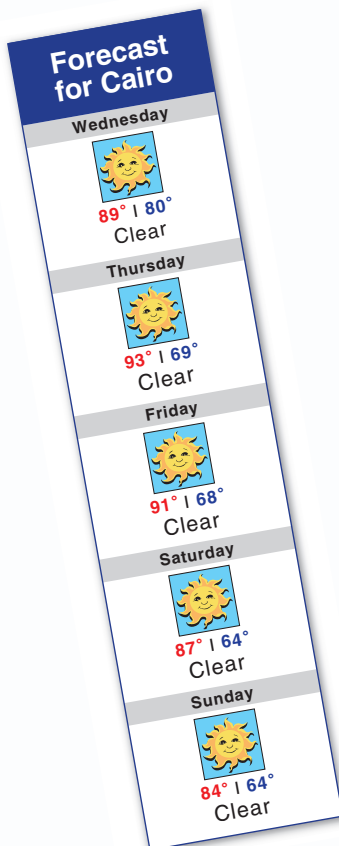


Unit 3

Organizer

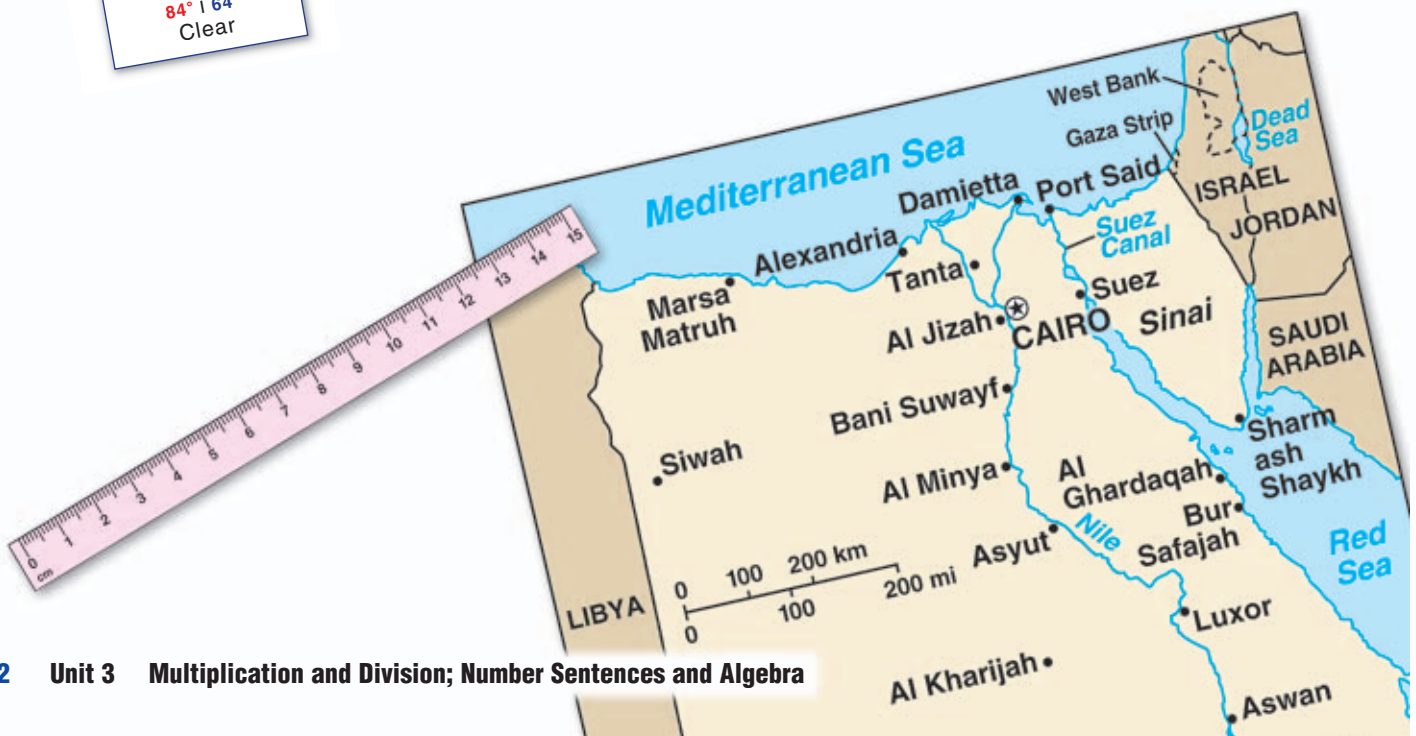
Multiplication and Division; Number Sentences and Algebra

Overview



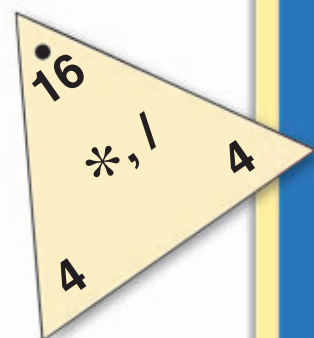
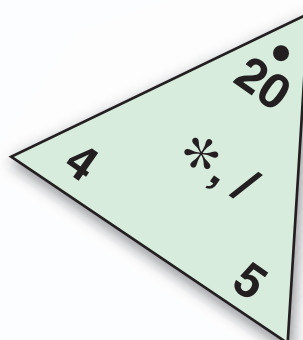
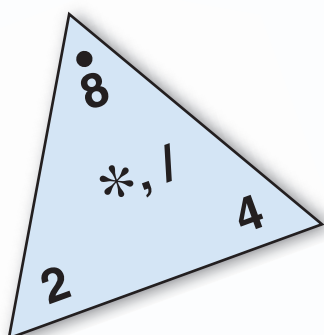
Unit 3 is divided into four main sections. The first section gives students an opportunity to review and practice basic multiplication facts. Next, a routine is established for the World Tour Project. Students are then taught a general problem-solving scheme that will help them solve number stories and find mathematical models for more complicated problems. Finally, some algebra concepts and skills that students have previously learned are extended. Unit 3 has four main areas of focus:

