Livingston Public Schools

Empowering All to Learn, Create, Contribute, and Grow

FIFTH GRADE MATHEMATICS
PARENT GUIDE

SUMMER 2007

Livingston School District

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ACKNOWLEDGEMENTS

A group of hard working teachers labored during the summer of 2007 to create the **Fifth Grade Mathematics Parent Guide**. A concentrated effort was made to create a guide that would provide parents with a tool to help them better understand what their child is learning in his/her fifth grade mathematics class. It was also meant to be a tool to enable parents to help support their child's mathematical development in the home.

A very special thanks to Jim Diegnan, Lisa Fischer, June Volk, and Mitch Wasserman for their dedication, insight, perseverance, and many hours of creative work. The students, parents, and teachers in Livingston will benefit from the creation of the **Fifth Grade Mathematics Parent Guide**.

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INTRODUCTION TO THE FIFTH GRADE MATHEMATICS PARENT GUIDE

The fifth grade mathematics program in Livingston continues to strengthen a strong foundation of all of the basic arithmetic operations (addition, subtraction, multiplication, and division). The program also continues to develop a dynamic number sense which prepares the learners to be able to solve non-routine, real-life problems. Many topics, including data analysis, number sense, geometry and spatial sense, and algebraic thinking, are integral parts of the program and are intertwined as well as presented as stand-alone topics. The activities implemented throughout the fifth grade mathematics program are carefully sequenced so that the learners have the optimal opportunity to build self esteem and the “I can” attitude about solving any problem they are faced with in mathematics.

Each skill is introduced with a concrete exploration which means the students will be using manipulatives. After much work with manipulatives, the students will be ready to participate in the process that will help them take the knowledge they have gained working hands-on and apply it to the second stage of symbolic understanding which is the iconic stage. The iconic stage requires the students to form an image or visual model of the concept rather than use a physical object. The third stage helps the students come to understand that the pictures or images may be represented by numeric symbols. The students then can transfer their concrete understanding of the concept to the symbolic and work with the traditional as well as alternative algorithms. Because their actions are based on understanding, the students are now ready to record their mental images into the symbols we think of as “mathematics.”

It is important to realize that students do not become dependent on manipulatives but use them as a tool in the journey to achieve internal understanding and ownership of concepts. It is essential that if algorithms are to be understood, remembered, and applied in new situations, students must experience mathematics by engaging in all three stages of mathematical learning: the concrete, the iconic, and the symbolic. This process is at the heart of the instructional techniques upon which the mathematics program in Livingston is built.

Throughout the school year, the students will spend a short time each day working with *Calendar Math*, a series of activities centered around the calendar. The activities relate to some of the mathematical concepts that are most difficult for fifth graders to learn including fractions and decimals to the hundredths place, place value exchanges, and number theory such as factors and multiples. The fifth grade objectives for the concepts of geometry and measurement are also presented during *Calendar Math*. By working with patterns which are inherent in these concepts and gradually developing their understanding of them in small daily increments, students develop a profound understanding of the underlying mathematical principles. To achieve this goal, students observe various patterns as they develop and make mathematics predictions about them. The predictions are adjusted as more evidence becomes available, and finally, students determine the accuracy of their original thoughts when the month ends. By the end of the year, students will have dealt with the concepts so many times with increasing sophistication and in such small segments that they will come to a deep knowledge of challenging mathematical concepts.

The Fifth Grade Mathematics Parent Guide is meant to provide you, the parent, with the scope and sequence of the units presented in the fifth grade mathematics program. It contains an overview and a description of the "big picture" for each unit along with the math terminology that students will be expected to use and apply throughout each of the units. The parent guide also contains the processes/procedures/skills that the students will be expected to demonstrate proficiency of by the end of each unit. Detailed descriptions along with sample problems are included to help you understand the methods that your child will be using to acquire the skills presented throughout the fifth grade. Finally, a glossary of the vocabulary words incorporated throughout the year during *Calendar Math* and each of the units is provided for you. The goal of the parent guide is to provide you with a tool to help you understand what your child is learning in his/her math class, thus enabling you to support his/her mathematical development in the home.

DATA ANALYSIS UNIT

I. Unit Overview:

The main emphasis for this unit is to provide students with a foundation for and an exposure to a number of data displays. This unit provides an opportunity for students to collect, organize and display data using a variety of data displays and/or graphs. As they do so, students will experience drawing conclusions and making inferences and predictions about the data presented. The students will also gain a better understanding of the measures of central tendency and their importance in different sets of data and data displays. Students will learn how to choose an appropriate graph to best represent given data and explain the reasoning behind their decisions.

II. The "big picture" or major concepts focused upon throughout the unit:

1. Students will demonstrate an understanding that different graphs are used to represent different types of data. Students will then be able to select a graph to best represent a specific data set.

2. Students will be able to read, interpret, and construct a variety of graphs. Students will be able to draw conclusions and make inferences and predictions about the data presented.

3. Students will continue to experience determining the "middle" value in a set of data through their exposure to the measures of central tendency (MCT).

III. The "math terminology" that students will be expected to use and apply throughout the unit:

1. Vocabulary:

a. Data: Pieces of information being collected.

b. Survey: A tool used to collect data; questions that generate the data to be studied or gathered.

c. Table: A tool for organizing data.

d. Tally mark: A mark that represents the occurrence of the specific data in the table.

e. Frequency: The number of times a value occurs in a set of data.

f. Mean: An “evening or leveling” of data so all the numbers are the same.

g. Mode: The piece (or pieces) of data that appears most often in a set of data. There can be one mode, no mode, or multiple modes (more than one mode).

h. Median: The middle value in a set of data ***after*** all of the data has been arranged from least to greatest.

i. Range: The difference between the least and the greatest values in a set of data.

j. Outlier: A value in a set of data that is much larger or much smaller than the other values in the set of data.

k. Ordered pair: A pair of numbers that gives the coordinates of a point on a coordinate grid in the order (x, y) (horizontal, vertical).

l. Origin: The intersection of the x-axis and y-axis in a coordinate plane. The coordinates of the origin are (0,0).

m. Coordinates: An ordered pair of numbers that gives the location of a point on a coordinate grid. The x-coordinate tells you how many unit to move horizontally starting at the origin. The y-coordinate tells you how many units to move in the vertical direction.

2. Graphs:

a. Bar graph: A graph that uses bars to represent data. The bars can be vertical or horizontal. Usually a bar graph is used to compare data that fall into different categories. Examples of categorical information include types of cars, favorite sport, or favorite candy bar.

b. Double bar graph: A graph that uses bars to compares categories with 2 different groups or situations (girls/boys).

c. Pictograph: A graph that uses pictures or symbols to represent data. This type of graph is often used to compare larger amounts of data that fall into different categories. A pictograph contains a **KEY** with a symbol that represents a certain number of data pieces.

d. Circle graph: A graph that represents data using a circle divided into parts. This graph shows how numerical data relates to each other or to a whole.

e. Line graph: A graph that represents data using points connected with line segments. This graph is used to show how data changes over time. Examples of the type of data displayed on a line graph would include change in population, temperature, or profit and loss over time.

f. Double line graph: This line graph is used to represent 2 different events or situations representing change over time.

g. Line plot: A graph showing frequency of data on a number line. “X’s”, used as a form of tally marks, are placed vertically on a number line to display the spread of data or frequency of data. A line plot does not have a vertical axis. The mode and outliers can be clearly seen in the data which is displayed on a number line. This graph is used when there is a small amount of data and the range is relatively small as well. Examples of data displayed on this type of graph include test scores for a specific class or monthly temperature.

h. Stem and leaf plot: This graph is used when there is a lot of data and/or when the focus is on the specific intervals of where the data falls. Examples of data displayed on this type of graph include the heights (in cm.) of students in a class and student test scores for a sixth grade math teacher’s Period 2 class.

i. Back-to-back stem and leaf plot: This stem and leaf plot is used to compare two sets of similar data. Examples of data displayed on this type of graph include the heights (in cm.) of the girls in one class versus the boys in another class or student test scores for a math teacher’s Period 1 versus Period 2 class.

IV. The knowledge that students should have acquired *PRIOR* to the start of the unit:

1. Students should be able to identify the basic components of a graph: title, x-axis (categories), y-axis (frequency).

2. Students should be able to interpret the following graphs: pictograph, bar graph, line graph, and line plot.

3. Students should be able to locate, plot, and identify coordinates on a coordinate grid or map using ordered pair notation (x, y). Students should be able to construct a simple figure by connecting points given a series of ordered pairs.

4. Students should be able to interpret information from a map, grid, or table to solve problems.

V. The processes/procedures/skills that students will be expected to demonstrate proficiency of by the end of the unit:

1. Students will be able to calculate the measures of central tendency.

a. mean:

Ex. 1 11_{-2} 10 7 7 5_{+2}

9 10_{-3} 7_{+1} 7_{+1} 7_{+1}

9_{-1} 7_{+1} 8 8 8

8 8 8 8 8

Ex. 2 56_{+1} 57 58_{-1}

57 57 57

To find the **mean** for a set of data the students take from one number and give it to another number to create a "**leveling"** effect on the numbers. This process is continued until all of the numbers are the same. "Take from the rich and give to the poor."

To find the average, add up all the data and divide by the number of pieces of data you have:

Ex. 11 + 10 + 7 + 7 + 5 = 40 40 ÷ 5 = 8

The average is 8. The sum of the pieces of data equals 40, then divide by 5 because there are 5 pieces of data.

Ex. 56 + 57 + 58 = 171 171 ÷ 3 = 57

The average is 57. The sum of the pieces of data equals 171, then divide by 3 because there are 3 pieces of data.

b. mode:

Ex. 1 32, 40, 56, 70, 48, 32

32 is the mode.

Ex. 2 45, 67, 90, 45, 23, 67, 36

45 & 67 are the modes.

To find the **mode** for a set of data the students underline, box, or circle the numbers which are repeated most in the set of data. There can be one mode, two modes or no modes.

Ex. 3 32, 40, 56, 70, 48, 39

No mode.

In this example, each piece of data appears only once so there is no mode.

c. median:

Ex.1 85, 107, 52, 99, 76

~~52~~, ~~76~~, 85, ~~99~~, ~~107~~

85 is the median (middle number).

For an **odd** set of data:
1. Rearrange the data set from least to greatest.
2. Cross off the least and greatest number from the data set. (52 & 107)
3. Continue this process until the middle piece of data remains (median). 76 & 99 are crossed off, 85 remains as the median.

In an even set of data, the mean of the middle two (2) values is the median.

Ex. 2 107, 99, 52, 89, 76, 85

~~52~~, ~~76~~, 85, 89, ~~99~~, ~~107~~

85 and 89 are the 2 remaining middle values.

