

Level

**C**



# The Key Elements to Mathematics Success

## Teacher's Edition

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# 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.

## Mathematics Success – Level C

T479

### LESSON 17: Fractions on a Number Line

#### [OBJECTIVE]

The student will plot fractions on a number line.

#### [PREREQUISITE SKILLS]

plotting whole numbers on a number line, basic understanding of fractions

#### [MATERIALS]

Student pages **S159 – S165**  
Transparencies **T488, T490, T492 and T494**  
Fraction strips – Kit 1 and Kit 2  
Overhead fraction kit  
Colored pencils

#### [ESSENTIAL QUESTIONS]

1. What is a fraction?
2. What are the parts of a fraction called, and what do they represent?
3. How can you create and plot a fraction on a number line?

#### [WORDS FOR WORD WALL]

fraction, numerator, denominator, number line, whole unit, interval

#### [GROUPING]

Whole Group (WG), Cooperative Pairs (CP), 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] (7 minutes – IP, I, WG) S159 (Answers are on T487.)

- Have students turn to S159 in their books to begin the Warm-Up. Students will plot whole numbers on a number line. 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. **{Pictorial Representation}**

#### [HOMEWORK] (5 minutes)

Take time to go over the homework from the previous night.

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

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.

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.

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.

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.

T480

## Mathematics Success – Level C

### LESSON 17: Fractions on a Number Line

#### [HOMEWORK] (5 minutes)

Take time to go over the homework from the previous night.

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

#### SOLVE Problem (3 minutes – WG, GP) T488, S160 (Answers on T489.)

Have students turn to S160 in their books, and place T488 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 draw number lines and plot fractions on number lines. They will use this knowledge to complete this SOLVE problem at the end of the lesson. **{SOLVE, Graphic Organizer}**

#### Fractions on a Number Line – Concrete to Pictorial (20 minutes – M, WG, GP, CP, IP) T488, S160 (Answers on T489.)

**14 minutes – M, WG, CP, GP:** Have students turn to S160, and place T488 on the overhead. Use the following modeling activity to introduce the concept of plotting fractions less than 1 on a number line. Designate the roles of Partner A and Partner B. **{Verbal Description, Concrete Representation, Pictorial Representation, Graphic Organizer}**

#### MODELING

Fractions on a Number Line – Concrete to Pictorial

**Step 1:** Explain to students that they are going to learn how to represent **fractions** such as  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{6}$ , and  $\frac{1}{8}$  on a **number line**.

- Partner A, place the  $\frac{1}{2}$  unit strip on the desk.
- Partner B, place the  $\frac{1}{2}$  strips underneath the 1 unit.
- Partner A, identify how many of the  $\frac{1}{2}$  strips are equivalent to 1 **whole unit**. (2)

**Step 2:** Have students look at the graphic organizer on S160.

- Partner A, identify the color of the 1 unit fraction strip. (blue)
- Partner B, identify the color of the  $\frac{1}{2}$  unit fraction strips. (brown)
- Partner A, identify the number of halves it takes to equal the whole unit. (2)
- Partner B, identify the number of halves it takes to equal the whole unit. (2)

**MODELING**

Fractions on a Number Line – Concrete to Pictorial

**Step 1:** Explain to students that they are going to learn how to represent **fractions** such as  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{6}$ , and  $\frac{1}{8}$  on a **number line**.

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**Step 2:** Have students look at the graphic organizer on S160.