- ◆ To review strategies for solving multiplication facts; and to help students work toward instant recall of the multiplication facts,
- ◆ To provide practice interpreting data, measuring length, and using a map scale through the World Tour Project,
- ◆ To introduce a simplified approach to solving number stories; and to provide practice solving number stories, and
- ◆ To provide practice with number sentences and open sentences.



Contents

Lesson	Objective	Page
3-1	“What’s My Rule?” To review “What’s My Rule?” problems.	158
3-2	Multiplication Facts To review strategies for solving multiplication facts; and to help students work toward instant recall of the multiplication facts.	163
3-3	Multiplication Facts Practice To establish a 50-facts test routine; and to provide practice with multiplication facts.	169
3-4	More Multiplication Facts Practice To give a 50-facts test and record the results; and to provide practice with multiplication facts.	175
3-5	Multiplication and Division To guide exploration of the relationship between multiplication and division; and to provide practice with division facts.	180
3-6	World Tour: Flying to Africa To provide practice interpreting data through the World Tour Project.	186
3-7	Finding Air Distances To provide practice measuring length and using a map scale.	192
3-8	A Guide for Solving Number Stories To introduce a simplified approach to solving number stories; and to provide practice solving number stories.	198
3-9	True or False Number Sentences To review the meanings of number sentences; and to provide practice determining whether number sentences are true or false.	203
3-10	Parentheses in Number Sentences To review the use of parentheses in number sentences.	208
3-11	Open Sentences To introduce vocabulary and notation for open sentences; and to provide practice solving open sentences.	214
3-12	Progress Check 3 To assess students’ progress on mathematical content through the end of Unit 3.	220



Learning In Perspective

Lesson Objectives	Links to the Past 	Links to the Future
3•1 To review “What’s My Rule?” problems.	Grades 1–3: Use “What’s My Rule?” tables and function machine routines.	Grades 4–6: Applications and maintenance.
3•2 To review strategies for solving multiplication facts; and to help students work toward instant recall of the multiplication facts.	Grade 3: Use Fact Triangles and the Facts Table to explore the relationship between $*$ and \div ; play games that promote recall of multiplication and division facts.	Grade 5: Identify prime numbers and composite numbers; find the prime factorization of a number.
3•3 To establish a 50-facts test routine; and to provide practice with multiplication facts.	Grade 3: Use Fact Triangles and the Facts Table to explore the relationship between $*$ and \div ; play games that promote recall of multiplication and division facts.	Grade 4: Continue the 50-fact test to promote automaticity of multiplication facts. Grades 4–6: Applications and maintenance through games and routines.
3•4 To give a 50-facts test and record the results; and to provide practice with multiplication facts.	Grade 3: Use Fact Triangles and the Facts Table to explore the relationship between $*$ and \div ; play games that promote recall of multiplication and division facts.	Grade 4: Continue the 50-fact test to promote automaticity of multiplication facts. Grades 4–6: Applications and maintenance through games and routines.
3•5 To guide exploration of the relationship between multiplication and division; and to provide practice with division facts.	Grade 3: Use Fact Triangles and the Facts Table to explore the relationship between $*$ and \div ; play games that promote recall of multiplication and division facts.	Grade 5: Identify prime numbers and composite numbers; find the prime factorization of a number. Grade 5: Use a divisibility test to determine if a number is divisible by another number.
3•6 To provide practice interpreting data through the World Tour Project.	Grades 1–3: Collect, organize and analyze data in projects and Explorations.	Grade 4 and 5: Applications and maintenance. Grade 6: Investigate how graphs may be used to propagandize or mislead.
3•7 To provide practice measuring length and using a map scale.	Grade 3: Use a map scale to estimate the direct distance between two places.	Grade 4: Estimate the lengths of non-linear paths drawn on square grids that include scale bars; make scale drawings. Grades 4–6: Applications and maintenance.
3•8 To introduce a simplified approach to solving number stories; and to provide practice solving number stories.	Grades 1 and 2: Use parts-and-total, change, and comparison diagrams to model and solve problems. Grade 3: Introduce and use a Guide to Solving Number Stories.	Grades 5 and 6: Solve number stories by modeling them with open sentences and then solving the open sentences.
3•9 To review the meanings of number sentences; and to provide practice determining whether number sentences are true or false.	Grades 1–3: Complete number sentences by inserting relation symbols ($=$, $>$, $<$) to make them true.	Grades 4–6: Applications and maintenance, with increasing complexity of number sentences.
3•10 To review the use of parentheses in number sentences.	Grade 3: Use parentheses to specify which operation to do first in a number sentence; insert parentheses to make a number sentence true.	Grades 5 and 6: Introduce an order of operations; introduce nested parentheses; match number stories to appropriate expressions.
3•11 To introduce vocabulary and notation for open sentences; and to provide practice solving open sentences.	Grades 1–3: Introduce the relation symbols ($=$, $>$, $<$); solve open sentences in which the missing numbers are shown by a question mark, blank, or box.	Grades 5 and 6: Use formulas to solve problems by substitution and by trial-and-error; introduce a pan-balance approach for solving equations.