85^{+2} 89^{-2} level the data so they are the same = 87

OR

85 + 89 = 174 174 ÷ 2 = 87

For an **even** set of data:
1. Rearrange the data set from least to greatest.
2. Cross off the least and greatest number from the data set. (52 & 107)
3. Continue this process until the two middle pieces of data remain. 76 & 99 are crossed off; 85 and 89 remain.
4. “Level” the remaining two numbers or add them together and divide.

d. range:

Ex. 85, 107, 52, 99, 76

52, 76, 85, 99, 107

107 – 52 = 55

range = 55

To find the **range:**
1. Rearrange the data set from least to greatest.
2. Subtract the smallest piece of data from the largest piece of data.
3. The difference between these two numbers is the range.

e. outlier:

Ex. 107, 99, 52, 89, 76, 85, 2

2, 52, 76, 85, 89, 99, 107

2 is the outlier because it is much smaller than the smallest piece of data in the set.

To identify an **outlier:**
1. Rearrange the data set from least to greatest.
2. Look for a piece of data that is much greater or much smaller than all of the other pieces of data.

2. Students will be able to understand the importance of the measures of central tendency used in a variety of careers.

Examples of careers which use measures of central tendency:

a. mean:

Sports statistics: Batting averages; pitching averages. Averages are used to measure a player's performance individually and in relationship to the whole league.

Marketing/Sales: Average number of specific products sold in a specific time period. This average can help identify trends or patterns in sales.

Teachers: Average test grades for a marking period; average class grade for a specific test. These averages help teachers measure a student's performance individually and compared to the whole.

Stock Broker: Average profit and loss; average sale price of a specific stock. This average measures how well a company or a stock is performing.

Meteorologist: Calculates the average rainfall for a period of time; the average temperature for a period of time. These averages are important in tracking elements of weather over a period of time.

b. median:

Real estate: Median value of property. This value is important when deciding to purchase a house in a specified area.

Personnel Departments in companies: Median salary in a company. This information is helpful when deciding to take to a job for a specific company.

c. mode:

Family Feud/Marketing survey: Tracks the answer/s that appear the most often. This will measure the number of times the same answer occurs in a set of data.

Retail stores: Tracks what product/s or size/s sold the most. Knowing what product sold the most is important so the store will keep the item/s clients want the most in stock.

Stock person: Tracks what product/s sell the most. This is important for a stock person so he/she will keep shelves stocked with the desired product/s. This keeps customers loyal; they will continue to shop at the store where the products are readily available.

Meteorologist: Reports the temperature that occurs the most in a specified time period. This information is important in making predictions for future temperature trends.

d. range:

Stock Broker: Measures profit and loss for a stock. This information helps track the amount of money a stock has increased or decreased over a specified time.

Meteorologist: Calculates the difference between the high and low monthly temperatures. This information helps to track the difference between the highest and lowest temperatures for a specified period of time.

<u>Teacher</u>: Range of test scores.
This identifies for a teacher the difference between the highest and the lowest scores for a specific test.

Please Note: The students will become proficient in the following skills through a variety of activities presented in class. Please refer to your child's math notebook/journal for examples of specific graphs, tables, and grids discussed in class.

3. Students will be able to read, interpret, analyze, and calculate the measures of central tendency (MCT) on a graph.

4. Students will be able to collect, organize, and display data generated from surveys.

5. Students will be able to read, interpret, generate questions about, draw inferences, and make predictions from different displays of data.

6. Students will be able to construct graphs including: double bar graph, double line graph, stem and leaf plot, and back-to-back stem and leaf plot.

7. Students will be able to choose an appropriate graph to represent data.

8. Students will be able to describe a set of data using a variety of mathematical terms.

9. Students will be able to locate, plot, and identify coordinates on a coordinate grid or map using ordered pair notation (x, y). The students will be able to construct simple figures on a coordinate grid.

10. Students should be able to interpret information from a map, grid, or table to solve problems.

NUMBER SENSE UNIT

I. Overview:

The student's ability to recall a place value chart and name the place value of a specific digit, while important, is not the only major focus of this unit. Rather, as students continue to use symbols to read, write, compare, and order numbers up to and including nine digits, they should be able to form a visual model and/or reflect on the concrete model of "Modeling a Million" they created in fourth grade. Students should be able to apply their understanding of the place value system and extend it to the concept of "One Billion" through the activity, "Were you alive 1 million seconds ago? One billion seconds ago?" Working through this activity helps students appreciate the difference in the size of numbers and exposes them to the magnitude of the numbers in our place value system. The concept of an exponent is introduced to help students represent the large numbers they are working with. Through warm-ups, slate activities, games, and calculator activities, students are provided with many opportunities to internalize the relationships between various numbers so they can easily recognize that there are 1,000 millions in one billion or 100 ten millions in one billion.

II. The "big picture" or major concepts focused upon throughout the unit:

1. Students will be able to demonstrate a conceptual understanding of real world applications of numbers up to and including the hundred billions. Students will be able to list items/things in the real world associated with billions such as: distance in miles in the solar system, salaries of famous people, population of a given location, etc.

III. The "math terminology" that students will be expected to use and apply throughout the unit:

1. Vocabulary:

a. Addends: The numbers used in an addition problem.

b. Sum: The answer to an addition problem.

c. Addition facts: An addition sentence that shows the sum of two 1-digit numbers.

d. Difference: The answer to a subtraction problem
56 → minuend (The number you subtract from)
-39 → subtrahend (The number you SUBTRACT – sub implies “under”. The subtrahend is the number on the bottom or under the minuend.)

e. Even number: Even numbers are the numbers you name when you skip count by two’s. Even numbers are numbers that can be formed by “making pairs.” Even numbers end in 0, 2, 4, 6, or 8.

f. Odd number: When you try to put an odd number of things into pairs, there is always one left over.
Odd numbers end in 1, 3, 5, 7, or 9.

g. Ordinal number: An ordinal number can be used to tell you the position of people or things that are in order.

h. Periods: The groups of three place values on the number chart. Commas are used to separate the periods when writing large numbers.

i. Standard form: A number written with one digit for each place value. The standard form for the number three thousand five hundred twenty-three is 3,523.

j. Word form: The value of a number written in words. The word form for the number 3,523 is three thousand five hundred twenty-three.

k. Short Word form: The value of a number written using a combination of digits and words. The short word form for 35,768,421 is 35 million 768 thousand 421.

l. Expanded form: A way to write numbers that shows the value of each digit. The expanded form for 56,319 is
50,000 + 6,000 + 300 + 10 + 9.

m. Expanded notation: A way to write numbers that shows each digit times the corresponding place value. The expanded notation for 56,319 is
$(5 \bullet 10{,}000) + (6 \bullet 1{,}000) + (3 \bullet 100) + (1 \bullet 10) + (9 \bullet 1)$.

n. Exponent: A short way of writing $10 \bullet 10$ is 10^2. The 2 is called the exponent. The 10 is called the base number. The 2 tells us how many times to use the base number as a factor.

o. Exponential notation: A way of writing a number using exponents. The exponential notation for 56,319 is $(5 \bullet 10^4) + (6 \bullet 10^3) + (3 \bullet 10^2) + (1 \bullet 10^1) + (9 \bullet 10^0)$.

p. Opposites: Opposites are two numbers the same distance away from zero on opposite sides of the number line. 5 and -5 are opposites.

q. Integers: The set of whole numbers {0, 1, 2, 3, 4, 5,…} and their opposites. The roster of the set of integers – {… -3, -2, -1, 0, 1, 2, 3,…}.

r. Variable: A symbol, (usually a letter) that represents a number.

s. Open sentence: A mathematical sentence that contains a variable. It is called an open sentence because until you know what the value of the variable is, you can't tell whether the sentence is true or false.

t. Function: Pairs of numbers that follow a rule. In a function there is only one "OUT" number for an "IN" number.

2. **Symbols**

<	less than
>	greater than
=	equal to
≠	not equal to
≈	is approximately equal to

IV. The knowledge that students should have acquired *PRIOR* to the start of the unit:

1. Students should be able to demonstrate a conceptual understanding of real world applications of numerals up to and including hundred millions. For example, students should be able to list items in the real world associated with millions such as the population of NJ and salaries of famous athletes and entertainers.

2. Students should be able to add and subtract whole numbers through the millions period.

3. Students should be able to demonstrate an understanding of place value concepts through the millions period.

4. Students should be able to demonstrate an understanding of and apply the concept of rounding.

V. The processes/procedures/skills that students will be expected to demonstrate proficiency of by the end of the unit:

1. Students will be able to demonstrate a conceptual understanding of place value concepts using counting, grouping, and pattern identification through the hundred billions (12 digits).

2. Students will properly name each of the **periods** up to and including billions.

   Ex. 450,876,003,120

billions	**millions**	**thousands**	**ones**
450	876	003	120

Please Note: As a numeral is read aloud, each period is stated except for the ones period.

3. Students will read, write and identify numerals up to and including twelve digits (hundred billions).

   Ex. 934,678,090,201
   nine hundred thirty-four billion six hundred seventy-eight million ninety thousand two hundred one

4. Students will be able to write a numeral in *expanded form, short word form, and expanded notation* up to and including twelve digits (hundred billions).

   Ex. 934,678,090,201

   <u>Expanded form:</u> 900,000,000,000 + 30,000,000,000 + 4,000,000,000 + 600,000,000 + 70,000,000 + 8,000,000 + 90,000 + 200 + 1

   <u>Short word form:</u> 934 billion 678 million 90 thousand 201

   <u>Expanded notation:</u> $(9 \bullet 100{,}000{,}000{,}000) + (3 \bullet 10{,}000{,}000{,}000) + (4 \bullet 1{,}000{,}000{,}000) + (6 \bullet 100{,}000{,}000) + (7 \bullet 10{,}000{,}000) + (8 \bullet 1{,}000{,}000) + (9 \bullet 10{,}000) + (2 \bullet 100) + (1 \bullet 1)$

5. Students will be able to define an **exponent** as a number that tells how many times the base number is used as a factor.

   Ex. $10^2 = 10 \bullet 10$ The base number is 10; the exponent is 2.

   $4^3 = 4 \bullet 4 \bullet 4$ The base number is 4; the exponent is 3.

6. Students will be able to write repeated multiplication in exponential form with a variety of bases. Students will be able to calculate the value of exponential expressions.

Ex. 1 $10 \bullet 10 \bullet 10 \bullet 10 = 10^4$

$6 \bullet 6 \bullet 6 \bullet 6 \bullet 6 = 6^5$

Ex. 2 $10^3 = 10 \bullet 10 \bullet 10 = 1{,}000$

$5^2 = 5 \bullet 5 = 25$

7. Students will demonstrate a conceptual understanding of zero as an exponent. Any base to the zero power equals one.

Ex. $10^0 = 1$ Explanation: $10^2 = 100$
$(100 \div 10)$
$10^1 = 10$
$(10 \div 10)$
$10^0 = 1$

$5^0 = 1$ Explanation: $5^2 = 25$
$(25 \div 5)$
$5^1 = 5$
$(5 \div 5)$
$5^0 = 1$

8. Students will be able to relate the position of place value to a power of 10.

Ex. $1{,}000 = 10^3$
$1{,}000{,}000 = 10^6$

9. Students will be able to write a numeral using exponential notation (using exponents).

Ex. 675,908,274 is written as:
$(6 \bullet 10^8) + (7 \bullet 10^7) + (5 \bullet 10^6) + (9 \bullet 10^5) + (8 \bullet 10^3) + (2 \bullet 10^2) + (7 \bullet 10^1) + (4 \bullet 10^0)$

Please Note: Each power of 10 is equal to a corresponding place value.

