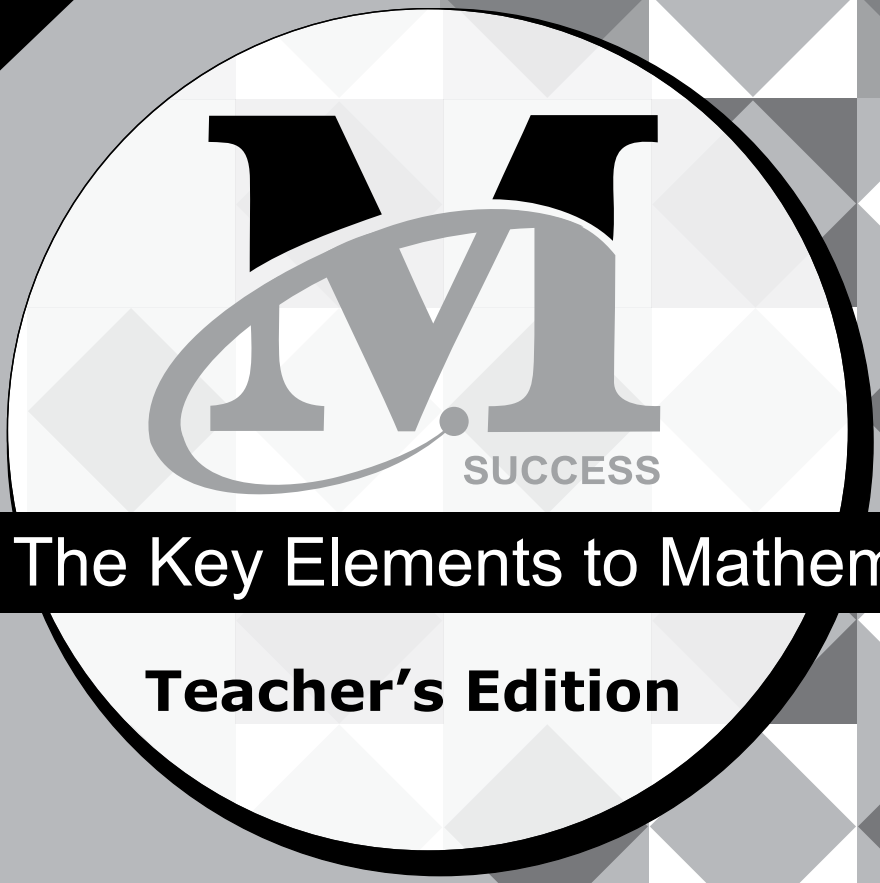
Level

E



The Key Elements to Mathematics Success

Teacher's Edition

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Lessons

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Lessons

The Key Elements to Mathematics Success Description of Teacher's Guide

Essential Questions are provided at the beginning of each lesson to provide the framework for the lesson and guide the learning process. The essential questions are used not only at the beginning of the lesson, but are also an important part of the lesson closure. Each essential question ties into a SOLVE problem which is used as an introduction and closure tool in each lesson.

Each lesson concept is bracketed with the SOLVE problem solving method. Along with the essential question, the "S" step of SOLVE is introduced at the beginning of the lesson. This helps to guide the learning of the student as they progress through the lesson. At the end of the lesson, the SOLVE problem introduced at the beginning of the lesson is revisited. The student completes the additional steps of SOLVE, applying the lesson concept in a problem solving situation.

LESSON 17: Add Fractions - Unlike Denominators

[Objective]
The student will add fractions with unlike denominators.

[Prerequisite Skills] equivalent fractions, adding fractions with like denominators

[Materials]
Student pages **S160 – S169**
Transparencies **T483, T485, T487, T489, T491, T493, and T495**
Fraction Kits 1–3
Overhead fraction strips
Colored pencils
Foldable from Lesson 16

[Essential Questions]
1. How does it help our understanding of adding fractions to build with concrete materials?
2. How does it help our understanding of adding fractions to build with pictorial models?
3. How can we add fractions with unlike denominators?

