

Unit Title: Estimation and Computation

Grade Level: 5<sup>th</sup> Grade

Subject Areas Addressed: Math

Time Frame: 1 Week

Designed By: Nicole Nolan

School District: Novi School District

School: Novi Meadows

Brief Summary of Unit (Including curricular context and unit goals):

In this unit on estimation and computation, students will build upon their prior knowledge of addition, subtraction, and multiplication algorithms, and apply that knowledge to decimal computation problems. Throughout each lesson students will be required to use estimation as a tool for checking their answers to gain a conceptual understanding. Number stories will then be used for students to apply their knowledge of estimation and the various computations in order to solve.

A variety of assessments will be used throughout the unit, such as study links, journal pages, exit slips, discussions, and observations to allow for differentiated instruction and to ensure that all students are being challenged and having their individual learning needs met. The final performance task will allow students to combine all of their learning from this unit and apply it to a real-life situation in an interactive, cooperative manner.

Overall, students will learn to use a variety of algorithms to solve computation problems, and will gain an understanding of when certain methods might be beneficial to use. Among a variety of problems, students will be asked to apply the appropriate method of computation, including estimation, in order to effectively problem solve. In addition, through learning and applying the various computation methods, students will gain a stronger conceptual knowledge of place value.

## Stage 1: Desired Results

### A. MCF Mathematics Standards/Benchmarks and Mathematics Grade Level Content Expectations and objectives:

- **Content Standard 1:** Students understand and use various types of operations (e.g., addition, subtraction, multiplication, division) to solve problems.
- **Benchmark:** Develop and apply the appropriate method of computation from among mental computation, estimation, paper-and-pencil or calculators; explain why they are choosing a method and how they know which operations to perform in a given situation. MTH.V.1.E.2
- **Content Standard 1:** Students understand and use various types of operations (e.g. addition, subtraction, multiplication, division) to solve problems. (Operations and their Properties).
- **Benchmark:** Apply operations efficiently and accurately in solving problems. V.1.E.4
- **Content Standard 2:** Students analyze problems to determine an appropriate process for solution, and use algebraic notations to model or represent problems. (Algebraic and Analytic Thinking)
- **Benchmark:** Write and solve open sentences (e.g.,  $\diamond + \Delta = 5$ ) and write stories to fit the open sentence. MTH.V.2.E.1
- **GLCE:** Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., one is 10 tenths, one tenth is 10 hundredths. N.ME.05.08
- **GLCE:** Multiply one-digit and two-digit whole numbers by decimals up to two decimal places. N.MR.05.17

### B. Understandings:

#### Students will understand...

- The significance of place-value in both whole numbers and decimals.
- That the methods used for adding/subtracting/multiplying whole numbers can be applied to decimals as well.
- How to use estimation, open sentences, and the various methods of addition and subtraction to solve number stories.

### C. Essential Questions:

- What is the significance of place-value in both whole numbers and decimals?
- How can the methods for adding, subtracting, and multiplying whole numbers be applied to decimals, and are certain methods more useful than others at different times?
- How can estimation, open sentences, and the various methods of computations be used to solve number stories?

### D. Students will know...

- The significance of place-value in both whole numbers and decimals.

#### Students will be able to...

- Use the various methods of addition, subtraction, and multiplication to effectively solve whole number and decimal problems.

- Use estimation, open sentences, and the various computation methods as aids in solving number stories.

**E. Prior Knowledge:**

- Students should have experience with addition, subtraction, and multiplication of whole numbers.
- Students should have extended whole-number addition and subtraction to 1- and 2-place decimals.
- Students should have started to extend multiplication methods to products of whole numbers and decimals.
- Students should have the basic multiplication facts memorized.
- Students should have some experience solving number stories.

**F. Misconceptions:**

- Students may confuse the place values and/or set up place values in computation problems improperly.
- Students may confuse the various methods of computation.
- Students may have difficulty identifying the open sentences and computation problems needed in order to solve number stories.

**Materials:** Math Journal, Math Notebook, Student Reference Book, White Boards/Markers/Erasers, Study Links, Grid Paper.

**Resources:** *Everyday Mathematics Teacher's Lesson Guide*, <http://everydaymath.uchicago.edu>: This is the Everyday Mathematics website, which includes lessons, sample work, discussion forums, and other useful resources for teachers. This is a great site to explore to find ways to best use the curriculum in the classroom.

