

So, Do You Know Your Multiplication Facts?

Grade Level: Grade 4 – 5

Content area(s): Math and Visual Arts

Classroom Time: 30 – 90 minutes

Purpose: Review/learn patterning and multiplication facts through the use of visual art and Sudoku

Skills Addressed:

Math skill: Patterning, meaning of multiplication, compute fluently

Visual Arts Skill: Analyzing art works

Supplies:

Paper, pencil, handouts, internet access, and markers/crayons

Lesson Process:

Warm-up –

- A. Show the students Jasper John’s “*Numbers In Color*”
- B. Ask the students the following questions:
 - What do you see? – *Ex: Numbers, different colors, the first piece doesn’t have a number in it, etc.*
 - Do you see a pattern in the picture? – *Ex: 0 – 9 repeats, top and left side go from 0 – 9, the rows start one number higher than the row above, etc.*
 - Do you think this is an art piece, why or why not? – *Ex: Yes because of the ways the color and numbers are put on the piece. No because it only has numbers on it, etc.*
 - Have you ever seen a piece of art that only had numbers in it? - *Answers will vary.*
 - Ask the students if they think a mathematician painted the picture, why or why not? – *Ex: Yes, because it has numbers all over it or no, because artwork can have numbers all over it.*
- C. Have each student create a pattern. After the students created their pattern have them create a work of art with it resembling Jasper John’s or another example – *Attachment 1*

Lesson procedure –

- A. Review multiplication facts by using Jasper John’s “*Numbers In Color*” by having students select two numbers at a time (each number can be a single digit or a combination of two numbers next to each other, ie. 12 and 90). Once the numbers are selected have the students write them down on a piece of paper in the form of a multiplication problem and find the product. – *Ex: $3 \times 9 = 27$*
- B. Repeat a few times. (*Attachment 2 – “Tricks to learning multiplication facts*)
- C. Ask the students how many of them have done a Sudoku puzzle before. Provide directions as needed. – *Each square is divided into smaller rectangles (in this case) by darker lines. Within the smaller rectangles there will be numbers in some squares and some blank squares. The object is to put numbers in the blank squares so that each small section, all the rows, and all the columns have one of each number in them.*
- D. Practice one puzzle together as a class. – *Attachment 3*

- E. The students will play Sudoku to review their multiplication facts. Select a factor or several factors for the students to practice. - *Attachment 4(All products start with the factor 7)*

Student assessment or final product to be developed:

Class participation, teacher observation, pattern picture, multiplication practice sheet, and Sudoku puzzles

Extension activities

- A. The “Bonus” Sudoku puzzle – *Attachment 5*
- B. Students write instructions for solving a Sudoku puzzle listing all the methods they use to determine where each answer is placed.
- C. Students create a puzzle with a given set of products with all the products in the puzzle noting all the columns, rows and sections have one of each product.

Multiplication Tricks

- 1.) Multiplying by 1 – Equals the number!
- 2.) Multiplying by 2 – Double the number
- 3.) Multiplying by 3
 - a. Double the number
 - b. Add the number to the double
 - c. Ex: 3×9 : $9 + 9 = 18$
 $18 + 9 = 27$
- 4.) Multiplying by 4's
 - a. Double the number
 - b. Double the number again
 - c. Ex: 4×8 : $8 + 8 = 16$
 $16 + 16 = 32$
- 5.) Multiplying by 5's
 - a. Divide the number in two
 - b. Multiply by 10
 - c. Ex: 5×9 : $9 / 2 = 4.5$
 $4.5 \times 10 = 45$
- 6.) Multiplying by 6's
 - a. 6×1 through 6×5 is above
 - b. $6 \times 6 = 36$ – rhymes!
 - c. $6 \times 7 = 42$ - Memorize
 - d. $6 \times 8 = 48$ – rhymes!
 - e. 6×9 through 6×11 is below
 - f. $6 \times 12 = 72$ – Memorize
- 7.) Multiplying by 7's
 - a. Already know through 6×7
 - b. $7 \times 7 = 49$ – You are cool, you are fine!
 - c. $7 \times 8 = 56$ 5,6,7,8
 - d. 7×9 through 7×11 below
 - e. $7 \times 12 = 84$ – memorize
- 8.) Multiplying by 8's
 - a. 8×1 through 8×7 is above
 - b. $8 \times 8 = 64$ – Close your mouth and shut the door
 - c. 8×9 through 8×11 below
 - d. $8 \times 12 = 96$ – Memorize

