Unit Plan
4th Grade Math: Developing Strategies to Multiply by 2-Digit Numbers and Divide 3- and 4-Digit Numbers

Unit Rationale
Process TEKS: The student will use [mathematical process standards](#) to acquire and demonstrate understanding of the concepts in this unit.

[**Focus TEKS**](#): In this unit, students develop strategies for multiplying a 2-digit number by a 2-digit number. With regards to division, students develop strategies for dividing a 3- or 4-digit dividend by a 1-digit divisor. It's important to know that multiplication and division is more than just computation. Students must also learn how to solve [story problems related to these operations](#), including situations where students must interpret the remainder after dividing. They must also represent relationships in story problems and be able to explain strategies used to solve problems using strip diagrams and equations with a letter standing for the unknown quantity.

● Want to learn more? Check out -
    ○ *Teaching Student-Centered Mathematics, Grades 3-5* by John Van de Walle
        ■ Chapter 4 Strategies for Whole-Number Computation
            ● pp. 100-105 An overview of invented strategies and traditional algorithms
            ● pp. 113-118 Invented strategies for multiplication
            ● pp. 118-120 Traditional US algorithm for multiplication
            ● pp. 121-124 Invented strategies for division
            ● pp. 124-128 Traditional US algorithm for division
    ○ [The Progression of Multiplication](#) and [The Progression of Division](#) - Videos from Graham Fletcher that show how these concepts are built across the elementary grades. There are a few inconsistencies between our grade level TEKS and the grade levels in which he talks about a few topics, but the general flow across the the elementary grades is powerful to see all together.

Computational Fluency TEKS: In this unit students build fluency adding and subtracting whole numbers. While students learned the standard US algorithms for addition and subtraction in unit 2, in order to be considered fluent, students need to become flexible with their strategy choice as they practice adding and subtracting efficiently and accurately. For some problems the standard US algorithm may be the most efficient strategy while for others another strategy is a more efficient and appropriate choice. Basically, if you observe a student using one and only one strategy for every problem, they are not demonstrating computational fluency.

● Want to learn more? Check out -
    ○ [Progression of Addition and Subtraction](#) - Video from Graham Fletcher that shows how these concepts are built across the elementary grades. There are a few inconsistencies between our grade level TEKS and the grade levels in which he talks about a few topics, but the general flow across the the elementary grades is powerful to see all together.
    ○ *Teaching Student-Centered Mathematics: Grades 3-5* by John Van de Walle
        ■ Chapter 4 Strategies for Whole-Number Computation
            ● pp. 100-105 An overview of invented strategies and traditional algorithms |

- pp. 108-111 Invented strategies for addition and subtraction - These strategies can be scaled up to computation with larger numbers.
- pp. 112-113 Traditional algorithms for addition and subtraction

Spiral Review TEKS: In this unit, students review place value - representing and comparing numbers up to 999,999. Students also represent and solve problems involving addition and subtraction of whole numbers. Problem contexts include measurement (liquid volume, mass, and money) and data. Representations include strip diagrams and equations with a letter standing for the unknown quantity.

Suggested Pacing

18 Days
- Days 1-4: Representing Multiplication
- Days 5-6: Representing Multiplication and Division with Strip Diagrams
- Day 7: Solving Problems Involving Data
- Day 8: Relating Multiplication and Division
- Days 9-13: Division
- Days 14-15: Multi-Step Problem Solving
- Day 16: Assessment

Academic Vocabulary
(Words in **bold** are new vocabulary. Everything else is review.)
ESL/DL Support: Concept Overview

- area model / modelo de área
- arrays / matrices
- compatible numbers / números compatibles
- digit / dígito
- dividend / dividendo
- divisor / divisor
- doubling division & multiplication / división y multiplicación duplicada
- equal jumps / saltos iguales
- equal-sized groups / grupos del mismo tamaño
- equation / ecuación
- estimation / estimación

- factor / factor
- mental math / cálculo mental
- number line / recta numérica
- number pair / par de números
- open number line / recta numérica abierta
- partial products / productos parciales
- partial quotients / cocientes parciales
- product / producto
- properties - commutative, associative, distributive (teacher language) / propiedades - conmutativo, asociativo, distributivo
- quotient / cociente

