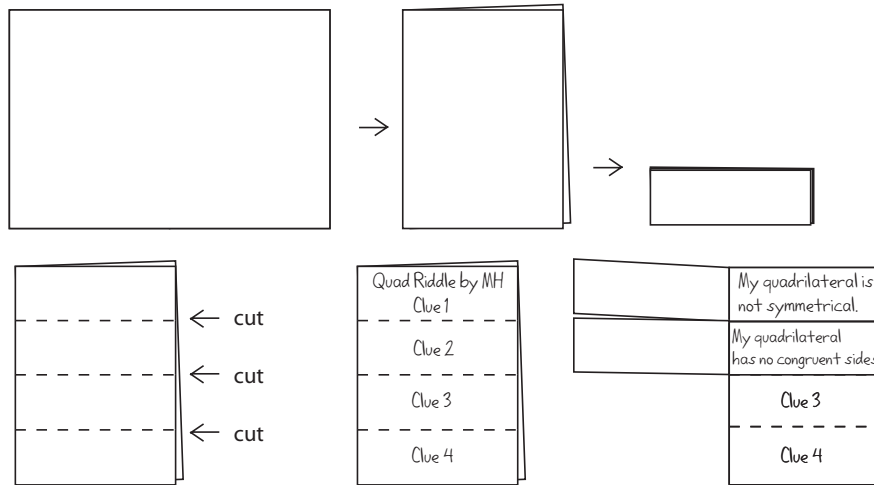
9. After you have had a chance to look over the students' finished work, you can

• set up a special time for children to solve one another's riddles over the next day or two, or
• set up the riddles with several sets of Quadrilateral Cards at a back table for students to solve when they have a few minutes to spare, or
• set up the riddles and a few sets of Quadrilateral Cards as a Work Place.

INDEPENDENT WORKSHEET

Use Set C4 Independent Worksheet 2 to provide students with more practice classifying quadrilaterals by their properties.

Set C4 ★ Activity 4

ACTIVITY

Perimeters of Paper Quadrilaterals

Overview
After reviewing the meaning of *perimeter*, students esti-mate, measure, and compare the perimeters of 5 different paper quadrilaterals.

Skills & Concepts
★ identify and describe special types of quadrilaterals

★ estimate and measure perimeters of quadrilaterals in metric units

### You'll need
★ Perimeter Record Sheet, (page C4.23, class set plus a display master)

★ Paper Quadrilaterals, (page C4.24, half class set plus a few extra, see note at right)

★ a piece of 20 cm × 25 cm red construction paper

★ blue masking tape

★ rulers (class set)

★ scissors (class set)

★ Word Resource Cards (perimeter)

....

Note The side lengths of all the figures on the Paper Quadrilaterals sheet should be whole numbers. Run 1 copy and check to see that the side lengths on the square are 9 cm. If they are not, make adjustments to your printer or copy machine as needed. Run copies of the Paper Quadrilaterals sheet on several differ-ent colors of copy paper (e.g., 4 copies on pink, 4 on green, 4 on blue, and 4 on yellow) This will make it easier for students to keep their work separate from others nearby.

....

Instructions for Perimeters of Paper Quadrilaterals

1. Post the perimeter card on the board and give students a minute to share anything they already know about this term.
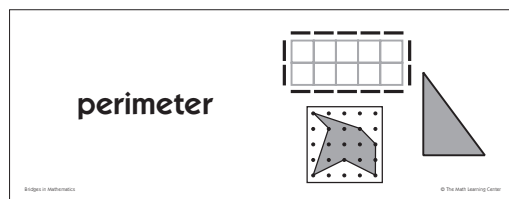
*Students It's how far it is around a shape, like a square or a rectangle.
You measure all the sides and add them together.
You have to find out how many inches or centimeters around.*

## **Activity 4** Perimeters of Paper Quadrilaterals (cont.)

2. Explain that perimeter is the distance around any figure. People find the perimeter of a figure by measuring its side lengths and adding them together. As students watch, tape the piece of red construction paper to the board. Have one of the students come up and indicate, using a ruler or other pointer, where the perimeter of this rectangular piece of paper is. Then work with input from the class to measure and find the perimeter of the red rectangle in centimeters. Next, ask the students what they would do to find the perimeter of a rhombus or a trapezoid or a square.

> **Students** *Just measure the sides and add them together.*
> *A square would be easy. You don't even have to measure all t1 the sides are congruent*

3. Give each pair of students a copy of the Paper Quadrilaterals sheet. (If you give each pair at a table a different color sheet, they'll be able to keep track of their own quadrilaterals more easily.) Have students work with their partners to label each of the 5 quadrilaterals with its most specific name (A: Parallelogram, B: Trapezoid; C: Rhombus; D: Square; E: Rectangle). Then ask them to carefully cut out the 5 quadrilaterals along the heavy lines.

4. Let students know that in a minute, they'll be estimating and finding the perimeter of each quadrilateral in centimeters. Before they do, ask them to use their estimation skills to place the 5 figures in order, from smallest to largest perimeter. Have them discuss their thinking with their partners as they sequence the quadrilaterals, and then choose a few volunteers to share their ideas with the class.
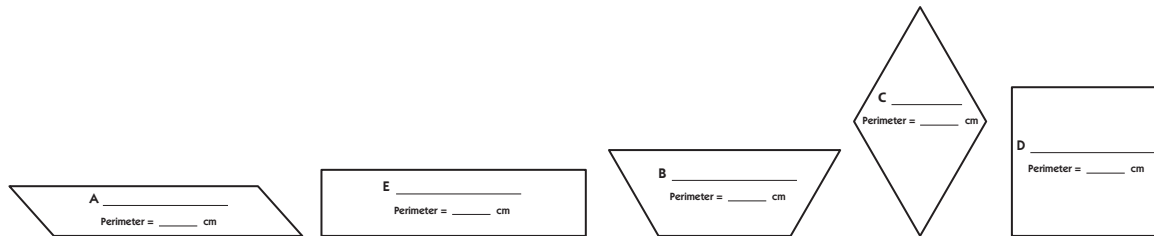
> **Andrew** *We thought the square looked biggest around so we put it last. The parallelogram and the rectangle looked pretty skinny, so we put them together at the beginning.*

> **Dara** *We thought the trapezoid and rhombus looked like they would be pretty big around, but not as big as the square, so we put them in the middle.*

> **Jason** *We had a different idea from Andrew and Dara. We thought that the parallelogram and the rectangle would have the biggest perimeters. Even though they're not as tall as the others, they're the longest. Here's how we put our shapes in order.*
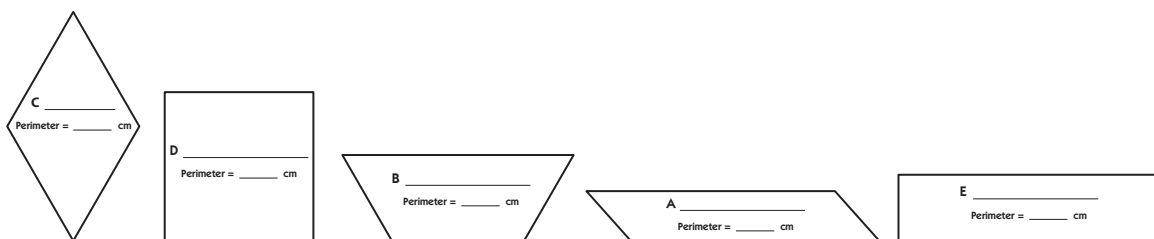
Activity 4 Perimeters of Paper Quadrilaterals (cont.)

5. Ask students to get out their rulers, and give each student a copy of the Perimeter Record Sheet. Review the instructions on the sheet with the class. Have them continue to work in pairs even though each student needs to complete his or her own sheet. As you review the instructions, remind students to write the measurements, computations, and perimeter on the quadrilaterals themselves. You may want to demonstrate this process or work with the class to find the perimeter of one of the shapes.

> **Teacher** *Let's do the rhombus together. How many centimeters around do you think the rhombus is? Please talk to the person next to you, and then I'll ask some people to share their ideas with the class. (Waits a few moments.) Sydney?*
>
> **Sydney** *We think it might be about 40 centimeters, because each side looks like it's about 10 centimeters, and 4 times 10 is 40.*
>
> **Jake** *Ours is pretty close. We think maybe each side is about 9 centimeters, so the perimeter would be 36 because 9 + 9 + 9 + 9 is 36.*
>
> **Teacher** *I'll record those estimates on the board. Now let's measure the rhombus to find its actual perimeter. Do we need to measure all the sides?*
>
> **Students** *Yes, you measure all the sides and then add up the numbers.*
> *I respectfully disagree with Hannah. I think you can just measure one side and multiply it by 4.*
>
> **Teacher** *How are you thinking about that, Katie?*
>
> **Katie** *Well, we found out last week that the sides of a rhombus are like a square because they're all equal. If you just measure 1 side, you can multiply that number by 4 or add it up 4 times, and you'll have the answer.*
>
> **Teacher** *Let's try it out. I'd like each of you to work with your partner. Measure the rhombus, and I'll record the information up here, right on my rhombus.*
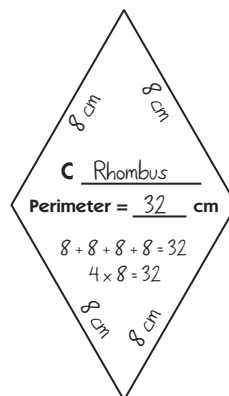
6. When students understand what to do, have them go to work. Encourage them to use the measurements from the first quadrilateral to estimate the side lengths and perimeters of the other 4 shapes. Remind them to enter their estimates and the actual perimeters on the Perimeter Record Sheet as they go.

Activity 4 Perimeters of Paper Quadrilaterals (cont.)

7. Have students share and compare their results with other pairs as they finish. Pull the class back together toward the end of the math period, or at the beginning of the math period the following day, to share and discuss their results. Start the discussion by asking students to put their quadrilaterals in order from smallest to largest perimeter. How does that order compare with their original predictions? Here are some questions you may want to pose during the discussion:

• Are you surprised that the rhombus and the square have the smallest perimeters? Why or why not?
• The square looks pretty big. How is it possible that the rectangle had a larger perimeter than the square?
• Do you need to measure the length of every side to find the perimeter of a quadrilateral? Why or why not?
• Can you find an example of a quadrilateral in our collection where you only have to measure 2 of the sides to find the perimeter? Can you find an example where you only have to measure 1 of the sides to find the perimeter?

....

Key: *Here are the perimeters of each of the quadrilaterals in order from smallest to largest for your reference. Quadrilateral C (rhombus): 32 cm; Quadrilateral B (trapezoid): 34 cm; Quadrilateral D (square): 36 cm; Quadrilateral A (parallelogram): 38 cm; Quadrilateral E (rectangle): 40 cm.*

....

NAME _____   DATE _____

Perimeter Record Sheet

1 Label each figure on the Paper Quadrilaterals sheet with its name.

2 Work with your partner to carefully cut out the 5 quadrilaterals and put them in order, from smallest to largest perimeter.

3 After you've agreed on the order, write the letters of the quadrilaterals where you think they belong in the boxes below.

Smallest Perimeter	⟶			Largest Perimeter

4 Estimate the perimeter of each quadrilateral. Write your estimates on the chart below. Then measure the perimeter of each quadrilateral and label the quadrilateral to show your work. Record the actual perimeters on the chart below.

Quadrilateral Letter	Your Estimate in centimeters (cm.)	Actual Perimeter in centimeters (cm)

Paper Quadrilaterals

A _____

Perimeter = _____ cm

B _____

Perimeter = _____ cm

C _____

Perimeter = _____ cm

D _____

Perimeter = _____ cm

E _____
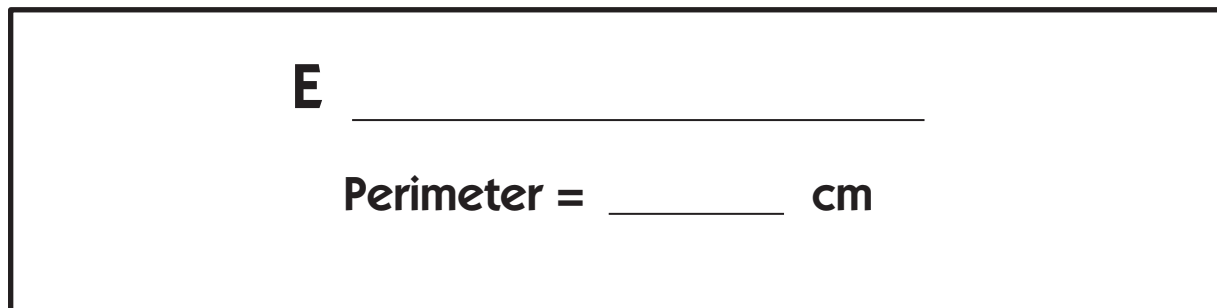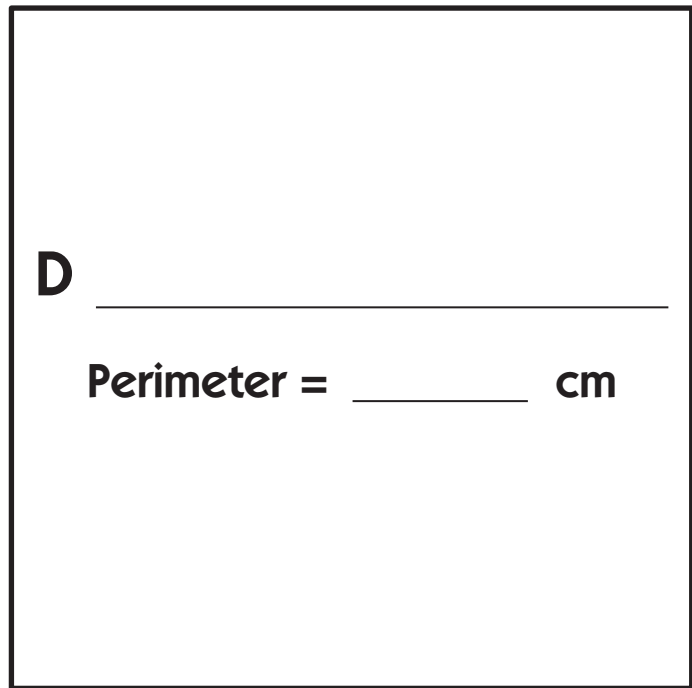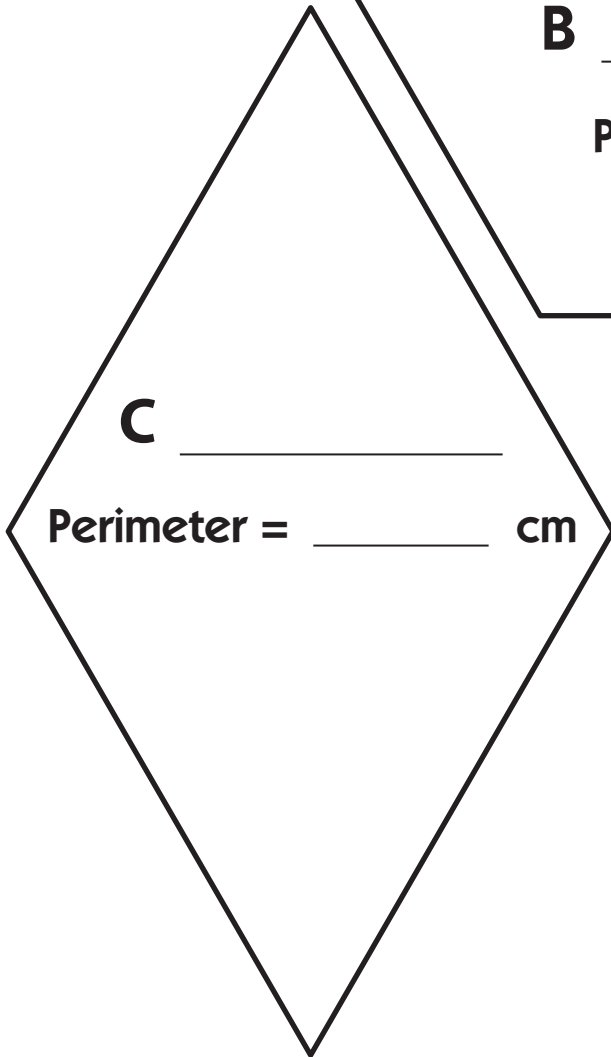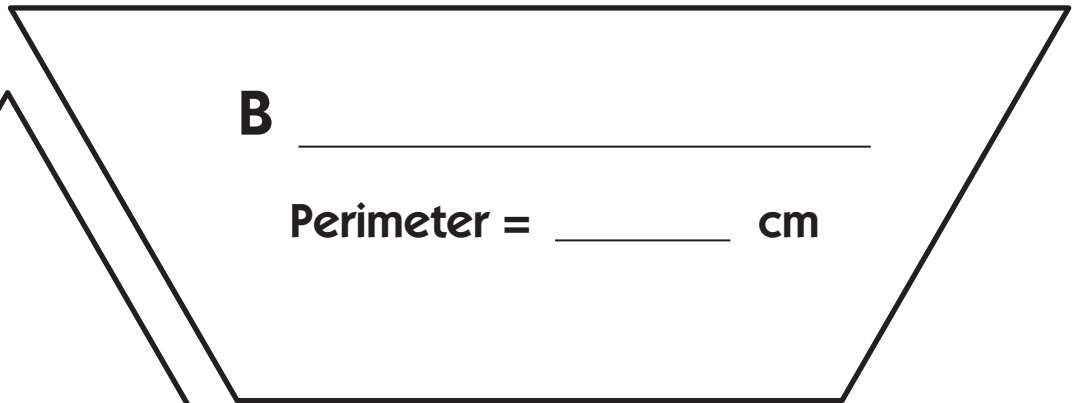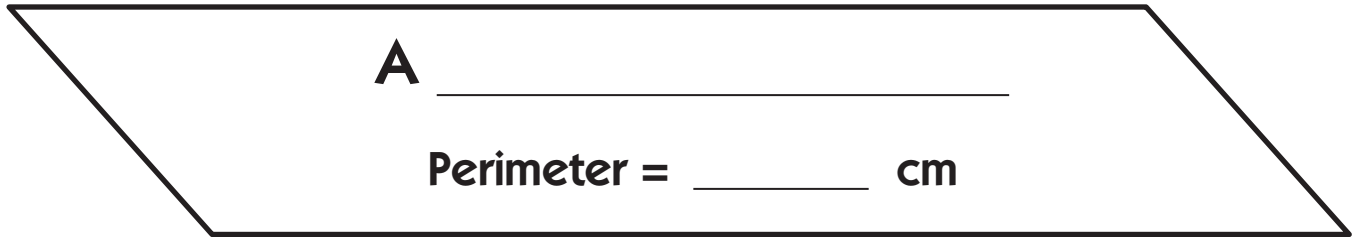
Perimeter = _____ cm

Set C4 ★ Activity 5

ACTIVITY

Measuring Classroom Quadrilaterals

Overview
Students estimate and measure the perimeters of quadri-laterals in the classroom, such as the whiteboard, a desk, a table, a piece of chart paper, the calendar grid pocket chart, and so on. In doing so, they must choose appropri-ate tools and units, based on the sizes of the objects they are measuring.

Skills & Concepts
★ identify and describe special types of quadrilaterals

★ estimate and measure perimeters of quadrilaterals

★ measure perimeter in U.S. customary units

★ choose appropriate tools and units of measure

You'll need
★ Measuring Classroom Quadrilaterals, (page C4.28, class set plus a display master)

★ rulers (class set)

★ other tools to measure length in U.S. Customary units, including yardsticks and measuring tapes marked in inches and feet

Instructions for Measuring Classroom Quadrilaterals

1. Open this activity by asking students to share what they know about perimeter now.

> **Students** *Perimeter is how far it is around something.*
> *You have to measure the side lengths and add them together.*
> *You can do multiplication too, like if the shape is a square. Then you can just measure 1 of the sides and multiply by 4.*
> *You can do perimeter with lots of different shapes, not just squares and rectangles.*
> *I think the sides have to be straight, though, because you can't really measure how far it is around a circle with a ruler.*

2. Explain that today, students are going to work in pairs to measure the perimeters of quadrilaterals around the classroom. Ask them to look around quietly from where they are sitting to find examples of small and large quadrilaterals, including non-rectangular quadrilaterals if possible. After they've had a few moments to search the room with their eyes, have students pair-share their ideas, and then call on volunteers to share with the class. As each idea is shared, ask the class to identify what kind of quad-rilateral it is. Record the name and shape of each item suggested by the students on the board. 3. Then show students the measuring tools available to them, including a ruler, a yardstick, and a measuring tape. Ask them whether they would use the same tools and units to measure all of the items listed on the board. Would they, for instance, use the same tools and units to measure the trapezoid pattern block and the whiteboard? Why or why not? Record some of the ideas that emerge as students share their thinking with the group.

Activity 5 Measuring Classroom Quadrilaterals (cont.)

Students *No way! I would use inches for the pattern block, and feet for the whiteboard.*
I think maybe feet or yards would be good for the whiteboard because it's really big. You could use the yardstick to get the feet or yards. If it doesn't come out exact, you could use a regular ruler to do the inches that are left over.
I think inches are good for things like a notebook or the tile on the floor, but you should use feet or yards for big things like the rug.
It seems like it would be easier to use a regular ruler for little things, and a measuring tape for big things.
Can we use more than one unit? Like can we use feet and inches? Because sometimes things don't come out perfect when you measure them.

4. Give students each a copy of the Measuring Classroom Quadrilaterals sheet and place a copy on display at the overhead or document camera. Review the instructions at the top of the sheet with the class. Then examine the example given in the first row of the chart with students.

NAME _____   DATE _____

Measuring Classroom Quadrilaterals

1 Choose 6 different quadrilateral-shaped items in your classroom to measure.
Fill in the chart below to show the following for each item:

- the name of the item
- the shape of the item (tell which kind of quadrilateral it is)
- the unit of measure you're planning to use for that item (inches, feet, or yards)
- your estimate of the perimeter
- the actual perimeter (show your work)

Item Name	Shape Name	Unit of Measure	Esitmated Perimeter	Actual Perimeter (Show you work.)
Example red pattern block	trapezoid	inches	6 inches	1+1+1+2 = 5 inches
a				
b				
c				
d				

Teacher *What classroom quadrilateral did they use for an example in the first row of the chart?*

Juan-David *One of those red pattern blocks. It's a trapezoid.*

Teacher *Why do you think they picked inches for the unit of measure?*

Teal *Because it's really little. You couldn't measure it in feet or yards - that doesn't make sense.*

Teacher *Was the estimate they made correct? No? Is that okay?*

Marcus *Yes, because it's just an estimate. It doesn't have to be exact.*

Activity 5 Measuring Classroom Quadrilaterals (cont.)

5. After you have examined the example at the top of the chart together, model the steps described at the top of the worksheet. Choose one of the larger classroom quadrilaterals from the list on the board. Work with input from the class to fill in Row A on your display sheet with the name and shape of the item. Discuss with students whether it would be most appropriate to measure the item in inches, feet, or yards. Make an estimate of the item's perimeter. Then have students help you measure the side lengths. As you do so, establish with the class the desired degree of accuracy (i.e., to the nearest foot, the nearest inch, the nearest half an inch). Get students' input to record the equation needed to determine the perimeter of the item. Have students solve the equation to find the actual perimeter.

6. Once students understand what to do, have them go to work in pairs, each partner responsible for filling in his or her own sheet. Ask them to choose items of different sizes to measure - not all small and not all large. Let them know that they can choose items from the list on the board, or other items of their own choosing, as long as they are quadrilaterals. Challenge them to include at least one non-rectangular quadrilateral among the items they measure; more than one if possible. Ask students who finish quickly to turn the worksheet over, draw a chart on the back similar to the one on the front, and continue measuring and recording.

7. Toward the end of the math period, pull the group back together to discuss their discoveries and results. Here are some questions you might want to pose:

* Which items did you decide to measure in feet?
* Were there any you measured in yards, instead of feet or inches?
* What unit of measure would you use to find the perimeter of the playground?
* What items were you able to find that were non-rectangular quadrilaterals? Why do you suppose it's so challenging to find objects that are shaped like rhombuses, parallelograms, and trapezoids? Why are rectangles and squares so common in our surroundings?
* When might you need to find the perimeter of something in your everyday life? What about your parents? What kinds of workers would need to find the perimeters of things on the job?
* Did you get any surprises as you were finding the perimeters of different items in our classroom?