10^0 is the ones place
10^1 is the tens place
10^2 is the hundreds place
10^3 is the thousands place

10. Students will be able to write a numeral in standard form given the exponential form:

    a. Ex. The place value is in descending order
    $(5 \bullet 10^9) + (9 \bullet 10^5) + (7 \bullet 10^3) + (6 \bullet 10^2) + (4 \bullet 10^0)$

    The greatest exponent is 9, so the standard form of the number must have 10 digits. The number of digits in the standard form of the number is always one higher than the greatest exponent. Students should use dashes to mark the number of digits.
    _, _ _ _, _ _ _, _ _ _   5,000,907,604

    b. Ex. The place value is mixed up
    $(7 \bullet 10^4) + (4 \bullet 10^7) + (3 \bullet 10^0) + (6 \bullet 10^8) + (8 \bullet 10^1)$

    Again, the greatest exponent plus one will tell the number of digits in the numeral. Students should use dashes to mark the number of digits for proper placement of place value.
    _ _ _, _ _ _, _ _ _   640,070,083

11. Students will be able to round a whole number to an indicated place value through the hundred billions.

    Rounding rules: If the digit to the right of the desired place value is 0, 1, 2, 3, or 4, then the desired place value stays the same. If the digit to the right of the desired place value is 5, 6, 7, 8, or 9, then the desired place value is rounded up.

    Ex. 765,987,432 Round to the nearest ten thousand.

    $765{,}9\underline{8}7{,}432$

    $765{,}9\underline{8}\textcircled{7}{,}432$

    765,990,000

    1. Underline the place value we are rounding to which is the ten thousands place (8).
    2. Circle the number immediately to the right of the underlined number which is the thousands place (7).
    3. According to the rounding rules, the 8 is rolled/pushed up to a 9 because the 7 is closer to the next ten thousand.

Ex. 2,599,984,320 Round to the nearest hundred thousand.

$2{,}599{,}\underline{9}84{,}320$

$2{,}599{,}\underline{9}\textcircled{8}4{,}320$

2,600,000,000

1. Underline the place value we are rounding to which is the hundred thousands place (9).
2. Circle the number immediately to the right of the underlined number which is the ten thousands place (8).
3. The 8 in the ten thousands makes the 9 in the hundred thousands place become a ten which means the 9 "rolls" to a 0. This is the process we call "rolling nines."

12. Students will be able to find the greatest common factor (GCF) and the least common multiple (LCM) of two numbers.

Ex. Find the GCF for 48 and 72

48 – {①,②,③,④,⑥,⑧,⑫,16,㉔,48}

72 – {①,②,③,④,⑥,⑧,9,⑫,18,㉔,36,72}

1. List all of the factors for both numbers.
2. Circle the common factors, and choose the greatest one.
3. 24 is the greatest Common Factor (GCF).

Ex. Find the LCM for 12 and 15

15: 15, 30, 45, (60)
12: 12, 24, 36, 48, (60)

1. List the multiples of the greater number.
2. List the multiples of the lesser number and stop when a common multiple is found.
3. 60 is the Least Common Multiple (LCM).

MULTIPLICATION UNIT

I. Unit Overview:

The main emphasis for this unit is for students to master their conceptual understanding of multiplication. Students continue to experience multiplication in a variety of ways such as groups of objects, patterns of numbers, repeated addition, and the area of a rectangle or square. Doing so helps the student continue to acquire meaning for the multiplication facts. Multiplication algorithms of 2 digits x 1 digit, 3 digits x 1 digit, and 2 digits x 2 digits are reinforced. The multiplication algorithm of 3 digits x 2 digits is introduced. Students are exposed to three different multiplication methods which include partial product, area model, and the traditional method. Students explore which method is easiest and most accurate for them to use given the factors in a specific problem and their individual learning styles. However, all students must demonstrate proficiency in using the traditional method to multiply as that is the most common method that is used throughout many school systems.

II. The “big picture” or major concepts focused upon throughout the unit:

1. Students will be able to define/model/represent the concept of multiplication in three different ways:

   a. As “groups of objects/items”

      Ex. 3 x 5 is read as 3 groups of 5 items

      Ex. 5 x 3 is read as 5 groups of 3 items

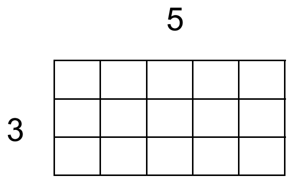
   b. As “repeated addition”

      Ex. 3 x 5 is equal to 5 + 5 + 5

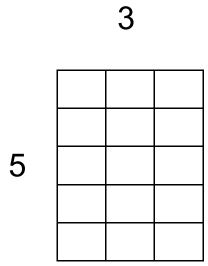
      Ex. 5 x 3 is equal to 3 + 3 + 3 + 3 + 3

   c. As a “model for area” in the form of an array

      Ex. 3 x 5 represents an array with 3 rows (horizontal) and 5 columns (vertical)



Ex. 5 x 3 represents an array with 5 rows (horizontal) and 3 columns (vertical)



III. The “math terminology” that students will be expected to use and apply throughout the unit:

1. Vocabulary:

a. Factor: The numbers used in a multiplication problem **OR** A factor of a given number is any number that divides evenly into a given number with ***no remainder***.

b. Product: The answer to a multiplication problem.

c. Prime number: A number that has only two factors: the number 1 and itself.

d. Composite number: A number that has more than 2 factors.

e. #1: The number 1 is neither prime nor composite because it has only 1 factor: itself.

f. Multiple: A multiple of a given number is the product of that number and any natural number (counting numbers).

Ex. The multiples of 4 are 4, 8, 12, 16, 20, 24, etc.
because 1 • 4 = 4, 2 • 4 = 8, 3 • 4 = 12,
4 • 4 = 16, 5 • 4 = 20, 6 • 4 = 24, etc.

g. Array: A rectangular arrangement of objects with an equal number of objects in each row.

h. PeRIMeter: The distance around the RIM of a figure.

i. Area: The measure of covering inside a figure. It is measured in square units. You count the square units that cover the inside of the figure.

j. Divisibility: The first number is divisible by the second number if the second number divides into the first number ***evenly with no remainder.***

k. Zero Property: The product of any number and zero is zero.
For any number n, $n \bullet 0 = 0$. Ex. $5 \bullet 0 = 0$.

l. Identity Property/Identity Element for Multiplication: The product of any number and one is the same as that number.
For any number n, $n \bullet 1 = n$. Ex. $5 \bullet 1 = 5$.

m. Commutative Property or "Turn Around Rule": ***Changing the order*** of the factors does not change the product.
For all numbers, a and b, $a \bullet b = b \bullet a$.
Ex. $2 \bullet 3 = 3 \bullet 2$.

n. Associative Property: ***Changing the grouping of three or more factors*** does not change the product.
For all numbers, a, b, and c, $(a \bullet b) \bullet c = a \bullet (b \bullet c)$
Ex. $(3 \bullet 4) \bullet 5 = 3 \bullet (4 \bullet 5)$
$12 \bullet 5 = 3 \bullet 20$
$60 = 60$

IV. The knowledge that students should have acquired *PRIOR* to the start of the unit:

1. Students are required to memorize multiplication facts up to and including 12 x 12. Students should be able to state the multiplication/division fact families through the 12 times table.

2. Students should be able to list the prime numbers 1 through 50. The list is as follows: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, and 47.

3. Students should be able to state the divisibility rules for the given numbers: 2, 3, 5, 6, 9, and 10. Given a number, students should be able to determine which number(s) the given number is divisible by.

There are 3 categories that the divisibility rules fall into:

a. Look at the last digit – Rules for 2, 5, and 10.

Rule for 2: If the number ends in 0, 2, 4, 6, or 8, it is divisible by 2. All even numbers are divisible by 2.

Rule for 5: If the number ends in a 0 or 5, it is divisible by 5.

Rule for 10: If the number ends in a 0, it is divisible by 10.

b. **Sum of the digits – Rules for 3 and 9**

Rule for 3: Add the digits. If the sum of the digits is divisible by 3, then the entire number is divisible by 3.
Ex. 1,041 – Add the digits: 1 + 4 + 1 = 6. Check: Is 6 divisible by 3? Yes. So the entire number of 1,041 ***is*** divisible by 3.

Ex. 1,042 – Add the digits: 1 + 4 + 2 = 7. Check: Is 7 divisible by 3? No. So the entire number of 1,042 ***is not*** divisible by 3.

Rule for 9: Add the digits. If the sum of the digits is divisible by 9, then the entire number is divisible by 3.
Ex. 1,935 – Add the digits: 1 + 9 + 3 + 5 = 18. Check: Is 18 divisible by 3? Yes. So the entire number of 1,935 ***is*** divisible by 9.

Ex. 1,936 – Add the digits: 1 + 9 + 3 + 6 = 19. Check: Is 19 divisible by 9? No. So the entire number of 1,936 ***is not*** divisible by 9.

c. **Product of the factors – Rule for 6:** If a number is divisible by ***2 and 3***, then it is divisible by 6.

Ex. 2,016. Check: Is the number divisible by 2? Yes because it is even and ends in a 2. Check: Is the number divisible by 3? Add the digits: 2 + 1 + 6 = 9. 9 is divisible by 3 so 2,016 is divisible by 3. 2,016 is divisible by ***both 2 and 3*** so it is divisible by 6.

Ex. 2,018. Check: Is the number divisible by 2? Yes because it is even and ends in an 8. Check: Is the number divisible by 3? Add the digits: 2 + 1 + 8 = 11. 11 ***is not*** divisible by 3 so 2,018 ***is not*** divisible by 3. 2,016 ***is not*** divisible by ***both 2 and 3*** so it ***is not*** divisible by 6.

V. The processes/procedures/skills that students will be expected to demonstrate proficiency of by the end of the unit:

1. Students will be able to multiply numbers by multiples of 10, 100, 1000, etc.

Ex.1 $\boxed{6}00 \bullet \boxed{5} = \boxed{3{,}0}00$

$\boxed{8}{,}000 \bullet \boxed{12}{,}000 = \boxed{96}{,}000{,}000$

$\boxed{5}00 \bullet \boxed{8}{,}000 = \boxed{40}0{,}000$

1. Draw a box around the non-zero digits in each factor.
2. Multiply the boxed factors and write their product.
3. Count the zeros in each factor.
4. Record the total number of zeros in the factors and write them in the product.