- remainder / resto
- skip-counting / conteo saltándose números
- strategy / estrategia
- strip diagram / diagramas de tiras
- table (including t-chart) / tabla (incluyendo gráfica "T")
- unknown (number) / desconocido (número)
- unknown quantity / cantidad desconocido
- **use tens division & multiplication / usar división de decenas y multiplicación**

Note: The redesigned ARRC is a work in progress. If you are unable to find a resource you are looking for, it may not have been transferred over yet. In the meantime, you can access all of the available resources for this unit on the corresponding unit timeline from the 2017-18 ARRC (RRISD employees only). Also, be sure to check out the ARRC redesign roadmap to see the timeline for the redesigned ARRC.

Suggested Unit Plan

(Back to top)

Thank you to RRISD 4th grade teachers Stephanie Billingsley, Andrew Schleisman, and Margie Gray for their expertise in helping to develop this suggested unit plan!

(Note: Purple links contain district adopted, copyrighted materials and can only be accessed by RRISD employees.)

Focus TEKS

Day	Topic and Guiding Questions	Lessons/Activities and Teaching Notes	TEKS
1	Representing Multiplication In this lesson, students kick off their second multiplication and division unit with a 3 Act Task that challenges them to use multi-digit multiplication. This is a great formative assessment opportunity to see how students are able to make sense of this situation and the quantities involved. It is less important that students come up with the exact answer and more important to attend to the reasoning they are using to help you plan as you proceed through this unit.	**Krispy Kreme Me 3-Act Task**	4.4D 4.4H 4.1A 4.1B 4.1C 4.1D 4.1E 4.1F 4.1G
2	Representing Multiplication This lesson opens with a Notice and Wonder carousel to give students an opportunity to analyze various representations of	**Notice and Wonder Carousel** (If you opt to use the Partial Product Tool with the Stepping Stones lesson, then you may want to skip this Notice and Wonder Carousel to allow for sufficient time for students to practice partitioning using the app.) ● Print one copy of these slides and put them in sets:	4.4D 4.1D 4.1F

multiplication and division. Then in the Stepping Stones lesson, students partition rectangular arrays into sections to help them determine the total amount of squares inside the array. Students build an understanding of how "multiplying the dimensions of the rectangle in parts" connects to using partial products when multiplying two-digit numbers by two-digit numbers.

- ○ Set 1: Slides 1-2
- ○ Set 2: Slides 3-4
- ○ Set 3: Slides 5-6
- ○ Set 4: Slides 7-8
- ○ Set 5: Slides 9-10
- ○ Set 6: Slides 11-12
- Create 6 stations around the room. Put one set of pictures at each station. Also put a poster at each station. On each poster create a t-chart. Label the two columns "I Notice" and "I Wonder."
- Students will rotate in groups from station to station. At each station they should analyze the images and record their noticings and wonderings.
- When the class has rotated through all four stations, call the class together to discuss their noticings and wonderings about each set of images. Focus the conversation around the different ways multiplication and/or division is represented in each of the images.

Stepping Stones, Module 3, Lesson 5 - Using the Distributive Property to Multiply Two-Digit Numbers (Partial Products)
Step 2
- Facilitate as written

Step 3
- Facilitate as written, but consider using the Partial Product Finder app instead of the Staticware images to interactively partition 15 × 16 and 18 × 26. With the app, you might also make this more of an Explore where students attempt to partition the factors before guiding them through the provided discussion.
- If you want to let your students use the Partial Product Finder for practice, then provide students some two-digit multiplication problems where the factors are 30 or less. The Partial Product Finder cannot model factors greater than 30. You can do this in place of the Student Journal page, or you could do this first and then let students attempt to transfer what they've learned as they do the Student Journal page. The app is not able to model the factors in the problems on the Student Journal page.