Key Concepts and Skills

Key Concepts and Skills	Grade 4 Goals*
3•1 Solve addition and subtraction problems. Solve multiplication and division problems. Use rules to complete “What’s My Rule?” tables. Use words and symbols to describe and write rules for functions.	Operations and Computation Goals 1 and 2 Operations and Computation Goals 3 and 4 Patterns, Functions, and Algebra Goal 1 Patterns, Functions, and Algebra Goal 1
3•2 Find factors and multiples of numbers. Identify square numbers. Solve multiplication facts. Identify and use patterns in the Multiplication/Division Facts Table.	Number and Numeration Goal 3 Number and Numeration Goal 4 Operations and Computation Goal 3 Patterns, Functions, and Algebra Goal 1
3•3 Rename a fraction as an equivalent fraction and as a percent. Solve multiplication facts. Identify and use patterns in the Multiplication/Division Facts Table.	Number and Numeration Goal 5 Operations and Computation Goal 3 Patterns, Functions, and Algebra Goal 1
3•4 Rename a fraction as an equivalent fraction and as a percent. Solve multiplication facts. Use data to create a line graph. Find the median and mean of a data set.	Number and Numeration Goal 5 Operations and Computation Goal 3 Data and Chance Goal 1 Data and Chance Goal 2
3•5 Solve multiplication facts. Use multiplication facts to generate related division facts. Apply multiplication and division facts and extended facts to solve problems. Write multiplication and division number sentences.	Operations and Computation Goal 3 Operations and Computation Goal 3 Operations and Computation Goal 3 Patterns, Functions, and Algebra Goal 2
3•6 Read and write large numbers. Calculate relative time across time zones. Judge the reasonableness of counts; describe the difference between a count and an estimate. Use a table of climate data and a time zones map.	Number and Numeration Goal 1 Operations and Computation Goal 2 Operations and Computation Goal 6 Data and Chance Goal 2
3•7 Solve multiplication problems. Use a map scale. Measure to the nearest $\frac{1}{2}$ inch.	Operations and Computation Goal 4 Operations and Computation Goal 7 Measurement and Reference Frames Goal 1
3•8 Solve addition and subtraction number stories. Explain strategies for solving addition and subtraction number stories. Use a table of air distance data. Write number models to represent addition and subtraction number stories.	Operations and Computation Goal 2 Operations and Computation Goal 2 Data and Chance Goal 2 Patterns, Functions, and Algebra Goal 2
3•9 Compare whole numbers. Add, subtract, multiply, and divide to solve expressions. Use conventional notation to write number sentences. Determine whether a number sentence is true or false.	Number and Numeration Goal 6 Operations and Computation Goals 1–4 Patterns, Functions, and Algebra Goal 2 Patterns, Functions, and Algebra Goal 2
3•10 Add, subtract, multiply, and divide to solve expressions. Determine whether number sentences are true or false. Evaluate expressions containing parentheses. Insert parentheses to make true number sentences.	Operations and Computation Goals 1–4 Patterns, Functions, and Algebra Goal 2 Patterns, Functions, and Algebra Goal 3 Patterns, Functions, and Algebra Goal 3
3•11 Add, subtract, multiply, and divide to solve open sentences. Use a “guess-and-check” strategy to make reasonable estimates for open sentences. Identify the solution of an open sentence. Determine whether number sentences are true or false.	Operations and Computation Goals 1–4 Operations and Computation Goal 6 Patterns, Functions, and Algebra Goal 2 Patterns, Functions, and Algebra Goal 2

* See the Appendix for a complete list of Grade 4 Goals.

Ongoing Learning and Practice

Math Boxes



Math Boxes are paired across lessons as shown in the brackets below. This makes them useful as assessment tools. Math Boxes also preview content of the next unit.

Mixed practice [3•1, 3•3, 3•5], [3•2, 3•4], [3•6, 3•8], [3•7, 3•9], [3•10, 3•11]

Mixed practice with multiple choice 3•2, 3•5, 3•6, 3•8, 3•9, 3•10, 3•12

Mixed practice with writing/reasoning opportunity 3•1, 3•4, 3•7, 3•8, 3•10

Practice through Games



Games are an essential component of practice in the *Everyday Mathematics* program. Games offer skills practice and promote strategic thinking.

Lesson	Game	Skill Practiced
3•2, 3•10	<i>Name That Number</i>	Representing numbers in different ways Operations and Computation Goals 1 and 3
3•2	<i>Buzz and Bizz-Buzz</i>	Naming multiples Operations and Computation Goal 3
3•3	<i>Baseball Multiplication</i>	Solving multiplication facts Operations and Computation Goal 3
3•3, 3•6	<i>Multiplication Top-It</i>	Solving multiplication facts Operations and Computation Goal 3
3•5	<i>Beat the Calculator</i>	Solving multiplication facts Operations and Computation Goal 3
3•5	<i>Division Arrays</i>	Exploring the relationship between multiplication and division Operations and Computation Goal 3
3•6	<i>Seega</i>	Exploring mathematical connections with Egypt Patterns, Functions, and Algebra Goal 1
3•7	<i>Polygon Pair-Up</i>	Identifying properties of polygons Geometry Goal 2
3•8	<i>High-Number Toss</i>	Identifying place-value and comparing numbers Number and Numeration Goal 1

See the *Differentiation Handbook* for ways to adapt games to meet students' needs.