Ex. 2 $\boxed{4}00 \bullet \underline{\qquad\qquad} = \boxed{3{,}6}00{,}000$

1. Draw a box around the non-zero digits in both the factor and the product.
2. Determine the unknown factor. In this case, 4 x ___ = 36 or 36 ÷ 4 = ____.
3. Write the unknown factor on the line, in this case 9.
4. Count the number of zeros in the product and subtract the number of zeros in the original factor to determine how many zeros are needed in the unknown factor. In this case, there are 5 zeros in the product minus 2 zeros in the original factor leaving 3 zeros to be included in the unknown factor.
5. Answer: 400 • $\underline{9000}$ = 3,600,000

Ex. 3 $\boxed{8}$,000 • ________ = $\boxed{4,0}$00,000

1. Draw a box around the non-zero digits in both the factor and the product. However, in this example, the box in the product must include 40 because 8 is not a factor of 4, but it is a factor of 40. Obviously, 4 is not divisible by 8.
2. Determine the unknown factor. In this case, 8 x ___ = 40 or 40 ÷ 8 = _____.
3. Write the unknown factor on the line, in this case 5. Count the number of zeros in the product and subtract the number of zeros in the original factor to determine how many zeros are needed in the unknown factor. In this case, there are 5 zeros in the product (**do not** include the zero in 40) minus 3 zeros in the original factor leaving 2 zeros to be included in the unknown factor.
4. Answer: 8,000 • <u>500</u> = 4,000,000

2. Students will be able to estimate products.

Students round the factors in the problem to the nearest 10, 100, 1000, etc. to make **“friendly numbers”** – numbers they can work with mentally. Then multiply to compute an estimated product.

Ex. 346 • 18

300 • 20 = 6,000

1. Round 346 to 300
2. Round 18 to 20
3. Multiply 300 • 20 = 6,000

The estimated product of 6,000 allows the students to check the “reasonableness” of their actual product.

3. Students will be able to multiply numbers using three different methods.

a. Partial Product:

With this method, the students multiply each place value and record its product. Then add the partial products for a final product.

Ex.

346	(think: 300 + 40 + 6)
x 18	(think: 10 + 8)
48	(8 x 6)
320	(8 x 40)
2,400	(8 x 300)
60	(10 x 6)
400	(10 x 40)
+ 3,000	(10 x 300)
6,228	

b. Area Model:

With this method, the students multiply the value of each digit and record the product in the appropriate box. Then total each column and add across for a final product.

Ex. 346 x 18

	300	40	6
10	3,000	400	60
8	2,400	320	48

5,400 + 720 + 108 = 6,228

c. Traditional Method:

With this method, the students regroup as they multiply. All fifth grade students are expected to master this method of multiplication.

Ex.: 346 x 18

~~3 4~~
346
x 18
2,768 (8 x 346)
\+ 3,46**0** (put a zero in the one's place as a place
6,228 value holder, then multiply 1 x 346)

4. Students will solve application word problems using the *Four Step Problem Solving Method.*

Steps:

1. FIND OUT: This step includes identifying what question must be answered to solve the problem. In some cases the problem may be broken up into smaller problems until the larger problem can be solved. Students use a variable to represent the unknown quantity in the problem.

2. CHOOSE A STRATEGY / WRITE AN EQUATION: Students determine the process/strategy to be used to compute the answer to the problem. They express this process in the form of an equation.

3. SOLVE IT: Students work out the solution to the problem. This is where they record their work.

4. LOOK BACK: Students reflect/evaluate the work they have done to be sure it is correct. They answer the question from Step 1 in a complete sentence with a label.

Ex.: John and Sally went apple picking. They filled 25 baskets with apples and each basket held 235 apples. How many apples did they pick?

1. **Find out**: Let P = the number of apples they picked.

2. **Pick a strategy and write an equation**: Use multiplication: 235 x 25 = P

3**. Solve it**: Students can use the multiplication method of their choice to solve this problem. All work must be recorded.

4. **Look Back**: After reviewing their work and evaluating their accuracy, students write a complete sentence to answer the question, “How many apples did they pick?” using a label. They picked 5,875 apples.

DIVISION UNIT

I. Unit Overview:

The main emphasis for this unit is for students to master their conceptual understanding of division. Students continue to experience division in a variety of ways such as fair sharing, making equal groups, and repeated subtraction. Students will demonstrate the various ways to represent a division problem. Division algorithms of 2 digits ÷ 1 digit and 3 digits ÷ 1 digit are reinforced. The division algorithm of 2 digits ÷ 2 digits and 3 digits ÷ 2 digits are introduced. Students are exposed to two different division methods which include the traditional method and the short division method. Students explore which method is easier and more accurate for them to use given the factors in a specific problem and their individual learning styles. All students must demonstrate proficiency in using the traditional method to divide, as that is the most common method that is used throughout many school systems.

II. The "big picture" or major concepts focused upon throughout the unit:

1. Students will be able to define/model/represent the concept of division in three different ways:

   a. As "fair sharing"

      Ex. Sally has 27 marbles. She wants to share them with 4 friends. How many marbles will each person receive?

      Sally would distribute the marbles **one at a time** to each person until she gave out all of the marbles. In this case, each person would receive 5 marbles, and there would be a remainder of 2 marbles.

   b. As "making equal groups"

      Ex. John is placing students in groups to create different basketball teams. Five students are needed for each team. If thirty-five students are interested in playing basketball, how many teams can John create?

      John would assign five players **at one time** to make a team. He would repeat this process as many times as possible until he cannot make a complete team. John can make 7 complete teams with no remainder. All students were assigned to a team.

c. As “repeated subtraction”

Ex. $5\overline{)15}$ is the same as:

$$\begin{array}{r} 15 \\ \underline{-\ 5} \\ 10 \\ \underline{-\ 5} \\ 5 \\ \underline{-\ 5} \\ 0 \end{array}$$

The number five (5) can be subtracted from fifteen (15) three (3) times, so 15 ÷ 5 = 3.

2. Students will be able to express division using three different formats:

a. Using the math symbol:

Ex. $\begin{array}{r} 8 \\ 9\overline{)72} \end{array}$ $5\overline{)2}$

b. As a fraction:

Ex. $\frac{72}{9} = 8$ $\frac{2}{5}$

c. As a division sentence:

Ex. 72 ÷ 9 = 8 2 ÷ 5

III. The “math terminology” that students will be expected to use and apply throughout the unit:

1. Vocabulary:

a. Dividend: The total number that you start with before fair sharing or making equal groups.

b. Divisor: The number of equal groups.

c. Quotient: The answer to a division problem.

d. Remainder: The amount leftover after “fair sharing” or “making equal groups”.

e. Divisibility: The first number is divisible by the second number if the second number divides into the first number ***evenly with no remainder***.

2. Special Cases of Division:

a. Division by zero is meaningless or undefined. This means that zero can never be used as a divisor or placed in the denominator of a fraction.

Ex. 7 ÷ 0 = meaningless or undefined

Ex. $0\overline{)7}$ meaningless or undefined

Ex. $\frac{7}{0}$ = meaningless or undefined

b. Division by one – any number divided by one is equal to itself:

Ex. 7 ÷ 1 = 7

Ex. $\begin{array}{r} 7 \\ 1\overline{)7} \end{array}$

Ex. $\frac{7}{1}$ = 7

c. Division by a divisor equal to the dividend equals one:

Ex. 7 ÷ 7 = 1

Ex. $\begin{array}{r} 1 \\ 7\overline{)7} \end{array}$

Ex. $\frac{7}{7}$ = 1

3. Treatment of Remainders:

Students must be able to interpret remainders as they apply to “real world” phenomena. It is extremely important for the students to understand what the remainder represents in order for them to interpret what to do with it.

There are three different ways to interpret remainders:

a. Keep the remainder – The actual answer requires the remainder. Whenever problems are presented with money, this interpretation prevails.

Ex. John and his three brothers are buying a birthday gift for their mother. The gift costs $162 including tax. How much will each brother need to contribute to buying the gift?

FOUR STEP PROBLEM SOLVING METHOD:

Step 1. Let P = $ each brother has to contribute

Step 2. $162 ÷ 4 = P

Step 3. Show your work.

$\$162 \div 4 = \$40\frac{2}{4} = \$40\frac{1}{2}$

The remainder of $\frac{1}{2}$ represents money, so it needs to be translated into $0.50 for the final answer.

Step 4. Recheck calculation.

Answer: Each brother must contribute $40.50 to purchase the gift.

b. <u>Ignore or Drop the remainder</u> – This interpretation prevails when it doesn't make sense to include the remainder in the actual answer. Examples of this would include determining age, purchasing items, sharing items, etc.

Ex. Chelsea had \$67 to spend on DVDs. At the store, each DVD sold for \$7. How many DVDs could Chelsea purchase?

FOUR STEP PROBLEM SOLVING METHOD:

Step 1. Let P = the # of DVDs that can be purchased

Step 2. $\$67 \div 7 = P$

Step 3. Show your work.

$\$67 \div 7 = 9\frac{4}{7}$

The remainder of $\frac{4}{7}$ represents part of a DVD, so it needs to be ignored or dropped from the final answer. $\frac{4}{7}$ of a DVD cannot be purchased.

Step 4. Recheck calculation.

Answer: Chelsea can purchase 9 DVDs.

c. <u>Round up</u> – This interpretation prevails in situations where the remainder in a problem must be rounded up to the next whole number. Example situations include calculations to accommodate a given number of people or items.

Ex. The class trip to Medieval Times is scheduled in June. There are 78 students, 11 chaperones, and 5 teachers. The school bus seats 42 people. How many buses will be needed to transport everyone to Medieval Times?

FOUR STEP PROBLEM SOLVING METHOD:

Step 1. Let x = the # of buses needed for everyone

Step 2. $78 + 11 + 5 = y$ (y= the total number of people on the trip)

$y \div 42 = x$

Step 3. Show your work.

$78 + 11 + 5 = 94$

$94 \div 42 = 2\frac{10}{42}$

The remainder of $\frac{10}{42}$ represents 10 more people who need to be seated on a bus. In order to accommodate the additional 10 people, another bus will be needed. The answer needs to be rounded up to 3 for the final answer.

Step 4. Recheck calculation.

Answer: Three buses will be needed to transport everyone to Medieval Times.

IV. The knowledge that students should have acquired *PRIOR* to the start of the unit:

1. Students are required to memorize division facts up to and including 144 ÷ 12. Students should be able to state the multiplication/division fact families through the 12 times table.

2. Students should be able to list the prime numbers 1 through 50. The list is as follows: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, and 47.

3. Students should be able to state the divisibility rules for the given numbers: 2, 3, 5, 6, 9, and 10. Given a number, students should be able to determine which number(s) the given number is divisible by.

   There are 3 categories that the divisibility rules fall into:

   a. **Look at the last digit – Rules for 2, 5, and 10.**

      Rule for 2: If the number ends in 0, 2, 4, 6, or 8, it is divisible by 2. All even numbers are divisible by 2.

      Rule for 5: If the number ends in a 0 or 5, it is divisible by 5.

      Rule for 10: If the number ends in a 0, it is divisible by 10.

   b. **Sum of the digits – Rules for 3 and 9**

      Rule for 3: Add the digits. If the sum of the digits is divisible by 3, then the entire number is divisible by 3.
      Ex. 1,041 – Add the digits: 1 + 4 + 1 = 6. Check: Is 6 divisible by 3? Yes. So the entire number of 1,041 ***is*** divisible by 3.