## Stage 2: Assessment Evidence

### A. Culminating Performance Task:

- What understanding(s) and goal(s) will be assessed?
  - Students will demonstrate understanding of estimation by making decisions on how much of each item they should buy to reach the target amount of money.
  - Students will have to use computation methods of their choosing to figure out exactly how much they have spent/have left to spend throughout the activity.
  - Students' ability to compute addition, subtraction, and multiplication problems with whole numbers and decimals will be assessed.
  - Students' understanding of money will also be evident.
- Through what authentic task will students demonstrate understanding? (Describe the task.)
  - We will have a "store" set up in the classroom with various items around the room with price tags. Students will work with partners and will be given a set amount of paper money they need to spend and will have to buy multiple quantities of each item around the room. Students will have to decide how to spend their money, with the goal of spending all or as much as possible, but not going over their predetermined amount. Students will be required to keep track of the estimations and computations they use to figure out how much of each item they should spend their money on. Each group will report back to the class their purchases, and explain how they went about choosing how much to buy of each item as well as how they figured out how much money their items were worth.
- By what criteria will student produces and performances be evaluated?
  - Students' participation, effort, and engagement in the activity will be assessed with observations.
  - Students' ability to work with others in a cooperative manner to solve a problem will be evident.
  - Students will show a solid understanding of estimation and the various computations learned in class if they are able to use reasoning and the skills they have learned and apply them in a real-life context.

**B. Culminating Performance Task Rubric:**

	<b>Answer</b>	<b>Method</b>	<b>Explanation</b>
<b>3</b>	Effectively spends allotted amount of money without exceeding budget.	Effectively uses estimation and computation methods to determine quantities to buy in order to spend allotted amount of money without going over budget.	Clearly explains method and steps followed in solving the problem.
<b>2</b>	Follows directions and attempts to spend allotted amount of money with some accuracy.	Attempts to use estimation and computation methods to determine quantities to buy in order to spend allotted amount of money without going over budget.	Shows partial understanding of steps involved in task when explaining method to group.
<b>1</b>	Fails to apply strategies to spend allotted amount of money.	Little or no attempt to use estimation and computation methods to determine quantities to buy in order to spend allotted amount of money without going over budget.	Vague explanation, shows limited understanding.

### C. Other Evidence:

- Through what other evidence (e.g. quizzes, tests, prompts, observations, dialogues, homework, journals) will students demonstrate achievement of the desired results?
  - Students will demonstrate understanding on practice problems done in class and as homework. Homework will be checked for completion each day. All study links will be handed in and graded. Homework that receives a grade below 80% can be redone. Grades on homework let teachers know when concepts and skills need to be re-taught or reviewed.
    - Study Link 2.2 (addition of whole numbers and decimals)
    - S.L. 2.3 (subtraction of whole numbers and decimals)
    - S.L. 2.4 (open sentences and number stories)
    - S.L. 2.8 (multiplication of whole numbers and decimals)
    - S.L. 2.9 (multiplication using the lattice method)
    - Math journals
    - Example problems in class
  - Students will always begin the next class period by doing warm-up problems relating to the previous lesson, which will be a good indicator of their understanding.
  - “Exit Slips” used as informal assessments of student understanding (example: *Solve  $39 \times 4.92$  using both partial products and lattice methods for multiplication. This will be your ticket out the door.*)
  - Discussions about what methods are preferred or important points to take away from lessons are assessing students’ ability to make connections and think about learning in a real-world context.
  - Unit test will assess students’ cumulative understanding of all of the topics covered in this unit.
  - Students’ participation, effort, and interest in the topics will also be assessed to ensure students are being challenged and having their individual needs met.
- How will students reflect upon and self-assess their learning?
  - Students will discuss the methods of computation they prefer and when/why it would make the most sense to use the various methods.
  - Students discuss why it is beneficial to begin any computation problem with estimation, and think through real-life scenarios where they might use estimation.
  - When solving number stories, students are asked to look back at the question and see if their answer makes sense in the context of the story.

### Stage 3: Learning Plan

What sequence of teaching and learning experiences will equip students to develop and demonstrate the desired understanding?

#### Lesson 2.2

##### Day 1

**(O)** \*Remind students that they will need their templates for this unit and will need to bring them to class each day.

1) (Estimated time: 5 minutes)

**(H)** Present the problem:  $4.907 + 123.01 + 56.1234$  and have students estimate the answer on a fresh sheet of paper in their math notebooks (estimating focuses thinking on the meaning of the numbers and the operations and not on counting decimal places).