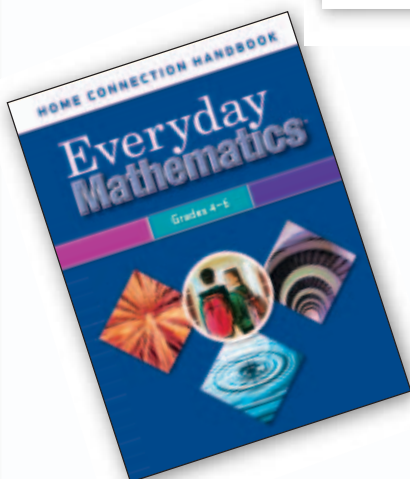
Home Communication



Study Links provide homework and home communication.

◀ **Home Connection Handbook** provides more ideas to communicate effectively with parents.

Unit 3 Family Letter provides families with an overview, Do-Anytime Activities, Building Skills Through Games, and a list of vocabulary.



Problem Solving

Encourage students to use a variety of strategies to solve problems and to explain those strategies. Strategies that students might use in this unit:

- ◆ Identifying and using patterns
- ◆ Using data in a table
- ◆ Writing a number sentence
- ◆ Using logical reasoning
- ◆ Making an organized list
- ◆ Trying and checking
- ◆ Using estimation
- ◆ Using computation

Lessons that teach *through* problem solving, not just *about* problem solving

Lesson	Activity
3•3	Find patterns in the 9s, 5s, and other multiplication facts.
3•6	Solve number stories involving data about Egypt.
3•7	Find the air distances between cities.
3•8	Solve addition and subtraction number stories involving a variety of data.
3•10	Use three numbers to name a target number when playing <i>Name That Number</i> .
3•11	Solve Broken Calculator problems.

See Chapter 18 in the *Teacher's Reference Manual* for more information about problem solving.

Planning Tips

Pacing

Pacing depends on a number of factors, such as students' individual needs and how long your school has been using *Everyday Mathematics*. At the beginning of Unit 3, review your *Content by Strand Poster* to help you set a monthly pace.



NCTM Standards

Unit 3 Lessons	3•1	3•2	3•3	3•4	3•5	3•6	3•7	3•8	3•9	3•10	3•11	3•12
NCTM Standards	1, 6–10	1, 2, 6–8	1, 2, 6–8	1, 2, 6–8	1, 2, 6–8	1, 2, 4–10	1, 2, 4–10	1, 3, 6–9	1, 2, 6, 7	1, 2, 6, 7	1, 2, 6–10	1, 6–10

Content Standards: 1 Number and Operations, 2 Algebra, 3 Geometry, 4 Measurement, 5 Data Analysis and Probability
Process Standards: 6 Problem Solving, 7 Reasoning and Proof, 8 Communication, 9 Connections, 10 Representation

Balanced Assessment

Ongoing Assessment



Recognizing Student Achievement

Opportunities to assess students' progress toward Grade 4 Goals:

Lesson	Content Assessed
3♦1	Complete "What's My Rule?" tables. [Patterns, Functions, and Algebra Goal 1]
3♦2	Use numerical expressions involving arithmetic operations to give equivalent names for whole numbers. [Number and Numeration Goal 4]
3♦3	Estimate reasonable solutions for whole-number addition and subtraction problems. [Operations and Computation Goal 6]
3♦4	Demonstrate automaticity with the *0, *1, *2, *5, and *10 multiplication facts. [Operations and Computation Goal 3]
3♦5	Use conventional notation to write multiplication and division number sentences. [Patterns, Functions, and Algebra Goal 2]
3♦6	Solve multidigit addition and subtraction problems. [Operations and Computation Goal 2]
3♦7	Use a map scale to estimate distances. [Operations and Computation Goal 7]
3♦8	Use and explain a strategy for solving an addition number story. [Operations and Computation Goal 2]
3♦9	Determine whether number sentences are true or false. [Patterns, Functions, and Algebra Goal 2]
3♦10	Demonstrate proficiency with basic division facts. [Operations and Computation Goal 3]
3♦11	Use and explain a strategy for solving open number sentences. [Patterns, Functions, and Algebra Goal 2]

Use the **Assessment Management System** weekly to collect and analyze data about students' progress throughout the year.



Informing Instruction

To anticipate common student errors and to highlight problem-solving strategies:

- Lesson 3♦6** Understand vocabulary used in Country Notes
- Lesson 3♦7** Differentiate between distances traveled and travel time
- Lesson 3♦9** Represent a word sentence as a number sentence correctly
- Lesson 3♦10** Understand the reason for parentheses placement
- Lesson 3♦11** Calculate correctly when variables are placed in different positions