INDEPENDENT WORKSHEET

Use Set C4 Independent Worksheet 3 to provide students with more practice measuring quadrilaterals to determine their perimeter.

NAME _____   DATE _____

Measuring Classroom Quadrilaterals

1 Choose 6 different quadrilateral-shaped items in your classroom to measure. Fill in the chart below to show the following for each item:

- the name of the item
- the shape of the item (tell which kind of quadrilateral it is)
- the unit of measure you're planning to use for that item (inches, feet, or yards)
- your estimate of the perimeter
- the actual perimeter (show your work)

Item Name	Shape Name	Unit of Measure	Esitmated Perimeter	Actual Perimeter (Show you work.)
Example *red pattern block*	*trapezoid*	*inches*	*6 inches*	*1+1+1+2 = 5 inches*
a				
b				
c				
d				
e				
f				

NAME _____   DATE _____

Set C4 ★ Independent Worksheet 1

Sorting and Identifying Quadrilaterals

1 A trapezoid is a quadrilateral with exactly 1 pair of parallel lines. Circle the 2 lines that are parallel to each other on each of the trapezoids below. Mark the 2 lines that are *not* parallel to each other with an x on each of the trapezoids below.

Example	a	b	c	d

2 A parallelogram is any quadrilateral with 2 pairs of parallel lines. On each of the parallelograms below, circle 1 pair of parallel lines in blue. Circle the other pair of parallel lines in red.

Example	a	b	c	d

3 Find all the trapezoids below. Color them orange. Find all the parallelograms below. Color them purple. When you finish, you should have 2 quadrilaterals that are not colored.
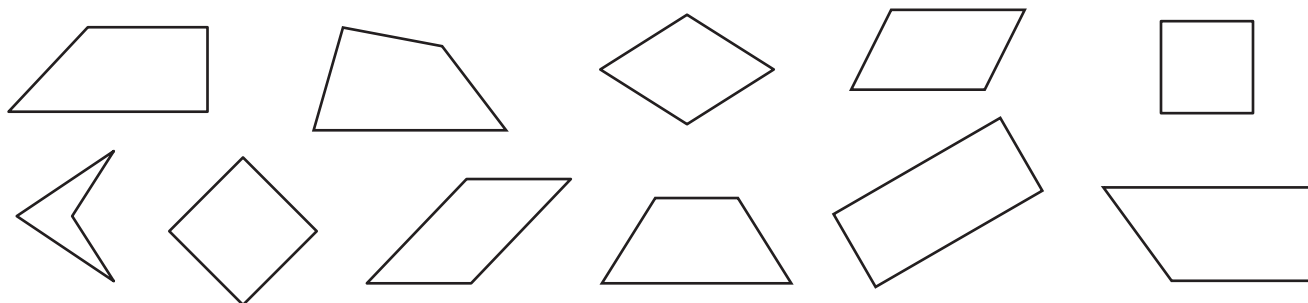
(continued)

Independent Worksheet 1 Sorting and Identifying Quadrilaterals (cont.)

4 Fill in the bubble to show the answer. Then write an explanation.

a This shape is a
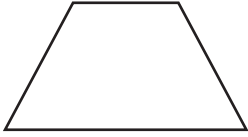
○ trapezoid   ○ square   ○ parallelogram   ○ rectangle

Explain why:.

b How do you know that the shape in **a** is *not* a parallelogram? Use labeled sketches, numbers, and/or words to explain. Give at least 2 reasons.
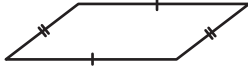
c This shape is a
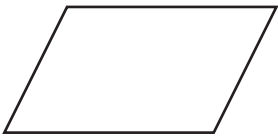
○ trapezoid   ○ square   ○ parallelogram   ○ rectangle

Explain why:.

d How do you know that the shape in **c** is *not* a rectangle? Use labeled sketches, numbers, and/or words to explain. Give at least 2 reasons

e This shape is a

○ trapezoid   ○ square   ○ quadrilateral   ○ rectangle

Explain why:.

f How do you know that the shape in **e** is *not* a trapezoid? Use labeled sketches, numbers, and/or words to explain. Give at least 2 reasons.

NAME _____   DATE _____
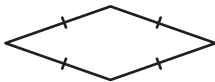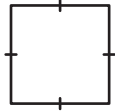
Set C4 ★ Independent Worksheet 2

Classifying Quadrilaterals

A quadrilateral is any polygon that has 4 sides. There are many kinds of quadri-laterals, including:
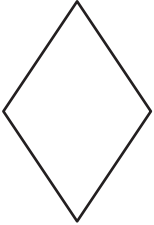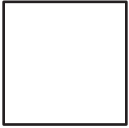
trapezoid a quadrilateral with exactly 1 pair of parallel sides	**parallelogram** a quadrilateral with 2 pairs of parallel sides opposite each other

rectangle a parallelogram with 4 right angles	**rhombus** a parallelogram with 4 congruent sides	**square** a parallelogram with 4 congru-ent sides and 4 right angles

1 Look carefully at the figures below. Find out how many right angles, pairs of parallel sides, and pairs of congruent sides each has. Then circle all the words that describe the figure.

Figure	How many right angles?	How many pairs of congruent sides?	How many pairs of parallel sides?	Circle the word(s) that describe(s) the figure.
a				trapezoid parallelogram rectangle rhombus square

(continued)

Independent Worksheet 2 Classifying Quadrilaterals (cont.)

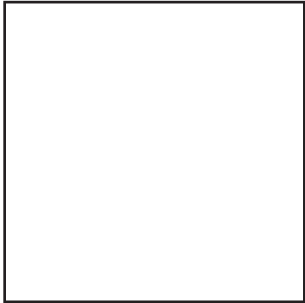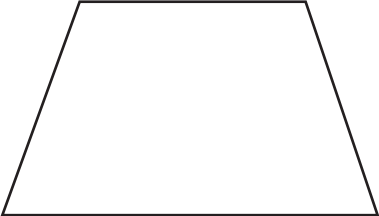| Figure	How many right angles?	How many pairs of congruent sides?	How many pairs of parallel sides?	Circle the word(s) that describe(s) the figure.
b				trapezoid parallelogram rectangle rhombus square
c				trapezoid parallelogram rectangle rhombus square
d				trapezoid parallelogram rectangle rhombus square
e				trapezoid parallelogram rectangle rhombus square

Set C4 ★ Independent Worksheet 3

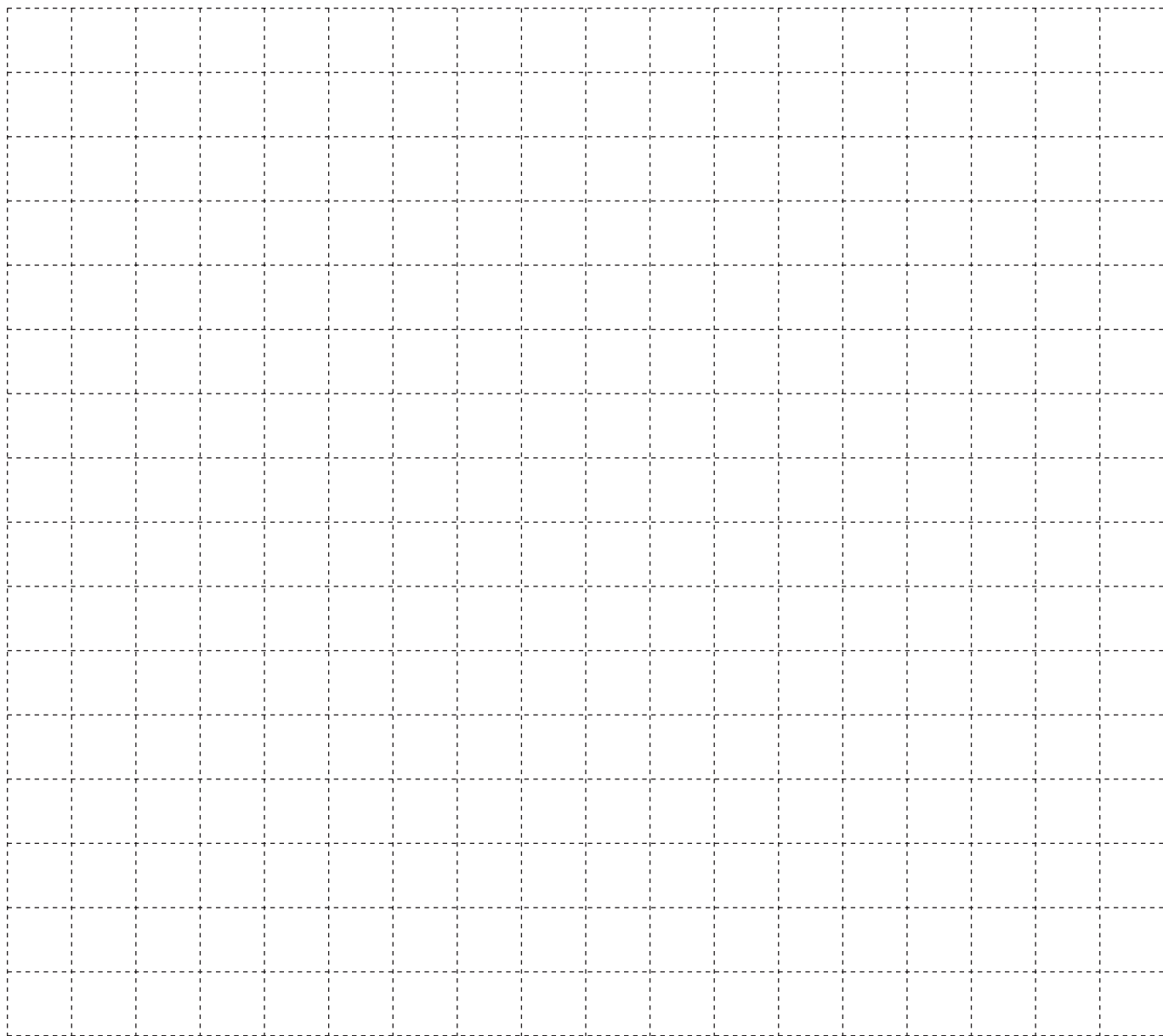**INDEPENDENT WORKSHEET**

Perimeter Review

1 For the quadrilaterals below, measure in centimeters and label as many sides as you need to find the perimeter. Then write an equation to show the perimeter of the quadrilateral and fill in the answer at the bottom of the box.

Example

6 cm

2 cm

$(2 \times 6) + (2 \times 2) = 12 + 4$

$12 + 4 = 16$ cm

Perimeter = ____16 cm_____

a

Perimeter = _____

b

Perimeter = _____

c

Perimeter = _____

2 Sarah says you only need to measure one side of a square to figure out its perimeter. Do you agree with Sarah? Why or why not? Use labeled sketches, numbers, and/or words to explain your answer.

Independent Worksheet 3 Perimeter Review (cont.)

3 Jacob and his dad are going to make a rabbit pen in the backyard. They have 16 feet of fencing. Help Jacob draw some plans. Sketch and label at least 4 different rectangles with a perimeter of 16 centimeters on the centimeter grid paper below. Write an equation under each sketch to show that the perimeter is actually 16 centimeters. Circle the sketch you think would be best for a rabbit pen.

3 BRIDGES IN MATHEMATICS

GRADE 3 SUPPLEMENT

Set D2 Measurement: Area

Includes

Skills & Concepts

★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ use non-standard units to estimate and measure area

Bridges in Mathematics Grade 3 Supplement
Set D2 Measurement: Area

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set D2 ★ Activity 1

ACTIVITY

Measuring the Area of Paper Rectangles

Overview
Students explore the concept of area by covering 4 different paper rectangles with square tile units and then copying one of them onto grid paper.

Skills & Concepts
★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ use non-standard units to estimate and measure area

You'll need
★ Rectangles (page D2.4, run a half-class set on 3 or 4 different colors of copy paper)

★ Rectangle Z (page D2.5, run 1 copy on a transparency)

★ Grid Paper (page D2.6, run a class set)

★ overhead base 10 units

★ overhead pens

★ square units from the sets of largebase 10 pieces (about 50 for every 2 students)

★ scissors

★ crayons or colored pencils

★ rulers

★ Word Resource Card (area)

Instructions for Measuring the Area of Paper Rectangles
1. Post the area card on the whiteboard and give students a minute to share anything they already know about this term.

> **Students** *It's something with shapes.*
> *I think it's a kind of measuring.*
> *I think it's about how big some shapes are, like rectangles and triangles.*

2. Explain that when people measure area, they find out how many square units it takes to cover a shape. Today, students are going to use the units from their base 10 kits to measure the area of several different rectangles.

3. Ask students to pair up, or assign partners. Give each pair a copy of the Rectangles blackline, along with about 50 square units from the base 10 kits. (If you give each pair at a table a different color sheet, they'll be able to keep track of their own rectangles more easily.) Have them work together to cut apart the four rectangles along the heavy lines. If someone mentions that one of the shapes on the sheet is a square, ask the class to consider how a square a special kind of rectangle, one with four equal sides.

Activity 1 Measuring the Area of Paper Rectangles (cont.)

4. As the first pairs finish cutting their rectangles apart, ask students to set their materials aside for a minute. Place the Rectangle Z overhead on display. Read the text with your class and ask students to estimate how many square units it would take to measure the area of the rectangle. That is, how many units would it take to cover the entire rectangle, without leaving any holes, gaps, or overlaps? Record some of their estimates and then cover the rectangle with overhead base 10 units as they watch.

Rectangle Z

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

Z

Estimates:

30, 25, 16, 15, 20, 24, 32, 28

5. Ask students to whisper the number of square units it actually took to cover the rectangle. Can they figure it out without counting the tiles one by one? Perhaps they see 4 rows of 5, or 4 × 5. Others may skip count by 4's or by 5's, and some may see 2 groups of 8 plus 4 more. Write the actual area on the overhead once students agree that it's 20 square units.

6. Now have them return to their own paper rectangles. Before they measure the area of the rectangles, ask them to use their estimation skills to place the 4 in order, from smallest to greatest area. Have them discuss their thinking with their partners as they sequence the rectangles, and then choose a few volunteers to share their ideas with the class.

A

B

D

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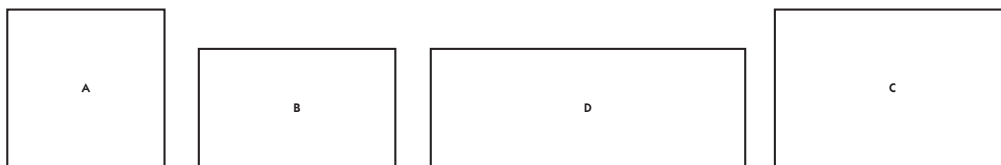
> **Austin** We put them on top of each other, like if you put A on top of C, you can see that C is bigger, and D is bigger than B. We're not totally sure about A and B, but we think it's right.

7. Next, ask students to use their square units to determine the area of each rectangle. Press them to use efficient computation strategies rather than counting the units one by one. Have them record the area directly on the paper rectangles.
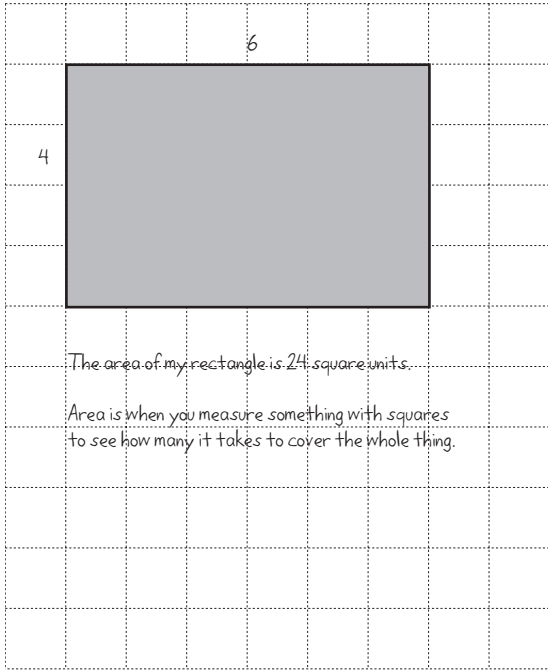
8. When the pairs have measured the area of all 4 rectangles, give each student a piece of the 2-Centimeter Grid Paper. Ask them to copy one of the rectangles onto the grid paper by coloring in the correct number of square units. (They may want to outline the rectangle using a pencil and ruler before coloring it in.) Then have them label its dimensions and area. At the bottom of the grid paper, have students write what they know about area right now.

Activity 1 Measuring the Area of Paper Rectangles (cont.)

NAME Brisa   DATE

Grid Paper

6

4

The area of my rectangle is 24 square units.

Area is when you measure something with squares
to see how many it takes to cover the whole thing.

Extensions

- If some of your students need more of a challenge, have them draw triangles or parallelograms on a piece of grid paper and find the area of these shapes in square units.
- If you have sets of tangrams (like those in Unit Three of *Bridges in Mathematics*), have students use their estimation skills to order the 7 pieces by area. Then have them use the square in the tangram set to find the area of the other pieces. (If the square is assigned an area of 1 unit, each small triangle has an area of one-half. The medium triangle and the parallelogram each have an area of one square unit. The area of the large triangle is 2 square units.)

Rectangles

A

B

C

D

Rectangle Z

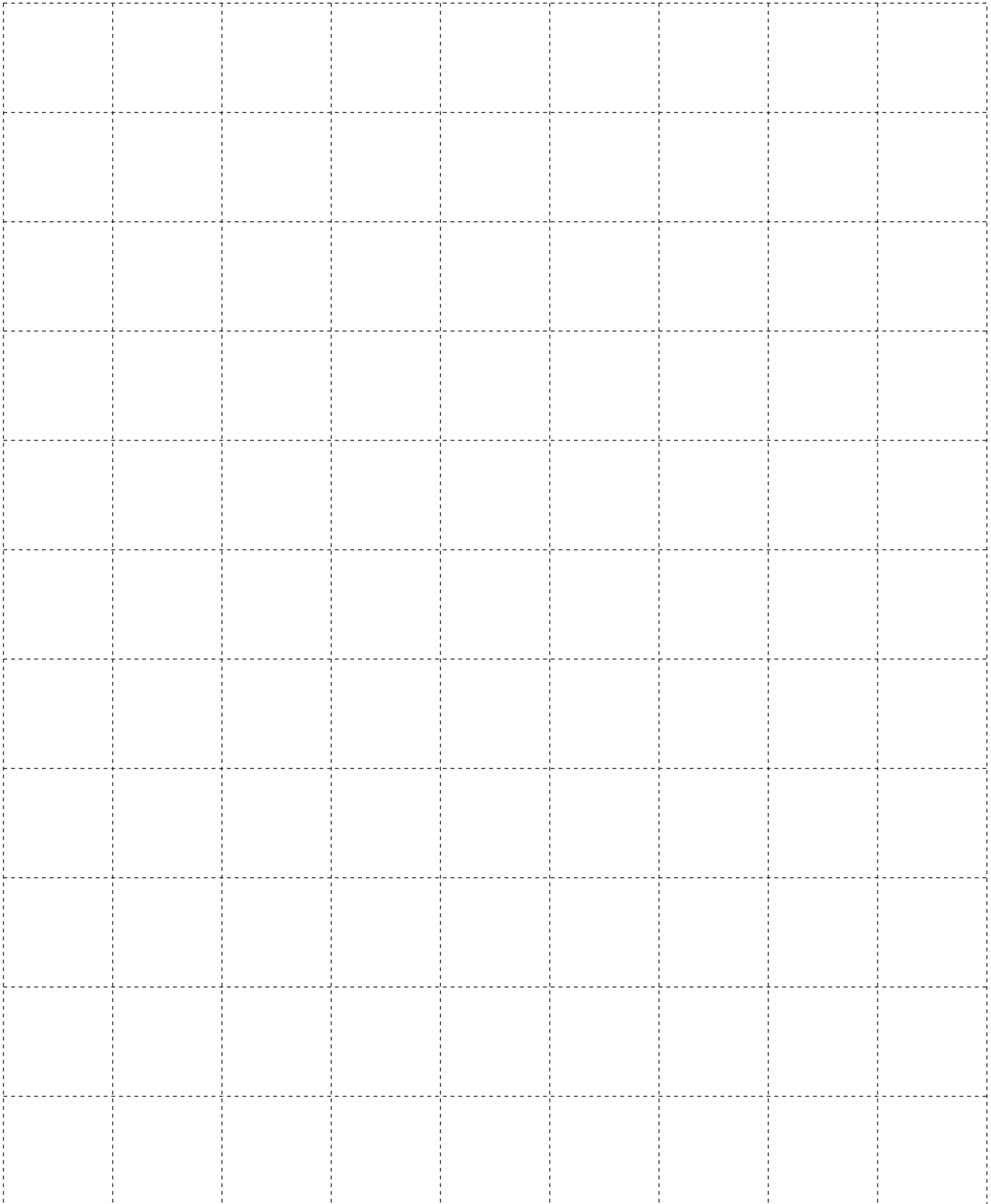What is the area of Rectangle Z in square units this size?

Z
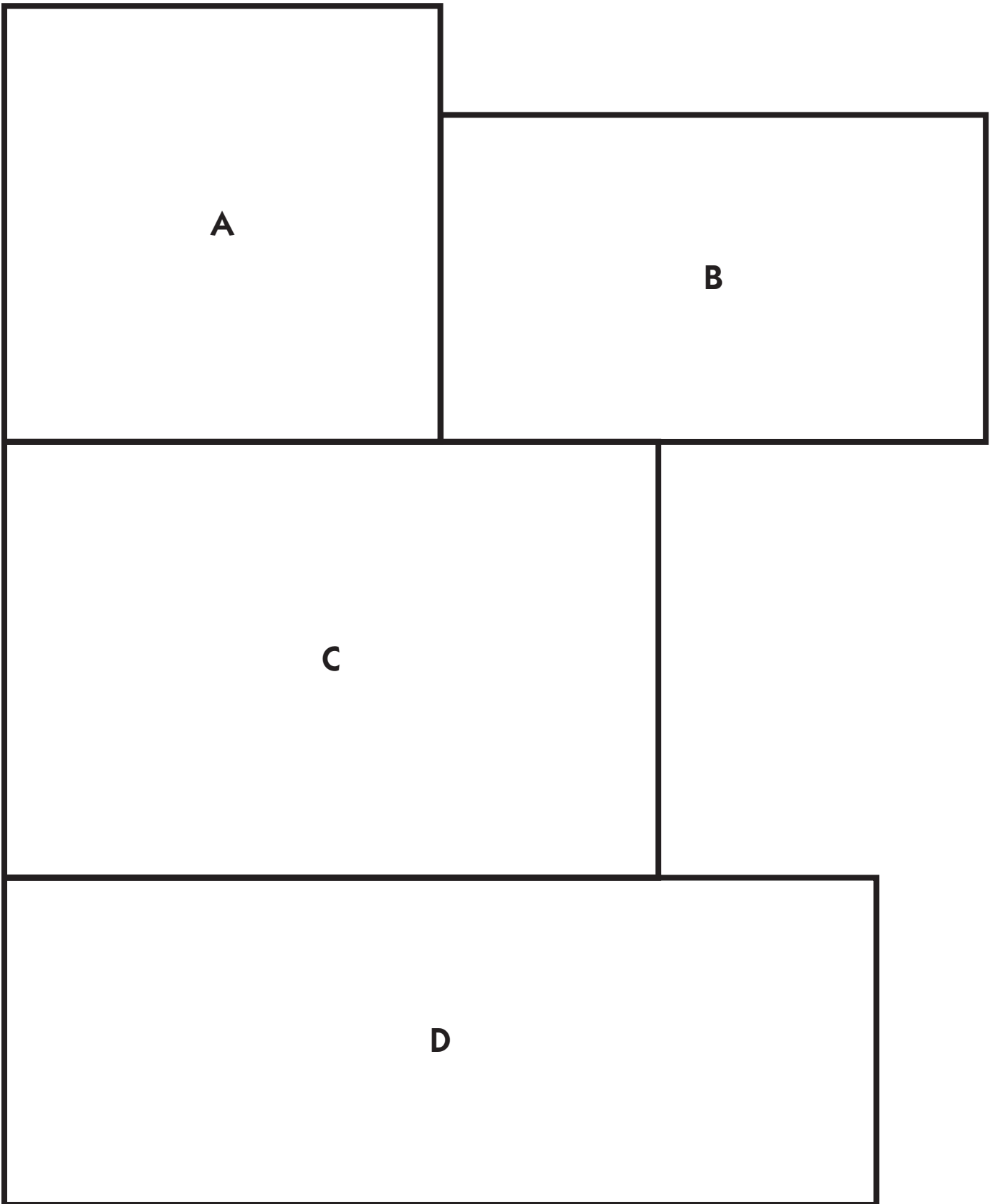
Estimates:

Actual Measure: _____ square units

NAME _____   DATE _____

Grid Paper

Set D2 ★ Activity 2

ACTIVITY

Finding Areas Large & Small

Overview
Students use construction paper squares to find the area of several different rectangular surfaces in the classroom. They also determine the area of several smaller rectangles that are already marked with square units.