      Ex. 1,042 – Add the digits: 1 + 4 + 2 = 7. Check: Is 7 divisible by 3? No. So the entire number of 1, 042 ***is not*** divisible by 3.
      Rule for 9: Add the digits. If the sum of the digits is divisible by 9, then the entire number is divisible by 3.
      Ex. 1,935 – Add the digits: 1 + 9 + 3 + 5 = 18. Check: Is 18 divisible by 3? Yes. So the entire number of 1,935 ***is*** divisible by 9.

      Ex. 1,936 – Add the digits: 1 + 9 + 3 + 6 = 19. Check: Is 19 divisible by 9? No. So the entire number of 1, 936 ***is not*** divisible by 9.

c. **Product of the factors – Rule for 6:** If a number is divisible by ***2 and 3***, then it is divisible by 6.

Ex. 2,016. Check: Is the number divisible by 2? Yes because it is even and ends in a 2. Check: Is the number divisible by 3? Add the digits: 2 + 1 + 6 = 9. 9 is divisible by 3 so 2,016 is divisible by 3. 2,016 is divisible by ***both 2 and 3*** so it is divisible by 6.

Ex. 2,018. Check: Is the number divisible by 2? Yes because it is even and ends in an 8. Check: Is the number divisible by 3? Add the digits: 2 + 1 + 8 = 11. 11 ***is not*** divisible by 3 so 2,018 ***is not*** divisible by 3. 2,016 ***is not*** divisible by ***both 2 and 3*** so it ***is not*** divisible by 6.

4. Students should be able to understand and apply the concept of rounding.

V. The processes/procedures/skills that students will be expected to demonstrate proficiency of by the end of the unit:

1. Students will be able to compute division problems which include divisors that are multiples of 10, 100, 1000, etc.

Ex. 1 $\boxed{48}\,0{,}0\cancel{00} \div \boxed{8}\,\cancel{00} =$ _____

1. Draw a box around the non-zero digits in both the dividend and the divisor.
2. Divide them and write their quotient on the line. In this case, 48 ÷ 8 = ___ or 8 x ___ = 48.
3. Partner one zero from the lowest place value in both the dividend and divisor. This is called "dancing zeros". Continue to do this until there are zeros remaining in the dividend that cannot be paired. The remaining zeros in the dividend need to be included in the quotient.
4. Take the total number of zeros which are not paired and write them in the quotient.
5. Answer: 480,000 ÷ 800 = <u>600</u>.

Ex. 2 $\boxed{7,2}$00,~~000~~ ÷ ________ = $\boxed{8}$,~~000~~

1. Draw a box around the non-zero digits in both the dividend and the quotient.
2. Determine the beginning digit of the unknown divisor. In this case, 72 ÷ ___ = 8 or 8 x ___ = 72.
3. Write the beginning digit of the unknown divisor on the line.
4. Partner one zero from the lowest place value in both the dividend and quotient. This is called “dancing zeros”. Continue to do this until there are zeros remaining in the dividend that cannot be paired. The remaining zeros need to be included in the divisor.
5. Take the total number of zeros which are not paired and write them next to the beginning digit of the divisor.
6. Answer: 7,200,000 ÷ <u>900</u> = 8,000.

Ex. 3 $\boxed{60}$,00~~0~~ ÷ $\boxed{12}$~~0~~ = _____

1. Draw a box around the non-zero digits in the dividend and divisor. In this example the box must include the zero in 60 because 6 is not divisible by 12.
2. Divide them and write their quotient on the line. In this case, 60 ÷ 12 = ___ or 12 x ___ = 60.
3. Partner one zero from the lowest place value in both the dividend and divisor. This is called “dancing zeros”. Continue to do this until there are zeros remaining in the dividend that cannot be paired. In this example there is only one zero in 120, so only one zero gets partnered with one zero in 60,000.The remaining zeros in the dividend not in the box need to be included in the quotient.
4. Take the total number of zeros which are not paired and write them in the quotient.
5. Answer: 60,000 ÷ 120 = <u>500</u>.

Ex. 4 $\boxed{40}$,00~~0,000~~ ÷ ________ = $\boxed{8}$~~0,000~~

1. Draw a box around the non-zero digits in the dividend and divisor. In this example the box must include the zero in 40 because 4 is not divisible by 8.
2. Divide them and write their answer on the line. In this case, 40 ÷ 8 = ___ or 8 x ___ = 40.
3. Partner one zero from the lowest place value in both the dividend and quotient. This is called "dancing zeros". Continue to do this until there are zeros remaining in the dividend that cannot be paired. In this example there are two zeros remaining in the dividend. The remaining zeros in the dividend not in the box need to be included in the divisor.
4. Take the total number of zeros which are not paired and write them on the line for the divisor.
5. Answer: 40,000,000 ÷ <u>500</u> = 80,000.

2. Students must be able to estimate quotients using the concept of "friendly numbers".

Students round the dividend and divisor in the problem to the nearest 10, 100, 1000, etc. to make "friendly numbers" — numbers they can work with mentally. Then divide to compute an estimated quotient. If the division problem has a **single digit** divisor, **do not round the divisor**.

Ex. 1 547 ÷ 7
560 ÷ 7 = 80

1. The divisor is a single digit, so it remains the same. Look at the first two digits of the dividend and round to a multiple that can be easily divided by a divisor equal to 7. Think about a multiple of 7 which is close to 54. 56 is the closest multiple of 7.
2. Round 547 to 560.
3. 560 ÷ 7 = 80

Ex. 2 123 ÷ 12
120 ÷ 10 = 12
120 ÷ 12 = 10

In this example there is a double digit divisor. There are two options that can be used to compute this answer. The divisor can be rounded to the nearest multiple of 10 which is 10, or it can remain equal to 12.

1. Look at the first two digits of the dividend and round to a multiple that can be easily divided by a divisor of 10 or 12. 120 can be divided by both 10 and 12.
2. Round 123 to 120.
3. 120 ÷ 10 = 12 or 120 ÷ 12 = 10

Ex. 3 826 ÷ 87
810 ÷ 90 = 9

1. Round the divisor of 87 to the nearest multiple of 10 which is 90.
2. Look at the first two digits of the dividend and round to a multiple that can be easily divided by a divisor of 90. Round 826 to the nearest multiple of 90 which is 810.
3. 810 ÷ 90 = 9
   The estimated quotient allows the students to check the "reasonableness" of their actual quotient.

3. Students will be able to divide numbers using two different methods:

a. Traditional Method:
With this method, the students follow the steps of traditional division.

Ex.
$$\begin{array}{r} 72 \\ 27\overline{)1944} \\ -\underline{189}\downarrow \\ 54 \\ \underline{-54} \\ 0 \end{array}$$

Estimate:
$$\begin{array}{r} 70 \\ 30\overline{)2100} \end{array}$$

1. Estimate the quotient.
2. **D**ivide by using the estimated quotient as the first digit in the actual quotient.
3. **M**ultiply
4. **S**ubtract
5. **C**heck that the difference cannot be divided by the divisor. If the difference is greater than the divisor, adjust the digit in the quotient. If it is less, continue on to the next step.
6. **B**ring down the next digit in the dividend.
7. **R**epeat these steps.

To remember these steps the students are taught the following mnemonic device: **D**oes **M**cDonald's **S**ell **C**heese **B**urgers **R**aw?

b. Short Division:

This method is for one digit divisors only.

Ex.
$$\begin{array}{r} 4\ 8\ 7 \\ 4\overline{)19^{3}4^{2}8} \end{array}$$

$$\begin{array}{r} 1\ 9 \\ 6\overline{)11^{5}4} \end{array}$$

Divide as in traditional division except the multiplication and subtraction steps are done mentally. The remainder is recorded in the form of a superscript and placed before the next digit. For example, 4 x 4 = 16, subtracted from 19 equals 3. The 3 is placed next to the 4 to make 34 for the next step of division.

4. Students will record the remainder as a fraction.

Ex. $\begin{array}{r} 22\frac{2}{7} \\ 7\overline{)156} \end{array}$

$22\frac{2}{7}$ is the answer.

Note: “22 R2” is no longer acceptable.

5. Students will solve application word problems using the *Four Step Problem Solving Method.*

Steps:

1. FIND OUT: This step includes identifying what question must be answered to solve the problem. In some cases the problem may be broken up into smaller problems until the larger problem can be solved. Students use a variable to represent the unknown quantity in the problem.

2. CHOOSE A STRATEGY / WRITE AN EQUATION: Students determine the process/strategy to be used to compute the answer to the problem. They express this process in the form of an equation.

3. SOLVE IT: Students work out the solution to the problem. This is where they record their work.

4. LOOK BACK: Students reflect/evaluate the work they have done to be sure it is correct. They answer the question from Step 1 in a complete sentence with a label.

Ex.: John and Sally went apple picking. They picked 148 apples. To store the apples, they placed them in large baskets. If each basket holds 37 apples, how many baskets will they need to store all of the apples they picked?

1. **Find out**: Let P = the number of baskets they picked.

2. **Pick a strategy and write an equation**: Use division;
   148 ÷ 37 = P

3. **Solve it**: Students use the traditional division method to solve this problem. All work must be recorded.

4. **Look Back**: After reviewing their work and evaluating their accuracy, students write a complete sentence to answer the question “How many baskets will they need?” using a label. They need 4 baskets to hold all of the apples they picked.

FRACTION UNIT

I. Unit Overview:

The main emphasis for this unit is for students to master their conceptual understanding of fractions. Students continue to experience fractions in a variety of ways such as parts of a whole, parts of a set, as a division problem, as a ratio, and in real life applications. Doing so helps the student continue to acquire meaning for fractions. Fraction algorithms such as addition and subtraction of fractions and mixed numbers with like denominators are reinforced. The algorithms for addition and subtraction of fractions and mixed numbers with unlike denominators are introduced.

II. The “big picture” or major concepts focused upon throughout the unit:

1. Students will be able to determine the relative size of a fraction using strategies to compare parts of a whole.

2. Students will compare and order fractions and mixed numbers with like and unlike denominators.

3. Students will add and subtract fractions and mixed numbers with like and unlike denominators.

III. The “math terminology” that students will be expected to use and apply throughout the unit:

1. Vocabulary:

a. Fraction: One or more equal parts of a whole.

b. Numerator: The number of equal parts you are interested in out of the whole.

c. Denominator: The total number of equal parts in the whole.

d. Unit fraction: A proper fraction whose numerator is one (1).

e. Proper fraction: A fraction whose numerator is less than its denominator.

f. Improper fraction: A fraction whose numerator is greater than or equal to its denominator.

g. Mixed number: An expression that contains a whole number and a fraction.

h. Equivalent fractions: Fractions that have the same value. Equivalent fractions name the same or equal part of the whole.