Step 4

		● Facilitate as written ● Exit ticket	
3	Representing Multiplication The lesson opens with the Three Reads routine to give students practice making sense of a story problem. Then in the lesson, students multiply two two-digit numbers. Emphasis is placed on connecting the partial-products strategy to the standard algorithm for multiplication.	**Engage** - Introduce students to the Three Reads routine for comprehending story problems. **Stepping Stones Module 3 Lesson 6 - Using the Standard Algorithm to Multiply Two-Digit Numbers** Step 2 ● Facilitate as written Step 3 ● Facilitate as written Step 4 ● Facilitate as written	4.4D 4.1B 4.1D 4.1F 4.1G
4	Representing Multiplication In this lesson, students engage in a 3-act task involving multiplication of two two-digit numbers. The goal is to formatively assess how students are making sense of multi-digit multiplication.	**"Array"bow of Colors 3-Act Task** **Exit ticket**	4.4D 4.4H 4.1A 4.1B 4.1C 4.1E 4.1F 4.1G
5	Representing and Solving Problems In this lesson, students choose from a range of strategies to solve multi-step word problems involving multiplication.	**Stepping Stones, Module 7 Lesson 6 - Solving Word Problems Involving Multiplication (Two-Digit Numbers)** Step 2 ● Facilitate as written. Step 3 ● Project slide 1 of this modified Step In Discussion. Let students notice and wonder. Use Think-Pair-Share structure. ● Then give each student a copy of the Student Page. Students may work independently or in pairs.	4.4G 4.5A 4.8C

- After students have completed the three problems, use the remaining slides of the Step In Discussion to discuss students' solutions to the problems.
  - Slide 2: Ask, "How did you figure out the total cost of the shorts? What strategy did you use? Why?" Invite one or two students to share their strategies on the board.
  - Slide 3: Compare Abraham's strategy to the ones shared by your students. How is it similar? How is it different?
  - Slide 4: Discuss the question. How do we know our answer is correct?
  - Slide 5: Repeat the discussion to figure out the total cost of buying 12 team shirts and 12 pairs of team shorts.
  - Slide 6: Highlight how the letter T is used as a variable to represent the total cost of the shirts and shorts. Ask, "Why is it helpful to use a letter as the unknown amount?" Discuss how it is much quicker and easier to write one letter (T) instead of writing "total cost of the shirts and shorts." Ask, "Why are 35 and 27 added first before multiplying by 12?" Through discussion, bring out that there would be fewer steps involved compared to multiplying the price of each piece of the uniform by 12. Ask, "What final number needs to be multiplied by 12?" Write 62 × 12 on the board and have students use a strategy of their choice to figure out the total cost ($744). The total cost can then be confirmed with their initial answers.
  - Slide 7: Based on the discussion of the previous question, ask students if there's anything they can learn from that question that could have helped them solve the final question on their sheet. Let students discuss in pairs or trios and, if necessary, try out what they learned from the previous problem.

Step 4
- Skip.
- Instead do this Math Mystery with the class.

| 6 | Representing and Solving Problems

In this lesson, students use strip diagrams and write number sentences to help solve multi-step word problems involving comparisons. Students consider whether the comparison involves part-whole thinking or equal-groups thinking. | **Stepping Stones Module 6 Lesson 6- Using Strip Diagrams to Solve Word Problems**
Step 2
● Facilitate as written
Step 3
● Project slide 1 of these modified Step In Discussion slides. Let students notice and wonder. Use Think-Pair-Share structure.
● Project slide 2. Read the new information in bold and the clues out loud to the students. Then let students work in pairs or trios to work on the challenge. As students work, circulate around and ask questions such as:
  ○ Which clue are you working on? Is this clue about an equal-groups relationship or a part-whole relationship?
  ○ Which clue did you start working on first? Why?
  ○ If students finish early, pose another challenge to them: Think about the ages of the people in your family. What clues could you write?
● After a little more than half of the class has finished the initial challenge, call the class back together. Tell them you have some additional information to share. Adan made the following diagrams to go with the clues. Give each group of students a set of strip diagram and clue cards. Students may write on the diagrams to help them find and prove their answers.
  ○ For groups that have already finished, tell them to match the diagrams with the clues and then use the diagrams to help **prove** their answers are correct.
  ○ For groups that have not finished yet, tell them to match the diagrams with the clues and then think about how the diagrams can **help** them find the ages they're still missing.
● Once everyone has completed the challenge, call the class back together. Work through slides 3 and 4. As you discuss solutions, be sure to specifically ask which diagram represents the clue being discussed and how the students used it to either find or prove their answer. The diagrams and clues can be found on slides 5-9 for easy reference. | 4.5A

