Amber Sami Kubesch

Course:	Math
Grade Range:	This can be adapted to fit any grade range. This would also work well as a fun lesson for the end of the year, right before a holiday, or as a Math Club activity.
Unit:	Multiplication
Time Frame:	One day
Context:	In this unit, students explore several meanings and representations of multiplication. These methods are: lattice multiplication, Ancient Egyptian multiplication, Chinese multiplication, Russian multiplication, modern multiplication, and computer algorithms used to compute products (based on target grade range).
Central Focus:	Through history, different methods of multiplying numbers came to be developed. In this unit, students explore several methods and representations of multiplication. They will be able to prove that all covered methods are equivalent in that they will all give the same product.
Standards:	Standard 3.0A, Operations & Algebraic Thinking : Understand properties of multiplication and the relationship between multiplication and division.

5. Apply properties of operations as strategies to multiply and divide. Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)

9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

Standard 4.0A, Operations & Algebraic Thinking : Understand properties of multiplication and the relationship between multiplication and division.

1. Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

Standards (Continued):	Standard 4.NBT, Number & Operations in Base Ten: Use place value understanding and properties of operations to perform multi-digit arithmetic.

5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Standard 5.NBT, Number & Operations in Base Ten: Use place value understanding and properties of operations to perform multi-digit arithmetic.

5. Fluently multiply multi-digit whole numbers using the standard algorithm.

Standard 7.NS, The Number System: Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

    c. Apply properties of operations as strategies to multiply and divide rational numbers.

Learning Objectives:	✐ Students will be able to correctly demonstrate the steps of Russian multiplication using both even and odd multiplicands. ✐ Students will be able to compare and contrast Russian multiplication to the Modern method of multiplication. ✐ Students will be able to explain how the Russian multiplication method works. ✐ Students will be able list trade-offs between Russian and Modern multiplication.

Assessments:	<u>Diagnostic</u>: I will ask students "How many methods of multiplication do you know? Can you share any examples?" <u>Formative</u>: ✎ Students will be given several opportunities for guided practice during class. I will walk around observing and asking them to explain how/why they are completing certain steps. ✎ Students will be given exercises to complete at home for independent practice. ✎ Exit cards will be given at the end of class. Students will be asked to write one sentence responding to the question "What is the most interesting thing you learned about Russian multiplication today?" <u>Summative</u>: Students will write a few paragraphs explaining the similarities and differences between Modern and Russian multiplication. They will be asked to explain (in sentences) how the Russian multiplication method works and to list trade-offs between this and the Modern method they learned in grade school. <u>Feedback</u>: Students will be given continuous feedback during the guided practice activities. Observation will be used as the teacher checks on student progress during guided practice and assesses their ability complete the steps correctly and in order. Feedback will also be given on the correctness of independent practice, and again on the summative writing assignment. Exit cards will be used to inform future lessons and meet the students at the point where further help is needed.
Academic Language:	<u>Content-Specific Vocabulary</u>: Even number Odd number Double Halve Addition Multiplication Multiplicand Product Modern multiplication Russian multiplication <u>Academic Language Function</u>: Students will be expected to compare and contrast the Russian and Modern multiplication methods, explain how Russian multiplication works, identify even and odd numbers", identify multiplications and products, and select which numbers to double and which to halve.
Prior Knowledge / Prerequisite Skills	To be successful in the lesson, students should have learned and remember how to compute the product of two multi-digit integers using Modern multiplication. They need to be able to consider differing perspectives in evaluating pros and cons of the Russian multiplication method as compared to Modern multiplication. They need to be able to distinguish between even and odd integers, be able to halve and double integers, and be able to add multi-digit integers together by hand.

Lesson Procedures: Instructional Strategies and Learning Tasks	Before the beginning of class, the agenda and objectives will be clearly posted on the white board. At the beginning of class, I will walk over to these on the board and draw student attention to them, reading them aloud.

Objectives:
• Correctly demonstrate the steps of Russian multiplication using both even and odd multiplicands.
• Compare and contrast Russian multiplication to the Modern method of multiplication.
• List trade-offs between Russian and Modern multiplication.
• Explain how the Russian multiplication method works.

Agenda, June 18:
How do we multiply?
Russian multiplication
Guided practice
Exit Cards

Launch: I will launch the lesson by drawing on their prior-knowledge related to the topic. I will ask the class "How many methods of multiplication do you know? Can you share any examples?"