Skills & Concepts
★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ use non-standard units to estimate and measure area

Recommended Timing
Anytime after Set D2 Activity 1

You'll need
★ Finding Areas Large & Small (pages D2.9 and D2.10, run a class set back-to-back)

★ Grid Paper (Set D2 Actvity 1, page D2.6, class set)

★ 32 four-inch squares of construction paper for each pair of students (see note)

★ a piece of copy paper

★ 2 or 3 pieces of 18″ × 24″ chart paper

....

Advance Preparation A sheet of 12″ × 18″ construction paper can be cut into 16 four-inch squares, so you just need to count out and cut 1 sheet per student. It's best to use all one color (not white). Students will need these squares for Set D2 Independent Worksheet 1, so be sure to save them.

....

Instructions for Finding Areas Large & Small

1. Let students know that they're going to be measuring some rectangular surfaces around the classroom with larger square units today. Show them one of the 4″ paper squares you've cut, along with a piece of copy paper. Ask them to think privately about how many of the squares it might take to cover the piece of paper.

2. Ask volunteers to share their estimates with the class and then use some of the squares to cover a piece of copy paper as the students watch. Note with them that the measurements aren't exact. The paper squares run a little over the length of the paper and don't quite cover the width. What would they say the approximate measurement is in square units?
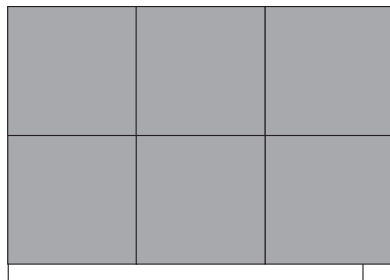
Activity 2 Finding Areas Large & Small (cont.)

> **Students** *The squares go over the end, but they don't quite cover the paper to the bottom.*
> *If you think about cutting the extra off and putting it on the bottom, it's about 6.*
> *Yeah, I'd say the paper is about 6 squares big.*
>
> **Teacher** *So we can say that the approximate area of this paper is 6 square units.*

3. Then explain that they're going to work in pairs to measure some different surfaces around the classroom. Give each student a copy of Finding Areas Large & Small, and review the first side with the class. To complete it, they'll need to locate each of the items shown on the sheet and estimate the area in large paper squares. Then they'll need to measure each item and record its approximate area. Finally, they'll need to find and record the difference between their estimate and the approximate measure.

4. Review and clarify the second side of the sheet as necessary and then let students get started. In order to reduce the amount of classroom traffic, you might want to have half of the pairs complete the second side of the sheet first and then do the first side.
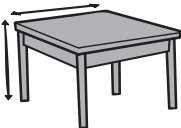
INDEPENDENT WORKSHEET

See Set D2 Independent Worksheet 1 for more practice estimating and measuring area. Students will need the 4˝ construction paper squares they used today to complete this assignment, so be sure to save them.

NAME _____   DATE _____

Finding Areas Large & Small page 1 of 2

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

I noticed
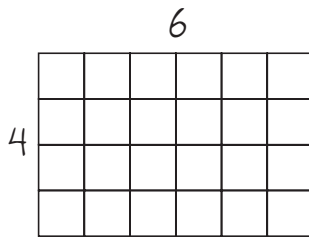
NAME _____   DATE _____

Finding Areas Large & Small page 2 of 2

7 The rectangles below have already been marked with square units. Record the dimensions of each and then find the area. Write 2 different number sentences to show how you found the area of each.
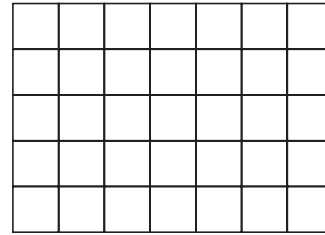
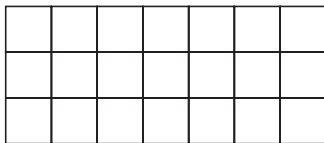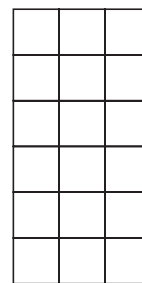| **example**	**a**

6
4
 	
Area = __24__ square units
 	
Number sentences:
   $6 + 6 + 6 + 6 = 24$
   $4 \times 6 = 24$
	Area = _____ square units
	
	Number sentences:

b Area = _____ square units Number sentences:	**c** Area = _____ square units Number sentences:

NAME _____   DATE _____

Set D2 ★ Independent Worksheet 1

Finding More Areas

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

Object	Your Estimate (in square units)	Approximate Measurement (in square units)	The Difference (in square units)
a			
b			
c			
d			
e			

(Continued on back.)

Independent Worksheet 1 Finding More Areas (cont.)

2 The rectangles below have already been marked off in square units. Record the dimensions of each and then find the area. Write 2 number sentences to show how you found the area of each.

example	a

3
 	
5 ▯ (5×3 grid)
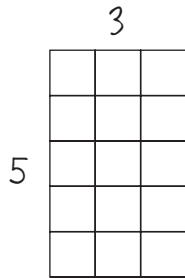 	
Area = __15__ square units
 	
Number sentences:
 	
    5 + 5 + 5 = 15
    5 × 3 = 15
	▯ (6×5 grid)
	
	Area = _____ square units
	
	Number sentences:

b	**c**
▯ (7×3 grid) Area = _____ square units Number sentences:	▯ (6×6 grid) Area = _____ square units Number sentences:

GRADE 3 SUPPLEMENT

Set D3 Measurement: Telling Time

Includes

Skills & Concepts

★   tell time to the minute using digital and analog clocks

Bridges in Mathematics Grade 3 Supplement
Set D3 Measurement: Telling Time

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set D3 ★ Activity 1

ACTIVITY

Roll, Tell & Record the Time

Overview
Students practice reading and writing time to the minute on analog and digital clocks.

Skills & Concepts
★ tell time to the minute using digital and analog clocks

You'll need
★ Roll, Tell & Record the Time (page D3.3, run a class set)

★ two red 6-sided dice and two blue 6-sided dice

★ student clock for each pair of students

★ *Clocks and More Clocks* by Pat Hutchins (optional)

Instructions for Roll, Tell & Record the Time

1. Tell students you're going to do a time-telling activity today. Ask them to get out their pencils as you give each student a copy of Roll, Tell & Record the Time. Give each pair of children a student clock to share as well.

2. Have a volunteer roll the 2 red dice and read the numbers out loud. Ask the class to *add* the 2 numbers and set the *hour hand* on their student clocks to that number.

3. Then ask another volunteer to roll the 2 blue dice and read the numbers out loud. Have students *multiply* the 2 numbers and set the *minute hand* on their clocks to that many minutes. Then have them read the time.

> **Students** *Okay, we got 2 + 4 on the red dice, so we have to set the hour hand to 6.*
> *We got 3 and 6 on the blue dice. 3 × 6 is, let's see … 6, 12, 18. It's 18.*
> *So the minute hand goes on 18, but there's no 18 on the clock.*
> *No, 18 is supposed to be the number of minutes.*
> *Okay, so that's 5, 10, 15 minutes, plus 3 more.*
> *So the whole thing is 6:18. It's 18 minutes past 6:00.*
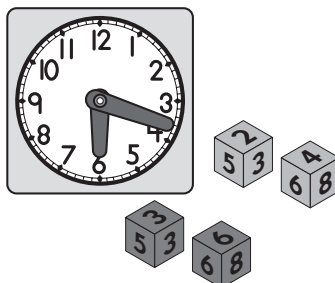
4. When there's general agreement among the students, write the time on the board (6:18 in this case). Then have students record the time on the digital clock in box 1 on their record sheet.

5. Repeat steps 2–4 seven more times.

Activity 1 Roll, Tell & Record the Time (cont.)

6. When the students have filled all the clocks on their worksheet, read each of the times they've re-corded at random. Have them draw a different shape or mark (i.e., star, check mark, circle, triangle, and so on) beside each of the times you read.

> *Teacher* *Make a star beside the clock that says 6:18. Okay, now draw a little happy face beside the clock that says 1:36.*

Extension

• Read *Clocks and More Clocks* by Pat Hutchins to your class before or after this session. This humorous book presents the dilemma of a man who can't tell which of his many clocks tells the right time and provides more opportunities for your students to tell time to the minute.
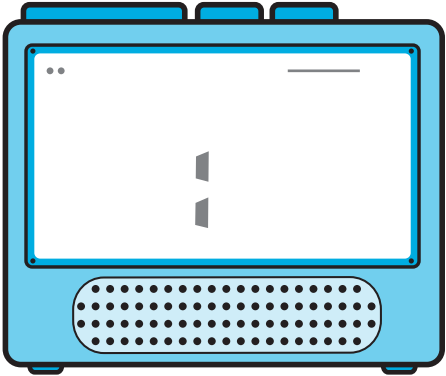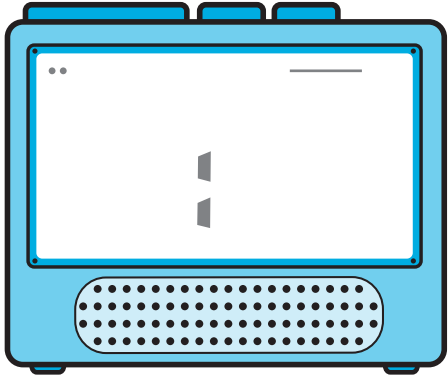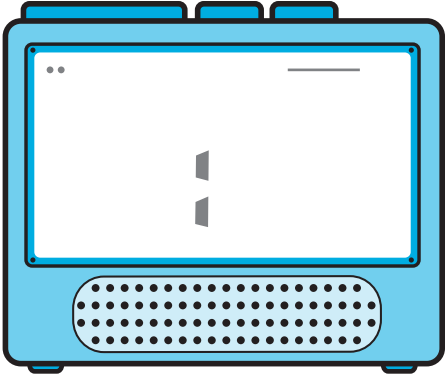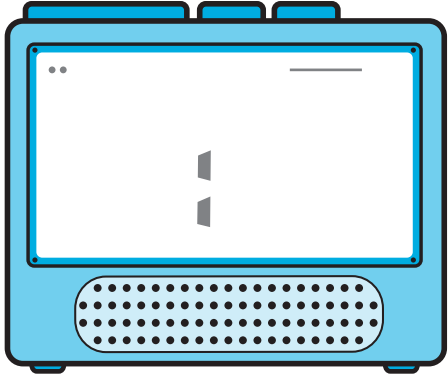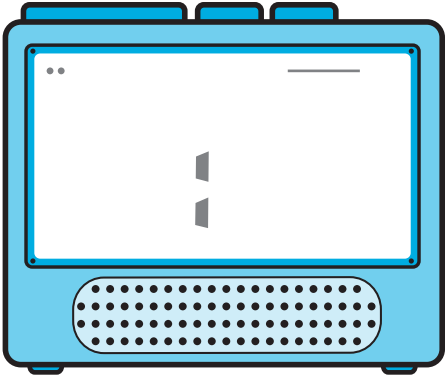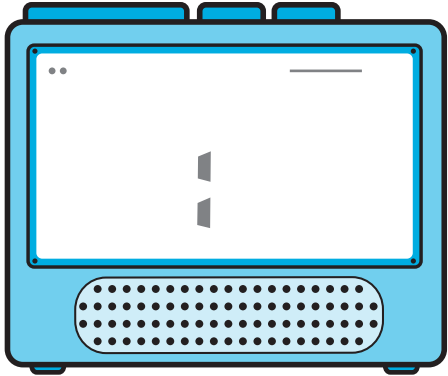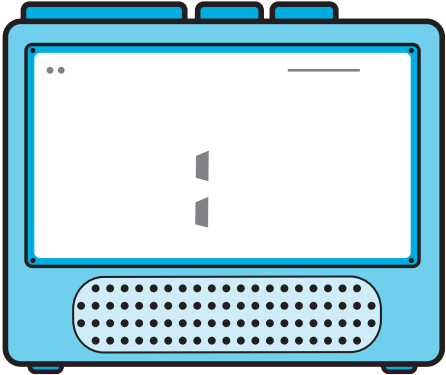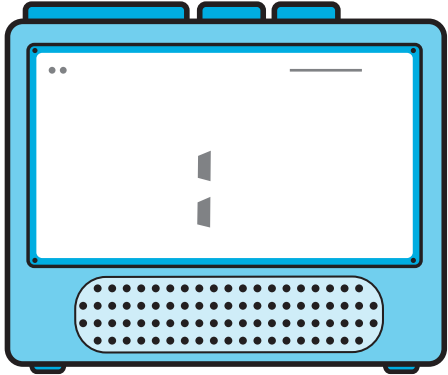
INDEPENDENT WORKSHEET

See Set D3 Independent Worksheets 1 and 2 for more practice telling and writing time to the minute on digital and analog clocks.

NAME _____   DATE _____

Roll, Tell & Record the Time

1	**2**
3	**4**
5	**6**
7	**8**

NAME _____   DATE _____
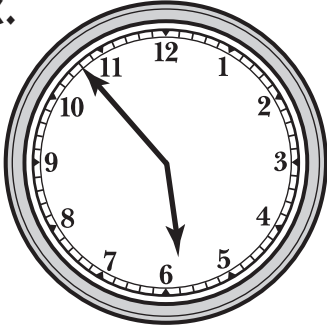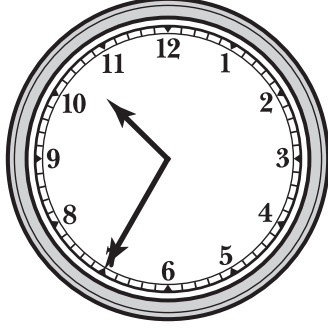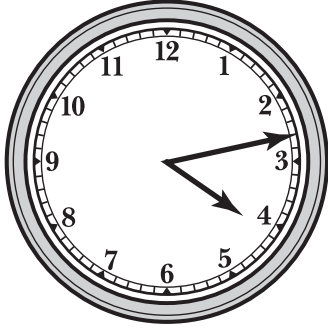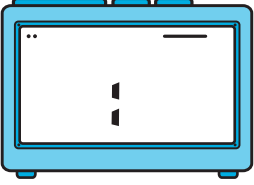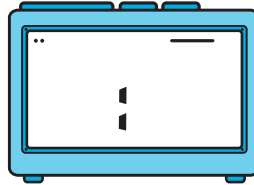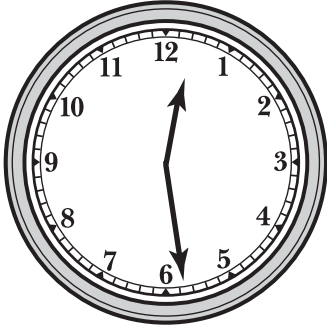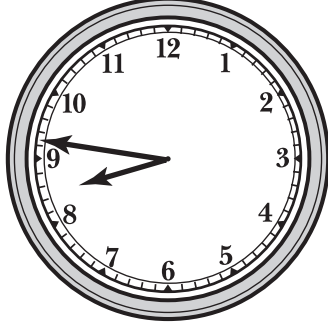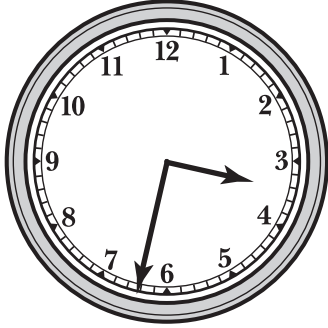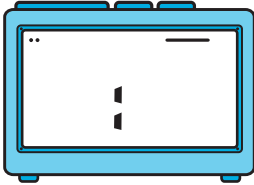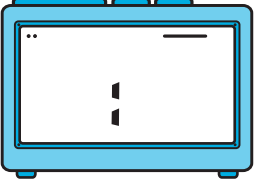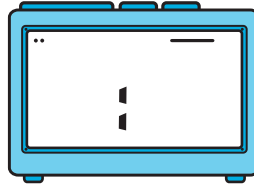
Set D3 ★ Independent Worksheet 1

Telling Time on Two Kinds of Clocks
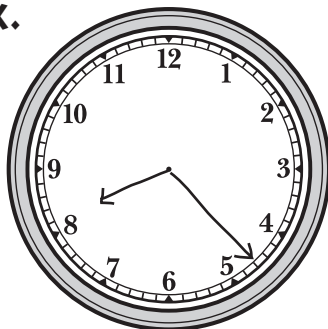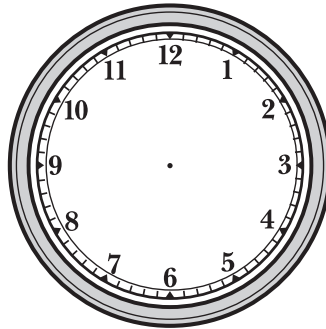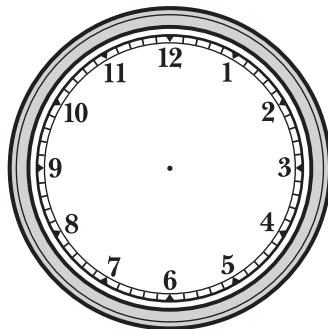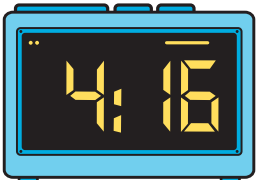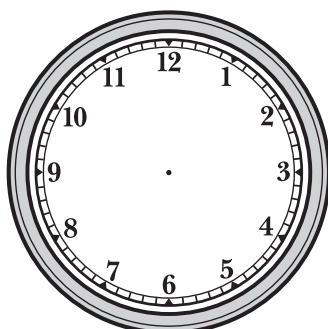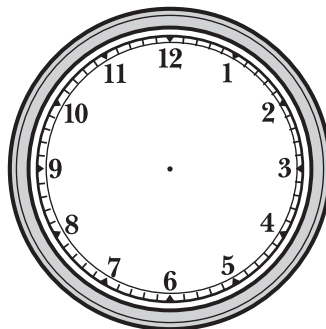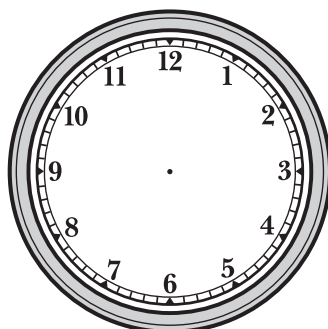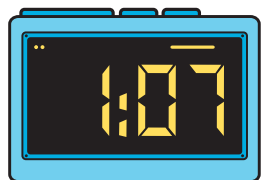
1 Read each of these clock faces and write the time on the digital clock.

ex.	a	b
5:53		

c	d	e

Independent Worksheet 1 Telling Time on Two Kinds of Clocks (cont.)

2 Draw the hour and minute hands on the clock faces to show the times below.

ex.	a	b
8:23	4:16	9:28
c	d	e
11:50	1:07	3:48

NAME _____   DATE _____
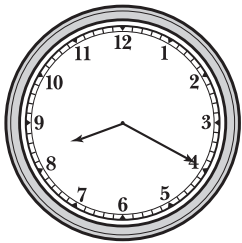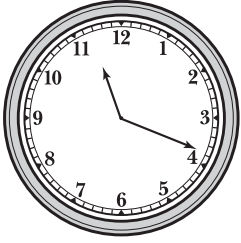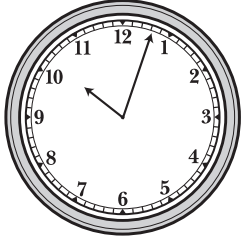
Set D3 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

Annie's School Day

1 Annie is a third grader at Bridger School. There are 2 clocks in her classroom. One is a digital clock, and the other is an analog clock with a regular clock face.

Read the clocks below and write the time to show when Annie's class does different activities through the day.

a School starts at _____.	**b** Recess is over at 10:20, but by the time the kids got back to class today, it was _____.
c Reading starts at _____.	**d** On Tuesdays and Thursdays, Annie's class has gym at 11:20, but today they got there a little early, at _____.
e Recess starts at 10:00, but Annie's class is sometimes a few minutes late getting out to the playground. Today, they got out at _____.	**f** Lunch starts at 11:50, and then the kids have recess again. Annie and her friends didn't get out to the playground until _____ today.
	(Continued on back.)

Independent Worksheet 2 Annie's School Day (cont.)

g Annie's teacher always reads a chapter book to the class after lunch recess. It took the kids a few minutes to get in from the playground and get settled, so Mr. Willis didn't start reading until _____.
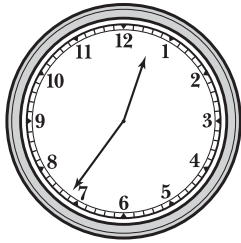
h Math always starts at 1:00, but Mr. Willis got finished with the book a couple of minutes early, so the class started math at _____.

i School is over at 3:20, and it usually takes Annie a few minutes to gather her things and walk down to the After-School Club in the gym. Today, she got there at _____.

GRADE 3 SUPPLEMENT

Set D5 Measurement: Area in U.S. Customary Units

Includes

Skills & Concepts

★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area

★ solve problems involving areas of rectangles and squares

★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rect-angles, squares)

★ measure necessary attributes of shapes to use area formulas to solve problems

Bridges in Mathematics Grade 3 Supplement
Set D5 Measurement: Area In U.S. Customary Units

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set D5 ★ Activity 1

Measuring Area: U.S. Customary Units

Overview
Students work together to list some things that might be best measured in square inches, square feet, and square yards. Then they measure their math journals in square inches.

Skills & Concepts
★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area

★ solve problems involving areas of rectangles and squares

★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rectangles, squares)

★ measure necessary attributes of shapes to use area formulas to solve problems

You'll need
★ Area: U.S. Customary Units (page D5.3, run 1 copy on a transparency)

★ Measuring My Math Journal (page D5.4, run a class set)

★ 1" Grid Paper (page D5.5, run 10–15 copies)

★ yard stick

★ rulers (class set)

★ color tile (class set)

★ Word Resource Card (area)

★ Student Math Journals

Instructions for Measuring Area: U.S. Customary Units

1. Post the area card on the whiteboard and take a minute to review this term with the class. Be sure students understand that when people measure area, they find the total number of square units needed to cover a 2-dimensional surface.

2. Now display the Area: U.S. Customary Units overhead. Ask the class to study the words and pictures shown on the transparency and think quietly about different surfaces that could be measured using these units.
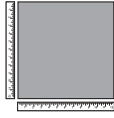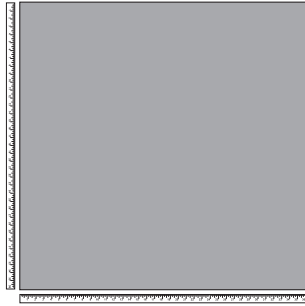
3. Have them write the phrases *square inches*, *square feet*, and *square yards* in their math journals and then record at least one area they would measure with each unit. Encourage them to look at their rulers, as well as the class yardstick, for reference as they think about how big each unit would be.

4. When they have finished writing, ask students to share their ideas and record them on the overhead. Encourage students to add to the lists in their journals as others share their suggestions.