Have a few students share their answers with the class. Then explain why different answers may have come up (front-end estimation versus rounding).

Let students know that estimating is a good way to begin any computation problem, as it gives a rough answer.

2) (Estimated time: 10 minutes)

Give students a sum involving different numbers of decimal places (on overhead or board):

$$73.46 + 6.2 + 0.582$$

- The first task is to make an estimate and explain why the estimate was made.
- The second task is to compute the exact answer and explain how that was done (no calculators).

Choose 1-2 student to share their methods to solving the problem (select students beforehand- ask if they would be willing to share because I saw their methods- only have two students share if they used two separate methods, otherwise just one).

3) (Estimated time: 15 minutes)

\*Pass out grid paper for the students to take notes!

**(W)** Tell the class they we are going to be learning two new methods for addition of whole numbers and decimals. Even though many of them already have a strategy they use and are comfortable with for doing addition, these new methods are going to stretch their brains and help them learn new material in the future. They also may be useful when solving certain addition problems.

On the overhead, do an example whole number addition problem using the partial-sum method.

\*Have students write down the examples I provide on the grid paper provided.

$348 + 177 = ?$	100s 10s 1s
	3 4 8
	+ 1 7 7
$300 + 100 \Rightarrow$	4 0 0
$40 + 70 \Rightarrow$	1 1 0
$8 + 7 \Rightarrow$	+ 1 5
$400 + 110 + 15 \Rightarrow$	5 2 5

\*Remind students that each digit in a numeral has a value that depends on its place in the numeral.

\*After example, then title “Partial Sums” and ask class why they think it’s called this (this will help students remember the method).

Then have students practice this method with another whole number addition problem on their own.

$$174 + 98$$

\*Go around room checking student work at this time.

\*Make sure to pay attention to students’ methods in solving the problem, and do not just check for correct answer.

4) (Estimated time: 10 minutes)

Next, do an example of decimal addition using the partial-sum method.

\*Stress that by this method, addition problems involving decimals are done in the same way as problems involving only whole numbers.

\*What is important is that you have to line up the places correctly, either by adding 0s to the end of the number or by lining up the ones places.

$4.65 + 3.25 = ?$	1s 0.1s 0.01s
	4. 6 5
	+ 3. 2 5
$4 + 3$	7. 0 0
$0.6 + 0.2$	0. 8 0
$0.05 + 0.05$	+ 0. 1 0
$7.00 + 0.80 + 0.10$	7. 9 0

5) **(E)** Assign pg. 32 problems 1-3. Tell students to change the directions on their sheet and for now just do problems 1-3 using the partial-sum method of addition.

**(T) HINT**

- A good first step would be to figure out how many numbers are in the problem and write that amount of decimal places down, making sure to line them all up.
- Then they should write each number in, paying attention to the digits that go before/after decimal.
- Next they should add in zeros
- Now ready to compute the problem!



Homework: S.L. 2.1

\*During the last 15 minutes of class, when students have time to work on their homework, have one student from each table work on the computers in the two team rooms. Use the website: Coolmath4kids.com. Students will have opportunities to explore the various activities the website offers, including rounding practice, addition/subtraction/multiplication with whole numbers and decimals, multiplication facts practice, mental math practice, and place-value games.

**Day 2**

1) (Estimated time: 5 minutes)

Warm-up: Read SRB pp. 28-29- Be ready to share two key ideas.

2) (Estimated time: 10 minutes)

**(R)** Present a decimal addition problem to the students and have them solve it individually using the partial-sum method they learned the day before. Once they finish, students may compare their answers with the other students at their table.

Problem:  $3.98 + 7.4 + 0.26$

Choose a student at random to tell the class what they got for an answer. Ask the rest of the class if they agree.

Then ask, what was important to make sure to do before solving the problem? (Line up ones places/add zeros to the end of numbers)

3) (Estimated time: 10 minutes)

\*Pass out grid paper for students to take notes!

Next, tell the class we are going to be learning a second method for doing addition with decimals, and it also works the same way it did for addition with whole numbers.

Do an example decimal addition problem using the column-addition method.

\*Have students record this method on the grid paper provided just as they did the day before.