IV. The knowledge that students should have acquired *PRIOR* to the start of the unit:

1. Students are required to memorize multiplication facts up to and including 12 x 12.

2. Students are required to memorize division facts up to and including 144 ÷ 12. Students should be able to state the multiplication/division fact families through the 12 times table.

3. Students should be able to list the prime numbers 1 through 50. The list is as follows: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, and 47.

4. Students should be able to state the divisibility rules for the given numbers: 2, 3, 5, 6, 9, and 10. Given a number, students should be able to determine which number(s) the given number is divisible by. (Please refer to the Multiplication and/or Division Units for a more detailed explanation.)

5. Students should be able to list the multiples and factors of a given number. For example, the factors of 8 are {1, 2, 4, 8} and the multiples of 8 are 8, 16, 24, 32, 40… (Please refer to the Number Sense Unit for a more detailed explanation.)

6. Students should be able to state the Least Common Multiple (LCM) and Greatest Common Factor (GCF) of two numbers. (Please refer to the Number Sense Unit for a more detailed explanation.) For example, the LCM of 6 and 15 is 30 because multiples of 15 are 15, 30, 45… and multiples of 6 are 6, 12, 18, 24, 30…The lowest multiple that is common to both numbers is 30. The GCF of 6 and 15 is 3 because the factors of 6 are {①, 2, ③, 6} and the factors of 15 are {①, ③, 5, 15}. After the common factors are circled, the greatest number is 3.

V. The processes/procedures/skills that students will be expected to demonstrate proficiency of by the end of the unit:

1. Students will be able to “build a fraction to higher terms.”

Ex. $\frac{5}{6} = \frac{x}{48}$

$\frac{5}{6} \bullet 1 = \frac{x}{48}$

Using the Identity Property of Multiplication, we can multiply a fraction by 1 to create an equivalent fraction. .

$\frac{5}{6} \bullet \frac{8}{8} = \frac{40}{48}$

Determine 6 x 8 = 48 and substitute $\frac{8}{8}$ for 1 whole. Multiply the numerator by 8 to find the missing numerator in the equivalent fraction; $x = 40$.

2. Students will be able to simplify/reduce a fraction to lowest terms.

Ex. $\frac{48}{54} = ?$

$\frac{48}{54} \div 1 = \frac{48}{54}$

$\frac{48}{54} \div \frac{6}{6} = \frac{8}{9}$

Determine the greatest common factor (GCF) for the numerator and denominator. Using the inverse of the Identity Property of Multiplication, we can divide a fraction by one to create an equivalent fraction. Divide by one whole written as a fraction with the GCF as the numerator and the denominator.

3. Students will be able to compare fractions using three different methods:

   a. Concepts of parts of a whole

      (1) Same denominator: If the denominators are the same, compare the numerators. The fraction with the greater numerator will be the greater fraction.

      Ex. $\frac{5}{11} > \frac{3}{11}$

      (2) Same numerator: If the numerators are the same, the fraction with the smaller denominator will be the greater fraction.

      Ex. $\frac{5}{11} > \frac{5}{80}$

      (3) Equal difference between the numerator and the denominator

      Ex. Which is larger: $\frac{11}{12}$ or $\frac{19}{20}$?

Students analyze the fractions to determine the “missing piece” needed to complete the whole.

$\frac{11}{12}$ is $\frac{1}{12}$ away from a whole. $\frac{19}{20}$ is $\frac{1}{20}$ away from a whole.

$\frac{19}{20}$ is closer to one whole, so it is the greater fraction.

Answer: $\frac{11}{12} < \frac{19}{20}$

b. Finding a common denominator:

Ex. $\frac{3}{10} + \frac{2}{15}$

Determine the least common multiple (LCM) for both denominators, in this case 10 and 15.

$$\frac{3}{10} \bullet \left(\frac{3}{3}\right) = \frac{9}{30}$$

$$\frac{2}{15} \bullet \left(\frac{2}{2}\right) = \frac{4}{30}$$

Check to see if one denominator is a factor of the other. If so, use the greater number. If not, check to see if they share a common factor. List the multiples of the larger number until a common multiple is reached: 15, 30. 30 is also a multiple of 10. Create an equivalent fraction with the least common denominator (LCD) for each of the fractions.
Compare the newly created equivalent fractions to determine which is greater.

$\frac{9}{30} > \frac{4}{30}$ so $\frac{3}{10} > \frac{2}{15}$

(Please refer to Part V.1 earlier in this unit for a more detailed explanation.)

c. Using cross products:

Ex. Determine which fraction is greater $\frac{5}{11}$ or $\frac{3}{7}$.

$$\overset{35}{\frac{5}{11}} \times \overset{33}{\frac{3}{7}}$$

$$\frac{5}{11} > \frac{3}{7}$$

Multiply the denominator of one fraction by the numerator of the other and record the product above it as illustrated. The “new” numerator will determine the greater fraction.

4. Students will be able to change improper fractions to mixed numbers.

Ex. $\frac{12}{7} = 12 \div 7 = 1\frac{5}{7}$

Ex. $\frac{18}{7} = 18 \div 7 = 2\frac{3}{7}$

Divide the numerator by the denominator and express the remainder as a fraction.

5. Students will be able to change mixed numbers to improper fractions.

Ex. $1\frac{5}{7} = 1 \bullet 7 = 7 + 5 = \frac{12}{7}$

Ex. $2\frac{3}{7} = 2 \bullet 7 = 14 + 3 = \frac{17}{7}$

Multiply the whole number in the expression by the denominator. Add the numerator to that sum. Write this quantity as the numerator with the original denominator.

6. Students will be able to add and subtract fractions and mixed numbers with like denominators.

Ex. 1 $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

$\frac{7}{8} - \frac{3}{8} = \frac{4}{8} = \frac{1}{2}$

When the denominators are the same, add or subtract the numerators. Make sure the answer has been simplified to lowest terms. (Please refer to Part V.2 earlier in this unit for a more detailed explanation.)

Ex. 2 $\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = 1\frac{2}{5}$

In this example the answer is an improper fraction which must be changed to a mixed number. (Please refer to Part V.4 earlier in this unit for a more detailed explanation.)

Ex. 3

$$\begin{array}{r} 2\frac{3}{6} \\ +\ 1\frac{5}{6} \\ \hline \end{array}$$

$$3\frac{8}{6} = 3 + 1\frac{2}{6} = 4\frac{2}{6} = 4\frac{1}{3}$$

In this example the answer is a mixed number with an improper fraction which must be changed to a mixed number with a proper fraction. Then it must be simplified to lowest terms. **Do not** change all mixed numbers into improper fractions in order to compute.

Ex. 4

$$\begin{array}{rcr} \overset{2+(\frac{5}{5})}{\cancel{3}} & = & 2\frac{5}{5} \\ -\ 1\frac{2}{5} & = & -\ 1\frac{2}{5} \\ \hline & & 1\frac{3}{5} \end{array}$$

In the example above the students have to “go to the bank” to make an exchange to complete the subtraction problem. Students make the exchange at the “5th National Bank” (the denominator names the bank) where they exchange 1 whole for $\frac{5}{5}$.

1. Add the remaining whole number 2 with the $\frac{5}{5}$ received in exchange for the whole for a “new” total of $2\frac{5}{5}$.
2. Subtract $1\frac{2}{5}$ from $2\frac{5}{5}$.
3. Answer: $1\frac{3}{5}$

Ex. 5

$$\begin{array}{rr} & \overset{0}{\cancel{1}}\frac{3}{8} \\ - & \frac{5}{8} \\ \hline & \end{array} \qquad \left(\frac{8}{8}+\frac{3}{8}\right) = \begin{array}{rr} & \frac{11}{8} \\ - & \frac{5}{8} \\ \hline & \frac{6}{8} = \frac{3}{4} \end{array}$$

In the example above the students have to “go to the bank” to make an exchange to complete the subtraction problem.
Students make the exchange at the “8th National Bank” (the denominator names the bank) where they exchange 1 whole for $\frac{8}{8}$.

Do not change all mixed numbers into improper fractions in order to compute.

1. Add the remaining fraction of $\frac{3}{8}$ to the $\frac{8}{8}$ received in exchange for the whole for a “new” total of $\frac{11}{8}$.
2. Subtract $\frac{5}{8}$ from $\frac{11}{8}$.
3. Simplify the answer to lowest terms: $\frac{6}{8} \div \left(\frac{2}{2}\right) = \frac{3}{4}$

Ex. 6

$$\begin{array}{r} \overset{2}{\cancel{3}}\frac{3}{8} \\ -\ 1\frac{5}{8} \\ \hline \\ \end{array} \qquad \left(\frac{8}{8}+\frac{3}{8}\right) \quad = \quad \begin{array}{r} 2\frac{11}{8} \\ -\ 1\frac{5}{8} \\ \hline \\ 1\frac{6}{8} = 1\frac{3}{4} \end{array}$$

In the example above the students have to “go to the bank” to make an exchange to complete the subtraction problem.
Students make the exchange at the “8th National Bank” (the denominator names the bank) where they exchange 1 whole for $\frac{8}{8}$.

Do not change all mixed numbers into improper fractions in order to compute.

1. Add the remaining fraction of $\frac{3}{8}$ to the $\frac{8}{8}$ received in exchange for the whole for a “new” total of $\frac{11}{8}$. Rewrite the original mixed number $3\frac{3}{8}$ as $2\frac{11}{8}$.
2. Subtract the whole numbers. (1)
3. Subtract $\frac{5}{8}$ from $\frac{11}{8}$. ($\frac{6}{8}$)
4. The difference must be simplified to lowest terms. ($\frac{3}{4}$)
5. Record the final answer as a mixed number. ($1\frac{3}{4}$)

7. Students will be able to add and subtract fractions and mixed numbers with unlike denominators.

Ex. 1

$$\begin{array}{rcccc} & \frac{5}{9} & = & \frac{10}{18} \\ + & \frac{4}{6} & = & \frac{12}{18} \\ \hline \end{array}$$

$$\frac{22}{18} = 1\frac{4}{18} = 1\frac{2}{9}$$

1. Find the Least Common Multiple for 9 and 6 which equals 18. Because we are working with fractions, 18 is called the Least Common Denominator (LCD).
2. Make equivalent fractions with a denominator of 18 by “building to higher terms”. (Please refer to Part V.1 in this unit for a more detailed explanation).
3. Add the equivalent fractions.
4. In this example the answer is an improper fraction which must be changed to a mixed number.
5. Then it must be simplified to lowest terms.

Ex. 2

$$\begin{array}{rcccc} & \frac{4}{6} & = & \frac{12}{18} \\ - & \frac{5}{9} & = & \frac{10}{18} \\ \hline \end{array}$$

$$\frac{2}{18} = \frac{1}{9}$$

1. Find the LCD for 9 and 6 which equals 18.
2. Make equivalent fractions with a denominator of 18 by “building to higher terms”.
3. Subtract the equivalent fractions.
4. The difference must be simplified to lowest terms.