Activity 1 Measuring Area (cont.)
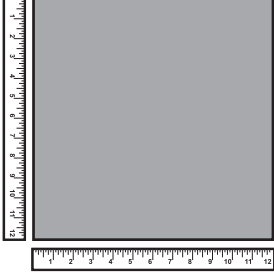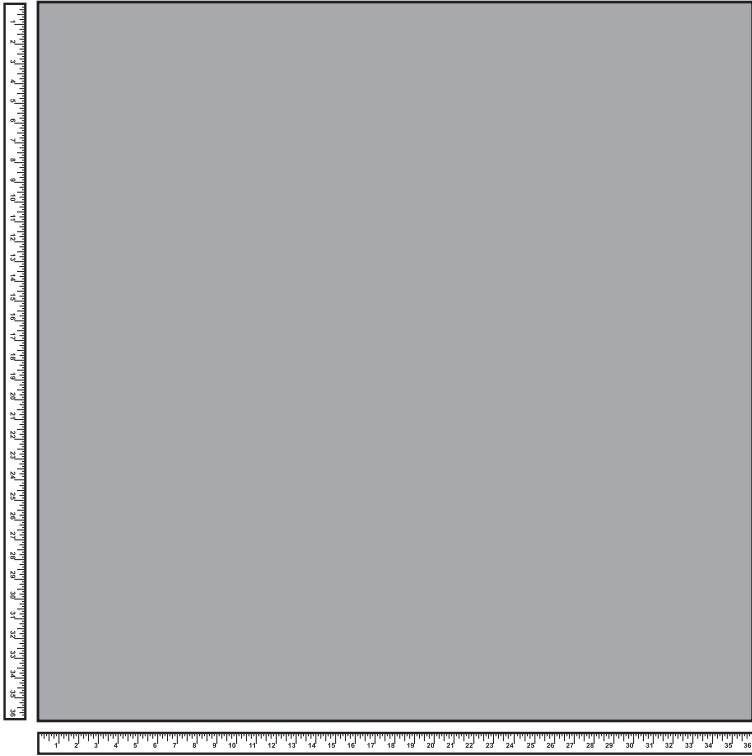
Area: U.S. Customary Units

Square unit	Things we would measure with this square unit
Square Inch	book CD case envelope magazine piece of paper
Square Foot	door window fabric for making a dress curtains the rug in my room
Square yard	our classroom floor the hallway gym floor ceiling the playground the soccer field

5. Give each student a copy of Measuring My Math Journal. Review the sheet together, and discuss the measuring tools available to them. Which might be most efficient?

6. Once students understand what to do, have them get started. Circulate as they work, and encourage them to devise methods that are more efficient than covering their math journals with tiles and then counting the tiles one by one.

Area: U.S. Customary Units

Square unit	Things we would measure with this square unit
Square Inch	
Square Foot	
Square yard	

NAME _____   DATE _____

Measuring My Math Journal

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

Estimate: _____

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

Area of my math journal:

CHALLENGE

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

1-Inch Grid Paper
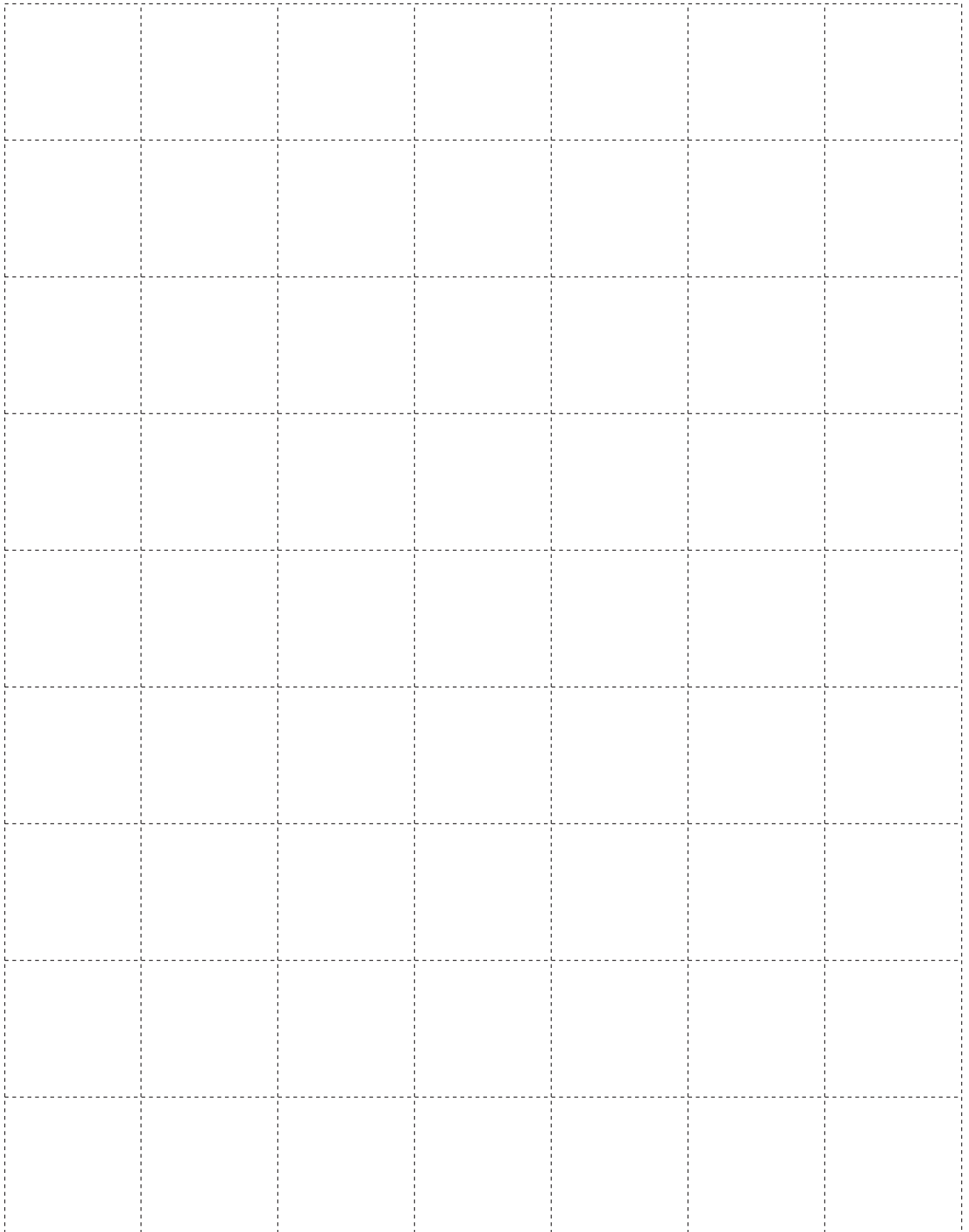
Set D5 ★ Activity 2

ACTIVITY

Rainbow Rectangles

Overview
Students estimate and measure the area of paper rectangles, working toward increasingly efficient methods, including the use of the area formula.

Skills & Concepts
★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area

★ solve problems involving areas of rectangles and squares

★ measure necessary attributes of shapes to use area formulas to solve problems

You'll need
★ Rainbow Rectangles (page D5.10, run a class set)

★ construction paper rectangles (see Advance Preparation)

★ rulers (class set)

★ color tile (class set)

★ tape

Advance Preparation You will need a set of 6 construction paper rectangles in the following colors and sizes for each group of 4 students: 6" × 9" (blue), 7" × 8" (green), 9" × 9" (yellow), 8" × 10" (red), 10" × 12" (purple), 12" × 12" (orange)

Instructions for Rainbow Rectangles

1. Explain that you're going to do some more work with area today. Hold up a single tile and ask students to tell you what they think its area is in square inches. If necessary, have a volunteer measure the dimensions of the tile and work with students to establish the fact that each of the color tile has an area of exactly 1 square inch.

2. Distribute sets of tile. Ask students to work in groups of 4 to build a square with an area of exactly 100 square inches. After they've had a few minutes to work, have students share and compare their results.
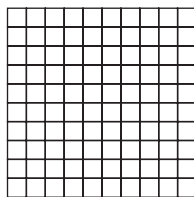
Students *We thought it was going to be really big, but it's not so big after all.*
We knew it was going to be a 10" × 10" square because 10 × 10 is 100.
We each made 2 rows of 10 and put them together. Then we each made a little row of 5 and hooked them onto the big square. It went pretty fast for us.

Units Activity 2 Rainbow Rectangles (cont.)

3. Ask each group to measure the dimensions of the square they've just built with the inch side of their ruler. What can they tell you about the square now? As volunteers share with the class, press them to explain their thinking.

> **Corey** It's 10 inches on both sides.
>
> **Teacher** What is the area of your square, and how do you know?
>
> **Students** It's 100 square inches because that's what you told us to do.
> It's 100 square inches because we used 100 tiles, and each tile is 1 square inch.
> There are 10 in each row, right? If you count by 10's, you get 100 in all.
> If you just multiply 10 × 10, it makes 100.

4. Now hold up one of the red construction paper rectangles you've prepared. Ask students to estimate the area in square inches, using their tile square as a visual benchmark.
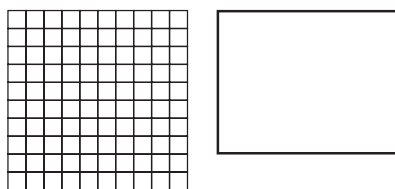
> **Students** That paper rectangle is a little smaller than our square.
> I think it's just smaller along one side. Can we hold it up against our square?
>
> **Teacher** Sure, here it is. If you want to stand up where you are so you can see what Vanesa is doing, go ahead. Raise your hand if you have an estimate. What do you think the area of the red paper rectangle is in square inches?
>
> **Students** Less than 100. Maybe about 60.
> I think it's 10 along the top and maybe 7 or 8 inches along the side. I'd say 70 or 80 square inches.
> I agree with 70.

5. Now ask students to pair-share ideas for finding the actual area of the red paper rectangle. Challenge them to think of a method that's more efficient than covering the paper with individual tile. Some may propose laying the rectangle on top of the tile square they just built. Others may suggest laying tile across the top to see how wide the paper is, and then laying tile down the side to see how many rows would be required without actually laying out every single tile.

6. Try some of the suggestions students have made to determine the area of the red paper rectangle. If it doesn't come from the class, propose measuring the side and top of the rectangle and multiplying the two numbers. Ask students to evaluate your suggestion. Will it work? Will it yield the same answer as the other methods? Why or why not?

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

Activity 2 Rainbow Rectangles (cont.)

7. Tape the red rectangle to the board. Ask a volunteer to measure and label the dimensions as the others watch. Record the numbers on the board and then have students multiply them. Ask them to comment on the results. Does the method work? Why?

8" × 10" = 80 square inches
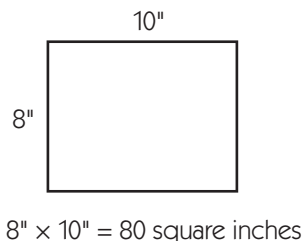
> **Students** *The 10 tells you how many tiles fit across the top. The 8 tells you how many rows of tiles you'd need.*
> *You can just multiply them together to get the answer.*
> *This is cool! It's way faster than covering the paper with tiles.*

8. Ask students to take their tile squares apart and put them back in their bags for now. Give each table a set of 6 construction paper rectangles. Ask them to use their estimation skills to place the 6 in order, from least to most area. Let them know that the red rectangle in the set is the same size as the one you just measured together. Have them discuss their thinking as they sequence the rectangles, and then choose a few volunteers to share their ideas with the class.
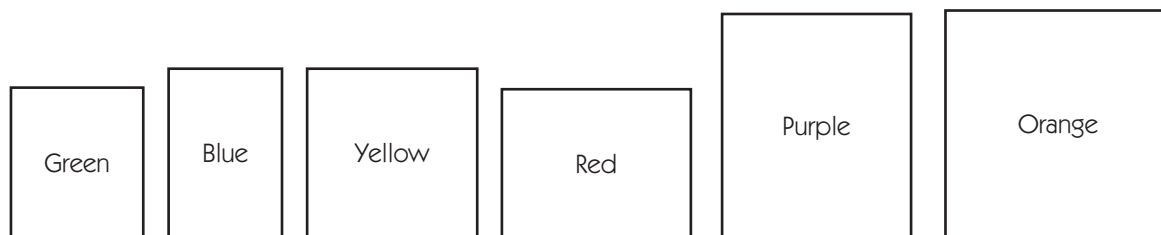
> **Mirabel** *You can definitely see that the orange one is the biggest, and then the purple. It's a little harder to tell with the green and blue, and the yellow and red.*

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

9. Ask students to get out their rulers (if they haven't done so already), and give each student a copy of the Rainbow Rectangles worksheet. Encourage them to work together in their groups, even though each student needs to complete his or her own sheet. Circulate as they work and continue to challenge them to find methods more efficient than covering each of the paper rectangles with tile and then counting the tile one by one. If they are using the area formula comfortably, press them to explain how and why it works.

INDEPENDENT WORKSHEET

See Set D5 Independent Worksheet 1 for more practice estimating and measuring area in customary units.

NAME _____   DATE _____

Rainbow Rectangles

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

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

Least Area					Most Area

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

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

NAME _____   DATE _____

Set D5 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Estimating & Measuring Area in Square Inches

1 Estimate the area of each rectangle. Then use tile or a ruler to find the area in square inches.

a
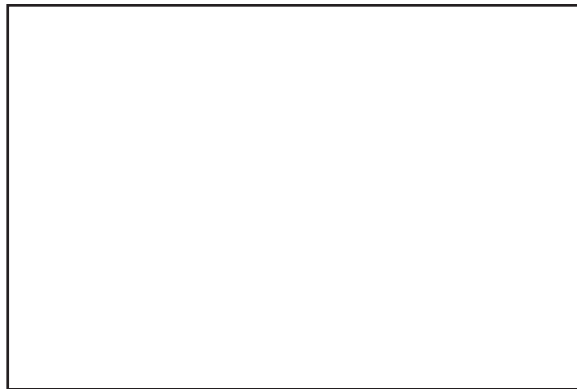
Estimate: _____ sq. in.   Area: _____ sq. in.

b

Estimate: _____ sq. in.   Area: _____ sq. in.

(Continued on back.)

Independent Worksheet 1 Estimating & Measuring Area in Square Inches (cont.)

C
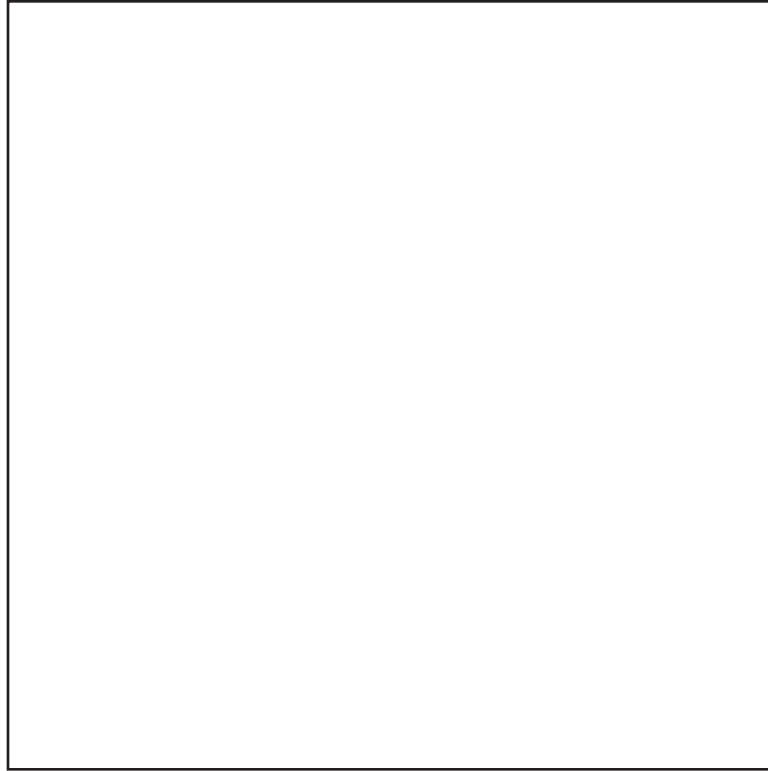
Estimate: _____ sq. in.   Area: _____ sq. in.

2 In the space below, draw a 2" × 4" rectangle Label the dimensions and the area of the rectangle.

(Continued on next page.)

NAME _____ DATE _____
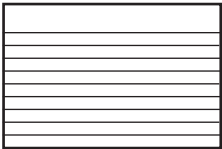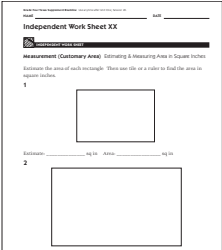
Independent Worksheet 1 Estimating & Measuring Area in Square Inches (cont.)
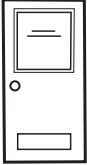
3 James says all you have to do to find the area of a 4" × 5" rectangle is multiply 4 × 5 Do you agree? Why or why not?

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

Continue estimating, finding the area, and finding the difference for the other objects below and on the next page. Use what you know about the area of the first object to estimate the others.

Object	Your Estimate (in square inches)	Actual Area (in sq. in.)	The Difference (in sq. in.)
a A Notecard			
b This Worksheet			
c Cover of a Chapter Book from your classroom			

Independent Worksheet 1 Estimating & Measuring Area in Square Inches (cont.)

Object	Your Estimate (in square inches)	Actual Area (in sq. in.)	The Difference (in sq. in.)
d Top of Your Calculator			
e Your Classroom Door			

BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set D6 Measurement: Area in Metric Units

Includes

Skills & Concepts

★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area

★ solve problems involving areas of rectangles and squares

★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rectangles, squares)

★ measure necessary attributes of shapes to use area formulas to solve problems

Bridges in Mathematics Grade 3 Supplement
Set D6 Measurement: Area In Metric Units

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

The Math Learning Center is a nonprofit organization serving the education community. Our mission is to inspire and enable individuals to discover and develop their mathematical confidence and ability. We offer innovative and standards-based professional development, curriculum, materials, and resources to support learning and teaching. To find out more, visit us at www.mathlearningcenter.org.

Set D6 ★ Activity 1

ACTIVITY

Metric Rectangles

Overview
Students estimate and measure the area of paper rectangles in square centimeters, working toward increasingly efficient methods, including the use of the area formula.

Skills & Concepts
★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area

★ solve problems involving areas of rectangles and squares

★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rectangles, squares)

★ measure necessary attributes of shapes to use area formulas to solve problems

You'll need
★ Metric Rectangles (page D6.4, half-class set, run on 3 or 4 different colors of copy paper)

★ Metric Rectangles Record Sheet (page D6.5, class set)

★ a 20 cm × 30 cm piece of construction paper, any color

★ rulers (class set)

★ base 10 pieces (class set)

Instructions for Metric Rectangles

1. Distribute sets of base 10 pieces, and ask students to each place 1 small square unit in front of themselves. Ask them what the area of this single unit is in square centimeters. If necessary, have them measure the dimensions of the unit with the centimeter side of their ruler. Work with their input to establish the fact that a single base 10 unit has an area of exactly 1 square centimeter.

2. Ask students to work in groups of 4 to build a square with an area of exactly 400 square centimeters. After they've had a minute to work, have students share and compare their results.
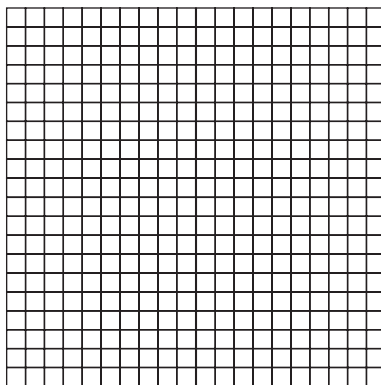
Students 400 square centimeters isn't very big.
Yeah, 400 square inches would be way bigger.
We just each got a mat because the mats have 100 square centimeters in them.

Activity 1 Metric Rectangles (cont.)

Teacher *How are you thinking about that, Kiara?*

Kiara *Well, one of the little squares is a square centimeter. There are 100 of those squares in a mat, so the mat must be 100 square centimeters.*

3. Ask each group to measure the dimensions of the square they've just built with the centimeter side of their ruler. What can they tell you about the square now? As volunteers share with the class, press them to explain their thinking.

Gage *It's 20 centimeters on both sides.*

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

Students *It's 400 square centimeters because that's what you told us to do.*
It's 100 square centimeters because we used 4 mats, and each mat is 100 square centimeters.
If you just multiply 20 × 20, it makes 400.

4. Now hold up the construction paper rectangle you've prepared. Ask students to estimate the area in square centimeters, using their base 10 square as a visual benchmark.
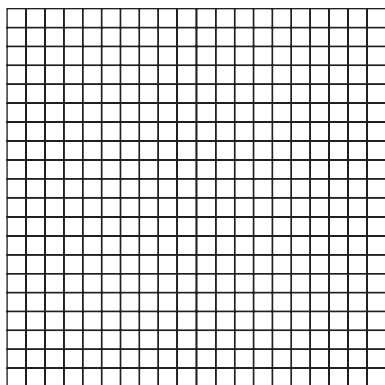
Students *That paper rectangle is definitely more than 400 square centimeters.*
I think it's just longer along one side. Can we hold it up against our square?

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

Students *More than 400. Maybe about 500.*
It's 20 centimeters along the side, but maybe more like 30 along the top.
I think it's about 2 mats bigger than our square, so it's probably 600 square centimeters.

5. Now ask students to pair-share ideas for finding the actual area of the construction paper rectangle. Challenge them to think of a method that's more efficient than covering the paper with base 10 pieces. Some may propose laying the paper rectangle on top of square they just built with base 10 pieces. Others may suggest covering it with base 10 mats. Implement some of their suggestions. If it doesn't come from the class, propose measuring the side and top of the rectangle in centimeters and multiplying the two numbers. Ask students to evaluate your suggestion. Will it work? Will it yield the same answer as the other methods? Why or why not?

Activity 1 Metric Rectangles (cont.)

6. Tape the paper rectangle to the board. Ask a volunteer to measure and label the dimensions as the others watch. Record the numbers on the board and then have students multiply them. Ask them to comment on the results. Does the method work? Why?

30 cm

20 cm

20 cm × 30 cm = 600 square cm
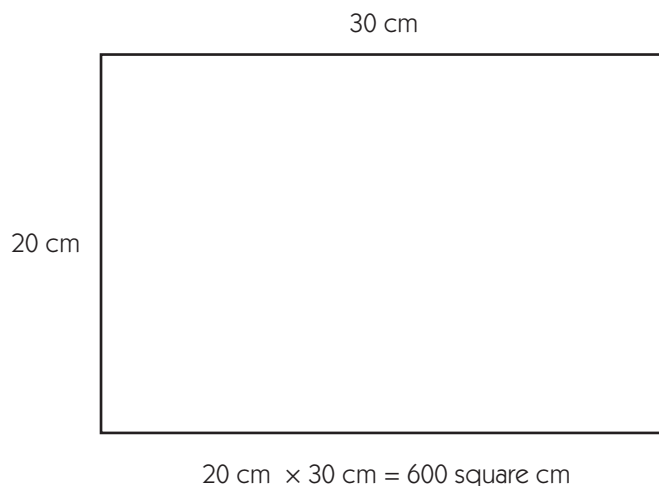
7. Ask students to take their base 10 squares apart and put the pieces back in their bags for now. Then have them pair up, or assign partners. Give each pair a copy of the Metric Rectangles blackline. (If you give each pair at a table a different color sheet, they'll be able to keep track of their own rectangles more easily.) Have them work together to cut apart the 6 rectangles along the heavy lines.

8. Let students know that in a minute, they'll be estimating and finding the area of each rectangle in square centimeters. Before they do, ask them to use their estimation skills to place the 6 in order, from smallest to largest area. Have them discuss their thinking with their partners as they sequence the rectangles, and then choose a few volunteers to share their ideas with the class.