[Words For Word Wall]
addend, sum, denominator, numerator, equivalent, legal trade, simplest form

[Grouping]
Cooperative Pairs (CP), Whole Group (WG), Individual (I)
*For Cooperative Pairs (CP) activities, assign the roles of Partner A and Partner B to students. This allows each student to be responsible for designated tasks within the lesson.

[Levels of Teacher Support]
Modeling (M), Guided Practice (GP), Independent Practice (IP)

[Multiple Representations]
SOLVE, Graphic Organizer, Verbal Description, Pictorial Representation, Concrete Representation

[Warm-Up] (5 minutes – IP, I, WG) S160 (Answers on T482.)
- Have students turn to S160 in their books to begin the Warm-Up. Students will add fractions with like denominators. Monitor students to see if any of them need help during the Warm-Up. Give students 3 minutes to complete the problems and then spend 2 minutes reviewing the answers as a class. **{Verbal Description}**

LESSON 17: Add Fractions - Unlike Denominators

[Homework] (5 minutes)
Take time to go over the homework from the previous night.

[Lesson] (60 minutes – M, GP, IP, WG, I, CP)

SOLVE Problem **(3 minutes – GP, WG) T483, S161 (Answers on T484.)**

Have students turn to S161 in their books, and place T485 on the overhead. The first problem is a SOLVE problem. You are only going to complete the S step with students at this point. Tell students that during the lesson they will learn how to add fractions with unlike denominators. They will use this knowledge to complete this SOLVE problem at the end of the lesson. **{SOLVE, Graphic Organizer}**

Add Fractions – Concrete – Unlike Denominators
(9 minutes – M, CP, GP, IP, WG) T483, T485, S161, S162 (Answers on T484, T486.)

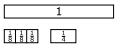
5 minutes – M, CP, GP, WG: Have students turn to S161 in their books, and place T483 on the overhead. Use the overhead fraction strips and the following modeling activity to help students investigate adding fractions with unlike denominators using their fraction kits. Assign the roles of Partner A and Partner B. **{Verbal Description, Concrete Representation, Graphic Organizer}**

MODELING

Add Fractions – Concrete - Unlike Denominators

Step 1: Direct students' attention to Problem 1. Explain to students that they will use their fraction kits to find the sum of $\frac{3}{8}$ and $\frac{1}{4}$.

Step 2: Have students place the fraction strips for $\frac{3}{8}$ and $\frac{1}{4}$ underneath the whole unit as shown below as you model on the overhead.