Periodic Assessment



3•12 Progress Check 3

CONTENT ASSESSED	ASSESSMENT ITEMS			
	Self	Oral/Slate	Written	Open Response
Find multiples and factors. [Number and Numeration Goal 3]	✓	✓	✓	
Give equivalent names for whole numbers. [Number and Numeration Goal 4]				✓
Solve addition and subtraction number stories. [Operations and Computation Goal 2]	✓		✓	
Know multiplication and division facts. [Operations and Computation Goal 3]	✓	✓	✓	
Use a map scale. [Operations and Computation Goal 7]	✓	✓	✓	
Interpret a bar graph. [Data and Chance Goal 2]			✓	
Estimate and measure the length of line segments. [Measurement and Reference Frames Goal 1]			✓	
Solve “What’s My Rule?” problems. [Patterns, Functions, and Algebra Goal 1]	✓		✓	
Use conventional notation to write expressions and number sentences. [Patterns, Functions, and Algebra Goal 2]				✓
Determine whether a number sentence is true or false. [Patterns, Functions, and Algebra Goal 2]		✓	✓	
Solve open sentences. [Patterns, Functions, and Algebra Goal 2]	✓		✓	
Use parentheses. [Patterns, Functions, and Algebra Goal 3]	✓		✓	✓

Portfolio Opportunities



Some opportunities to gather samples of students’ mathematical writings, drawings, and creations to add balance to the assessment process:

- ◆ Finding the range of a data set, **Lesson 3•1**
- ◆ Exploring the relationship between numbers using concrete models, **Lesson 3•1**
- ◆ Finding perimeter, **Lesson 3•1**
- ◆ Defining prime numbers, **Lesson 3•2**
- ◆ Coloring skip-count patterns, **Lesson 3•3**
- ◆ Solving a combination problem, **Lesson 3•3**
- ◆ Comparing data landmarks, **Lesson 3•4**
- ◆ Solving a *Name That Number* problem, **Lesson 3•12**

Assessment Handbook

Unit 3 Assessment Support

- ◆ Grade 4 Goals, pp. 37–50
- ◆ Unit 3 Assessment Overview, pp. 68–75
- ◆ Unit 3 Open Response
 - Detailed rubric, p. 72
 - Sample student responses, pp. 73–75

Unit 3 Assessment Masters

- ◆ Unit 3 Self-Assessment, p. 164
- ◆ Unit 3 Written Assessment, pp. 165–167
- ◆ Unit 3 Open Response, p. 168
- ◆ Unit 3 Class Checklist, pp. 256, 257, and 303
- ◆ Quarterly Checklist; Quarter 1, pp. 294 and 295
- ◆ Unit 3 Individual Profile of Progress, pp. 254, 255, and 302
- ◆ Exit Slip, p. 311
- ◆ Math Logs, pp. 306–308
- ◆ Other Student Assessment Forms, pp. 304, 305, 309, and 310

Differentiated Instruction

Daily Lesson Support

ENGLISH LANGUAGE LEARNERS

- 3•2 Building a Math Word Bank
- 3•5 Creating a poster
- 3•8 Building vocabulary
- 3•9 Building a Math Word Bank

EXTRA PRACTICE

- 3•1 Completing “What’s My Rule?” tables
 - 3•2 Playing *Buzz* and *Bizz-Buzz*
 - 3•3 Playing *Multiplication Top-It*
 - 3•5 Practicing with fact families
 - 3•11 Solving Broken Calculator problems
- 5-Minute Math**
- 3•7 Solving scale problems
 - 3•10 Using parentheses in number sentences

READINESS

- 3•1 Modeling functional relationships
- 3•2 Making rectangular arrays
- 3•3 Skip-counting on a hundreds grid
- 3•4 Finding the mean
- 3•5 Playing *Division Arrays*
- 3•6 Exploring time zones
- 3•7 Measuring to the nearest $\frac{1}{2}$ inch
- 3•8 Reviewing situation diagrams
- 3•9 Reviewing $>$ and $<$ symbols
- 3•11 Using Fact Triangles to solve open sentences

ENRICHMENT

- 3•1 Solving a perimeter problem
- 3•2 Exploring prime numbers
- 3•3 Calculating combinations
- 3•4 Comparing the mean and median
- 3•5 Exploring the relationship between division and fractions
- 3•6 Playing *Seega*
- 3•7 Comparing map scales
- 3•8 Writing number stories
- 3•9 Solving a number-sentence puzzle
- 3•10 Writing number models with parentheses
- 3•11 Solving open sentences



Adjusting the Activity

- | | |
|--|--|
| 3•1 Pose function machine questions | 3•5 Playing a version of <i>Beat the Calculator</i> |
| 3•2 Using Venn diagrams ELL | 3•6 Multiplying 2-digit numbers by 1-digit numbers |
| 3•2 Using multiplication tools and strategies ELL | 3•7 Creating a reference tool |
| 3•3 Using base-10 blocks to illustrate percents and fractions ELL | 3•8 Using situation diagrams and drawings ELL |
| 3•3 Using multiplication tools in games | 3•9 Using calculators |
| 3•5 Understanding math vocabulary ELL | 3•10 Learning about order of operations |
| 3•5 Using a piece of paper to track on the Multiplication/Division Facts Table | 3•10 Demonstrating a strategy |
| | 3•11 Restating an open sentence in words |

A U D I T O R Y ♦ K I N E S T H E T I C ♦ T A C T I L E ♦ V I S U A L

Cross-Curricular Links

Social Studies

Lesson 3•6 Students travel to Egypt.

Lesson 3•8 Students solve and write number stories based on data in an essay.

Lesson 3•11 Students determine actual distances on a map of Egypt.

Literature

Lesson 3•6 Students are introduced to time zones by reading *Nine O’Clock Lullaby*.

Differentiation Handbook

See the *Differentiation Handbook* for materials on Unit 3.

Language Support

Everyday Mathematics provides lesson-specific suggestions to help all students, including non-native English speakers, to acquire, process, and express mathematical ideas.