D

B

C

F

E

A
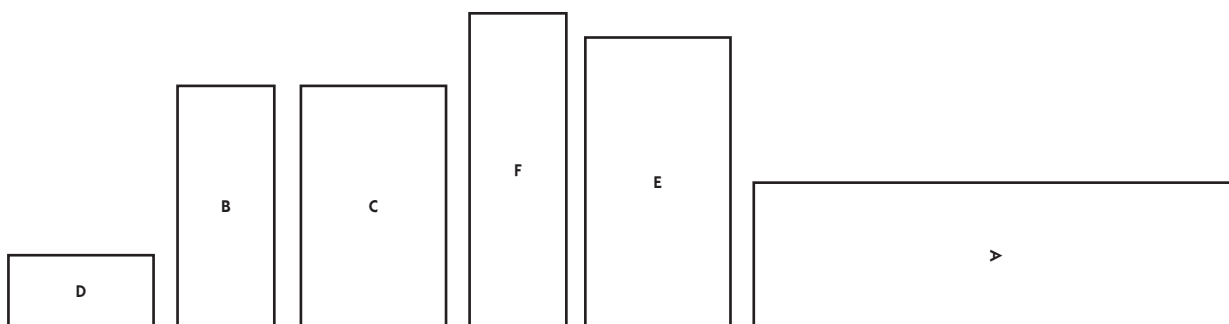
Erica *You can definitely tell that D is the smallest and A is the biggest. C is bigger than B and E is bigger than F, but we're not really sure about whether C or F is bigger.*

9. Ask students to get out their rulers (if they haven't done so already), and give each student a copy of the Metric Rectangles Record Sheet. Review the instructions on the sheet with the class. Have them continue to work in pairs even though each student needs to complete his or her own sheet. Encourage them to use the base 10 pieces to help estimate the areas of their cut-out rectangles. Some students may want or need to lay the base 10 strips and mats directly on top of their paper cut-outs to find the actual area of each, while others will probably choose to measure the side lengths and multiply.

Metric Rectangles

A

B

C

D

E

F
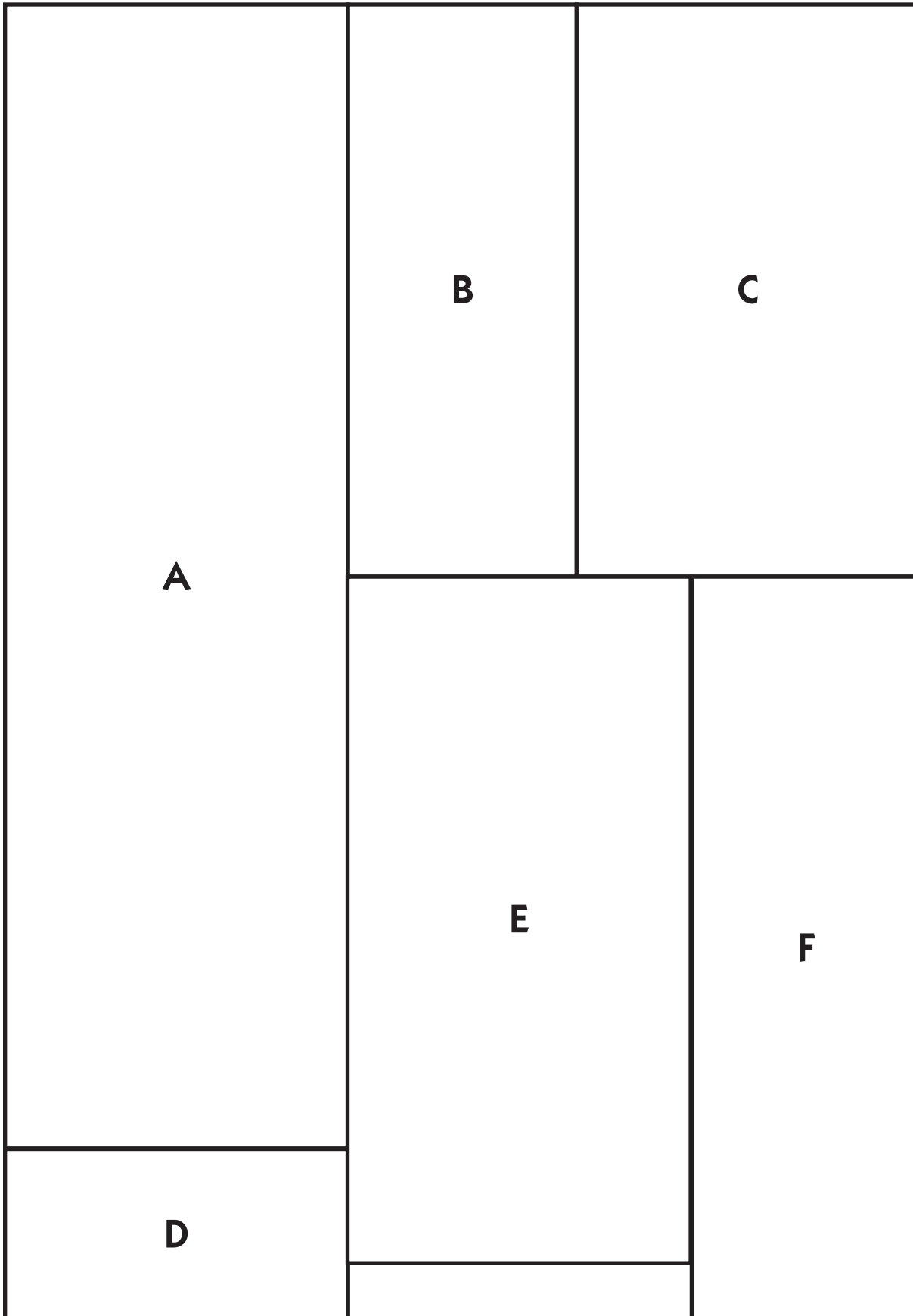
NAME _____   DATE _____

Metric Rectangles Record Sheet

1 Work with your partner to cut out the 6 rectangles and put them in order, from smallest to largest area.

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

Smallest Area					Largest Area

3 Estimate the area of each rectangle and then measure it in square centimeters. Remember to label your work with the correct units (square centimeters). Record your work on the chart below.

Rectangle Letter	Your Estimate in square centimeters (sq. cm)	Actual Area in square centimeters (sq. cm)

Set D6 ★ Activity 2

ACTIVITY

Ladybug Dream House

Overview
Students estimate and measure area in square centimeters as they draw floor plans for ladybug dream houses.

Skills & Concepts
★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps

★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area

★ solve problems involving areas of rectangles and squares

★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rectangles, squares)

★ measure necessary attributes of shapes to use area formulas to solve problems

You'll need
★ Centimeter Grid Paper (page D6.11, class set plus a transparency)

★ Ladybug Dream House Planning Sheet (pages D6.9 and D6.10, class set)

★ rulers (class set)

★ calculators (half-class set)

Instructions for Ladybug Dream House

1. Place the Centimeter Grid Paper on display at the overhead. Tell students that they have been hired to design and draw the plans for the Ladybug family's new house. As students watch, use your ruler to draw a 14-by-18-centimeter rectangle on the grid. These are the outside dimensions of the Ladybug Dream House. Ask students to pair-share estimates of the total area of the house in square centimeters. Have volunteers share and explain their estimates. Then work with input from the class to find the actual area, using methods the students suggest. If it doesn't come from the class, ask them to use their calculators to confirm their results by multiplying the dimensions of the rectangle.

2. Give each students each a sheet of Centimeter Grid Paper. Ask them to draw a 14 × 18 centimeter rectangle on their own sheet, using their ruler to help make the lines straight.

3. As students watch, draw a 6 × 8 centimeter rectangle in one of the corners of the house floor plan at the overhead. Explain that this is one of the bedrooms. Ask students to estimate the area of the rectangle you just drew and then work with you to find the actual area. Label the room with its dimensions, area, and room name. Then ask students to choose a place on their ladybug floor plan to draw and label a 6 × 8 centimeter bedroom. Let them know that they can place it anywhere in the house they want, but they'll want to make good use of the space because the Ladybug family needs lots of other rooms.

Activity 2 Ladybug Dream House (cont.)

4. Give each students a copy of the Ladybug Dream House Planning Sheet. Review both pages with the class. Be sure students understand that the rooms listed on the first page have to be at least as big as the areas specified on the sheet, but can be bigger. Remind students that they can put the rooms anywhere in the house they want. Encourage them to make optimal use of the space, because they may want to design extra rooms and put in hallways, as suggested on the second page.

5. When students understand what to do, let them go to work. Circulate to provide encouragement and assistance as needed.

Extension
• If some of your students need an extra challenge, encourage them to make rooms that aren't square or rectangular. They can make some of the rooms triangular, hexagonal, or even irregular as long as they use the area specifications on the first sheet and follow the grid lines when they can so they're able to calculate the area of each room.

INDEPENDENT WORKSHEET

See Set D6 Independent Worksheet 1 for more practice estimating and measuring area in metric units.

NAME _____   DATE _____

Ladybug Dream House Planning Sheet page 1 of 2

Congratulations! The Ladybug family has hired you to design and draw the plans for their new house.

1 Draw a rectangle on your grid paper that is 14 centimeters by 18 centimeters. Use your ruler to help make the lines straight. This is the outside of your Ladybug Dream House.

2 Inside the house, wherever you'd like, draw a rectangle that is 6 centimeters by 8 centimeters for one of the bedrooms. Record the dimensions, the area, and the name of the room on your plan. Your work will look something like this:
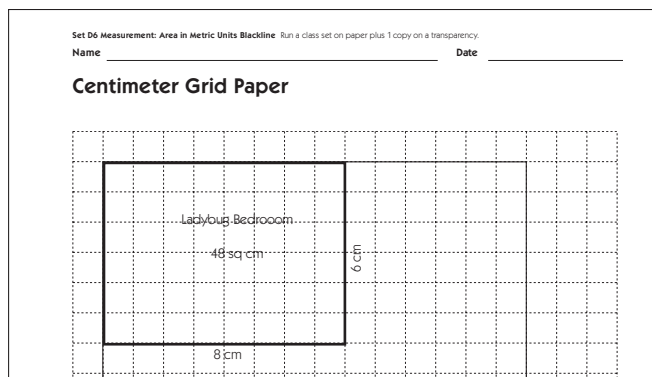
3 Design your Ladybug Dream House by adding the rooms listed below. The rooms have to be at least as big as the number of square centimeters on the chart, but you can make them bigger if you want. Label each one with its dimensions and the actual area. (Hint: Leave space between the rooms for hallways.)

Room	Minimum Area (the room has to be at least this big)	Actual Area (sq. cm)
Ladybug Kids' Bedroom	40 sq. cm	
Ladybug Baby's Room	20 sq. cm	
Ladybug Bathroom	24 sq. cm	
Ladybug Living Room	64 sq. cm	
Ladybug Kitchen	32 sq. cm	

Ladybug Dream House Planning Sheet page 2 of 2

4 If there is any space left after you've drawn the rooms listed on the first page, design your own rooms. (Perhaps the Ladybug family needs a computer room, a guest room, a playroom, an art room, a music room, or some other creative spaces?) Label each one of your extra rooms with its dimensions, area and name. Also, list them below. You can pick the best size for each extra room you design.

Room	Area (in sq. cm)

5 If you have time, use colored pencils to add doorways, ladybug furniture, and other fun features to your house plan.

NAME _____   **DATE** _____

Centimeter Grid Paper
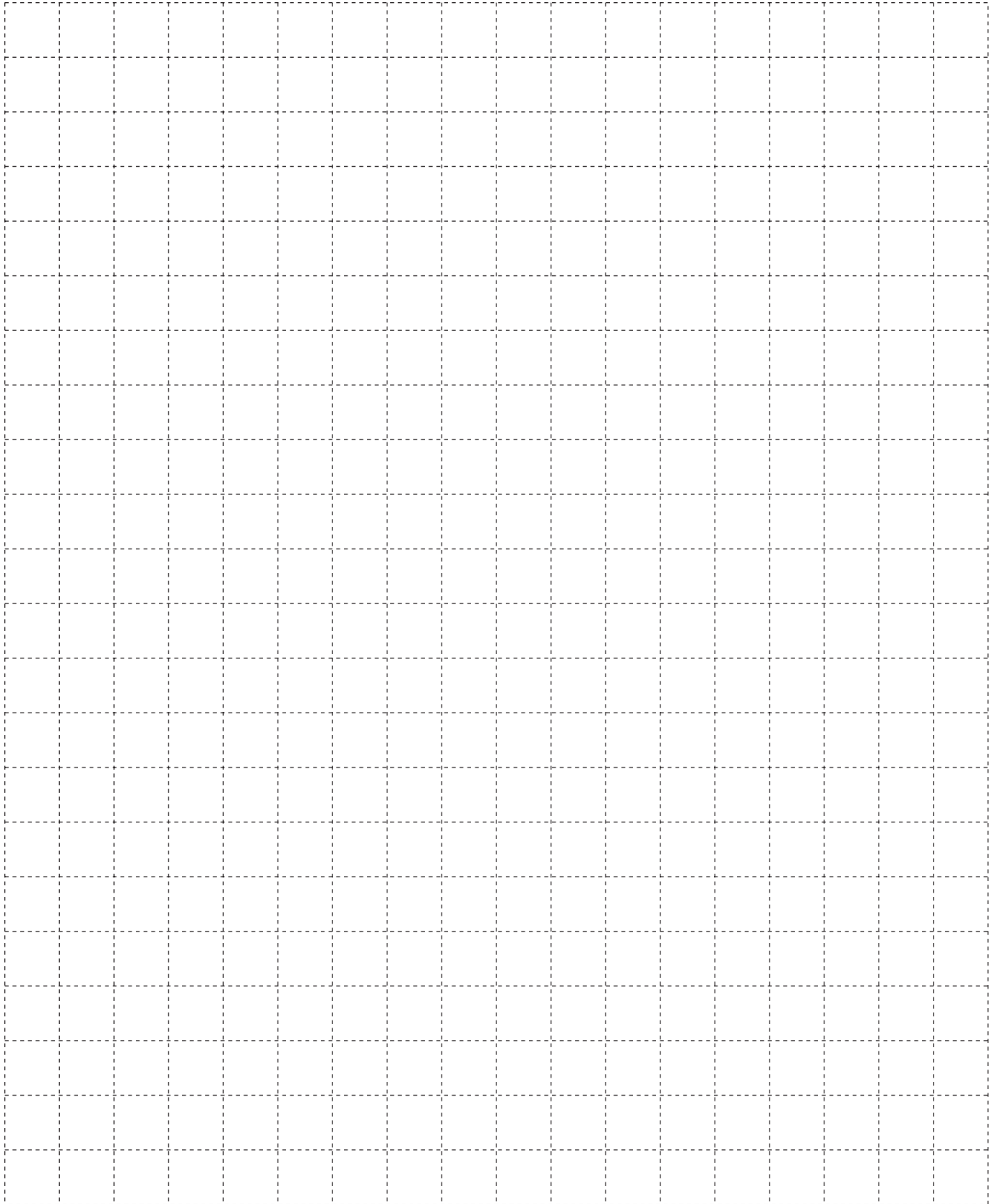
NAME _____   DATE _____

Set D6 ★ Independent Worksheet 1

Measuring Area in Metric Units
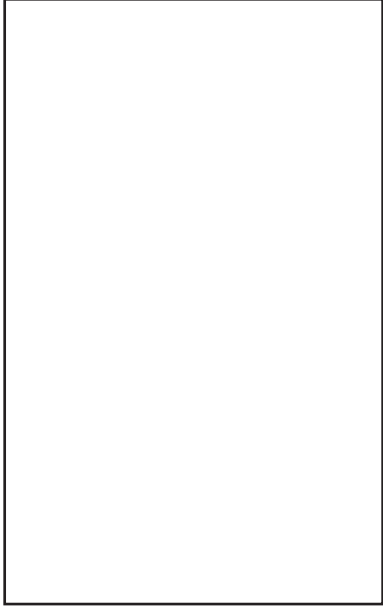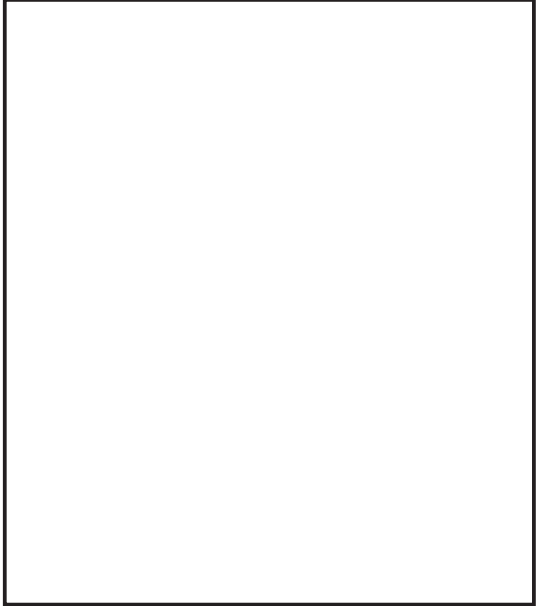
1 For each rectangle below
- estimate the area
- use the centimeter side of your ruler to measure the dimensions
- find the area in square centimeters (multiply the dimensions or use base 10 pieces)
- label the rectangle with its dimensions and area

example	**a**
Estimate: ___24___ sq cm	Estimate: _____ sq cm
6 cm 3 cm 18 sq cm	

b	**c**
Estimate: _____ sq cm	Estimate: _____ sq cm
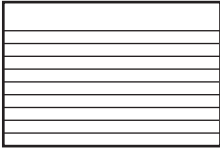
(Continued on back.)

Independent Worksheet 1 Measuring Area in Metric Units (cont.)

d	e
Estimate: _____sq cm	Estimate: _____sq cm
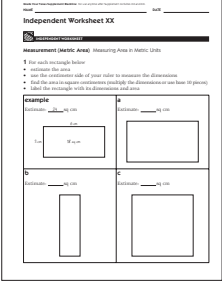
2 Estimate the area of the first object on the chart below in square centimeters. Record your estimate. Using base 10 pieces or a ruler, find the area of the object and record the measurement. Find the difference between your estimate and the actual measurement. Record the difference in the last column.

3 Continue estimating, finding the area, and finding the difference for the other three objects. Use what you know about the area of the first object to estimate the others.

Object	Your Estimate (in sq cm)	Actual Area (in sq cm)	The Difference (in sq cm)
a An Index Card			

(Continued on next page.)

Independent Worksheet 1 Measuring Area in Metric Units (cont.)

Object	Your Estimate (in sq cm)	Actual Area (in sq cm)	The Difference (in sq cm)
b This Worksheet			
c Cover of a Chapter Book			
d Top of your Calculator			

3 BRIDGES IN MATHEMATICS

GRADE 3 SUPPLEMENT

Set E1 Data Analysis: Graphing

Includes

Skills & Concepts

★ construct and analyze picture and bar graphs and use them to answer questions and solve problems

★ organize data in tables, pictographs, bar graphs, and dot plots

★ interpret data in tables, pictographs, bar graphs, and dot plots

★ analyze dot plots, pictographs, and bar graphs to make predictions about populations

★ compare the benefits of using tables, bar graphs, and dot plots as representations of a given data set

Bridges in Mathematics Grade 3 Supplement
Set E1 Data Analysis: Graphing

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Set E1 ★ Activity 1

ACTIVITY

Ice Cream Survey

Overview

The teacher surveys the class to find out which of four ice cream flavors each student likes best. The data is organized and students work in pairs to represent the survey results on a pictograph. Each student then transfers the information to a bar graph. Students interpret the results of these two graphs and evaluate the two different presentations.

Skills & Concepts

★ construct and analyze picture and bar graphs and use them to answer questions and solve problems

You'll need

★ Ice Cream Cones (page E1.4, quarter-class set cut in half)

★ Ice Cream Bar Graph (page E1.5, class set)

★ 1 sheet of 8½″ × 11″ or 8½″ × 14″ copy paper for each student pair (see note)

★ 3″ × 3″ sticky notes, 1 per student

★ scissors

★ glue sticks

★ crayons or colored pencils

★ pencils and rulers

....

Note Give students a choice of copy paper size for their pictographs. Their choice will depend to some extent on your class size and the results of the survey.

....

Instructions for Ice Cream Survey

1. Tell students you want to conduct a survey about ice cream flavors today. Write the following flavors on the whiteboard: strawberry, chocolate, vanilla, and chocolate chip. Ask students to think privately about which of these 4 flavors is their favorite. Give out 3" × 3" sticky notes, and ask each student to write his or her favorite flavor on a note without talking to anyone else. (This allows each student to make his or her own choice without being influenced by classmates.)

2. Call students up to post their sticky notes in rows beside the appropriate flavor, and discuss the data briefly. How many students chose each flavor? Which flavor is most popular? Which is least popular? How many students participated in the survey?

Activity 1 Ice Cream Survey (cont.)

Which of these 4 flavors do you like best?

strawberry	strawberry	strawberry	strawberry	strawberry				
chocolate	chocolate	chocolate	chocolate	chocolate	chocolate	chocolate	chocolate	chocolate
vanilla	vanilla	vanilla	vanilla	vanilla	vanilla	vanilla		
chocolate chip	chocolate chip	chocolate chip	chocolate chip	chocolate chip	chocolate chip	chocolate chip	chocolate chip	

3. Once the data is recorded, ask students to pair up or assign partners. Give each pair a half sheet of the Ice Cream Cones, and show them the 2 different sizes of copy paper. Explain that you'd like them to use these materials, along with their scissors, glue sticks, and crayons, to present the results of the survey in the form of a pictograph, or a graph that uses pictures. Give them a minute to pair-share ideas about what they'll need to do to accomplish the job. Then ask volunteers to share their thinking with the class.

> **Students** *We can cut the ice cream cones apart and glue them on the paper.*
> *We're going to color the chocolate ones brown and the strawberry ones pink.*
> *Can we make our graph up and down instead of sideways?*
> *I think we're going to need that long paper instead of the regular paper.*

4. If it doesn't come up in discussion, remind students that each pair only has 15 ice cream cones to work with, which is probably fewer than the number of people who participated in the survey. Discuss ways they might solve the problem. (Making more copies of the cones or drawing more aren't options.) Someone will probably generate the idea of using 1 ice cream cone to stand for more than 1 student, but if no one does, propose it yourself. Depending on your class size, each cone will need to stand for 2 or even 3 students.

5. Once the class has decided how many students each cone will stand for, record the decision on the whiteboard.

Key

= 2 kids
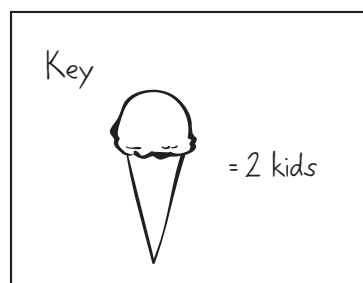
6. Ask students how many cones they'd need to represent 4 children. What about 6? 8? What about 5?

Activity 1 Ice Cream Survey (cont.)

Twilight It's 2 cones for 4 kids, 3 cones for 6, and 4 cones for 8, but how can we show 5? That's impossible!

Rosa I know! We can cut a cone in half, so for 5 kids, it would be 2 cones and then half a cone.

7. Once students understand what to do, have them go to work in pairs, cutting, organizing, and gluing their cones onto the size paper they've selected. Let them know that they can organize the cones into rows or columns. Remind them to give the graph a title, label both axes, and include a key to show how many children each cone stands for.

8. As the first pairs finish their pictographs, give each student a copy of the Ice Cream Bar Graph blackline. Explain that they'll each need to show the results of the survey as a bar graph as well as a pictograph. Talk with them about some of the things they'll need to do to transfer the information from one to the other. Each cone stands for 2 (or 3) students. Will they be able to keep the same scale on their bar graph, coloring in 1 cell for every 2 (or 3) students, or will they need to change the scale in some way? As you discuss the assignment with the class, elicit some of the similarities and differences between pictographs and bar graphs.

9. Give students who are still working on their pictographs time to complete them, while the others start work on their bar graphs. When they're finished with both, they may have definite preferences for one or the other. Encourage them to voice and explain their opinions as they complete question 4 at the bottom of the bar graph sheet. Which type of graph is more fun to make? Which is easier to read? Why?