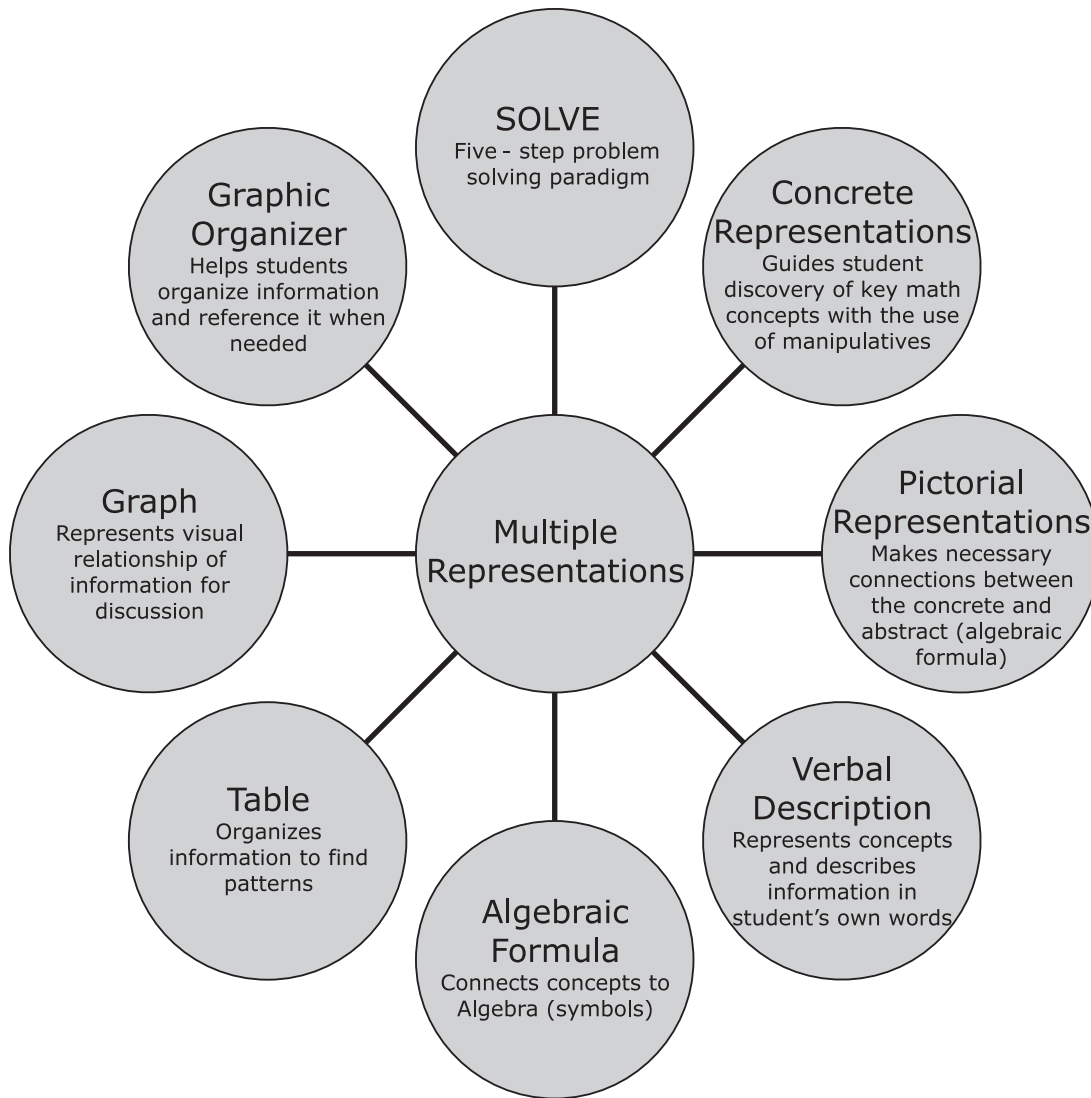
- Partner A, identify the color of the 1 unit fraction strip. (blue)
- Partner B, identify the color of the  $\frac{1}{2}$  unit fraction strips. (brown)
- Partner A, identify the number of halves it takes to equal the whole unit. (2)
- Partner B, identify the number of halves it takes to equal the whole unit. (2)

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 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.

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

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:

### S Study the Problem

Underline the question.

Answer the question, “What is this problem asking me to find?” in your own words.

### O Organize the Facts

Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts.

### L Line up a Plan

Choose an operation or operations.

Write in words what your plan of action will be.

### V Verify Your Plan with Action

Estimate your answer.

Carry out your plan.

### E Examine 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. – +, •, /

$$\frac{\text{number of nuts}}{\text{total}} + \frac{\text{number of bolts}}{\text{total}} = \frac{\text{total}}{\text{total}} \cdot \frac{\text{number of boxes}}{\text{total}} = \frac{\text{answer}}{\text{total}}$$