Connecting Math and Literacy

Each Orange Had Eight Slices: A Counting Book, by Paul Giganti, Jr., HarperTrophy, 1999

My Full Moon Is Square, by Elinor J. Pinczes, Houghton Mifflin, 2002

Sea Squares, by Joy N. Hulme, Hyperion, 1993

Count Your Way through Africa, by Jim Haskins, Carolrhoda Books, 1989

Count Your Way through the Arab World, by Jim Haskins, Carolrhoda Books, 1988

Lesson 3•6 *Nine O’Clock Lullaby*, by Marilyn Singer, HarperTrophy, 1993

Safari Park, by Stuart J. Murphy, HarperTrophy, 2001



Student Reference Book

pp. 16, 151, 175, 178, 231–234, 240, 252, 254, 258, 264, 276, 277, 282–293, and 309

Multiage Classroom ♦ Companion Lessons

Companion Lessons from Grades 3 and 5 can help you meet instructional needs of a multiage classroom. The full Scope and Sequence can be found in the Appendix.

Grade 3	2•3	4•1, 4•5, 4•6, 4•8	4•1, 4•5, 4•6	4•1, 4•5, 4•6, 4•8	4•1, 4•4	4•9	4•9	2•4, 2•6, 4•1, 4•2		7•4, 7•5	
Grade 4	3•1	3•2	3•3	3•4	3•5	3•6	3•7	3•8	3•9	3•10	3•11
Grade 5	10•4, 10•6	2•8, 2•9	2•8, 2•9	2•8, 2•9	8•7, 8•8, 8•12	4•1	2•1, 4•3	2•4, 12•5	7•4	7•4	2•4, 7•5

Unit 3 Vocabulary

dividend
divisor
fact family
factor pair
factors
false number sentence
function machine
input
multiples
multiplication facts
number sentence
open sentence
output
parentheses
percent
products
quotient
remainder
rule
solution
solve
square numbers
true number sentence
turn-around facts
variable
“What’s My Rule?”

Professional Development



Teacher’s Reference Manual Links

Lesson	Topic	Section	Lesson	Topic	Section
3•1	“What’s My Rule?”/Function Machines	1.3.7	3•8	Problem Solving	18
	Functions	17.1.3		Addition and Subtraction Use Classes	10.3.1
				Situation Diagrams	1.3.5
3•2	Fact Families/Fact Triangles	1.3.1	3•9	Reading and Writing Number Sentences	10.2
	Basic Facts and Fact Power	16.3.2		3•10	Grouping Symbols
3•3	Fact Practice	16.3.3	The Order of Operations		10.2.3
3•4	Games for Fact Practice	16.3.4	3•11		Algebra and Uses of Variables
3•7	Map and Model Scales	15.4.2			

Materials

Lesson	Masters	Manipulative Kit Items	Other Items
3•1	transparency of <i>Math Masters</i> , p. 407; Study Link Master, p. 72; Teaching Masters, pp. 73 and 74; Teaching Aid Master, p. 407	slate; calculator; pattern blocks (triangles, squares, hexagons)	straightedge
3•2	Study Link 3•1; transparencies of <i>Math Masters</i> , pp. 408 and 409*; Study Link Master, p. 75; Game Master, p. 489; Teaching Masters, pp. 76 and 77; Teaching Aid Master, p. 403	calculator; deck of number cards; number cards 1–10, 4 of each; centimeter cubes	paper clips; envelopes or resealable plastic bags; scissors; counters*
3•3	Study Link 3•2; Teaching Aid Master, p. 410; Study Link Master, p. 78; Game Masters, pp. 460 and 506; transparency of <i>Math Masters</i> , p. 460*; Teaching Masters, pp. 79 and 80	base-10 blocks*; 2 six-sided dice; calculator; number cards 1–10, 4 of each	*, / Fact Triangles; pen or colored pencil; 4 pennies or other markers; counters*; highlighter, colored pencil, or crayon
3•4	Study Link 3•3; Teaching Masters, pp. 81, 83, and 84; Teaching Aid Masters, pp. 411 and 414–417; transparency of <i>Math Masters</i> , p. 414*; Study Link Master, p. 82	calculator; centimeter cubes	*, / Fact Triangles; chart paper; pen or colored pencil
3•5	Study Link 3•4; transparencies of <i>Math Masters</i> , pp. 408* and 409*; Study Link Master, p. 85; Game Masters, pp. 461 and 470; Teaching Master, p. 86; Teaching Aid Master, p. 418	slate; number cards 1–10, 4 of each, and 11–18; calculator; six-sided die	*, / Fact Triangles; 18 counters; grid paper*
3•6	Study Link 3•5; Teaching Aid Masters, pp. 419–421*; Study Link Master, p. 87; Game Masters, pp. 503 and 506*	number cards 1–10, 4 of each	*, / Fact Triangles; globe; classroom world map; 6 counters (3 each of 2 colors); <i>Nine O'Clock Lullaby</i>
3•7	Study Link 3•6; Study Link Master, p. 88; <i>Math Masters</i> , pp. 496 and 497; Teaching Masters, pp. 89 and 90	calculator; cloth tape measure	*, / Fact Triangles; classroom world map; globes; ruler
3•8	Study Link 3•7; Teaching Aid Masters, pp. 388 or 389; 422*, and 423*; transparency of <i>Math Masters</i> , p. 422*; Study Link Master, p. 91; Game Master, p. 487; Teaching Masters, pp. 92 and 93	six-sided die	demonstration clock*; chart paper
3•9	Study Link 3•8; Study Link Master, p. 94; Teaching Aid Masters, pp. 412, 414, and 416; Teaching Masters, pp. 95 and 96	slate; calculator*	*, / Fact Triangles; pen or colored pencil; scissors; tape
3•10	Study Link 3•9; Study Link Master, p. 97; Game Master, p. 489*; Teaching Master, p. 98	slate; deck of number cards	
3•11	Study Link 3•10; Teaching Aid Masters, pp. 388 or 389 and 424; transparency of <i>Math Masters</i> , p. 425*; Study Link Master, p. 99; Teaching Masters, pp. 100 and 101	slate; calculator	overhead calculator*; ruler; *, / Fact Triangles
3•12	Study Link 3•11; Assessment Masters, pp. 164–168; Study Link Masters, pp. 102–105		