Step-by-Step Procedures: Academic language will be explained and then used through this section. I will present an example showing the steps of Russian multiplication. First I will find the product using the Modern multiplication method, then demonstrate how to obtain the same product using the Russian multiplication method; this will also help connect the new material to prior knowledge while showing that the end result will be the same with either method. I will demonstrate the math on the white board while leaving the list of steps displayed on the SMART board, referring back to each listed step as I perform it in the example. I will demonstrate examples using both even and odd multiplicands. I will then do guided practice by providing a new example and asking students to follow along with me using their individual white boards and markers. I will ask them to do one step as a time, pausing as I give them time to work before demonstrating how that step should be completed correctly. Finally I will give examples for them to do as seat work as I walk around observing, asking questions, and providing feedback. The specific examples to be used are attached to this lesson plan.

Closure: With five minutes remaining for the lesson, I will distribute index cards to all students and ask them to reflect on the lesson by answering the following question: "Compute the product of 5 and 9 using Russian multiplication. Please show all work." To help visual learners, this question will also be displayed on the SMART Board before passing out the cards, giving students more time to think about their responses.

Differentiation	1. Students will be able to both listen to and read ideas, thus accommodating aural and visual learners. Instruction will be both read and displayed on the SMART board/white board. 2. Students are given multiple ways to demonstrate learning, including written word explaining their steps. This will allow students to use multiple intelligences.
Instructional Resources and Materials:	✏ Markers ✏ Individual white boards ✏ Wall-mounted white board ✏ SMART Board
Theoretical Principles and/or Research-Based Best Practices	The central focus of this unit is on using different methods of multiplication to get the same product when using the same multiplicands. This particular lesson aims to teach students how to use the technique of Russian multiplication. Since all students must obtain this skill, I have chosen to teach this lesson using the Direct Teaching method. Following the recommendations made by Arends in *Learning to Teach*, I have structured my lesson in the following way: First I establish set and launch the lesson making connections to their prior knowledge on Modern multiplication. Then I direct attention to the posted agenda and lesson objectives on the white board so that students will know what procedure is being taught. The Russian multiplication method will be demonstrated step-by-step, with each step being clearly explained as part of the example. Structured, guided initial practice will follow in the form of seat work, while I check for understanding and provide specific feedback to make sure that all students learn how to correctly do the multiplication. I assign independent practice in the form of additional exercises for practice and provide extended practice and opportunities for transfer in subsequent lessons.
Lesson Reflection	To be filled in after the lesson

Sources used to create the unit plan were *Learning to Teach* by Arends; *The Russian Peasant Multiplication Algorithm: A Generalization* by Beverly Gimmestad in The Mathematical Gazette, 75(472), June 1991; and *The Russian Peasant Method for Multiplication: Why Does It Work?* by David Pagni in Mathematics in School, 29(5), November 2000.

<u>Multiplication:</u> How many methods of multiplication
do you know? Can you share any examples?

Russian Multiplication: Step-by-Step

1. Write down the multiplicands at the head of each column.

2. Halve the number in the first column, and double the number in the second column.

   If the number in the first column is odd, divide it by two and drop the remainder.

3. Keep doubling, halving, and crossing out until the number in the first column is "1."

4. Cross out all rows where the number in the first column is even.

5. Add up the remaining numbers in the second column. The total is the product of your original numbers.

$$\begin{array}{r} 8 \\ \times \quad 9 \\ \hline 72 \end{array}$$

Column 1	Column 2
~~8~~	~~9~~
~~4~~	~~18~~
~~2~~	~~36~~
1	72
	72

$$\begin{array}{r} 9 \\ \times \quad 8 \\ \hline 72 \end{array}$$

Column 1	Column 2
9	8
~~4~~	~~16~~
~~2~~	~~32~~
1	64
	72

$$\begin{array}{r} 7 \\ \times \quad 8 \\ \hline 56 \end{array}$$

Column 1	Column 2
57	86
~~7~~	~~8~~
~~3~~	~~16~~
~~1~~	~~32~~
	56

```
     37
×     6
─────────
    222
```

Column 1	Column 2
37	6
~~18~~	~~12~~
9	24
~~4~~	~~48~~
~~2~~	~~96~~
1	192
	222

```
      48
×     16
─────────
     288
+    480
─────────
     768
```

Column 1	Column 2
~~48~~	~~16~~
~~24~~	~~32~~
~~12~~	~~64~~
~~6~~	~~128~~
3	256
1	512
	768

```
      57
×     86
─────────
     342
+   4560
─────────
    4902
```

Column 1	Column 2
57	86
~~28~~	~~172~~
~~14~~	~~344~~
7	688
3	1376
1	2752
	4902

Compute the product of 5 and 9 using
Russian multiplication. Please show all work.