- 9.) Multiplying by 9's – Finger rule – only through 9 x 10
- Spread fingers out on both hands – putting them down on a flat surface helps
 - Start with the little finger on the left hand
 - Count the number of fingers as the number being multiplied
 - Bend finger down
 - Starting from the left, the fingers before the bent finger is the 10's digit, after the bent finger is the 1's digit
 - Ex: 9 x 6: Counting six fingers from the left
 Fold thumb down
 Answer: 5 fingers to the left, 4 fingers to the right = 54
 - NOTE: The tens digit is always one less than the factor being multiplied (9 x 6 = 54)

- 10.) Multiplying by 10's
- Add a zero to the number
 - Ex: 10 x 4: 4 0 = 40

- 11.) Multiplying by 11's
- Single digit number
 - The answer is the number in both the ten's and one's place holders
 - Ex: 11 x 7 = 77
 - Double digit number

- Example 1
 - Separate the 2 digits leaving a "hole" between them
 - Add the two numbers together
 - Put the result in the "hole"
 - Ex: 11 x 54

$$\begin{array}{r} 5 _ 4 \\ (5 + 4 = 9) \\ \hline 594 \end{array}$$

- NOTE: If the sum is greater than 9, put the ones digit in the hole and carry the tens digit. Ex: 11 x 67

$$\begin{array}{r} 6 _ 7 \\ (6 + 7 = 13 \text{ (double digits!)}) \\ (6 + 1) \underline{3} 7 = 737 \end{array}$$

- Example 2
 - Write down the number with a "0" in front of it
 - Draw a line under the number
 - Working from the one's digit to the LEFT
 - Write down the one's digit
 - For the tens place add the ones and tens digit together
 - Continue as needed
 - Ex: 11 x 12

$$\begin{array}{r} 012 \\ \underline{2} \\ (1 + 2)2 = 32 \\ (0 + 1)32 \end{array}$$

132 – (Continued)

$$\begin{array}{r}
 \text{Ex: } 11 \times 5314 \\
 05314 \\
 4 \\
 (1 + 4)4 = 54 \\
 (3 + 1)54 = 454 \\
 (5 + 3)454 = 8454 \\
 (0 + 5)8454 \\
 \mathbf{58,454}
 \end{array}$$

12.) Multiply by 12's

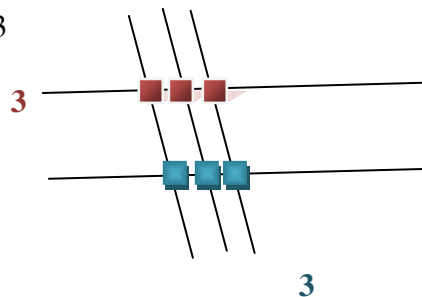
- See above
- 12 x 12 is gross!!! – 1 dozen dozens is One Gross!!

13.) Count by the factor - Ex: 3's – 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36....., repeat until they are known then change to the multiplication facts

14.) Chinese multiplication

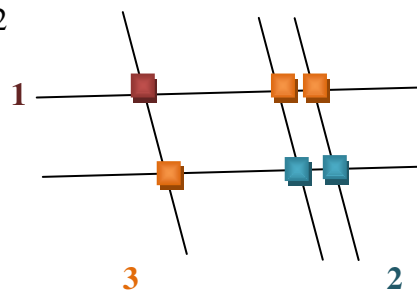
- Draw horizontal lines representing the first number separate the horizontal lines representing the tens digit from the lines representing the ones digit.
- Draw vertical lines representing the second number putting a space between the lines representing each digit
- Starting at the first intersections in the top right corner, count the **number** of intersections writing the number to the left of the intersections
- Going to the bottom right corner, count the intersections writing the **number** below the intersections
- Count the intersections through the **diagonals**
- If any sum is larger than 9, write the ones unit down and carry the tens digit to the number to the left