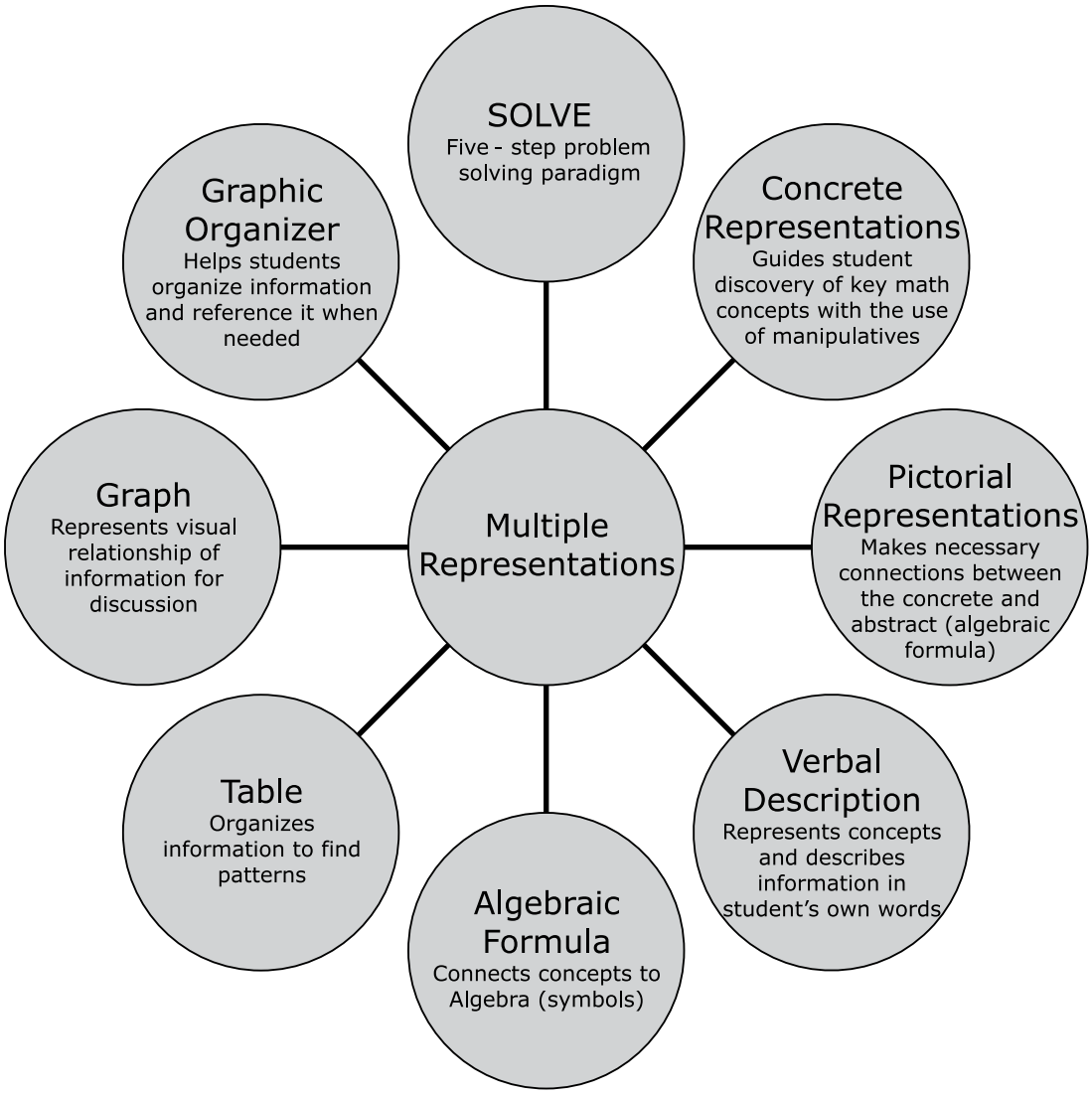
- Partner A, identify the color of the first **addend.** (red) Record.
- Partner B, identify the color of the second addend. (yellow) Record.
- Partner A, determine if the **denominators** are the same. (No.)
- Partner B, explain how you know. (The fraction strips are different colors.)

Each lesson begins with a warm up activity which connects previously learned skills and concepts to the current topic. The warm-up sets the stage for new concepts being introduced in each lesson.

Multiple representations of the concept are incorporated in each lesson. These representations include concrete, pictorial, algebraic formula, verbal descriptions, graphs, tables, graphic organizers and a problem solving paradigm. The multiple representations provide students with different learning styles and abilities the opportunity to acquire and apply knowledge of the lesson concept.

Lessons have been designed for a 60 minute class. Suggested times are provided as a guideline for each section of the lesson, indicating the instructional time needed for each section of the lesson.

Each lesson contains "modeling boxes" which contain step by step instructions on how to model each concept. Modeling steps are provided for concrete, pictorial and procedural steps of the lesson.


SOLVE
Five - step problem solving paradigm
Graphic Organizer
Helps students organize information and reference it when needed
Concrete Representations
Guides student discovery of key math concepts with the use of manipulatives
Graph
Represents visual relationship of information for discussion
Multiple Representations
Pictorial Representations
Makes necessary connections between the concrete and abstract (algebraic formula)
Table
Organizes information to find patterns
Algebraic Formula
Connects concepts to Algebra (symbols)
Verbal Description
Represents concepts and describes information in student's own words

SOLVE

SOLVE is a 5-step problem-solving paradigm taught in the first lesson of *The Key Elements to Mathematics Success* and throughout the program. SOLVE is an acronym which gives students step-by-step strategies for finding the solutions to word problems. The ultimate goal of *teaching* SOLVE is to provide students with a problem-solving strategy that can be applied to any concept they will encounter in algebra. The steps are as follows:

S̲tudy the Problem
Underline the question.
Answer the question, "What is this problem asking me to find?" in your own words.