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](http://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	<ul style="list-style-type: none"> <li>Groupings used today - seating arrangements needed?</li> <li>Word Wall updates for this lesson?</li> <li>Agenda, Objective &amp; Essential Questions posted?</li> <li>Needed technology set up?</li> </ul>
Warm-up	_____ minutes	<ul style="list-style-type: none"> <li>What are some great questions to ask during the warm-up?</li> <li>How does this warm up relate to the lesson?</li> <li>How can this be modified to fit within the 5 minute time frame?</li> </ul>
Fact Masters	_____ minutes	<ul style="list-style-type: none"> <li>How will math facts be practiced today? (Group led, DVD, CD, quiz)</li> <li>What time in the lesson will it be done?</li> <li>Choral Drill or Quiz today?</li> </ul>
Lesson	_____ minutes	<ul style="list-style-type: none"> <li>What is the goal for today's lesson?</li> <li>What materials are needed?               <ul style="list-style-type: none"> <li>Is there an activity from the activities section of my TE that I will use to support this lesson?</li> </ul> </li> <li>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?</li> <li>How does this lesson fit in with my district pacing guide?</li> <li>How will this concept be enhanced with the traditional textbook?</li> <li>How will I instruct partners to work?</li> <li>Pages being covered today...</li> <li>Complete SOLVE Problem               <ul style="list-style-type: none"> <li>ASK: What is the question asking me to find? (beginning of class)                   <ul style="list-style-type: none"> <li>What are my facts?</li> <li>What is my plan? What operation is needed?</li> <li>Estimate an answer.</li> <li>Work out the answer.</li> <li>Check over work, choose answer.</li> </ul> </li> </ul> </li> <li>What graphic organizer/foldable will be made/referenced?</li> <li><u>If time permits...</u> <ul style="list-style-type: none"> <li>Will this section be used today?</li> <li>If so, how?</li> <li>How will I use the quiz for this lesson?</li> </ul> </li> </ul>
Closure	_____ minutes	<ul style="list-style-type: none"> <li>Essential Questions</li> <li>Homework assigned</li> </ul>

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 for each student)  
Stapler  
"S" poster from packet

**Lesson 2**

Foldable from Lesson 1  
"0" poster from packet  
Index card with  $\sqrt{\quad}$  and  $\times$  on both sides (1 per student pair)

**Lesson 3**

Foldable from Lesson 1  
"L" poster from packet  
Index cards

**Lesson 4**

Foldable from Lesson 1  
"V" poster from packet

**Lesson 5**

Foldable from Lesson 1  
"E" poster from packet

**Lesson 6**

Beans (2 per student pair)

**Lesson 7**

Beans (50 per student pair)  
Colored pencils

**Lesson 8**

Copies of T212 or T213 on quiz days  
Copies of T210 (1 set of numbers per student)  
Copies of T211 (1 per student pair)  
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 - T208, T209, T214, T215, T216-T222 and T223

**Lesson 9**

Beans (50 per student pair)  
Colored pencils

**Lesson 10**

Copies of T288 or T289 on quiz days  
Copies of "TI/I" (total items/items) cards on T283-T286  
Copies of T287 (1 per student pair)  
Scissors  
Fact Masters Curtain  
Colored pencils  
Beans (81 per student pair)  
Masking tape  
Gridded index cards  
Hole punch  
Paper clips  
Phase 2 - T281, T282, T288, T289, T290, T291, T292-T298, and T299

**Lesson 11**

Beans (50 per student pair)  
Colored pencils

**Lesson 12**

Centimeter cubes (24 per student pair)  
Colored pencils

**Lesson 13**

Two-colored counters (12 per student pair)  
Colored pencils

**Lesson 14**

Colored pencils  
Two-color counters (18 per student pair)

**Lesson 15**

Beans (16 per student pair)  
Colored pencils

**Lesson 16**

Fraction strips - Kit 1 and Kit 2  
Scissors  
Overhead fraction strips  
Plastic bag (1 per student)  
Colored pencils

**Materials List****Lesson 17**

Fraction strips – Kit 1 and Kit 2  
Overhead fraction kit  
Colored pencils

**Lesson 18**

Fraction strips – Kit 1 and Kit 2  
Overhead fraction kit  
Beans (4 per student pair)

**Lesson 19**

Toothpicks (2 per student pair)

**Lesson 20**

Large unit cube  
(1 per group of 4 students)  
Small unit cubes  
(100 per group of 4 students)

**Lesson 21**

Centimeter cubes  
(32 per student pair)  
Colored pencils

**Lesson 22**

Paper for foldable  
Colored pencils  
Sticky notes  
Scissors

**Lesson 23**

Painter's tape  
Sticky notes  
Foldable from Lesson 22

**Lesson 24**

Copy Master T685 (1 per six students)  
Copy Master T690 (1 copy – cut apart  
to pass out to students)  
Painter's tape  
Two-color counters (1 per student pair)  
Overhead two-color counters (1 per  
student pair)  
Fraction Kits 1, 2 and 3 (1 per student  
pair)  
Overhead fraction strips  
Foldable from Lesson 22