- In the column-addition method, each column of numbers is added separately, and in any order.
- If adding results in a single digit in each column, the sum has been found.
- If the sum in any column is a 2-digit number, it is renamed and part of it is added to the sum in the column on its left.

$$\begin{array}{r} 4. \quad 5 \quad 6 \\ + 7. \quad 9 \quad 0 \\ \hline 11. \quad 14 \quad 6 \end{array}$$

*Add the numbers in each column*

*Adjust the tenths and ones:*

*14 tenths = 1 one and 4 tenths*

*Trade the 1 one into the*

\*Draw in columns!!!\*

*tenths column.*

12. 4 6

\*Stress that by this method, addition problems involving decimals are done in the same way as problems involving only whole numbers.

\*After example, then title “Column-Addition.”

Then have students practice this method with another decimal addition problem.

$$8.78 + 0.641 + 4.5$$

\*Travel around room to see who understands and who is struggling (will be able to check student understanding by looking at the steps students use to get to answer, and if steps aren't clear then ask what they did at different points in solving the problem).

4) (Estimated time: 15 minutes)

Have students work individually on p. 32 of their math journals (adding decimals and whole numbers using the partial-sum and column-addition methods).

\*Adding to the altered directions, tell students to use the column addition method for problems 4 and 5, and then pick which method they use for problems 6-8.

\*They may refer to SRB pp. 13, 14 and 35.

5) (Estimated time: 10 minutes)

**(E)** Bring the group back together to discuss solutions. Use turn sticks to draw student names, to give all students a chance to participate.

Possible discussion questions:

- Which method of addition do you prefer? Why?
- What are some of the advantages/disadvantages of each method?
- When might a particular method be useful? When might it not be useful?

Homework: Finish Math Journal p. 32, S.L. 2.2

\*Have a second student from each table use the computers to work on the website: Coolmath4kids.com and practice rounding, computations, place-values, and mental math.

## Lesson 2.3

### **Day 3**

1) (Estimated time: 5 minutes)

Begin lesson with Math Message:

*Solve each problem:*

$$\begin{array}{r} 81 - 47 \\ 608 - 73 \\ 35.26 \\ - 19.62 \end{array}$$

Have students make piles of homework (S.L. 2.2) on their tables. They may keep pg. 32 out to be graded together as a class.

2) (Estimated time: 10 minutes)

Briefly review the answers to pg. 32 and ask students to share the strategies they used to solve the problems. Point out the strategy of using estimation to start out and then the process of elimination (ex. When finding the sum for 832, 901 can immediately be eliminated since it is greater than 832, also all combinations for pairs of numbers in the 500s can be eliminated since their sums would exceed 1,000, also any combination of 2-digit numbers).

\*A quick way to focus in on a solution is to look at 3-digit numbers whose one digits add to a sum ending in 2.

3) (Estimated time: 5 minutes)

Next, have students share solution strategies to the Math Message problems with the whole class. Just as with addition, they are encouraged to use whatever method they choose.

4) (Estimated time: 10 minutes)

Review the trade- first method of subtraction.

- If each digit of the minuend (the larger number) is greater than or equal to the digit directly below it, the problem is very easy to solve. Subtraction is performed separately in each column.

$$\begin{array}{r} 93 \\ - 21 \\ \hline 72 \end{array} \qquad \begin{array}{r} 6.48 \\ - 3.45 \\ \hline 3.03 \end{array} \qquad \begin{array}{r} 54,729 \\ - 34,026 \\ \hline 20,703 \end{array}$$

- If any digit of the minuend is less than the digit directly below it, then the minuend is adjusted *before* any subtracting is done. The minuend is adjusted by “trading.”

Example:  $463 - 275 = ?$

*Look at the 1s place;*

*5 ones cannot be removed*

*from 3 ones; trade 1 ten*

*for the 10 ones; adjust the*

*tens and ones:*

$$\begin{array}{r} \text{100s} \quad \text{10s} \quad \text{1s} \\ 4 \quad 6 \quad 3 \\ - 2 \quad 7 \quad 5 \\ \hline \end{array}$$

*Look at the 10s place*

*7 tens cannot be removed*

*from 5 tens; trade 1 hundred*

*for 10 tens; adjust the*

*hundreds and tens:*

$$\begin{array}{r} 3 \quad 15 \quad 13 \\ 4 \quad 5 \quad 3 \\ - 2 \quad 7 \quad 5 \\ \hline 1 \quad 8 \quad 8 \end{array}$$

*Subtract in each column:*

$$3 \text{ [100s]} - 2 \text{ [100s]}$$

$$15 \text{ [10s]} - 7 \text{ [10s]}$$

$$13 \text{ [1s]} - 5 \text{ [1s]}$$

\*If students “trade” when not necessary, point out that they can always adjust the answer, as they do with column addition.