4.1C
4.1D |

		This lesson continues tomorrow.	
7	Representing and Solving Problems

In this lesson, students use strip diagrams and write number sentences to help solve multi-step word problems involving comparisons. Students consider whether the comparison involves part-whole thinking or equal-groups thinking. | **Math Mystery** - Open the lesson with a math mystery.

Stepping Stones Module 6 Lesson 6- Using Strip Diagrams to Solve Word Problems (continued)
Step 3
- Project this slide. Say, "Look at these four different strip diagrams. What do you notice? What do you wonder?" Use a think-pair-share structure to analyze and discuss the strip diagrams.
- Give pair of students a copy of this card sort. Say, "Working with your partner, match each story problem with a strip diagram that represents the relationships within the problem." As students finish matching, circulate and pose the following follow-up tasks as pairs are ready:
  - Now that you've made all four matches, label each strip diagram using the quantities and information in the matching story problem.
  - Now that you've labeled each strip diagram, write the number sentence(s) you would use to solve each problem. Write them on the back of the story problem cards.
  - Now that you've written the number sentences you'll use, go ahead and find the solution to each problem. Record your answers on the front of the story problem cards.
Step 4
- Discuss the process of matching, labeling, and solving each story problem. Ask questions such as:
  - How did you decide which strip diagram matched this problem?
  - Which problems involved part-whole thinking? How do you know?
  - Which problems involved equal-groups thinking? How do you know?
- Exit Ticket - Each page contains two copies of the exit ticket | 4.5A
4.8C

4.1C
4.1D |

8	Relating Division and Multiplication In this lesson, students engage in a 3-Act Task to provide teachers a window into students' thinking about multi-digit division.	**Engage** - Have students notice and wonder about the slide. Use the think-pair-share strategy to structure the conversation. If students don't naturally make connections between the three representations (words, picture, symbols) then follow up with questions challenging students to do just that. For example, "There are two equations written down here. Can they both represent this situation?" **Money Roll - 3 Act Task** **Exit Ticket**	4.4E 4.4F 4.8C 4.1A 4.1B 4.1C 4.1E 4.1F 4.1G
9	Division In this lesson, students use an area model to record the partitions of a three-digit dividend that are easily divisible by the one-digit divisor.	**Stepping Stones Module 11 Lesson 4 - Using the Partial-Quotients Strategy to Divide (Three-Digit Dividends)** Step 2 ● Facilitate as written Step 3 ● Facilitate as written Step 4 ● Facilitate as written	4.4E 4.4F 4.1D 4.1F
10	Division In this lesson, students reinforce the division of a three-digit dividend by a one-digit divisor. Students practice partitioning dividends into parts that are easily divisible by the divisor.	**Stepping Stones Module 11 Lesson 5 - Reinforcing the Partial-Quotients Strategy for Division (Three-Digit Dividends)** Step 2 ● Facilitate as written Step 3 ● Facilitate as written Step 4 ● Facilitate as written	4.4E 4.4F 4.4G 4.1D 4.1F
11	Division In this lesson, students use the standard division algorithm to divide two-digit dividends by one-digit divisors. All examples involve regrouping.	**Stepping Stones Module 12 Lesson 4 - Introducing the Standard Division Algorithm** Step 2 ● Facilitate as written Step 3 ● Facilitate as written	4.4E 4.4F 4.1D

		Step 4	
		● Facilitate as written	
12	Division

In this lesson, students use the standard division algorithm to divide three- and four-digit dividends by one-digit divisors. All examples involve regrouping, some across multiple places. | **Stepping Stones Module 12 Lesson 5 - Working with the Standard Division Algorithm**
Step 2
● Facilitate as written
Step 3
● Facilitate as written
Step 4
● Facilitate as written | 4.4E
4.4F
4.4G