Ex. 3

$$\begin{array}{rrcr} & 7\frac{5}{9} & = & 7\frac{10}{18} \\ + & 4\frac{4}{6} & = & 4\frac{12}{18} \\ \cline{2-2} \cline{4-4} \end{array}$$

$$11\frac{22}{18} = 11 + 1\frac{4}{18} = 12\frac{4}{18} = 12\frac{2}{9}$$

1. Find the LCD for 9 and 6 which equals 18.
2. Make equivalent fractions with a denominator of 18 by “building to higher terms”.
3. Add the whole numbers. (11)
4. Add the equivalent fractions. ($\frac{22}{18}$) In this example the sum of the equivalent fractions is an improper fraction which must be changed to a mixed number. ($1\frac{4}{18}$)
5. Add the whole number (11) to the mixed number ($1\frac{4}{18}$) which equals $12\frac{4}{18}$.
6. The sum must be simplified to lowest terms which equals $12\frac{2}{9}$.

Do not change all mixed numbers into improper fractions in order to compute.

Ex. 4

$$\begin{array}{rcl} 2\frac{9}{12} & = & 2\frac{18}{24} \\ -\ 1\frac{3}{8} & = & 1\frac{9}{24} \\ \hline \end{array}$$

$$1\frac{9}{24} = 1\frac{3}{8}$$

1. Find the LCD for 12 and 8 which equals 24.
2. Make equivalent fractions with a denominator of 24 by “building to higher terms”.
3. Subtract the whole numbers. (1)
4. Subtract the equivalent fractions. ($\frac{9}{24}$)
5. The difference must be simplified to lowest terms. ($\frac{3}{8}$)
6. Record the final answer as a mixed number. ($1\frac{3}{8}$)

Do not change all mixed numbers into improper fractions in order to compute.

Ex. 5

$$\begin{array}{llllll}
 & 3\frac{3}{8} & = 3\frac{9}{24} & = \overset{2+\left(\frac{24}{24}\right)}{\cancel{3}}\frac{9}{24} = 2+\left(\frac{24}{24}+\frac{9}{24}\right) = & & 2\frac{33}{24} \\
- & 1\frac{9}{12} & = 1\frac{18}{24} & = 1\frac{18}{24} = & - & 1\frac{18}{24} \\
\cline{1-3}\cline{5-6}
 & & & & & 1\frac{15}{24} = 1\frac{5}{8}
\end{array}$$

1. Find the LCD for 8 and 12 which equals 24.
2. Make equivalent fractions with a denominator of 24 by “building to higher terms”.
3. You cannot subtract $\frac{18}{24}$ from $\frac{9}{24}$ so the students must “go to the bank” to make an exchange to complete the subtraction problem. Students make the exchange at the “24th National Bank” (the denominator names the bank) where they exchange 1 whole for $\frac{24}{24}$. **Do not** change all mixed numbers into improper fractions in order to compute.
4. Add the remaining $\frac{9}{24}$ to the $\frac{24}{24}$ received in exchange for the whole for a “new “ total of $\frac{33}{24}$. Rewrite the original mixed number $3\frac{3}{8}$ as $2\frac{33}{24}$.
5. Subtract the whole numbers. (1)
6. Subtract the equivalent fractions. ($\frac{15}{24}$)
7. The difference must be simplified to lowest terms. ($\frac{5}{8}$)
8. Record the final answer as a mixed number. ($1\frac{5}{8}$)

Ex. 6

$$\begin{array}{rcl} \frac{3}{8} & = & \frac{9}{24} \\[1em] \frac{5}{12} & = & \frac{10}{24} \\[1em] + \ \frac{5}{6} & = & \frac{20}{24} \\ \hline \end{array}$$

$$\frac{39}{24} = 1\frac{15}{24} = 1\frac{5}{8}$$

1. Find the LCD for 8, 12, and 6 which equals 24.
2. Make equivalent fractions with a denominator of 24 by “building to higher terms.”
3. Add the equivalent fractions.
4. In this example the answer is an improper fraction which must be changed to a mixed number.
5. Then it must be simplified to lowest terms.

8. Students will be able to solve application word problems using the *Four Step Problem Solving Method.*

Steps:

1. FIND OUT: This step includes identifying what question must be answered to solve the problem. In some cases the problem may be broken up into smaller problems until the larger problem can be solved. Students use a variable to represent the unknown quantity in the problem.

2. CHOOSE A STRATEGY / WRITE AN EQUATION: Students determine the process/strategy to be used to compute the answer to the problem. They express this process in the form of an equation.

3. SOLVE IT: Students work out the solution to the problem. This is where they record their work.

4. LOOK BACK: Students reflect/evaluate the work they have done to be sure it is correct. They answer the question from Step 1 in a complete sentence with a label.

Ex.: John is eating a pizza that has a total of 8 slices. He ate $\frac{3}{8}$ of the pizza. What fractional part of the pizza remains?

1. **Find out:** Let P = the amount of pizza which remains.

2. **Pick a strategy and write an equation:** Use subtraction:

$$\frac{8}{8} - \frac{3}{8} = P$$

3. **Solve it:** Students use subtraction with regrouping to solve this problem. All work must be recorded.

4. **Look Back:** After reviewing their work and evaluating their accuracy, students write a complete sentence to answer the question “What fractional part of the pizza remains?” using a label. $\frac{5}{8}$ of the pizza remains.

DECIMAL UNIT

I. Unit Overview:

The main emphasis for this unit is for students to master their conceptual understanding of decimals through the ten-thousandths place value. Students gain a better understanding of decimals as they explore the relationship between decimals and fractions. Students will also explore the uses of decimals in real life applications. Doing so helps the student continue to acquire meaning for decimals. Decimal algorithms such as addition and subtraction to the ten-thousandths place are introduced.

II. The “big picture” or major concepts focused upon throughout the unit:

1. Students will demonstrate an understanding of real world applications of decimals such as money, sports, thermometer, radio stations, Dewey Decimal System, and the stock market.

2. Students will become familiar with commonly used decimals including the place values of tenths, hundredths, thousandths, and ten-thousandths.

3. Students will continue to explore the relationships between decimals and fractions.

   Ex. $.1 = \frac{1}{10}$ $.01 = \frac{1}{100}$ $.001 = \frac{1}{1000}$

III. The “math terminology” that students will be expected to use and apply throughout the unit:

1. **Vocabulary:**

   a. Decimal: A fraction whose denominator is 10 or a power of 10.

   b. Standard form: A decimal written with one digit for each place value. The standard form for the decimal three thousand five hundred twenty-three ten-thousandths is 0.3523.

c. <u>Word form</u>: The value of a decimal written in words. The word form for the decimal 0.3523 is three thousand five hundred twenty-three ten-thousandths.

d. <u>Short Word form</u> : The value of a decimal written using a combination of digits and words. The short word form for 0.3523 is 3,523 ten-thousandths.

IV. The knowledge that students should have acquired ***PRIOR*** to the start of the unit:

1. Students should be able to read and write whole numbers properly through the billions using the following forms:
   a. <u>standard form</u> – example: 67,895,000,304
   b. <u>word form</u> – example: sixty-seven billion eight hundred ninety-five million three hundred four
   c. <u>short word form</u> – example: 67 billion 895 million 304

2. Students should be able to apply all skills and concepts discussed in the fraction unit such as building to higher terms, simplifying fractions, comparing, ordering, adding, and subtracting when working with decimal concepts.

V. The processes/procedures/skills that students will be expected to demonstrate proficiency of by the end of the unit:

1. Students will be able to recognize and determine equivalent decimals using models.

Ex. $.1 = \frac{1}{10} = \frac{10}{100} = \frac{100}{1000}$

Using the skill “building to higher terms” learned in the fraction unit, students are able to make equivalent decimals.

2. Students will be able to compare and order decimals using the symbols <, >, =.

Ex.1 0.345 ________ 0.354

$\frac{345}{1000}$ $\frac{354}{1000}$

Answer: **<**

Ex. 2 0.7854 ________ 0.7852

$\frac{7854}{10,000}$ $\frac{7852}{10,000}$

Answer: **>**

Students **compare** decimals beginning with the digit in the tenths place. The digit is the same in both numbers, so compare the digit in the hundredths place. Continue this process until it is determined which decimal number is smaller. Students should also use their prior knowledge of fractions to help them make their determinations when comparing.

Ex. Order from least to greatest: 0.45, 0.23, 0.236, 0.287

a. Convert decimals to fractions with equal denominators.

$0.45 = \frac{45}{100} \downarrow \frac{450}{1000}$

$0.23 = \frac{23}{100} \downarrow \frac{230}{1000}$

$0.236 = \frac{236}{1000} \downarrow \frac{236}{1000}$

$0.287 = \frac{287}{1000} \downarrow \frac{287}{1000}$

b. Make equivalent decimals – build to higher terms; all decimal are written so they extend to the same place value.

$0.45 = \underline{0.45\mathbf{0}}$ $0.23 = \underline{0.23\mathbf{0}}$ $\underline{0.236}$ $\underline{0.287}$

Answer: 0.23, 0.236, 0.287, 0.45

Students **order** decimals by comparing them. Again, converting the decimals to fractions helps the students “see” the value of the decimal in the form of a fraction. This skill is very helpful for ordering decimals.
In this example, the decimals to be ordered have varying place values. In this example it is important for the students to make **equivalent decimals**. The students extend the decimals to the same place value, so ordering them is easier.

3. Students will be able to round decimals to a given place value.

Ex. 1 Round 0.7586 to the nearest thousandths.

$0.75\underline{8}\textcircled{6}$

The digit to the right is 6, so the digit in the thousandths place needs to be rounded up to the next digit. Change the 8 in the thousandths place to a 9. All remaining zeros are dropped.

Answer: 0.759

Rounding decimals:

1. Locate and underline the place value being rounded to.
2. Draw a circle around the “right hand man” which is the digit to the right of the place value being rounded to.
3. If the digit to the right is 0,1, 2, 3, or 4, leave the place value the same. If the digit to the right is 5, 6, 7, 8, or 9, round the place value up to the next digit.
4. All digits to the right of the desired place value change to zero. The zero is dropped as there are no digits behind it. The decimal is simplified to the desired place value.

Ex. 2 Round 0.8895 to the nearest thousandths.

0.88$\underline{9}$⑤

In this example, the digit to the right is 5, so the digit in the thousandths place needs to be rounded up to the next digit. The 9 in the thousandths place rolls to a 10, so a 0 is placed there and the 1 from the 10 rolls to the hundredths place (this is referred to as "rolling nines"). The 8 in the hundredths place becomes a 9 when the 1 rolls to it from the thousandths place. In this example **the zero remains** in the answer, as it is holding the place value the decimal is rounded to.