\*After example, then title “Trade-First.”

Have students practice this method on their own, solving the problem:  $762 - 281$

\*Use this time to walk around the room and see how students are doing.

5) (Estimated time: 10 minutes)

Now do an example of the trade-first method with decimals.

*Example:*  $32.9 - 15.6 = ?$

	10s	1s	0.1s
<i>Trade 1 ten for 10 ones;</i>	2	12	.
<i>Adjust the tens and ones:</i>	3	2	. 9
	<u>-1</u>	<u>5</u>	<u>6</u>
<i>Subtract in each column:</i>	1	7	. 3

2 [10s] – 1 [10s]

12 [1s] – 5 [1s]

9 [0.1s] – 6 [0.1s]

Then have students practice this method with a decimal problem.

\*Go over what they should do to set up the problem before solving: Be sure to line up the decimal places correctly, and write 9.4 as 9.40 since 4.85 has two decimal places. Struggling students may also write place-value reminders such as 100s, 10s, 1s, and 0.1s above the columns.

$$9.4 - 4.85$$

Homework: Assign pg. 34 problems 1-3. Tell students to change the directions on their sheet and for now just do problems 1-3 using the trade-first method of subtraction.

\*Have a third student from each table use the computers to work on the website: [Coolmath4kids.com](http://Coolmath4kids.com) and practice rounding, computations, place-values, and mental math.

#### **Day 4**

1) (Estimated time: 10 minutes)

Present a decimal problem to the students and have them solve it individually using the trade-first method of subtraction they learned the day before. They may compare their answer with the rest of their table when finished.

Problem:  $68.235 - 39.14$

Choose a student at random to tell the class what they got for an answer. Ask the rest of the class if they agree.

Then ask, what was important to make sure to do before solving the problem? (Line up ones places/add zeros to the end of numbers)

2) (Estimated time: 15 minutes)

\*Pass out grid paper for students to take notes!

Next, tell the class we are going to be learning a second method for doing subtraction with decimals, and it also works the same way it did for addition with whole numbers.

Do an example decimal subtraction problem using the partial-differences method.

\*Have students record this method on the grid paper provided just as they did the day before.

- The subtraction is performed from left to right, column by column.
- The smaller number in each column is always subtracted from the larger number.
  - If the bottom number is less than the top number, then the result will be added to obtain the final answer.
  - If the bottom number is greater than the top number, then the result will be subtracted to obtain the final answer.
- To find the final answer, the partial differences are added or subtracted.

*Example:*  $4,261 - 2,637 = ?$

	4261
	<u>- 2637</u>
<i>Subtract the thousands:</i>	$4,000 - 2,000 \Rightarrow + 2000$
<i>Subtract the hundreds:</i>	$600 - 200 \Rightarrow - 400$
<small>(Smaller number is on top; so include minus sign.)</small>	
<i>Subtract the tens:</i>	$60 - 30 \Rightarrow + 30$
<i>Subtract the ones:</i>	$7 - 1 \Rightarrow - \underline{6}$
<small>(Smaller number is on top; so include minus sign.)</small>	
<i>Find the total:</i>	$2,000 - 400 + 30 - 6 \Rightarrow 1624$

\*After example, then title “Partial-Differences.”

Have students practice this method on their own:  $846 - 363 = ?$

\*Walk around the room to see who is getting it and who is struggling.

3) (Estimated time: 10 minutes)

Do an example decimal subtraction problem using the partial-differences method.

\*Stress that subtraction problems involving decimals are done in the same way as problems involving only whole numbers.

*Example:*  $76.38 - 39.81 = ?$

	76.38
	<u>- 39.81</u>
<i>Subtract the tens:</i>	$70 - 30 \Rightarrow + 40.00$
<i>Subtract the ones:</i>	$9 - 6 \Rightarrow - 3.00$
<i>Subtract the tenths:</i>	$0.8 - 0.3 \Rightarrow - 0.50$
<i>Subtract the hundredths:</i>	$0.08 - 0.01 \Rightarrow + \underline{0.07}$
<i>Find the total:</i>	$40.00 - 3.00 - 0.50 + 0.07 = 36.57$

4) (Estimated time: 10 minutes)

Have students work individually on p. 34 of their math journals.