O̲rganize the Facts
Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts.

L̲ine up a Plan
Choose an operation or operations.
Write in words what your plan of action will be.

V̲erify Your Plan with Action
Estimate your answer.
Carry out your plan.

E̲xamine Your Results
Does your answer make sense? (Compare your answer to the question.)
Is your answer reasonable? (Compare your answer to the estimate.)
Is your answer accurate? (Check your work.)
Write your answer in a complete sentence.

Cooperative Pairs

Working in cooperative pairs is a vital part of *The Key Elements to Mathematics Success*. Cooperative learning allows students at various performance levels to work together, using a variety of learning activities, to improve their understanding. Communication about the learning process is an essential element of working in cooperative pairs. This dialogue enhances student learning and creates a sense of responsibility on the part of the students. Cooperative learning can be a catalyst in creating an atmosphere of achievement and a sense of accomplishment on the part of the students when the task is successfully completed.

Levels of Teacher Support

The lessons are carefully designed with opportunities for modeling, guided practice, and independent practice.

Modeling:
Each lesson contains "modeling boxes" which list step by step instructions on how to model each concept. Modeling steps are provided for concrete, pictorial, and procedural steps of the lesson.

Guided Practice:
Detailed instructions about how to structure guided practice are given in each lesson. Guided practice is led and closely monitored by the teacher. Students may work individually or in pairs during the guided practice.

Independent Practice:
Independent practice is provided through practice problems and homework in each lesson. Independent practice is structured to take place in the lesson following modeling and guided practice sections. Teachers can use the independent practice as a tool for informal formative assessment.

Word Problem Closure
At the end of the lesson, the SOLVE problem introduced at the beginning of the lesson is revisited. The student completes the additional steps of SOLVE, applying the lesson concept in a problem-solving situation.

Closure
Closure is a crucial part of every lesson and provides the teacher an opportunity to evaluate if the lesson objectives have been met. Teachers use the essential questions to reinforce the concept from the lesson, help organize the learning, and bring the lesson to its conclusion. A quick discussion of the essential questions will allow the teacher to informally assess student understanding of the material.

Homework
Homework is provided at the end of each lesson to give students ample opportunity to practice the lesson concept.

Quizzes
The lesson quizzes consist of 10 multiple-choice questions. These 10 questions cover the material taught in the lesson. The quizzes can also be used as homework, class work, review for a test, or as warm-ups.

Review Activities
Review activities are provided for many lessons. There are a variety of engaging activities including scavenger hunts, chain reactions, "I Have, Who Has", and Mystery Squares. The activities are designed to provide multiple practice opportunities for the students in puzzle and game formats. The review activities incorporate the essential elements of cooperative learning and communication about the concepts.

The Key Elements to Algebra Success and the English Language Learner (ELL)

- SOLVE – A step-by-step procedure to attack word problems, dissecting the English language by identifying key words needed to solve the problem, and mapping out a plan with pictures and phrases to ultimately arrive at a well thought out answer. Steps can be written in students' native language while they are still becoming familiar with the process of SOLVE and gradually transitioning into English only.

  The steps of SOLVE have been modified slightly for use with ELL students. The modified steps provide additional support and involve verbal communication about the process, which is a vital link for the ELL student:

  S - Underline the question. TPIAMTF (this problem is asking me to find) – THE _____ . The students cannot just restate the question if they are made to start a sentence with *the*.

  O - Circle the necessary facts. When writing out the necessary facts, be as brief as possible and teach the students abbreviations right away ($, #, lb, cm, pkg. etc.).

  L - Choose an operation and discuss a plan out loud. – +, •, /

  number of nuts + number of bolts = total

  total • number of boxes = answer

  V - Estimate the answer out loud. Then use the set-up created in the L step to carry out the plan.