Ice Cream Cones
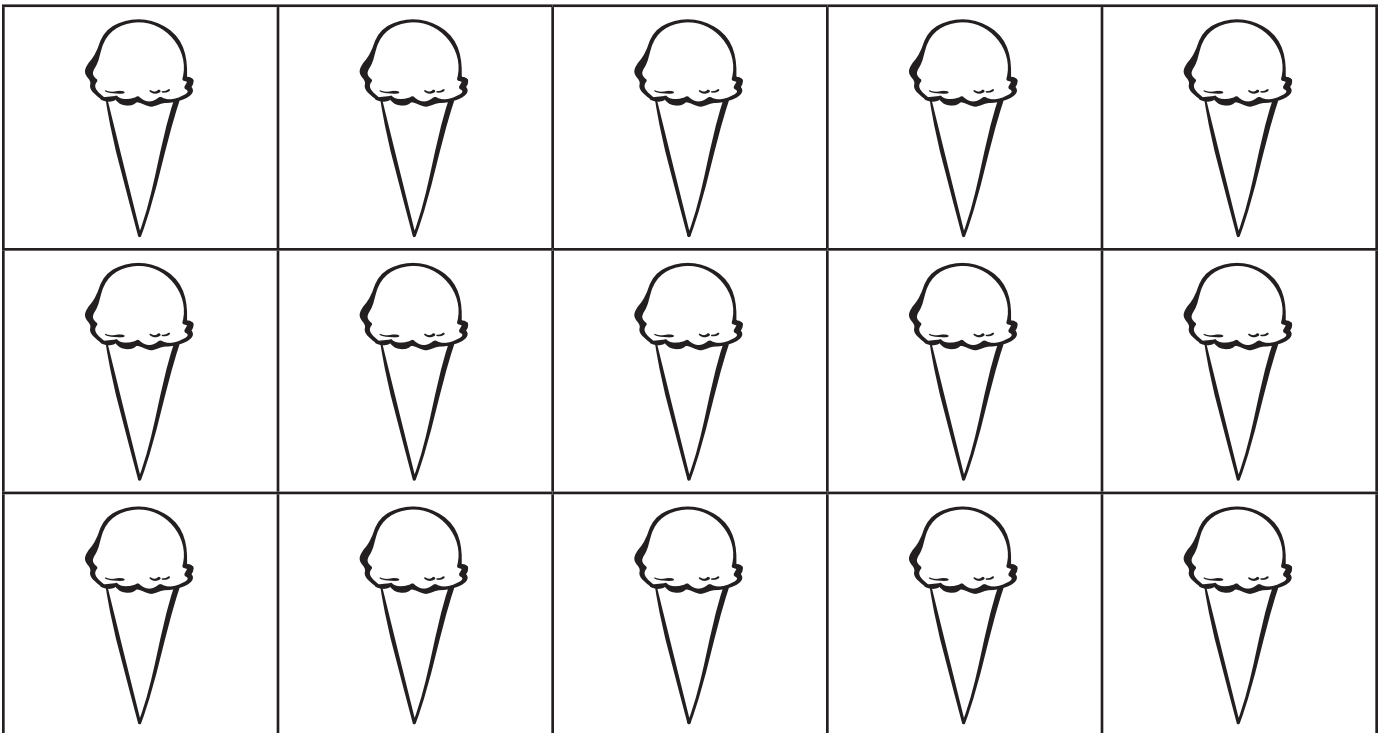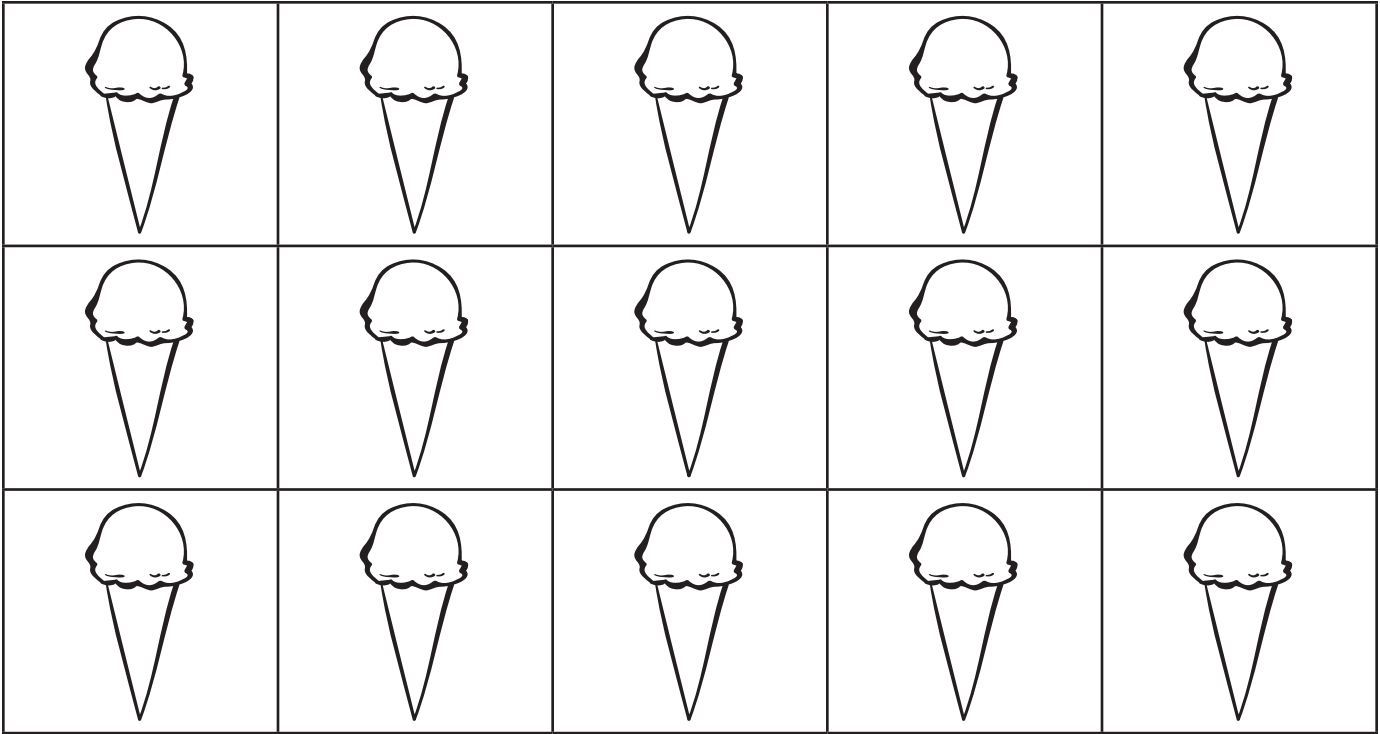
NAME _____   DATE _____

Ice Cream Bar Graph

Graph Title _____

Number of Students

Ice Cream Flavors
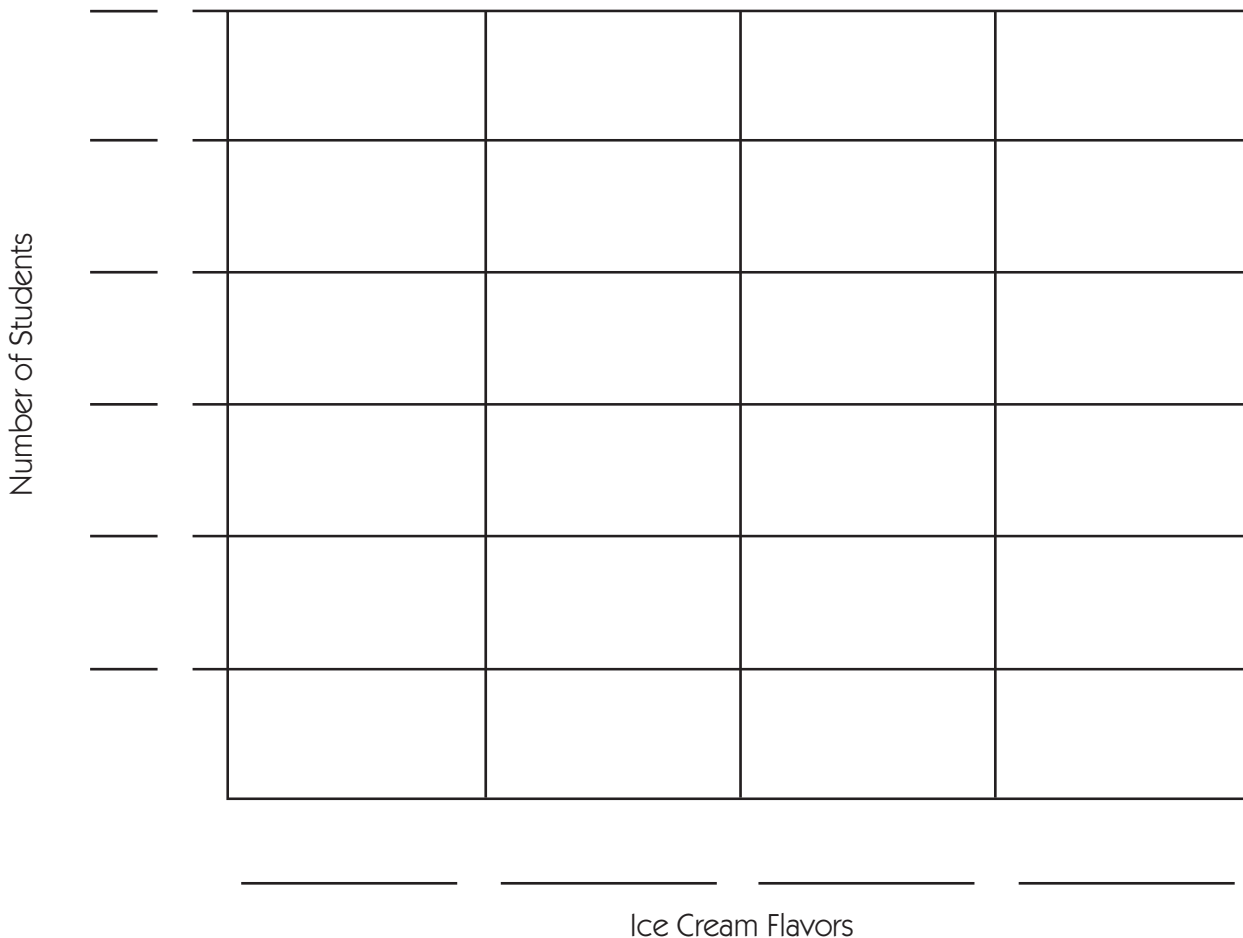
1 Which flavor is our class favorite? _____

2 Which flavor is the least favorite? _____

3 On the back of this sheet, write at least 3 other observations about your graph.

4 This kind of graph is called a bar graph. The other graph you made is called a pictograph. Which kind of graph do think is better? Why?

Set E1 ★ Activity 2

ACTIVITY

Book Lovers' Survey

Overview

The teacher surveys the class to find out which of four types of books each student likes best. The data is organized and students work in pairs to represent the survey results on a pictograph. Each student then transfers the information to a bar graph. Students interpret the results of these two graphs and evaluate the two different presentations.

Skills & Concepts

★ construct and analyze picture and bar graphs and use them to answer questions and solve problems

You'll need

★ Book Markers (page E1.10, quarter-class set cut in half)

★ Book Bar Graph (page E1.11, run a class set)

★ 1 sheet of 8½″ × 11″ or 8½″ × 14″ copy paper for each student pair (see note)

★ 3″ × 3″ sticky notes, 1 per student

★ scissors

★ glue sticks

★ crayons or colored pencils

★ pencils and rulers

....

Note Give students a choice of copy paper size for their pictographs. Their choice will depend to some extent on your class size and the results of the survey.

....

Instructions for Book Lovers' Survey

1. Tell students you want to conduct a survey about the kinds of books they most like to read. Write the following on the whiteboard: animal books, fantasy books, arts and crafts books, and sports books. (If these don't match what your students actually love to read, change the list. Ask students to think privately about which of these 4 types of books they like best to read. Give out 3" × 3" sticky notes, and ask each student to write his or her favorite of the 4 on a note without talking to anyone else. (This allows each student to make his or her own choice without being influenced by classmates.)

2. Call students up to post their sticky notes in rows beside the appropriate listing, and discuss the data briefly. How many students chose each type of book? Which type of book is most popular? Which is least popular? How many students participated in the survey?

Activity 2 Book Lovers' Survey (cont.)

Which of these 4 different types of books do you like to read the best?

| animal books | animal books | animal books | animal books | animal books | animal books | animal books |

| fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books | fantasy books |

| arts & crafts books | arts & crafts books | arts & crafts books | arts & crafts books |

| sports books | sports books | sports books | sports books |

3. Once the data is recorded, ask students to pair up or assign partners. Give each pair a half sheet of the Book Markers, and show them the 2 different sizes of copy paper. Explain that you'd like them to use these materials, along with their scissors and glue sticks, to present the results of the survey in the form of a pictograph (a graph that uses pictures). Give them a minute to pair-share ideas about what they'll need to do to accomplish the job. Then ask volunteers to share their thinking with the class.

4. If it doesn't come up in discussion, remind students that each pair only has 15 book markers to work with, which is probably fewer than the number of people who participated in the survey. Discuss ways they might solve the problem. (Making more copies of the markers or drawing more aren't options.) Someone will probably generate the idea of using 1 book marker to stand for more than 1 student, but if no one does, propose it yourself. Depending on your class size, each marker will need to stand for 2 or even 3 students.

5. Once the class has decided how many students each marker will stand for, record the decision on the whiteboard.

Key

= 2 kids

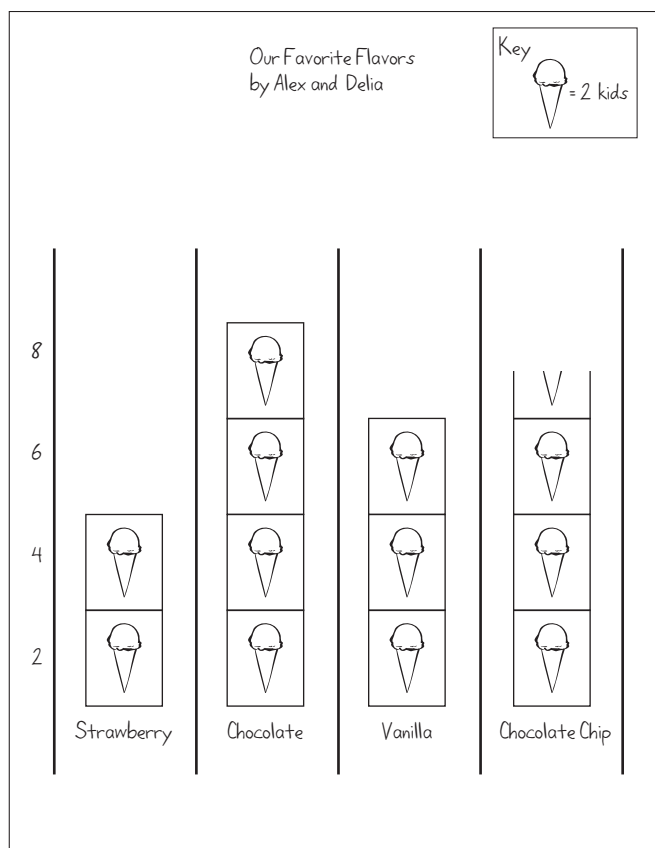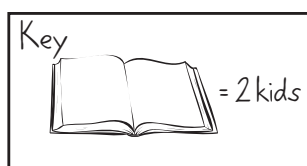6. Ask students how many books they'd need to represent 6 children. What about 8? 10? What about 7? If it doesn't come from the class, ask children to cut the book markers as needed to represent the survey numbers (e.g., use $3\frac{1}{2}$ markers to represent 7 students, or $3\frac{2}{3}$ markers to represent 8 students if each marker stands for 3 students).

7. Once students understand what to do, have them go to work in pairs, cutting, organizing, and gluing their markers onto the size paper they've selected. Let them know that they can organize the markers into rows or columns. Remind them to give the graph a title, label both axes, and include a key to show how many children each marker stands for.

8. As the first pairs finish their pictographs, give each student a copy of the Book Bar Graph blackline. Explain that they'll each need to show the results of the survey as a bar graph as well as a pictograph. Talk with them about some of the things they'll need to do to transfer the information from one to the other. Each book marker stands for 2 (or 3) students. Will they be able to keep the same scale on their bar graph, coloring in 1 cell for every 2 (or 3) students, or will they need to change the scale in some

Activity 2 Book Lovers' Survey (cont.)

way? As you discuss the assignment with the class, elicit some of the similarities and differences between pictographs and bar graphs.

Book Graph by Antonio and Casey

Casey *Oh, oh, I can see a problem right now. There are only 6 boxes for each kind of book on that bar graph, and 13 kids in our class like fantasy books the best. We said each marker stands for 2 kids, but what are we supposed to do on that bar graph?*

Antonio *We could make each box be for 3 kids. Let's see … 3, 6, 9, 12, 15, 18. Yep, that would work.*

9. Give students who are still working on their pictographs time to complete them, while the others start work on their bar graphs. When they're finished with both, they may have definite preferences in terms of which they find easier to read and understand. Encourage them to voice and explain their opinions as they complete question 3 at the bottom of the bar graph sheet.

INDEPENDENT WORKSHEET

See Set E1 Independent Worksheet 1 for more practice with pictographs and bar graphs.

Book Markers
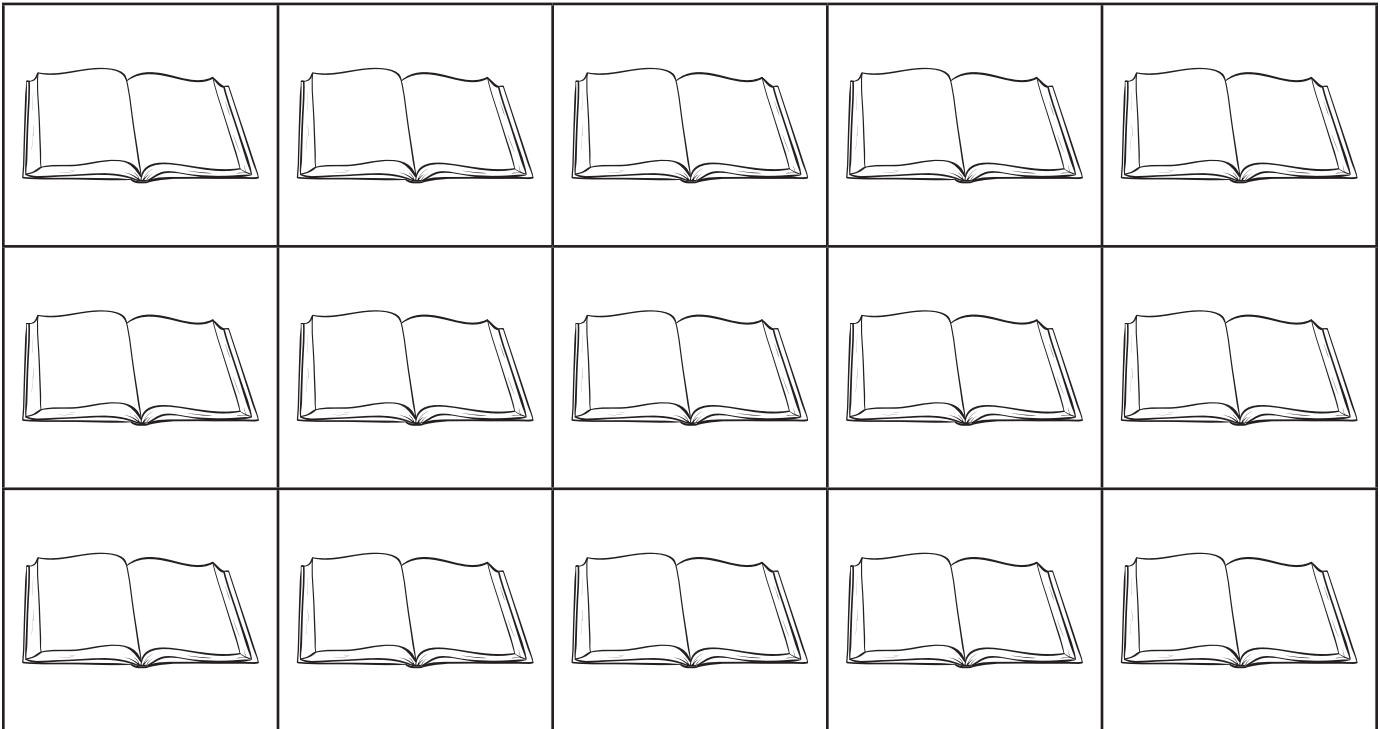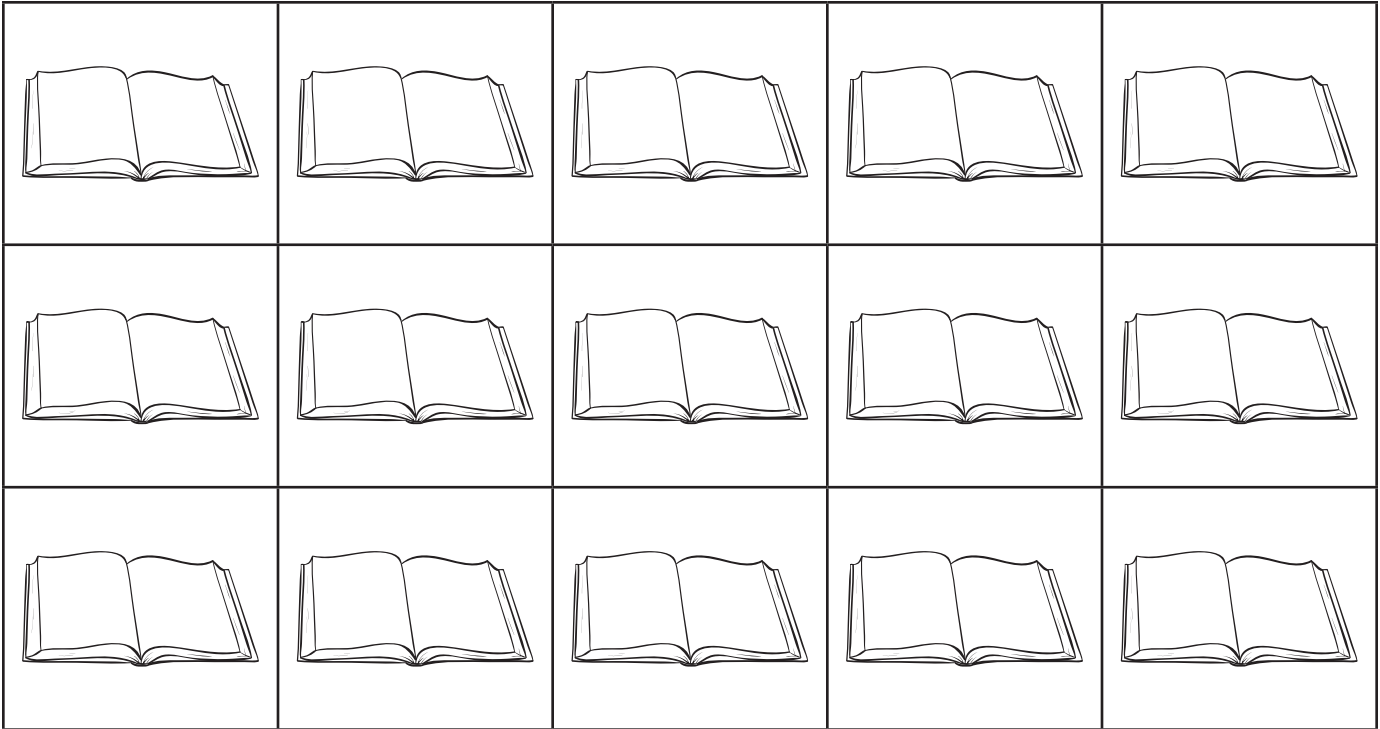
NAME _____ DATE _____

Book Bar Graph

Graph Title _____

Number of Students

Types of Books
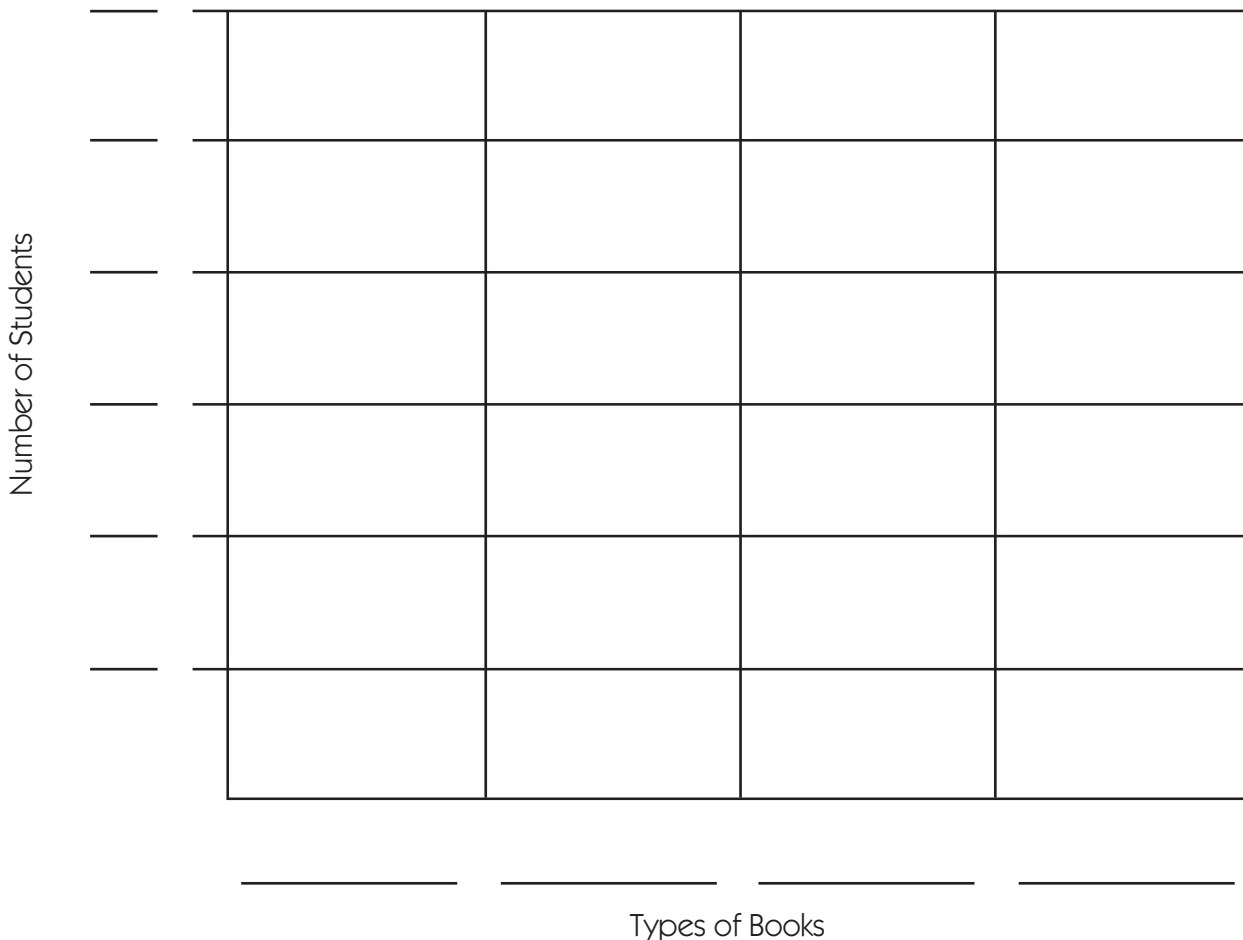
1 On the back of this sheet, write at least 4 different observations about your graph.