**Lesson 25**

Toothpicks (10 per student pair)  
Colored pencils  
Paper for foldable

**Lesson 26**

Toothpicks (10 per student pair)  
Colored pencils  
Foldable from Lesson 25

**Lesson 27**

Centimeter cubes (40 per student pair)

**Lesson 28**

3-inch sticky notes (4 per student pair)  
Colored pencils

**Lesson 29**

Transparency cut-outs of T838  
Copy Master T838 (1 per student pair)  
Scissors  
Glue

**Lesson 30**

Transparency of Copy Master T865  
Copy Master T865 (1 per student pair)  
Scissors  
Glue  
Colored pencils

**Appendix A**

Copies of T902 or T903 on quiz days  
Copies of T901 (each student needs 1  
set of numbers)  
Scissors  
Fact Masters Curtain  
Colored pencils  
Gridded index cards  
Beans (18 per student pair)  
Cups (2 per student pair)  
Hole punch  
Paper clips  
Masking tape  
Phase 2 – T899, T900, T904, T905,  
T906–T912, and T913

## Materials List

### Appendix B

Copies of T943 or T944 on quiz days  
Copy of of “Minuend/Subtrahend” cards  
on T939 – T942 for teacher (Cut apart  
for distribution to partners.)

Scissors

Fact Masters Curtain

Colored pencils

Beans (18 per student pair)

Masking tape

Gridded index cards

Hole punch

Paper clips

Phase 2 – T937, T938, T945, T946,  
T947–T953, and T954



**Word Wall List****Lesson 1**

S – Study the Problem

**Lesson 2**

O – Organize the Facts

**Lesson 3**

L – Line up a Plan

addition

subtraction

multiplication

division

equals

together

add

plus

increase

sum

and

total

rises

grow

above

all together

altogether

“How many”

take away

difference

left over

minus

below

decrease

subtract

How much more?”

times

product

each

per

double

triple

of

**Lesson 3 (cont.)**

groups

multiplied

items

quotient

per equal groups

cut into

split

divide

is

same

equivalent

is equal to

**Lesson 4**

V – Verify Your Plan with Action

**Lesson 5**

E – Examine Your Results

**Lesson 6**

round

place value

ones

tens

hundreds

digit

scale

**Lesson 7**

add

subtract

algorithm

addend

sum

minuend

subtrahend

difference

regroup

groups

items

inverse

**Word Wall List****Lesson 8**

groups  
items  
array

**Lesson 9**

groups  
items  
array  
multiply  
product  
factor

**Lesson 10**

groups  
items  
dividend  
divisor  
quotient  
total items

**Lesson 11**

groups  
total items  
items  
division  
quotient  
dividend  
divisor

**Lesson 12**

unknown value  
array  
multiply  
divide  
equation  
multiplication  
division  
fact family

**Lesson 13**

equation  
unknown number

division  
multiplication  
groups  
items  
total items

**Lesson 14**

equation  
unknown value  
equal sign

**Lesson 15**

pattern  
sum  
addend  
product  
factor  
odd  
even

**Lesson 16**

numerator  
denominator  
fractions  
halves  
fourths  
eighths  
thirds  
sixths  
equivalent  
legal trade  
whole unit

**Lesson 17**

fraction  
numerator  
denominator  
number line  
whole unit  
interval

**Word Wall List****Lesson 18**

equivalent fractions  
number line  
less than ( $<$ )  
greater than ( $>$ )  
equal ( $=$ )

**Lesson 19**

clock  
minute  
interval  
analog clock  
digital clock

**Lesson 20**

gram  
kilogram  
milliliter  
liter  
mass  
volume

**Lesson 21**

equation  
unknown value  
division  
multiplication  
groups  
items  
total items

**Lesson 22**

scale  
picture graph  
scaled picture graph

**Lesson 23**

scale  
bar graph  
scaled bar graph  
x-axis  
y-axis

**Lesson 24**

line plot  
x-axis  
y-axis

**Lesson 25**

perimeter  
formula  
units  
length  
width  
side

**Lesson 26**

area  
formula  
square units  
length  
width  
side

**Lesson 27**

area  
perimeter  
dimensions

**Lesson 28**

complex figure  
area  
non-overlapping

**Lesson 29**

quadrilateral  
attributes  
congruent  
right angles  
parallel sides  
rectangle  
square  
parallelogram  
rhombus  
trapezoid

**Word Wall List****Lesson 30**

unit fraction

area

**Appendix A**

addend

sum

**Appendix B**

minuend

subtrahend

difference