Answer: 0.89$\underline{0}$

4. Students will be able to add decimals through the ten-thousandths place.

Ex. 1 0.654 + 0.165

$$\begin{array}{r} {}^{1}\ \ \ \\ 0.654 \\ \underline{+0.165} \\ 0.819 \end{array}$$

Ex. 2 0.739 + 0.68

$$\begin{array}{r} {}^{1\ 1}\ \\ 0.739 \\ \underline{+\ 0.68\mathbf{0}} \\ 1.419 \end{array}$$

Ex. 3 12.739 + 8.68

$$\begin{array}{r} {}^{1\,1\,1}\ \ \ \\ 12.789 \\ \underline{+\ 8.68\mathbf{0}} \\ 21.469 \end{array}$$

To **add** decimals:

1. Rewrite the problem so the place values are lined up vertically.
2. Place the decimal point into the sum directly below the decimal point in the addends before adding. This will ensure the decimal will be correctly positioned in the sum.
3. Add, beginning with the smallest place value in the addends (begin furthest to the right), and regroup when necessary.
4. If an addend is extended to a place value beyond any other addend/s, "build to higher terms" by making an **equivalent decimal** (placing zeros in the missing place values).

5. Students will be able to subtract decimals through the ten-thousandths place.

To **subtract** decimals:
1. Rewrite the problem so the place values are lined up vertically.
2. Place the decimal point into the difference directly below the decimal point in both the minuend and subtrahend before subtracting. This will ensure the decimal will be correctly positioned in the difference.
3. Subtract, beginning with the smallest place value in either the minuend or subtrahend (begin furthest to the right), and regroup when necessary.
4. If the subtrahend is extended to a place value beyond the minuend, extend the minuend to the same place value as the subtrahend; "build to higher terms" by making an **equivalent decimal** (placing zeros in the missing place values).

Ex. 1 0.385 – 0.157

$$\begin{array}{r} 0.3\overset{7}{8}\overset{15}{\cancel{5}} \\ \underline{-\ 0.157} \\ 0.228 \end{array}$$

Ex. 2 0.67 – 0.352

$$\begin{array}{r} 0.6\overset{6}{\cancel{7}}\overset{10}{\mathbf{0}} \\ \underline{-0.352} \\ 0.318 \end{array}$$

Ex. 3 9.546 – 6.128

$$\begin{array}{r} 9.5\overset{3}{4}\overset{16}{\cancel{6}} \\ \underline{-\ 6.128} \\ 3.418 \end{array}$$

In this example, students rewrite the problem vertically and subtract following the steps outlined above.

Ex. 4 12 – 4.89

$$\begin{array}{r} 1\overset{1}{\cancel{2}}.\overset{10}{\mathbf{0}}\overset{\overset{9}{\cancel{10}}}{\mathbf{0}} \\ \underline{-\ \ 6.89} \\ 5.11 \end{array}$$

In this example, students must first extend the number out to the hundredths place by placing zeros in the tenths and hundredths place. Students then regroup and subtract as outlined in the steps above.

6. Students will be able to estimate sums and differences of decimals to the nearest whole number.

Ex. 1 0.654 + 0.165

Actual Estimate

$$\begin{array}{rcr} \cancel{1} & & \\ 0.654 & \qquad & 1 \\ +\ \underline{0.165} & & +\ \underline{0} \\ 0.819 & & 1 \end{array}$$

Ex. 2 0.739 + 0.68

Actual Estimate

$$\begin{array}{rcr} \cancel{1}\ \cancel{1} & & \\ 0.739 & \qquad & 1 \\ +\ \underline{0.68\mathbf{0}\ } & & +\ \underline{1} \\ 1.419 & & 2 \end{array}$$

Ex. 3 0.971 – 0.852

Actual Estimate

$$\begin{array}{rcr} 6\ 11 & & \\ 0.9\cancel{7}1 & \qquad & 1 \\ \underline{-0.852} & & \underline{-\ 1} \\ 0.119 & & 0 \end{array}$$

Ex. 4 11.876 – 8.249

Actual Estimate

$$\begin{array}{rcr} 6\ 16 & & \\ 11.87\cancel{6} & \qquad & 12 \\ \underline{-\ \ 8.249} & & \underline{-\ 8} \\ 3.627 & & 4 \end{array}$$

To **estimate** to the nearest whole number:

1. Look at the digit in the tenths place.
2. Use rounding rules. The digit in the tenths place will determine whether the digit in the one's place is rounded up or remains the same.

7. Students will be able to solve application word problems using the *Four Step Problem Solving Method.*

Steps:

1. FIND OUT: This step includes identifying what question must be answered to solve the problem. In some cases the problem may be broken up into smaller problems until the larger problem can be solved. Students use a variable to represent the unknown quantity in the problem.

2. CHOOSE A STRATEGY / WRITE AN EQUATION: Students determine the process/strategy to be used to compute the answer to the problem. They express this process in the form of an equation.

3. SOLVE IT: Students work out the solution to the problem. This is where they record their work.

4. LOOK BACK: Students reflect/evaluate the work they have done to be sure it is correct. They answer the question from Step 1 in a complete sentence with a label.

Ex.: Samantha and Sally ran the mile in gym class yesterday. Samantha completed the mile in 7.513 minutes. Sally completed the mile in 9.356 minutes. How much longer did it take for Sally to complete the mile?

1. **Find out:** Let P = the amount of additional time Sally needed to complete the mile compared to Samantha.

2. **Pick a strategy and write an equation:** Use subtraction: 9.356 – 7.513 = P

3. **Solve it:** Students use subtraction with regrouping to solve this problem. All work must be recorded.

4. **Look Back:** After reviewing their work and evaluating their accuracy, students write a complete sentence to answer the question "How many more minutes did it take Sally to complete the mile?" using a label. It took Sally 1.843 minutes more to complete the mile.

CALENDAR MATH GLOSSARY

Acute angle: An angle that measures greater than 0 degrees and less than 90 degrees.

Acute triangle: A triangle with all acute angles.

Addend: The numbers being added in an addition problem.

Angle: Two rays that meet at a common endpoint.

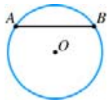
Area: The measure of covering inside a figure. It is measured in square units.

Array: A rectangular arrangement of objects with an equal number of objects in each row.

Center point: A point that is the same distance from all the points on a circle.

Certain: An event will always happen.

Chord: A line segment with its endpoints on the circle.

Example: 

Circle: A set of point equidistant from a fixed point called the center.

Circumference: The distance around the circle.

Commutative Property (turn around rule): ***Changing the order*** of the factors does not change the product.

Composite number: A number with more than two factors.

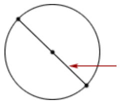
Congruent: Having ***exactly*** the same size and same shape.

Decagon: A ten-sided polygon.

Decimal: A fraction whose denominator is 10 or a power of 10.

Denominator: The total number of equal parts in the whole.

Diameter: A line segment that passes through the center of a circle and has its endpoints on the circle. A diameter is a special chord.

Example: 

Difference: The answer to a subtraction problem.

Dodecagon: A twelve-sided polygon.

Endpoint: A point at either end of a line segment or a point at one end of a ray.

Equally likely: Two or more events that have the same chance or equal probability.

Equiangular: All angles of a polygon are equal.

Equilateral triangle: A triangle with all sides and angles equal (congruent).

Equivalent fractions: Fractions that have the same value. Equivalent fractions name the same or equal part of the whole.

Even number: A number that can be formed by "making pairs" **OR** A number that is divisible by 2. Even numbers end in 0, 2, 4, 6, or 8.

Event: The "thing" that will or will not happen. For example, picking a red marble out of a bag.

Factor: The numbers used in a multiplication problem **OR** A factor of a given number is any number that divides evenly into a given number with ***no remainder***.

Fraction: One or more equal parts of a whole.

Hexagon: A six-sided polygon.

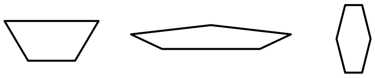
Impossible: An event that will never happen.

Improper fraction: A fraction whose numerator is greater than or equal to its denominator.

Intersecting lines: Lines that meet or cross at one point.

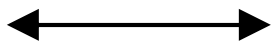
Example: 

Irregular polygon: A polygon whose sides and angles are ***not*** all equal.

Example: 

Isosceles triangle: A triangle with two sides and their opposite angles equal.

Line: An infinite set of points forming a straight path in two directions.

Example: 

Line segment: A part of a line defined by two endpoints.

Example: 

Minuend: The number being subtracted ***from.***

Mixed number: An expression that contains a whole number and a fraction.

Multiple: A multiple of a given number is the product of that number and any natural number (counting numbers).

Nonagon: A nine-sided polygon.

Numerator: The number of equal parts you are interested in out of the whole.

Obtuse angle: An angle that measure greater than 90 degrees and less than 180 degrees.

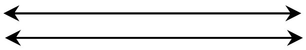
Obtuse triangle: A triangle with one obtuse angle.

Octagon: An eight-sided polygon.

Odd number: When you try to put an odd number of things into pairs there is always one leftover **OR** A number that is ***not*** divisible by 2. Odd numbers end in 1, 3, 5, 7, or 9.

Outcome: One of the possible “things” that can happen in a probability experiment.

Parallel lines: Lines that will never intersect and are always the same distance apart.

Example: 

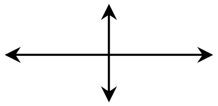
Parallelogram: A quadrilateral with 2 pairs of parallel and congruent sides.

Pentagon: A five-sided polygon.

Percent: A fraction whose denominator is 100 – written with a percent sign (%).

PeRIMeter: The distance around the RIM of a figure.

Perpendicular lines: A set of lines that form a right angle when they intersect.

Example: 

Point: An exact location in space represented by a dot.

Polygon: A simple closed figure made of line segments.

Prime number: A number with two factors: the number 1 and itself.

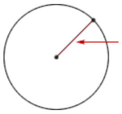
Probability: The chance that an event will or will not happen. Probability can be expressed as a fraction:

$$\text{Probability} = \frac{\text{the number of successes}}{\text{the total possible outcomes}}$$

Proper fraction: A fraction whose numerator is less than its denominator.

Quadrilateral: A four-sided polygon.

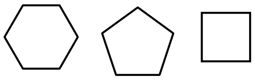
Radius: A line segment with one endpoint at the center of a circle and the other endpoint on the circle.

Example: 

Ray: A set of points that extends in one direction with one endpoint.

Rectangle: A quadrilateral with 2 pairs of congruent parallel sides and 4 right angles.

Regular polygon: A polygon with all sides and angles equal (congruent).

Example: 

Rhombus: A quadrilateral with 2 pairs of parallel sides and 4 congruent sides.

Right angle: An angle that measures exactly 90 degrees.

Right triangle: A triangle with one right angle.

Scalene triangle: A triangle with no sides or angles equal (congruent).

Septagon/Heptagon: A seven-sided polygon.

Similar figures: Figures that have the same shape but not necessarily the same size.

Square: A quadrilateral with 2 pairs of parallel sides, 4 equal (congruent) sides and 4 right angles.

Square number: The product of a number multiplied by itself.

Straight angle: An angle that measures exactly 180 degrees.

Subtrahend: The number ***being subtracted***.

Sum: The answer to an addition problem.

Trapezoid: A quadrilateral with one pair of parallel sides.

Triangle: A three-sided polygon.

Unique number (#1): The number 1 has only one factor. (It is therefore unique.)

Vertex: The point where two rays meet to form an angle.