2 Name one person who would find it helpful to see your graph. Explain why.

3 This kind of graph is called a bar graph. The other graph you made is called a pictograph. Which kind of graph do you think is easier for people to understand? Why?

Set E1 ★ Activity 3

ACTIVITY

Under the Same Roof

Overview
Students collect, organize, interpret, and analyze data about the number of people living in their house right now. The data is organized in three different ways, and students are asked to compare the benefits of the different formats.

Skills & Concepts
★ organize data in tables, bar graphs, and dot plots

★ interpret data in tables, bar graphs, and dot plots

★ analyze dot plot and bar graphs to make predictions about populations

★ compare the benefits of using tables, bar graphs, and dot plots as representations of a given data set

You'll need
★ Under the Same Roof (pages E1.17 and E1.18, run a class set plus a copy of each sheet on a transparency)

★ 1½˝ × 2˝ sticky notes, one per student

★ a book about families (see Advance Preparation)

Advance Preparations It's fun to open this activity by reading a book about families. Several books that describe and honor the diversity of families are *All Families are Different*, by Sol Gordon; *The Family Book*, by Todd Parr; and *All Kinds of Families*, by Norma Simon.

Instructions for Under the Same Roof

1. Open this activity by reading a story or otherwise introducing the topic of families. Then propose to conduct a survey about people's families. Share with students the number of people living in your house right now, including yourself. Then record that number on a small sticky note.

> **Teacher** *There are four people living in my house: my son, my daughter, my husband, and myself. My sister was living with us last year, but now she has her own house. Right now, there are just 4 of us, so I will write 4 on my sticky note.*

2. Give students each a sticky note. Ask them to record the number of people living in their house right now, and place the sticky note on their desk in front of them.

3. Place the Under the Same Roof, sheet 1, on display at the overhead. Write a 2 in the first row, first column of the table. Ask students to raise their hands if they have 2 people living in their house right now. Solicit help from the class to count the number of hands raised, and record the number in the first row, second column. Continue in this fashion until you have recorded all the students' data.

Activity 3 Under the Same Roof (cont.)

4. Have students pair-share their observations about the data. What do they notice? What does the table tell them? Then ask a few volunteers to share their ideas with the class.

5. Tell students that there are different ways to organize data. Today, you are going to work together to organize the data in three different formats, and then consider the advantages of each. The format you just used is called a table. Now you are going to organize the information on a dot, or line plot. Draw a line along the bottom of the whiteboard. Record the numbers 0, 1, and 2 at evenly spaced intervals along the first part of the line. Ask students who live in households with any of those three numbers of people to bring their sticky notes up and place them where they belong.

6. Continue adding numbers and inviting students to post their sticky notes. Stop periodically to discuss the data. What do students notice? What is the difference between looking at the data in the table and on the dot plot? Does either format seem to have advantages over the other? Be sure students take note of the fact that the dot plots shows all the numbers in the range, even though there may be no entries. Does this make a difference?
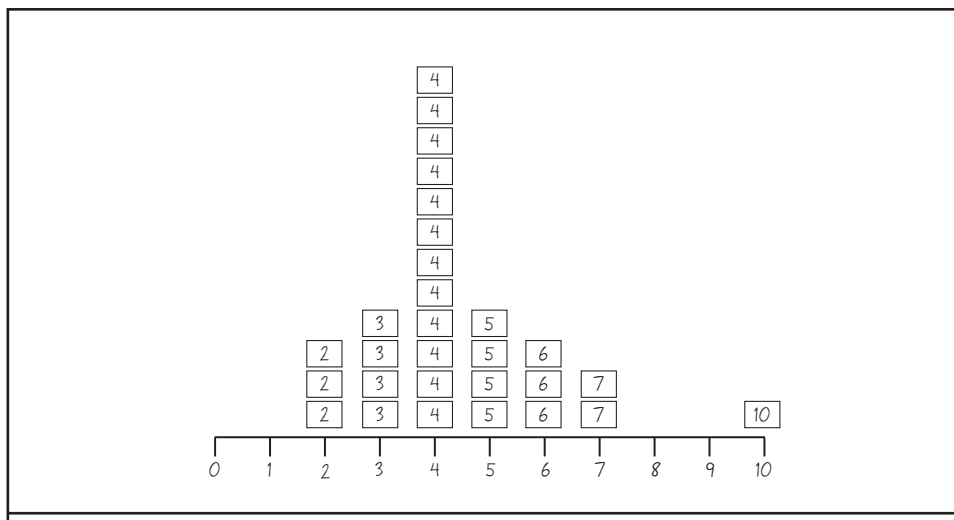
Students *Wow! Look at how high it goes on 4.*
A lot of kids have 4 people in their house.
It's even on both sides of the 4. There are four 3's and four 5's.

Activity 3 Under the Same Roof (cont.)

It goes way up, and then it goes back down.
There aren't any kids with 8 or 9 people in their house.

Teacher *Does it make any difference to look at our data on the dot plot? If you look at the table, you can see that lots of you have live in households with 4 people.*

Students *But you can see it even better on the graph.*
The table just shows numbers. The line plot is more like a picture.
The 12 doesn't seem so big on the table as when you see all the sticky notes on the board.
Also, you can see that no one has 0, 1, 8, or 9 people in the house. The table doesn't really tell you that.

7. When all the sticky notes have been posted, return to the overhead. Use the dot plot form at the bottom of the first sheet to show students how people use dots or x's to represent data. As you model how to transfer the information from the board to the paper, ask students to explain what each x or dot means.
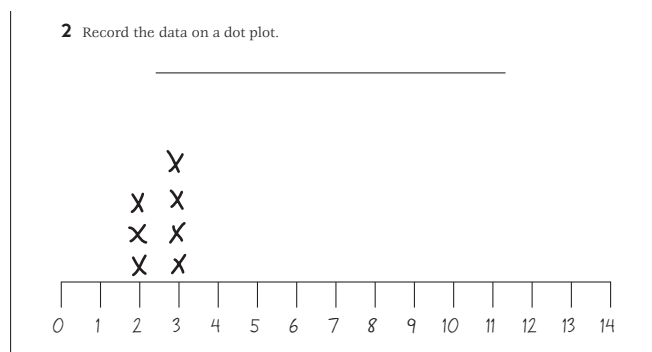
Students *Those x's are like the sticky notes we put on the board.*
Each one of those is like a kid. Three kids have 2 people in their house, so there are 3 x's over the 2.
Four kids have 3 in their house, so there are 4 x's there.

8. Give students each a copy of both Under the Same Roof sheets. Review the instructions on both sheets with the class. Take a minute to examine the bar graph form on the second sheet together. Are there enough boxes in the columns to assign each a value of 1? If not, what scale would work best?

Students *There are only 8 boxes going up on the bar graph.*
So we can color in a box for each kid.
I don't think so. Twelve kids have 4 people in their house. There won't be enough room.
We could go by 2's, like each box could stand for 2 kids.
You're right. Too bad there aren't 12 boxes going up!

9. Once students understand what to do, give them the remainder of the math period to work.

Activity 3 Under the Same Roof (cont.)

NAME _____   DATE _____

Under the Same Roof page 1 of 2

How many people live in your house right now? Is it the same for everyone in our class? Let's do a survey and find out.

1 Record the data in a table.

Number of People in the House	Number of Students

2 Record the data on a dot plot.

NAME _____   DATE _____

Under the Same Roof page 2 of 2

3 Record the data on a bar graph.

Bar Graph Title

Number of Students

Number of People in the House

4 Write at least 3 observations about the data we collected. What do the graphs tell you about the number of people living in our houses? What was the most interesting thing you learned from our survey?

5 Which format do you think works best to show this data - the table, the dot plot, or the bar graph? Why?

INDEPENDENT WORKSHEET

Use Set E1 Independent Worksheet 2 to provide students with more practice organizing, interpreting, analyzing, and comparing the advantages of data in tables, dot plots, and bar graphs.

NAME _____   DATE _____

Under the Same Roof page 1 of 2

How many people live in your house right now? Is it the same for everyone in our class? Let's do a survey and find out.

1 Record the data in a table.

Number of People in the House	Number of Students

2 Record the data on a dot plot.

_____

Under the Same Roof page 2 of 2

3 Record the data on a bar graph.

_____
Bar Graph Title

Number of Students

Number of People in the House

4 Write at least 3 observations about the data we collected. What do the graphs tell you about the number of people living in our houses? What was the most interesting thing you learned from our survey?

5 Which format do you think works best to show this data - the table, the dot plot, or the bar graph? Why?

NAME _____   DATE _____

Set E1 ★ Independent Worksheet 1

Pizza Survey

1 The cafeteria at Morgan School did a survey to see what kind of pizza the kids like best. Here are the results from Mrs. Hill's third grade.

Type of Pizza	Number of Students Who Like It Best
Pepperoni	8 students
Cheese	14 students
Ham & Pineapple	6 students

a Make a pictograph to show this data. Give your graph a title and be sure to finish labeling both axes (sides).

Graph Title _____   Key ◯ = 2 students

Kind of Pizza
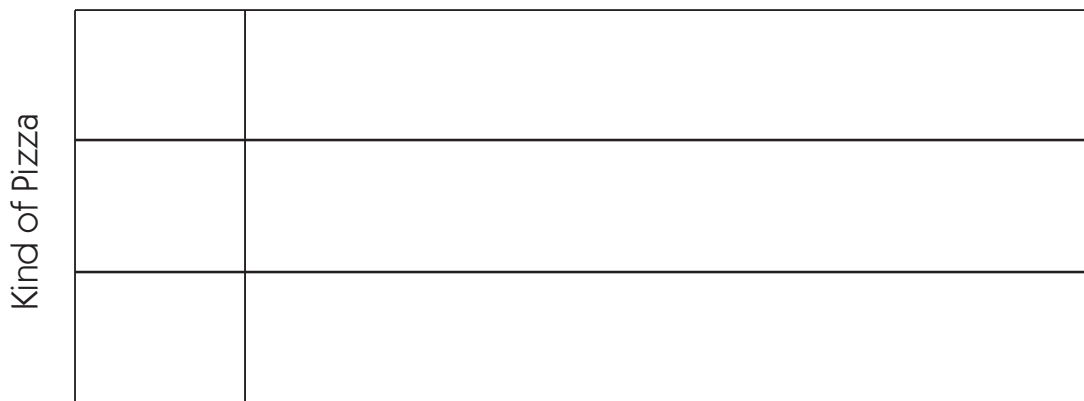
Number of Students

b How many students from Mrs. Hill's class took the survey? _____

c Do you think this survey would turn out about the same in your third grade? Why or why not?

(Continued on back.)

Independent Worksheet 1 Pizza Survey (cont.)

2 Here are the results from all the students at Morgan School.

Type of Pizza	Number of Students Who Like It Best
Pepperoni	55 students
Cheese	80 students
Ham & Pineapple	45 students

Make a bar graph to show this information. Give your graph a title and labels. You'll also need to decide how many students each box will stand for. (Hint: Look at the largest number in the data above to help.)

Graph Title _____

Number of Students

Kinds of Pizza
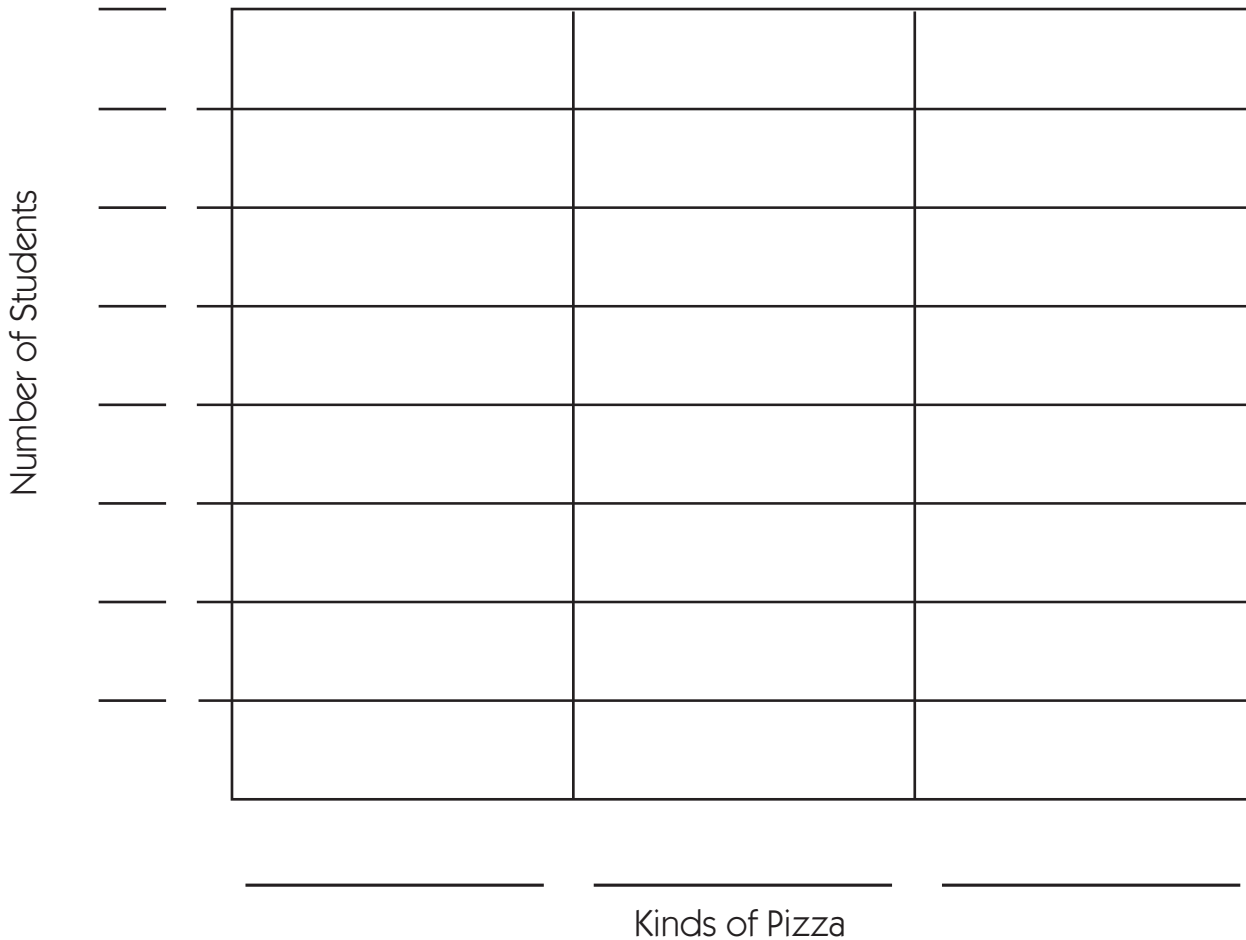
3 How many students in all took the survey? Show your work below.

(Continued on next page.)

NAME _____ DATE _____

Independent Worksheet 1 Pizza Survey (cont.)

4 The people who work in the cafeteria used the results of the pizza survey to help make some decisions about what to buy and what to cook. List 2 decisions they might have made after they saw the bar graph you just made.

●

●

CHALLENGE

5 Do a pizza survey in your own classroom. You can change the choices and have more if you want. After you've collected the data, make a pictograph or a bar graph to show the results.

NAME _____   DATE _____

Set E1 ★ Independent Worksheet 2

INDEPENDENT WORKSHEET

The Pencil Survey

One day last spring, Miss Brown asked her third graders to clean out their desks. She couldn't believe how many pencils most of the kids pulled out. "So that's where all the pencils have been!" she thought.

Miss Brown decided to take a survey to find out how many pencils had been hiding in the kids' desks. The table below shows the survey results.

Number of Pencils	Number of Students
1	2
2	7
3	8
4	5
7	3
8	2
10	1
12	1

1 Record the data on the dot plot below.

Miss Brown's Spring Pencil Survey

Number of Students (X = 1 student)

0 1 2 3 4 5 6 7 8 9 10 11 12 13
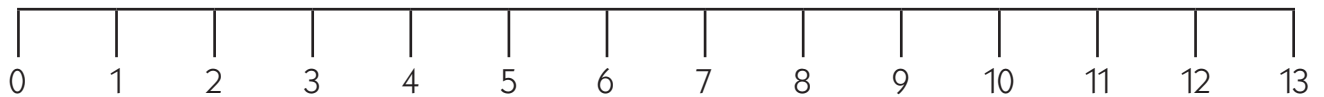
(Continued on back.)

Independent Worksheet 2 The Pencil Survey (cont.)

2 The next year, Miss Brown thought, "I will ask the children to clean out their desks earlier this year so we don't run out of pencils so fast." The dot plot below shows how many pencils the kids found in their desks that time.

Miss Brown's Fall Pencil Survey
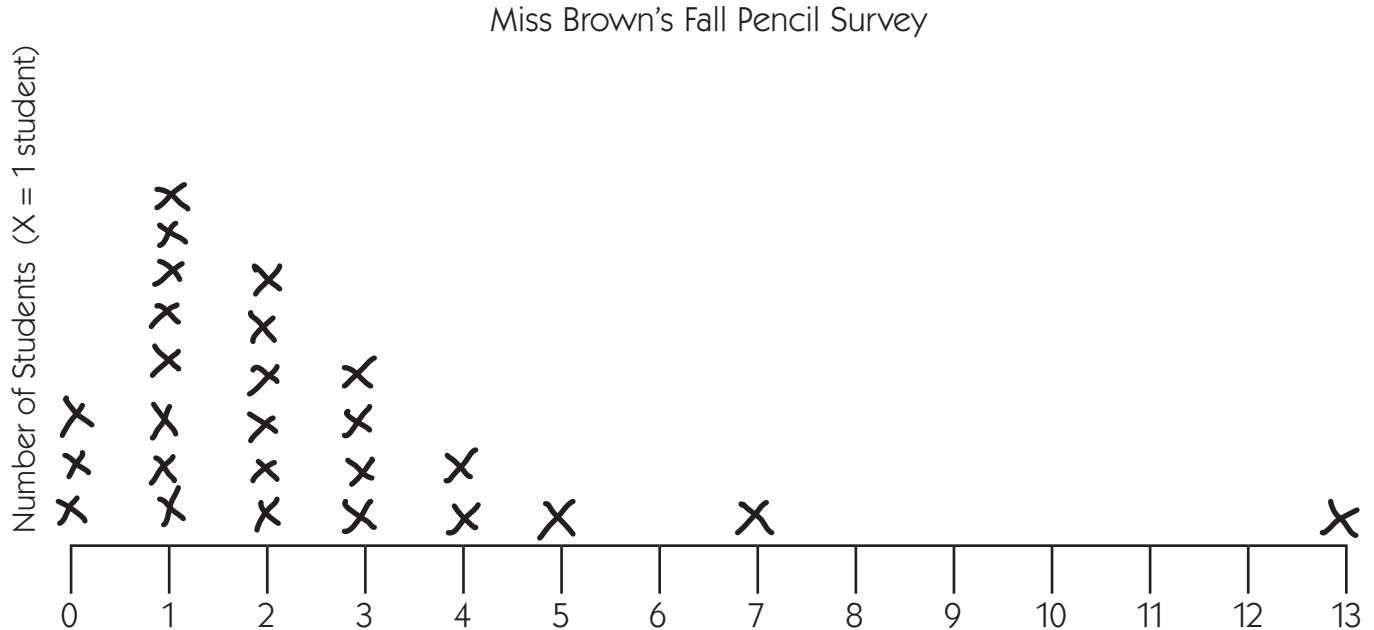
3 How many pencils did most of the kids have in their desks last spring?

4 How many pencils did most of the kids have in their desks in the fall?

5 Were there more pencils hiding in the kids' desks last spring or in the fall? Explain how you figured it out.

6 Why did the pencil survey turn out to be different in the fall than last spring? Give at least 2 possible explanations.

BRIDGES GRADE 3

PUBLISHER'S CORRELATIONS TO COMMON CORE STATE STANDARDS FOR MATHEMATICS, GRADE 3

Bridges Grade 3 Correlations to Common Core State Standards

Common Core State Standards for Mathematics, Grade 3

In Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

(1) Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

(2) Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

(3) Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

(4) Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Grade 3 Overview

Operations & Algebraic Thinking
- Represent and solve problems involving multiplication and division.
- Understand properties of multiplication and the relationship between multiplication and division.
- Multiply and divide within 100.
- Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number & Operations in Base Ten
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number & Operations—Fractions
- Develop understanding of fractions as numbers.

Measurement & Data
- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- Represent and interpret data.
- Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish linear and area measurements.

Geometry
- Reason with shapes and their attributes.

Mathematical Practices
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Taken from the Common Core State Standards for Mathematics 2010, pages 21 & 22.