* Denotes optional materials

Technology

Assessment Management System, Unit 3
iTLG, Unit 3



Mathematical Background

The discussion below highlights the major content ideas presented in Unit 3 and helps establish instructional priorities.

“What’s My Rule?”

(Lesson 3♦1)

In the first four grades, *Everyday Mathematics* uses function machines and tables of values to study functions. Function machines help students visualize how a rule associates each input value with an output value. A principal activity for developing this concept further is called “What’s My Rule?”



For more information about the “What’s My Rule?” routine, see Section 1.3.7 in the *Teacher’s Reference Manual*.

Instant Recall of Basic Multiplication Facts

(Lessons 3♦2 –3♦5)

The authors believe that most students should learn the basic facts for addition and multiplication to the point of instant recall. Mastery of the basic facts will give students surprising power in making quick estimates and operating with larger numbers.

Most of your fourth-grade students may already have rapid recall of addition facts. The majority of students probably know all of the multiplication facts, although they may have to take time to figure out some answers. A 50-facts test, introduced in Lessons 3-3 and 3-4, should help students develop speed and accuracy with the basic facts. An opportunity to administer this test will occur approximately once per unit. The games introduced in Lessons 3-3, 3-5, and 3-6 are another means of developing reflex multiplication skills.

Recall of division facts is an important skill, but instant recall is not an objective of *Everyday Mathematics*. Real understanding of the link between multiplication and division is crucial, however. Students who have instant recall of the multiplication facts will, with a few seconds’ pause, always produce the related division facts.

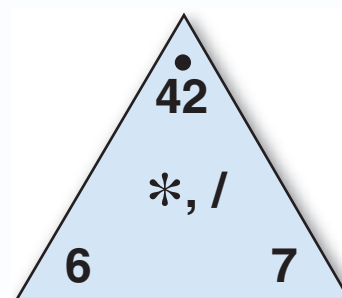
Notice that the basic Multiplication/Division Facts Table does not include the 0s facts, because they may cause difficulty in using the table as a division facts table. The 10s facts are included; these are useful and easy.



See Section 16.3 in the *Teacher’s Reference Manual* for more about multiplication and division fact recall.

Note

A few students may find it difficult, if not impossible, to achieve instant recall of addition and multiplication facts. Those few should be encouraged to move on by various means, and not to feel bad about what amounts to a minor handicap. They may, for example, rely on using Facts Tables or devise other strategies rather than always relying on memory.



$$6 * 7 = 42 \quad 42 / 6 = 7$$
$$7 * 6 = 42 \quad 42 / 7 = 6$$

Students use Fact Triangles to practice multiplication and division facts.

World Tour Project

(Lessons 3♦6 and 3♦7)

In Lesson 2-1, students began the World Tour by visiting Washington, D.C. Now it is time to leave the United States and fly to the first of five regions they will visit—the continent of Africa.

Lesson 3-6 is critical because it establishes the World Tour routine that students will follow throughout the year:

- ◆ Students travel as a class to one country in each of five regions of the world.
- ◆ For each country they visit, they look up specified information in the World Tour section of the *Student Reference Book* and record it on the Country Notes pages in their journals.



Optional Extension of the World Tour: Many teachers have expanded the World Tour for their classrooms by having students form small groups that travel to one or more additional countries within each region visited. If this is your routine, have students complete Country Notes pages for each additional country they visit, using *Math Masters*, pages 419 and 420.

The World Tour section contains information about 10 countries in each of the five world regions. If you plan to follow the optional extension of the World Tour, students should limit their additional travel to the 10 countries highlighted within each region.

The World Tour section also contains a time-zone map, maps for each of the world regions, and representative games from each of the regions. The games provide opportunities for developing thinking skills.

Above all, the authors want students to experience the many ways in which numerical data affect people's lives, in their own immediate environment as well as in other parts of the world.



Problem-Solving Strategies

(Lesson 3♦8)

Most elementary school mathematics texts display a list of “steps in problem solving.” This is usually a brief recipe for finding answers to arithmetic word problems. These guides may be helpful in doing textbook word problems, but they are usually oversimplified and often not useful in coping with even relatively simple problems that arise in everyday life.

Lesson 3-8 contains a more extensive and more useful “Guide for Solving Number Stories,” which students discuss and apply as they solve problems.

In many cases, a student will “see” a solution right away and decide immediately what math to use to solve the problem and compute an answer. In some cases, a student may play with the data first by drawing a picture or diagram, and then use some math to solve the problem by writing a number model. Other examples that illustrate this problem-solving approach appear in Lesson 3-8.