4.1C
4.1D |
| 13 | Division

In this lesson, students extend the standard algorithm for division to investigate situations that include remainders. The remainder in each situation is recorded beside the quotient. | **Stepping Stones Module 12 Lesson 6 - Working with the Standard Division Algorithm (with Remainders)**
Step 2
● Facilitate as written
Step 3
● Facilitate as written
Step 4
● Facilitate as written | 4.4E
4.4F

4.1C
4.1D |
| 14 | Interpreting Remainders

In this lesson students analyze word problems involving division to learn that the answer can vary depending on exactly what is asked. | **Engage**
● Be sure to use this in Present mode as it has animations.
● Ask, "What is the quotient of 26 divided by 4?" After students share, click to reveal the quotient, 6 remainder 2.
● Click to reveal the first question. Ask students to solve the problem with a partner. Then have students share out their answers. Click to reveal the answer. Talk about why the answer is 6 and not 6 remainder 2.
● Continue clicking, solving, and discussing to work through the second and third problem.
● At the end, ask, "What did these problems all have in common?" Follow up with, "Why did all of these problems have different answers?"

Interpreting Remainder Sort | 4.4F
4.4H

4.1A
4.1C
4.1F
4.1G |

			● Let students work in pairs to sort the story problems into the given categories. Students can solve before or after they've sorted the problems, whichever they think is most helpful. ● When students are finished, call the class together to discuss the sorting. Focus less on the accuracy of the answers and more on how students are interpreting the remainder. ● End with a written reflection, "What have you learned about solving story problems that involve division?"	

15	Interpreting Remainders
	
	In this lesson students use the Three Reads instructional routine to help process a story problem before solving. They also explore a financial literacy situation in Desmos involving division with remainders.
		Engage - Use the Three Reads routine to help students process a story problem.
		
		Carnival Tickets - In this Desmos activity, students explore a financial literacy concept involving division with remainders.
		● Before the activity
		    ● Go to teacher.desmos.com and sign in. You do not need to create an account. You can sign in using your Google account.
		    ● While you're signed in, follow this link to the Carnival Tickets activity.
		    ● Click the "Create Class Code" button to generate a class code. This is what you will share with students so they can access the activity. You may want to click the "Student Preview" button to familiarize yourself with the activity before leading it.
		    ● Here's a short how-to guide for starting a Desmos class activity.
		● During the activity
		    ○ Tell students to go to student.desmos.com on their devices. Give them the class code to enter the activity. Students should **not** sign in. They should continue as a guest.
		    ○ You will need to go to teacher.desmos.com and sign in. Then follow this link to the activity. Click the View Dashboard button to be taken to the teacher dashboard. While in the dashboard, you can use the Classroom Conversation tools to help facilitate this activity. These tools allow you to:
		        ■ Pause the class to get their attention so you can talk
			4.4F
			4.4H
			4.8C
			
			4.1A
			4.1B
			4.1C
			4.1F
			4.1G

		to them ■ Control the pacing of the lesson if you don't want students flying from screen to screen on their own. ■ Anonymize (and hide) student names so you can share and talk about student work without anyone knowing whose work is being shown.	
16	Flex Day	**Flex Day** - Use this day to review and practice based on the needs of your class: ● Computation practice ● Representing word problems ● Solving word problems **Resources:** ● Stepping Stones Module 11 Problem Solving Activity 2 ● Stepping Stones Module 11 Problem Solving Activity 4 (Problems a, b, and c) ● Stepping Stones Module 11 Lesson 8 Student Journal ● Stepping Stones Module 11 Performance Tasks ● Stepping Stones Module 12 Problem Solving 4 ● (Problems a, b, and c) ● Stepping Stones Module 12 Performance Task 1	
17	Multi-Step Problem Solving In this lesson, students engage in a 3-Act Task to put to use the various skills they've learned in this unit. Use this as an opportunity to see how far your students have come since the beginning of the unit.	**Tree of Lights 3-Act Task**	4.4D 4.4H 4.1A 4.1B 4.1C 4.1D 4.1E 4.1F 4.1G
18	DCA		