\*Adding to the altered directions, tell students to use the partial-differences method for problems 4-6, and then pick which method they use for problems 7 and 8.

\*They may refer to SRB pp. 15-17, 35, and 36.

\*Circulate and assist students at this time.

5) (Estimated time: 10 minutes)

Bring the group back together to discuss solutions.

Possible discussion questions:

- Which method of subtraction do you prefer? Why?
- What are some of the advantages/disadvantages of each method?
- When might a particular method be useful? When might it not be useful?
- How is the partial-sums method similar to the partial-differences method? How are the methods different?

Homework: Finish Math Journal p. 34, S.L. 2.3

\*Have a fourth student from each table use the computers to work on the website: Coolmath4kids.com and practice rounding, computations, place-values, and mental math.

## LESSON 2.4

### Day 5

1) Math Message: *Pick up the sheet on the stool and answer by yourself at desk.*  
(Estimated time: 5 minutes)

#### Number Sentences:

$$34 - 2 = 18$$

$$4 \times 2$$

$$6/2 = 3$$

What are the rules for number sentences/  
What do number sentences contain?

(contain math symbols-  
relation symbols ( $<$ ,  $>$ ,  $=$ )  
and operation symbols,  
some true/some false)

#### Open Sentences:

$$34 - x = 18$$

$$d * 3 = 27$$

$$146 + 34 = t$$

$$24 \times 3 + x$$

What are definitions/rules for open sentences?

(Contain variables (letters),  
neither true nor false)

2) (Time: 30 sec. – 1 minute)

Tell students to take a minute to share their answers with the rest of their group.

3) (Time: 2 minutes max.)

Have groups share with the class what they came up with.

\*Have students check off what they already have down and add new answers.

\*If no one mentions one of the key parts of number/open sentences (above), let them know ones they missed by pointing out examples ( $34 - 2 = 18$  shows that number sentences can be false, number sentences contain relation symbols other than  $=$ )

4) (Estimated time: 10 minutes)

Tell students we are going to be solving some number stories. Begin by doing two examples with the whole class.

\*Have each example written ahead of time on an overhead.

\*Students should have their spiral notebooks out, but do not need to copy down the story problems.

*Example 1:* At breakfast, the temperature outside was  $47^{\circ}\text{F}$ . By lunchtime, the temperature had gone up to  $63^{\circ}\text{F}$ . How many degrees warmer was it by lunchtime?

\*Talk through the problem. "So now the temperature is 63 degrees, so we need to find out by how much the temperature has increased..."

**Step 1:** We know that the temp. at breakfast was  $47^{\circ}\text{F}$  and that by lunchtime, it had gone up to  $63^{\circ}\text{F}$ . Decide on a letter variable to use for the missing number (the number of degrees the temperature has increased).  $t$  (for temperature) or  $d$  (for degrees) are sensible choices for this story.

\*Need to write an open sentence before solving the problem, so we need to use a variable.

\*Have students tell someone next to them what letter they think we should use and why.

**Step 2:** Ask students to write an open sentence showing how the variable and other numbers in the story are related. Depending on how students view this problem, both  $47 + t = 63$  and  $63 - 47 = t$  are possible open sentences.

\*Tell students to write an open sentence they need to use numbers and a letter.

**Step 3:** Ask students to solve their open sentences. What number should replace the variable  $t$  to make the sentence true? **16**

\*Quickly ask a few students what their open sentence is and how they got their solution (guess and check? subtraction?)

\*Point out to students that 16 would be the solution, while the answer requires a label with the number.

*Example 2:* Mary had  $\$32.50$  in her savings account. After she withdrew some money, she had  $\$17.25$  left in her account. How much money did she withdraw from her account?

\*We want to find by what amount the starting number is decreased.

1. Open sentence:  $32.50 - m = \$17.25$  (or  $32.50 - 17.25 = m$ ), where  $m$  is the money she withdrew from her account.

\*Have students pick a letter to use for their variable, and then write an open sentence and solve. They should then compare their answer with the rest of their table.

2. Solution: 15.25
3. Answer: Mary withdrew \$15.25 from her account.

5) (Time: 5-10 minutes)

Have students work either individually or with a partner to solve number stories.