  E - Choose your answer.

- Cooperative Pairs – Working, questioning, and communicating with others regarding mathematics at all stages of learning. Activities are done in an interactive setting, encouraging language development along with mathematical development. This includes the pairing of ELL students who speak the same language(s) with others who may be at varying stages of their English language development.
- Modeling with Manipulatives – Students participate in activities leading to the discovery of on-grade-level mathematical concepts. Through this process, they develop mathematical understanding while exploring ways of expressing their discoveries in English. Manipulative use is consistent throughout the program. The appearance of each manipulative, their meaning, as well as the language used to describe the actions of these manipulatives remain the same throughout.
- Word Walls – Updated through the use of KEMS lessons, new math vocabulary words (and their meaning/pictorial representation) are added for every new concept as they are discovered. The Word Wall is an interactive tool for all learners and provides an additional language resource for ELL students. Additionally an Operation Word Wall is created by each class and used for solving word problems throughout the year. As an added resource, words can be written in both English and the native language of the learner. Pictures/descriptions are also encouraged next to words wherever appropriate.
- Video Clips of Each Lesson – Available for use in class at www.NTNmath.com, the video clips can help overcome the significant classroom language barriers ELL students face. These video clips, though in English, show key vocabulary words as a way of familiarizing students with appropriate vocabulary used to build a concept.

Planning for your Key Elements to Mathematics Success Class

Materials Needed: include materials needed for both the teacher and the students including items from the manipulative kit, activities to prepare for pairs on cardstock, and/or pages to copy for class.

Objective: (from teacher lesson notes)
Essential Question: (from teacher lesson notes)
Word Wall Words: (from teacher lesson notes)
Agenda: Consider the following when planning each component of the lesson.

Activity	Time Frame	Notes/Details
Environment	N/A	• Groupings used today - seating arrangements needed? • Word Wall updates for this lesson? • Agenda, Objective & Essential Questions posted? • Needed technology set up?
Warm-up	_____ minutes	• What are some great questions to ask during the warm-up? • How does this warm up relate to the lesson? • How can this be modified to fit within the 5 minute time frame?
Fact Masters	_____ minutes	• How will math facts be practiced today? (Group led, DVD, CD, quiz) • What time in the lesson will it be done? • Choral Drill or Quiz today?

Lesson	_____ minutes	• What is the goal for today's lesson?
		• What materials are needed?
		  • Is there an activity from the activities section of my TE that I will use to support this lesson?
		• How does the flow of this lesson encourage student discovery of the concept being covered? What questions need to be asked to guide the discovery of today's concept?
		• How does this lesson fit in with my district pacing guide?
		• How will this concept be enhanced with the traditional textbook?
		• How will I instruct partners to work?
		• Pages being covered today…
		• Complete SOLVE Problem
		ASK: What is the question asking me to find? (beginning of class)
		What are my facts?
		What is my plan? What operation is needed?
		Estimate an answer.
		Work out the answer.
		Check over work, choose answer.
		• What graphic organizer/foldable will be made/referenced?
		• <u>If time permits…</u>
		  • Will this section be used today?
		  • If so, how?
		  • How will I use the quiz for this lesson?

Closure	_____ minutes	• Essential Questions • Homework assigned

Notes:

Planning for your Key Elements to Mathematics Success Class

Materials Needed:

Objective:
Essential Question:
Word Wall Words:
Agenda:

Activity	Time Frame	Notes/Details
Environment	N/A	
Warm-up	_____ minutes	
Fact Masters	_____ minutes	
Lesson	_____ minutes	
Closure	_____ minutes	

Notes:

Planning for your Key Elements to Mathematics Success Class

Materials Needed:

Objective:
Essential Question:
Word Wall Words:
Agenda:

Activity	Time Frame	Notes/Details
Environment	N/A	
Warm-up	_____ minutes	
Fact Masters	_____ minutes	
Lesson	_____ minutes	
Closure	_____ minutes	

Notes:

Planning for your Key Elements to Mathematics Success Class

Materials Needed:

Objective:
Essential Question:
Word Wall Words:
Agenda:

Activity	Time Frame	Notes/Details
Environment	N/A	
Warm-up	_____ minutes	
Fact Masters	_____ minutes	
Lesson	_____ minutes	
Closure	_____ minutes	

Notes:

Materials List

Lesson 1
Paper for foldable (3 sheets of different colors of paper for each student)
Stapler
"S" and "0" posters from packet
Index card per student pair with "N" and "U" on both sides

Lesson 2
Foldable from Lesson 1
"L" poster from packet
Index cards for operation words

Lesson 3
Foldable from Lesson 1
"V" and "E" posters from packet

Lesson 4
Calculators
Colored pencils

Lesson 5
None

Lesson 6
Copy Master T146 (1 per student pair)
Beans (2 per student pair)

Lesson 7
None

Lesson 8
Beans (96 per student pair)
Colored pencils

Lesson 9
Paper for foldable (1 sheet per student)
Paper clip (1 per student pair)

Lesson 10
Colored pencils
Foldable from Lesson 9
Paper clip (1 per student pair)

Lesson 11
Colored pencils
Calculators
Foldable from Lesson 9

Lesson 12
Colored pencils
Calculators
Foldable from Lesson 9

Lesson 13
Paper for foldable (1piece per student)
Two-colored counters (24 per student pair)
Overhead counters

Lesson 14
Copy Master Number and Symbols Cards (1 set per student pair)
Foldable from Lesson 13

Lesson 15
Wall grid
Beans (84 per student pair)
Foldable from Lesson 13
Colored pencils

Lesson 16
Fraction strips for all three kits
Scissors
Overhead fraction strips
Plastic bag (1 per student)
Colored pencils
Paper for foldable (1 sheet per student)

Materials List

Lesson 17
Fraction Kits 1–3
Overhead fraction strips
Colored pencils
Foldable from Lesson 16

Lesson 18
Fraction Kits 1–3
Overhead fraction strips
Colored pencils
Foldable from Lesson 16

Lesson 19
Fraction Kits 1–3
Overhead fraction strips (2 sets)
Colored pencils
Foldable from Lesson 16

Lesson 20
Colored pencils
Fraction Kits 1–3
Foldable from Lesson 16
Overhead fraction strips (2 sets)

Lesson 21
Fraction Kits 1–3
Overhead fraction strips
Colored pencils

Lesson 22
Fraction Kits 1–3
Overhead fraction strips (2 sets)
Colored pencils

Lesson 23
Fraction Kits 1–3
Overhead fraction strips (2 sets)
Foldable from Lesson 16
Colored pencils

Lesson 24
Centimeter cubes (100 per student pair)
1 meter stick – optional
Ruler (1 per student pair)
String – 1 meter long (1 per student pair)
Index card (1 per student pair)

Lesson 25
Copy Master T745
Painter's tape
Sticky notes

Lesson 26
Centimeter cubes (40 per student pair)

Lesson 27
Centimeter cubes (45 per student pair)

Lesson 28
Coordinate plane wall chart
Sticky notes
Dry erase markers
Colored pencils
Centimeter cubes (12 per student pair)

Lesson 29
Index cards (1 per student pair)
Scissors (1 per student pair)
Colored paper for foldable
(3 sheets per student)

Lesson 30
Copy Master T888 (1 per student pair)
Scissors

Materials List

Appendix A
Copies of T932 or T933 on quiz days
Copies of T930 (each student needs 1 set of numbers)
Copies of T931 (each pair/group needs 9 rectangles)
Scissors
Fact Masters Curtain
Colored pencils
Gridded index cards
Beans (81 per student pair)
2 cups for each pair
Paper clips
Hole punch
Masking tape
Phase 2 – T928, T929, T934, T935, T936–T942 and T943