For more on problem-solving strategies, see the *Teacher’s Reference Manual*, Section 18.4.

Diagrams for Representing Addition and Subtraction

(Lesson 3♦8)

In *Second* and *Third Grade Everyday Mathematics*, students were introduced to number-story diagrams to help them solve number stories involving addition and subtraction. The purpose of these diagrams is to help students organize the information given in the story, to identify the missing information, and to determine whether to add or subtract to solve the story. A review of number-story diagrams is an optional Readiness activity in Lesson 3-8, based on material in the *Student Reference Book* and on a page of number stories. Most uses of addition and subtraction in solving problems fall into three large categories. A diagram can illustrate each category.

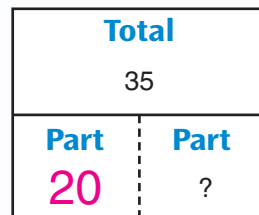
Parts-and-total diagrams are used to represent problems in which two or more quantities (parts) are combined to find a total quantity.

Example: 35 children are riding on the bus. 20 of these children are boys. How many are girls? See the parts-and-total diagram in the margin.

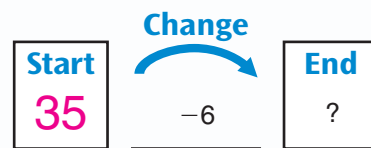
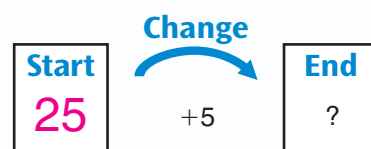
Change diagrams are used to represent problems in which a given (start) quantity is increased or decreased.

Example: 25 children are riding on the bus. At the next stop, 5 more children get on. How many children are on the bus now? See the change diagram in the margin.

Example: A bus leaves school with 35 children. At the first stop, 6 children get off. How many children are left on the bus? See the change diagram in the margin.



Parts-and-total diagram



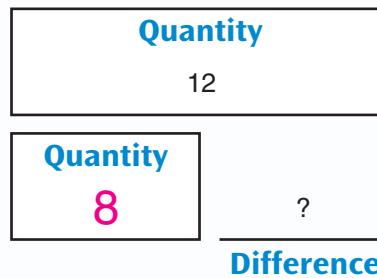
Change diagrams

Comparison diagrams are used to represent problems in which two quantities are given, and you are to find how much more or how much less one quantity is than the other (the difference).

Example: On the bus, there are 12 fourth graders and 8 third graders. How many more fourth graders are there than third graders? See the comparison diagram below.

Note

While a diagram may be useful in solving a particular number story, there are usually many ways of thinking about a problem. It is important for students to understand that problem solving is a creative activity that requires ingenuity and cannot be performed according to a preset prescription.



Comparison diagram

Extending Algebra Concepts and Skills (Lessons 3♦9–3♦11)

The ideas introduced in these three lessons are very powerful. They are also fairly easy to understand, if presented carefully and with clarity. These ideas will be reviewed, extended, and practiced often during the rest of the year—in Mental Math and Reflexes, in Math Boxes, and in Study Links.

In Lesson 3-9, students review **number sentences** as shorthand notation for word sentences. A number sentence can be true ($5 + 8 = 13$) or false ($12 \div 6 = 4$). In this lesson, students examine a variety of number sentences and determine whether they are true or false.

Lesson 3-10 reviews the use of parentheses in number sentences that involve more than one operation. Students determine whether number sentences containing parentheses are true or false. They practice using parentheses by inserting them in proper places in number sentences.

Lesson 3-11 considers number sentences in which a number is missing. A letter or other symbol, called a **variable**, can represent the missing number. Number sentences that contain variables are called **open sentences**. (In the algebra you studied, they may have been called "equations" or "linear equations.")

To solve an open sentence, students learn to replace the variable with a number that will make the sentence true. For example, if students replace the variable x in $8 + x = 12$ with the number 4, they obtain the true sentence $8 + 4 = 12$. The number 4 is called the solution of the open sentence $8 + x = 12$. If they replace the variable x with the number 6, the number sentence becomes $8 + 6 = 12$. This sentence is false; therefore, 6 is not a solution of the open sentence $8 + x = 12$. These ideas are summarized on page 148 of the *Student Reference Book*.

Everyday Mathematics has used open sentences informally since first grade. Missing numbers have been shown by a question mark, a blank, or a box. From now on, the program uses letters for variables in open sentences to reflect the more convenient and "grown-up" notation used in later grades and everywhere outside schools.

Note

An open sentence can have more than one solution; for example, 1, 2, and 3 are all solutions of the *inequality* $x < 4$. However, any open sentence in this unit contains an = sign and has only one solution.

$$3 + x = 13$$

$$5 = 12 - x$$

$$25 - x = 15$$

Calculator Usage (Lessons 3♦1 and following)

Calculators are used in this unit for games such as *Beat the Calculator* and activities such as Broken Calculator. In *Beat the Calculator*, students quickly realize that their brains are much more efficient than their calculators when finding a product such as $7 * 3$. In Broken Calculator, students pretend, for example, that the minus keys on their calculators are broken and then devise strategies to solve such problems as $2,421 - 874 = n$. Calculator usage is also encouraged as students work on the World Tour Project.

However, the no-calculator icon (see margin) does appear on some journal pages, including those in which the intention is to encourage practice with algorithms for adding and subtracting numbers. Alert students to watch for the icon.