\*\*\*Have examples 3 and 4 together on an overhead, so students can move on to a new problem when finished while teachers are assisting.

\*Have ELL students work with students proficient in English to write, illustrate, and solve addition and subtraction number stories.

*Example 3:* The school library has 486 fiction books and 321 nonfiction books. How many books does the library have in all?

This is a parts-and-total story, where two or more separate parts are known and we want to find the total.

1. Open sentence:  $486 + 321 = t$ , where  $t$  is the total number of books in the library.
2. Solution: 807
3. Answer: The library has 807 books in all.

*Example 4:* Mrs. Snow is 49 years old. Her son, Kevin, is 24 years old. Mr. Snow is 6 years older than Mrs. Snow. How old was Mrs. Snow when Kevin was born?

This is a comparison story involving the difference between two quantities.

1. Open sentence:  $49 - 24 = d$  (or  $24 + d = 49$ ), where  $d$  is the difference in their ages.
2. Solution: 25
3. Answer: Mrs. Snow was 25 years old when Kevin was born.

\*Note that the fact that Mr. Snow is 6 years older than Mrs. Snow is not relevant to the solution to the story.

\*When students begin to finish solving number stories 3 and 4, write their assignment up on the board and give them the rest of the class to work.

6) (Estimated time: 15 minutes)

Assign Journal pp. 36-38 (addition and subtraction number stories), S.L. 2.4

\*Have a fifth student from each table use the computers to work on the website: Coolmath4kids.com and practice rounding, computations, place-values, and mental math.



## LESSON 2.8

### Day 6

1) (Estimated time: 5 minutes)

Math Message: *Multiply. Show your work.*  $253 * 8$       $37 * 62$

2) (Estimated time: 8 minutes)

Have volunteers share how they solved the Math Message problems.

$$253 * 8 = 2,024 \qquad 37 * 62 = 2,294$$

Review the partial-products method for multiplication.

- Each part of one factor is multiplied by each part of the other factor.
- Each partial product is written on a separate line.
- These partial products are then added.

\*Have students write place-value reminders above the columns.

\*Make sure that the digits are properly aligned in columns.

\*Show work to the left of each row!!!

$48 * 26 = ?$	100s	10s	1s
<i>Think of 26 as 20 + 6</i>		2	6
<i>Think of 43 as 40 + 3</i>	*	4	3
$40 * 20 \rightarrow$	8	0	0
$40 * 6 \rightarrow$	2	4	0
<i>Multiply each part of 26</i>			
<i>by each part of 43:</i>			
$3 * 20 \rightarrow$		6	0
$3 * 6 \rightarrow$		1	8
<i>Add four partial products:</i>	11	1	8

Have students solve a whole number multiplication problem using the partial-product method on their own:

$$4 * 236 = ?$$

When finished students need to check their work with a partner at their table.

\*Circulate and assist at this time.

3) (Estimated time: 10 minutes)

Introduce multiplication of decimals using the partial-product method.

- Use the problem:  $1.3 * 5$  as an example.
- Tell the class that one way they can solve multiplication problems containing decimal factors is to multiply as if both factors were whole numbers and then adjust the product.
  - 1) First make a magnitude estimate of the product.
  - 2) Multiply the numbers as though they were whole numbers.
  - 3) Then use the magnitude estimate as a guide to reinsert the decimal point at the correct location in the answer.

*Ex:  $1.3 * 5 = ?$*

1. Round 1.3 to 1; since  $1 * 5 = 5$ , the product will be in the ones place.

2. Ignore the decimal point and multiply  $13 * 5$  as though both factors were whole numbers:  
 $13 * 5 = 65$ .

3. Since the magnitude estimate is in the ones, the product must be in the ones. The answer must be 6.5. So,  $1.3 * 5 = 6.5$ .

- Next, do an example of how to find the product of two decimals.

*Ex:  $3.4 * 4.6 = ?$*

1. Round 3.4 to 3 and 4.6 to 5; since  $3 * 5 = 15$ , the product must be in the tens.

2. Ignore the decimal points and multiply  $34 * 46$  as if they were whole numbers:  $34 * 46 = 1,564$ .

3. Since the magnitude estimate is in the tens, the product must be in the tens. The answer must be 15.64. So,  $3.4 * 4.6 = 15.64$ .

4) (Estimated time: 20 minutes)

Have students work individually or with a partner on pages 50-51 in their math journals (multiplication of whole numbers and decimals).