Appendix B
Copies of T974 or T975 on quiz days
Copies of "TI/I" (total items/items) cards on
T969–T972 (These should be cut apart for distribution to partners.)
Copies of T973 (each pair/group needs 9 rectangles)
Scissors
Fact Master Curtain
Colored pencils
Beans (81 per student pair)
Masking tape
Gridded index cards
Hole punch
Paper clips
Phase 2 – T967, T968, T974, T975, T976, T977, T978–T984 and T985

Word Wall List

Lesson 1
S – Study the Problem
O – Organize the Facts

Lesson 2
L – Line up a Plan
addition
subtraction
multiplication
division
equals
incline
deposit
together
add
plus
increase
sum
and
total
rises
grow
above
all together
altogether
"How many"
withdraw
write a check
decline
take away
difference
left over
minus
below
decrease
subtract
"How much more?"
times
product
each
per
double

Lesson 2 (cont.)
triple
of
groups
multiplied
items
quotient
per equal groups
cut into
split
divide
is
same
equivalent
is equal to

Lesson 3
V – Verify Your Plan with Action
E – Examine Your Results

Lesson 4
decimal
tenths
hundredths
thousandths
place value
power of ten
exponent

Lesson 5
decimal
tenths
hundredths
thousandths
expanded form

Lesson 6
decimal
tenths
hundredths
thousandths

Word Wall List

Lesson 7
groups
items
arrays
open array
multiplication
product
factor
algorithm
partial product

Lesson 8
quotient
dividend
divisor
total items
items
groups

Lesson 9
decimals
addend
placeholder
place value chart
tenths
hundredths

Lesson 10
decimals
minuend
subtrahend
placeholder
place value chart
tenths
hundredths

Lesson 11
factor
product
decimal point
groups
items
tenths

Lesson 11 (cont.)
hundredths
multiplicand
multiplier

Lesson 12
dividend
divisor
quotient
decimal point
groups
tenths
hundredths

Lesson 13
verbal expression
numerical expression
operations
addition
subtraction
multiplication
division
sum
difference
product
quotient

Lesson 14
numerical expression
grouping symbols
evaluate
parentheses
brackets
braces

Lesson 15
ordered pair
pattern
sequence
coordinate plane
x-axis
y-axis
horizontal

Word Wall List

Lesson 15 (cont.)
vertical
scale
term

Lesson 16
numerator
denominator
fraction
halves
fourths
eighths
thirds
sixths
ninths
twelfths
fifths
tenths
equivalent
legal trade
whole unit

Lesson 17
addend
sum
denominator
numerator
equivalent
legal trade
simplest form

Lesson 18
subtrahend
minuend
difference
denominator
numerator
equivalent
simplify
simplest form
legal trade

Lesson 19
improper fraction
mixed number
numerator
denominator
addend
sum
subtrahend
minuend
difference
simplest form

Lesson 20
numerator
denominator
model
groups
items
product
factor

Lesson 21
fraction
factor
numerator
denominator
model
groups
items
product

Lesson 22
quotient
fraction
division
groups
items
simplified

Word Wall List

Lesson 23
quotient
dividend
divisor
fraction
division
whole number

Lesson 24
conversion
centimeter
meter
kilometer
gram
kilogram
liter
milliliter

Lesson 25
line plot
x-axis
y-axis
equal distribution

Lesson 26
unit cube
cubic unit
volume
length
width
height
rectangular prism

Lesson 27
unit cube
cubic unit
volume
length
width
height
rectangular prism
complex figure

Lesson 28
coordinate plane
origin
x-axis
y-axis
plot
coordinates
ordered pair
horizontal
vertical
scale
axis

Lesson 29
quadrilateral
rhombus
rectangle
square
trapezoid
parallelogram
adjacent sides
congruent sides
properties
perpendicular lines
right angle
parallel lines

Lesson 30
quadrilateral
rhombus
rectangle
square
trapezoid
parallelogram
triangle
congruent sides
properties
isosceles triangle
equilateral triangle
scalene triangle
parallel sides
polygon
congruent angles

Word Wall List

Lesson 30 (cont.)
pentagon
hexagon
octagon

Appendix A
groups
items
array

Appendix B
groups
items
dividend
divisor
quotient
total items