Bridges Grade 3 Correlations to Common Core State Standards (cont.)

OPERATIONS AND ALGEBRAIC THINKING 3.OA

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Represent and solve problems involving multiplication and division.				
1. Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 × 7.	Unit 4, Sessions 1–4, 7, 8, 9, 12, 15, 16, 18–20, 23 Unit 4, pp 465 (HC 13)	October Numbers Grid November Numbers Grid Dec. Computational Fluency Mar. Computational Fluency	Set A2 Number & Operations: Basic Multiplication & Division, Activities 1 & 2 and Ind. Worksheets 1, 8 Bridges Practice Book, pp 14, 16, 24, 25, 61–63, 65, 68, 69,	**Formal** Bridges, Vol. 2, pp 441–444, 562–569 (Unit 4 Pre- and PostAssessment)
2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.	Unit 4, Sessions 1, 4, 9, 13, 23		Set A2 Number & Operations: Basic Multiplication & Division, Independent Worksheets 1, 2, 5, 8 Bridges Practice Book, pp 67, 69, 105, 109	**Formal** Bridges, Vol. 2, pp 441–444, 562–569 (Unit 4 Pre- and PostAssessment)
3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.	Unit 4, Sessions 9, 12–14, 16, 23		Set A1 Number & Operations: Equal Expressions, Activity 1 and Ind. Worksheets 1 & 2 Set A2 Number & Operations: Basic Multiplication & Division, Activities 1 & 2 and Ind. Worksheets 1, 6, 8 Bridges Practice Book, pp 14, 16, 24, 25, 62, 66, 68, 72, 74, 76, 78, 124, 127, 129, 136	**Formal** Bridges, Vol. 2, pp 441–444, 562–569 (Unit 4 Pre- and PostAssessment)
4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = ☐ ÷ 3, 6 × 6 = ?.	Unit 4, Sessions 12–14	Mar. Computational Fluency	Set A1 Number & Operations: Equal Expressions, Activity 1 and Independent Worksheets 1 & 2 Set A2 Number & Operations: Basic Multiplication & Division, Independent Worksheet 4 Set A7 Number & Operations: Multiplication Beyond the Basics, Independent Worksheet 3 Bridges Practice Book, pp 61, 63–67, 69, 75, 77, 83, 113	**Informal** Bridges Practice Book, pp 61, 63–67, 69, 75, 77, 83, 113

Bridges Grade 3 Correlations to Common Core State Standards

OPERATIONS AND ALGEBRAIC THINKING 3.OA

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Understand properties of multiplication and the relationship between multiplication and division.				
5. Apply properties of operations as strategies to multiply and divide. Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.) **Note** Students need not use formal terms for these properties.	Unit 4, Sessions 5–8, 18, 19, 22 Unit 4, p 492 (Introducing the Zero Facts) Unit 4, pp 551–552 (WP 4G) Unit 7, Sessions 12–17	October Magnetic Board May Magnetic Board May Computational Fluency	Set A2 Number & Operations: Basic Multiplication & Division, Activities 1 & 2 and Independent. Worksheets 3–7 Bridges Practice Book, pp 64, 83, 121, 122, 138	**Informal** Bridges Practice Book, pp 64, 83, 121, 122, 138
6. Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.	Unit 4, Sessions 13, 14, 19, 23 Unit 4, pp 488–489 (Sharing Students' Division Strategies)	Feb. Computational Fluency Mar. Computational Fluency	Set A2 Number & Operations: Basic Multiplication & Division, Independent Worksheets 1, 8 Bridges Practice Book, pp 67, 72, 83	**Informal** Bridges Practice Book, pp 67, 72, 83
Multiply and divide within 100.				
7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.	Unit 4, Sessions 5–10, 17, 20, 22 Unit 4, pp 495, 548, 564 (HC's 14, 16 & 17) Unit 5, p 603 (HC 18) Unit 7, pp 833, 855–856 (Home Connections 27 & 28)	September Numbers Grid October Numbers Grid November Numbers Grid Dec. Computational Fluency Feb. Computational Fluency Mar. Computational Fluency April Computational Fluency May Computational Fluency	Set A1 Number & Operations: Equal Expressions, Activity 1 and Independent Worksheets 1 & 2 Set A2 Number & Operations: Basic Multiplication & Division, Independent Worksheets 2–5, 8 Bridges Practice Book, pp 61, 63, 65, 67, 69, 70, 71, 73, 77, 79, 83, 111, 119, 121, 123, 135	**Informal** Bridges Practice Book, pp 61, 63, 65, 67, 69, 77, 79, 83, 119, 121, 123, 135 **Formal** Unit 4, Sessions 11, 21 (Multiplication Fluency Checkups 1 & 2) Unit 5, Session 9 (Multiplication Fluency Checkup 3) Number Corner Teacher's Guide, pp 266–268, 322–324 (Checkups 3 & 4)

Bridges Grade 3 Correlations to Common Core State Standards (cont.)

OPERATIONS AND ALGEBRAIC THINKING 3.OA

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Solve problems involving the four operations, and identify and explain patterns in arithmetic.				
8. Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	Unit 2, Sessions 25–27, 29 Unit 4, Sessions 9, 12–14 Unit 5, Sessions 3, 5, 10, 12, 13, 17 Unit 6, Sessions 1, 4 Unit 5, p 675 (HC 21)	Jan. Coins, Clocks & Bills Feb. Coins, Clocks & Bills April Coins, Clocks & Bills May Magnetic Board May Clocks, Coins & Bills	Set A1 Number & Operations: Equal Expressions, Activity 1 and Independent Worksheet 1 Set A2 Number & Operations: Basic Multiplication & Division, Activities 1 & 2 and Ind. Worksheet 6 Set A3 Number & Operations: Multi-Digit Addition & Subtraction, Activity 2 and Independent Worksheets 1–4 Set A6 Number & Operations: Estimating to Add & Subtract, Independent Worksheets 1–3 Bridges Practice Book, pp 18, 26, 28, 32, 33, 38, 40, 53, 70, 74, 78, 80, 90, 96, 98, 100, 104, 106, 118, 120, 126–129, 134, 136	**Formal** Bridges, Vol. 3, pp 695–699, 774–781 (Unit 6 Pre- and Post-Assessment) Number Corner Teacher's Guide, pp 200–202 (Checkup 2)
9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.	Unit 1, Sessions 4–9, 14, 16–18 Unit 1, p 154 (HC 3) Unit 1, pp 86–87 (WP 1B) Unit 2, Sessions 1–3, 5, 6, 9, 10, 13, 14 Unit 4, Sessions 2, 6, 10, 15, 17, 18, 20 Unit 4, p 548 (HC 16) Unit 5, Sessions 7, 8, 14, 15	September Numbers Grid September Magnetic Board October Numbers Grid November Numbers Grid December Calendar Grid Feb. Computational Fluency	Bridges Practice Book, pp 1, 5, 31, 35, 67, 121, 135	**Informal** Set A2 Number & Operations: Basic Multiplication & Division, Ind. Worksheet 2

NUMBER AND OPERATIONS IN BASE TEN 3.NBT

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Use place value understanding and properties of operations to perform multi-digit arithmetic.				
1. Use place value understanding to round whole numbers to the nearest 10 or 100.	Unit 2, Sessions 16, 17 Unit 5, pp 255–257 (WP 2D) Unit 5, Sessions 4, 5, 16–18 Unit 5, p 628 (HC 19)	Jan. Computational Fluency May Coins, Clocks & Bills	Set A3 Number & Operations: Multi-Digit Addition & Subtraction, Activity 5 and Independent Worksheet 4 Set A6 Number & Operations: Estimating to Add & Subtract, Independent Worksheets 1–3 Bridges Practice Book, pp 85–89, 91, 93, 95, 99, 131	**Informal** Bridges Practice Book, pp 85, 86, 87, 89, 91, 93, 95, 99, 131 **Formal** Bridges, Vol. 1, pp 232–236, 336–342 (Unit 2 Pre- and Post-Assessment) Number Corner Teacher's Guide, pp 200–202 and 266–268 (Checkups 2, & 3)

Bridges Grade 3 Correlations to Common Core State Standards (CONT.)

NUMBER AND OPERATIONS IN BASE TEN 3.NBT

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Use place value understanding and properties of operations to perform multi-digit arithmetic.				
2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.	Unit 2, Sessions 7, 8, 17–19, 22–27, 29 Unit 2, page 337 (HC 9) Unit 5, Sessions 2, 3, 5, 6, 10, 12, 13, 17, 19 Unit 6, Session 1 Unit 7, Session 1	Nov. Computational Fluency November Magnetic Board December Numbers Grid January Numbers Grid Jan. Computational Fluency January Coins, Clocks & Bills March Magnetic Board March Numbers Grid May Coins, Clocks & Bills Number Corner Student Book, pages 35, 40, 62	Set A3 Number & Operations: Multi-Digit Addition & Subtraction, Activities 1–5 and Independent Worksheets 1–3 Set A6 Number & Operations: Estimating to Add & Subtract, Independent Worksheets 1–3 Bridges Practice Book, pp 9, 27, 29, 31, 33, 36, 39, 40, 51, 53, 81, 87, 89, 90, 92–94, 96, 99, 100, 101, 107, 118, 123, 126, 129, 137	**Informal** Bridges Practice Book, pages 39, 87, 89, 90, 92, 93, 96, 99, 100, 126 **Formal** Bridges, Vol. 1, pp 232–236, 336–342 (Unit 2 Pre- and Post-Assessment) Bridges, Vol. 2, pp 583–585, 673–680 (Unit 5 Pre- and Post-Assessment) Number Corner Teacher's Guide, pp 200–202, 266–268 and 322–324 (Checkups 2, 3, & 4)
3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations.	Unit 7, Sessions 12–17	April Numbers Grid May Magnetic Board	Set A7 Number & Operations: Multiplication Beyond the Basics, Activity 1 and Ind. Worksheets 1–3 Bridges Practice Book, pp 64, 83, 113, 121, 122, 138	**Formal** Number Corner Teacher's Guide, pp 322–324 (Checkup 4)

NUMBER AND OPERATIONS—FRACTIONS 3.NF

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Develop understanding of fractions as numbers. (Note: Grade 3 expectations in this domain are limited to fractions with denominators 2, 3,4, 6, and 8.)				
1. Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.	Unit 6, Sessions 5–9, 12–15	December Magnetic Board January Magnetic Board February Magnetic Board April Calendar Grid May Calendar Grid	Set A5 Number & Operations: Fractions, Activity 1 Bridges Practice Book, pp 8, 10, 30, 103, 125	**Formal** Bridges, Vol. 3, pp 695–699, 774–779 (Unit 6 Pre- and Post-Assessment) Number Corner Teacher's Guide, pp 322–324 (Checkup 4)
2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.				
a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line.	Unit 6, Sessions 14, 15 (fractions on a ruler)		Set A5 Number & Operations: Fractions, Activity 1 Bridges Practice Book, p 133	

Bridges Grade 3 Correlations to Common Core State Standards (cont.)

NUMBER AND OPERATIONS—FRACTIONS 3.NF

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Develop understanding of fractions as numbers. (Note: Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.)				
2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.				
b. Represent a fraction ⅔ on a number line diagram by marking off a lengths ⅙ from 0. Recognize that the result-ing interval has size ⅔ and that its endpoint locates the number ⅔ on the number line.	Unit 6, Sessions 14, 15 (fractions on a ruler)	Set A5 Number & Operations: Frac-tions, Activity 1 Bridges Practice Book, pp 112, 114, 133		
3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.				
a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.	Unit 6, Sessions 6, 8, 9, 13–15	January Magnetic Board April Calendar Grid	Bridges Practice Book, p 105	**Formal** Number Corner Teacher's Guide, pp 322–324 (Checkup 4)
b. Recognize and generate simple equivalent fractions, e.g., ½ = ²⁄₄, ⁴⁄₆ = ²⁄₃). Explain why the fractions are equivalent, e.g., by using a visual fraction model.	Unit 6, Sessions 6, 8, 13–15	January Magnetic Board April Calendar Grid May Calendar Grid		**Formal** Number Corner Teacher's Guide, pp 322–324 (Checkup 4)
c. Express whole numbers as fractions, and recognize fractions that are equiv-alent to whole numbers. Examples: Express 3 in the form 3 = ³⁄₁; recognize that ⁶⁄₁ = 6; locate ⁴⁄₄ and 1 at the same point of a number line diagram.	Unit 6, Sessions 9, 12	January Magnetic Board February Magnetic Board May Calendar Grid		
d. Compare two fractions with the same numerator or the same denom-inator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.	Unit 6, Sessions 5–8, 13, 14	December Magnetic Board January Magnetic Board	Bridges Practice Book, pp 30, 103, 108–110, 112, 114–117, 125, 128	**Informal** Bridges Practice Book, pp 30, 103, 108–110, 112, 114–117, 125, 128

Bridges Grade 3 Correlations to Common Core State Standards (cont.)

MEASUREMENT AND DATA 3.MD

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.				
1a. Tell and write time to the nearest minute and measure time intervals in minutes.		October Coins, Clocks & Bills Nov. Coins, Clocks & Bills Dec. Coins, Clocks & Bills January Calendar Grid March Coins, Clocks & Bills	Set A7 Number & Operations: Multiplication Beyond the Basics, Independent Worksheet 3 Set D3 Measurement: Telling Time, Activity 1and Ind. Worksheets 1 & 2 Bridges Practice Book, pp 12, 17, 34	**Formal** Number Corner Teacher's Guide, pp 92–94, 266–268 (Checkups 1, 3)
1b. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.		Nov. Coins, Clocks & Bills Dec. Coins, Clocks & Bills January Calendar Grid March Coins, Clocks & Bills	Set A3 Number & Operations: Multi-Digit Addition & Subtraction, Independent Worksheet 3 Bridges Practice Book, pp 17, 20, 70, 120	**Formal** Number Corner Teacher's Guide, pp 92–94, 266–268 (Checkups 1, 3)
2a. Measure and estimate liquid volumes using standard units of liters (l).	Unit 7, Session 9 Unit 7, pp 829–830 (WP 7B)			
2b. Measure and estimate masses of objects using standard units of grams (g) and kilograms (kg).	Unit 5, Session 9 Unit 5, pp 621–623 (WP 5C)			
2c. Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.			Bridges Practice Book, p 82	
Represent and interpret data.				
3a. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.	Unit 1, Session 3		Set E1 Data Analysis: Graphing, Activities 1–3 and Ind. Worksheets 1 & 2 Bridges Practice Book, pp 4, 132	
3b. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.	Unit 1, Session 3	December Data Collector February Data Collector	Set E1 Data Analysis: Graphing, Activities 1–3 and Independent Worksheets 1 & 2 Bridges Practice Book, pp 2, 4, 132	**Formal** Number Corner Teacher's Guide, pp 200–202 (Checkup 2)

MEASUREMENT AND DATA 3.MD

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Represent and interpret data.				
4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	Not Yet Addressed			
Geometric measurement: understand concepts of area and relate area to multiplication and to addition.				
5. Recognize area as an attribute of plane figures and understand concepts of area measurement.				
a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.			Set D2 Measurement: Area, Activities 1 & 2 and Independent Worksheet 1 / Set D5 Measurement: Area in US Customary Units, Activity 2 and Ind. Worksheet 1 / Set D6 Measurement: Area in Metric Units, Activities 1, 2 and Ind. Worksheet 1	
b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.			Set D2 Measurement: Area, Activities 1 & 2 and Independent Worksheet 1 / Set D5 Measurement: Area in US Customary Units, Activity 2 and Ind. Worksheet 1 / Set D6 Measurement: Area in Metric Units, Activities 1, 2 and Ind. Worksheet 1	
6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).	Unit 7, Session 8	October Calendar Grid / October Magnetic Board	Set D2 Measurement: Area, Activities 1 & 2 and Ind. Worksheet 1 / Set D5 Measurement: Area in US Customary Units, Activities 1 & 2 / Set D6 Measurement: Area in Metric Units, Activity 1	
7. Relate area to the operations of multiplication and addition.				
a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.			Set D5 Measurement: Area in US Customary Units, Activity 2 and Ind. Worksheet 1 / Set D6 Measurement: Area in Metric Units, Activities 1, 2 and Ind. Worksheet 1	**Informal** Supplement Set D2 Measurement: Area, Independent Worksheet 1 / **Informal** Set D5 Measurement: Area in US Customary Units, Ind. Worksheet 1 / Set D6 Measurement: Area in Metric Units, Ind. Worksheet 1

Bridges Grade 3 Correlations to Common Core State Standards (cont.)

		MEASUREMENT AND DATA 3.MD		
Standard	**Bridges**	**Number Corner**	**Bridges Supplement**	**Assessments**
Geometric measurement: understand concepts of area and relate area to multiplication and to addition.				
7. Relate area to the operations of multiplication and addition.				
b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.	Unit 4, Sessions 4, 5, 8, 22 Unit 4, p 495 (HC 14) Unit 5, Session 8	October Calendar Grid October Magnetic Board Dec. Computational Fluency May Magnetic Board	Set A2 Number & Operations: Basic Multiplication & Division, Independent Worksheets 3, 5, 6 Set A7 Number & Operations: Multiplication Beyond the Basics, Activity 1 Set D2 Measurement: Area, Independent Worksheet 1 Bridges Practice Book, pp 67, 69, 75, 77	**Formal** Bridges, Vol. 2, pp 441–444, 562–569 (Unit 4 Pre- and PostAssessment)
c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.	Unit 7, Sessions 12–17	October Calendar Grid October Magnetic Board May Magnetic Board	Set A2 Number & Operations: Basic Multiplication & Division, Activities 1 & 2 Set A7 Number & Operations: Multiplication Beyond the Basics, Activity 1	**Formal** Bridges, Vol. 3, pp 796–799, 875–881 (Unit 7 Pre- and Post-Assessment)
d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.	Unit 4, Sessions 7, 8, 20 Unit 7, Sessions 12–17			
Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.				
8a. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, and finding an unknown side length,	Unit 5, Sessions 7, 8	March Data Collector	Set C4 Geometry: Quadrilaterals, Activities 4, 5 andIndependent Worksheet 3 Bridges Practice Book, pp 44, 46, 48, 50, 54, 60, 106, 119, 130, 134, 135	**Formal** Number Corner Teacher's Guide, pp 266–268 (Checkup 3)
8b. Exhibit rectangles with the same perimeter and different areas or with the same area and different perimeters.	Unit 5, Sessions 7, 8		Set C4 Geometry: Quadrilaterals, Independent Worksheet 3	**Informal** Set C4 Geometry: Quadrilaterals, Independent Worksheet 3

Bridges Grade 3 Correlations to Common Core State Standards (cont.)

GEOMETRY 3.G

Standard	Bridges	Number Corner	Bridges Supplement	Assessments
Reason with shapes and their attributes.				
1a. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals).	Unit 3, Sessions 2–4, 12	November Calendar Grid	Set C2 Geometry: Triangles & More, Activity 2 and Ind. Worksheets 3 & 4 Set C4 Geometry: Quadrilaterals, Activities 1–5 and Ind. Worksheets 1 & 2 Bridges Practice Book, pp 45, 47, 55, 56, 139, 140	**Informal** Bridges Practice Book, pp 45, 47, 55, 56, 139, 140
1b. Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.		November Calendar Grid	Set C4 Geometry: Quadrilaterals, Activities 1–5 and Ind. Worksheets 1–3 Bridges Practice Book, pp 45, 46, 139, 140	**Informal** Bridges Practice Book, pp 45, 46, 139, 140
2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as ¼ of the area of the shape.	Unit 3, Sessions 3, 11, 12 Unit 6, Sessions 5–9, 11, 13, 14	April Calendar Grid		**Formal** Bridges, Vol. 3, pp 695–699, 774–779 (Unit 6 Pre- and Post-Assessment)

Bridges in Mathematics & the Common Core State Standards (CCSS) – Grade 3

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	OPERATIONS & ALG. THINKING	NUMBERS/OPS. IN BASE 10	FRACTIONS	MEASUREMENT/DATA	GEOMETRY
	• *Multiplication & Division, Word Problems, Patterns* Bridges Units: 1, 2, 4, 5, 7 Number Corner: Sep–May Supplement Sets: A1, A2, A3, A6, A7	• *Use Place Value Concepts to Perform Multi-Digit Arithmetic* Bridges Units: 2, 5, 7 Number Corner: Nov–Jan, Mar, May Supplement Sets: A3, A6, A7	• *Develop Understanding of Fractions as Numbers* Bridges Units: 6 Number Corner: Dec, Jan, Feb, Apr, May Supplement Sets: A5	• *Time, Liquid Volume, Mass, Data, Perimeter, Area* Bridges Units: 4, 5, 7 Number Corner: Oct–Mar, May Supplement Sets: C2, D3, D5, D6, E1	• *Reason with Shapes and Their Attributes* Bridges Units: 3, 6 Number Corner: Nov, Apr Supplement Sets: C2, C4

Pacing Guide (171 Sessions Total)

Units

SEPT 17 SESSIONS	OCT–NOV 30 SESSIONS	NOV-DEC 22 SESSIONS	JAN–MID-FEB 27 SESSIONS	MID-FEB–MID-MAR 20 SESSIONS	MID-MAR–MID-APR 19 SESSIONS	MID-APR–MID-MAY 21 SESSIONS	MID-MAY–JUNE 15 SESSIONS
UNIT 1 **14 Sessions** Computation, Algebra & Probability	**UNIT 2** **30 Sessions** Place Value Structures & Multi-Digit Computation	**UNIT 3** **15 Sessions** 2-D and 3-D Geometry	**UNIT 4** **22 Sessions** Multiplication & Division Patterns & Concepts	**UNIT 5** **16 Sessions** Place Value & Computation with Larger Numbers	**UNIT 6** **18 Sessions** Money, Fractions & Probability	**UNIT 7** **16 Sessions** 3-D Geometry, Multiplication & Data Analysis	**UNIT 8** **15 Sessions** Bridges Design & Construction

CCSS Supplement Sets

SEPT	NOV-DEC	JAN–MID-FEB	MID-FEB–MID-MAR	MID-MAR–MID-APR	MID-APR–MID-MAY
SET E1: Graphs **3 Sessions** **1 IWS** **IWS =** Independent Worksheets to be used as homework or seatwork	**SET C2:** Triangles & More **1 Session** **2 IWS** **SET C4:** Quadrilaterals **4 Sessions** **3 IWS** **SET D2:** Area **2 Sessions** **1 IWS**	**SET A1:** Equal Expressions **1 Session** **1 IWS** **SET A2:** Basic Multiplication & Division **2 Sessions** **5 IWS** **SET D5:** Area in U.S. Customary Units **2 Sessions** **1 IWS**	**SET A1:** Equal Expressions **1 IWS** **SET A2:** Basic Multiplication & Division **3 IWS** **SET A3:** Multi-Digit Add/Subtract **4 Sessions** **2 IWS**	**SET A3:** Multi-Digit Add/Subtract **2 IWS** **SET A5:** Fractions **1 Session** **2 IWS**	**SET A3:** Multi-Digit Add/Subtract **1 Session** **SET A6:** Est to Add & Subtract **1 Session; 2 IWS** **SET A7:** Multiplication Beyond Basics **1 Session; 2 IWS** **SET D3:** Time During NC **1 Session** **SET D6:** Area **2 Sessions; 1 IWS**

Number Corner

SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY/JUNE
Skip counting; basic facts (+–); patterns; measuring tools and units; length; weight; time; capacity; money	Basic facts (–, ×); number patterns; telling time; area; probability and data	2-digit (+–); 2-D shapes; angles; symmetry; congruence; time and temperature	Place value; multi-digit (+–); basic facts (×); fractions; number patterns; elapsed time; temperature; picture and bar graphs	Multi-digit (+–×); story problems; fractions; number patterns; money; elapsed time; temperature	Place value; multi-digit (+–); basic facts (×); number patterns; counting money; making change; picture and bar graphs	Basic facts (×÷); multi-digit (+–×); repeating patterns; 3-D shapes; elapsed time; length and perimeter	Basic facts (×); multi-digit (+–×); fractions; story problems; number patterns; probability and data	Rounding and estimation; basic facts (+–×÷); multi-digit multiplication; fractions; number patterns; probability and data

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