\*Make sure students understand that they do not have to solve all of the problems on the journal pages. They should first make a magnitude estimate for each problem to determine if they should continue and solve the problem (p. 50 solve problems that will have a solution of at least 1,000 based on estimate, p. 51 solve problems that will have a solution of at least 10 based on estimate).

\*Have students change the directions in #7 on both journal pages: Cross out “for at least one” and replace with “all.”

\*Circulate and assist at this time.

Homework: Journal pp. 50-52, S.L. 2.8

\*Gives students the opportunity to take a second chance to work on the website: Coolmath4kids.com and practice rounding, computations, place-values, and mental math.

## LESSON 2.9

### Day 7

1) (Estimated time: 5 minutes)

Math Message: *Multiply. Show your work.*

$$32 * 146 \quad 4.5 * 0.82$$

2) (Estimated time: 15 minutes)

Ask volunteers to show how they solved the problems.

$$32 * 146 = 4,672 \quad 4.5 * 0.82 = 3.69$$

Tell the class you are going to use the **lattice method** to solve multiplication problems. Remind them that they have probably been using this method since third grade. It is very easy to use if you know the basic multiplication facts.

Do an example using whole numbers:  $42 * 37 = ?$

1. The box with squares and diagonals is called a **lattice**. Write 37 above the lattice. Write 42 on the right side.
2. Multiply  $4 * 7$ . Then multiply  $4 * 3$ . Multiply  $2 * 7$ . Then multiply  $2 * 3$ . Write the answers as shown.
3. Add the numbers along each diagonal. Begin with the diagonal in the bottom right-hand corner. If the sum on a diagonal is 10 or more, write the ones digit in the answer space and the tens digit at the top of the next diagonal. For example, the sum of the numbers in the second diagonal is 15, so write 1 above the 2 in the third diagonal. The sum of the numbers in that diagonal is  $1 + 2 + 2 = 5$ .
4. The answer is shown, starting on the left side of the lattice and continuing below the lattice.

$$42 * 37 = 1,554$$

	3	7	
	1	2 <sup>1</sup>	4
1	2	8	
	0	1	2
5	6	4	
	5	4	

Pass out a lattice-computation grid (*Math Masters*, page 21) to each student.

Give students a couple whole-number multiplication problems to solve using the lattice method.

$$88 * 97 = ?$$

$$487 * 8 = ?$$

\*At this time, walk around to assist students who are struggling. Also, watch to make sure students are setting up the problem in the lattice right, before attempting to solve the problem.

2) (Estimated time: 10 minutes)

Do an example of a decimal multiplication problem using the lattice method:

$$3.7 * 4.2 = ?$$

- Make a magnitude estimate.  $3.7 * 4.2 \approx 4 * 4 = 16$   
The product will be in the tens.
- When writing the factors above and on the right side of the lattice, include the decimal points. In the factor above the grid, the decimal point should be above a column line. In the factor on the right side of the grid, the decimal point should be to the right of a row line.
- Locate the decimal point in the answer as follows: Slide the decimal point in the factor above the grid down. Slide the decimal point in the factor on the right side of the grid across. The decimal points will intersect on a diagonal line. Slide that decimal point down along the diagonal line. Write a decimal point at the end of the diagonal line.

\*\*\*Draw in decimal points in this problem!!!\*\*\*

	<b>3</b>	<b>7</b>	
	1	2 <sup>1</sup>	<b>4</b>
<b>1</b>	2	8	
	0	1	<b>2</b>
<b>5</b>	6	4	
	5	4	

$4.2 * 3.7 = 15.54$

\*Students may make magnitude estimates in order to check their answers, but the lattice method does not require students to do this as it can automatically locate the position of the decimal in the final answer.

3) (Estimated time: 15 minutes)

Assign Journal p. 53 (Multiplication by the Lattice Method).

Have students work individually, then check their answers with a partner once they have solved the problems on their own.

\*Circulate and assist as needed.

\*For students who are still having difficulty with their multiplication facts, provide a lattice multiplication facts table (*Math Masters*, page 19).

4) (Estimated time: 5 minutes)

Have students complete an Exit Slip describing the advantages and disadvantages of the partial-products and lattice methods.

Homework: Finish journal pp. 53, Study Link 2.9

\*Gives students the opportunity to take a second chance to work on the website:

Coolmath4kids.com and practice rounding, computations, place-values, and mental math.