g. Ex: 11 x 3



Answer = 33

h. Ex: 11 x 12



Answer = 132

Sudoku Practice Fun

	4		3		
	5			6	1
		3		4	
1					2
2		5		1	
		6		5	

Sudoku Practice Fun - Key

6	4	1	3	2	5
3	5	2	4	6	1
5	2	3	1	4	6
1	6	4	5	3	2
2	3	5	6	1	4
4	1	6	2	5	3

Optional Steps -

1. Starting with the 5 since there are two fives in the first column of rectangles- there is a five in the first rectangle at the top and one at the bottom. Since the top one is in the middle column and the bottom one is in the third column the 5 in the middle rectangle has to be in the first column.
2. Still working with the 5, looking at the top right hand rectangle, the five can't go on the bottom row because of the 5 in the first rectangle and it can't go in the middle square because of the 5 in the bottom rectangle, therefore it has to go in the last square at the top.
3. The five in the middle rectangle at the right can't go on the top because of the rectangle to the left, it can't go in the middle column or the last column because of the five in the bottom and top rectangle, therefore the 5 goes in the lower left hand square.
4. Looking at the ones in the right hand rectangles (there are already 2 there!), the 1 has to go in the first column in the only space available.
5. Still working with 1, looking at the top rectangle on the left, the 1 can't go on the bottom or in the first column (1 on the bottom in the rectangle on the right and the 1 in the first column in the middle rectangle on the left). Therefore, the 1 has to go in the last box on the top.
6. The last 1 has to go in the middle column on the bottom row. (First and last column 1's above and the top row 1 to the right)
7. A 2 has to go in the middle rectangle on the left in the top row. (First column bottom 2 and bottom row 2 to the right)
8. The 2 goes in the top rectangle on the bottom row in the last square. Another 2 goes in the first rectangle to the left in the top row and in the bottom rectangle to the right in the first column bottom row.
9. The top rectangle is missing one number, a 4 and the 4 in the bottom rectangle on the left has to go in the first column since the last column is full and there is a 4 at the top in the middle column which also means the 4 in the bottom rectangle at the right has to go in the last column on the top.
10. The rectangle at the bottom on the left and the middle column on the right only need a 3s. This means there is a 3 in the bottom row in the bottom rectangle on the right and in the top rectangle in the bottom row. – Have fun filling in the last few boxes, Sudoku!

Factor Sudoku

Products of 5

	60			55	
55		35		45	
35			55		40
	55		35		
		60		40	
40	50			35	

Products of 6

72		54		66	
60		66			42
		48		72	
	72		66		
48			54		
	60		48		66

Products of 7

		49			70
77			84		
	63			77	
	84			49	
		70	49		
63					

Products of 8

64					96
	56	96	80		88
96					56
88					64
		64	88	56	
56					80

Products of 9

81			108		63
	108				
63		72			
			72		99
				90	
90		81			108

Products of 10

80	70		120	100	
				70	
110		100	80		
		90			110
90	100			110	120

Products of 11

				88	
132					77
	77			132	
	121			99	
110		88	132		121

Products of 12

	84	96			
120					96
		84	120	108	
	120			144	
96					144
		108	132		

Factor Sudoku - **KEY**

Products of 5

50	60	45	40	55	35
55	40	35	60	45	50
35	45	50	55	60	40
60	55	40	35	50	45
45	35	60	50	40	55
40	50	55	45	35	60

Products of 6

72	42	54	60	66	48
60	48	66	72	54	42
66	54	48	42	72	60
42	72	60	66	48	54
48	66	42	54	60	72
54	60	72	48	42	66

Products of 7

84	56	49	77	63	70
77	70	63	84	56	49
49	63	56	70	77	84
70	84	77	63	49	56
56	77	70	49	84	63
63	49	84	56	70	77

Products of 8

64	80	88	56	72	96
72	56	96	80	64	88
96	64	80	72	88	56
88	72	56	96	80	64
80	96	64	88	56	72
56	88	72	64	96	80

Products of 9

81	90	99	108	72	63
72	108	63	99	81	90
63	99	72	90	108	81
108	81	90	72	63	99
99	63	108	81	90	72
90	72	81	63	99	108

Products of 10

80	70	110	120	100	90
100	90	120	110	70	80
110	120	100	80	90	70
70	80	90	100	120	110
120	110	70	90	80	100
90	100	80	70	110	120

Products of 11

121	110	77	99	88	132
132	88	99	110	121	77
99	77	110	121	132	88
88	121	132	77	99	110
110	99	88	132	77	121
77	132	121	88	110	99

Products of 12

132	84	96	144	120	108
120	108	144	84	132	96
144	96	84	120	108	132
108	120	132	96	144	84
96	132	120	108	84	144
84	144	108	132	96	120

BONUS
Products of 15
Starting with 7 x 15

			120		180
	150				
		150	135	180	
150	180			120	
	165	120	180		
			150		

Directions: Each shaded area, column and row contain one of each product.

BONUS - KEY
Products of 15

165	135	105	120	150	180
135	150	180	165	105	120
120	105	150	135	180	165
150	180	165	105	120	135
105	165	120	180	135	150
180	120	135	150	165	105

National Standards

Math

Understand patterns, relations, and functions create and describe patterns

- describe, extend, and make generalizations about geometric and numeric patterns;
- represent and analyze patterns and functions, using words, tables, and graphs

Understand meanings of operations and how they relate to one another

- understand various meanings of multiplication and division;

Compute fluently and make reasonable estimates

- develop fluency with basic number combinations for multiplication
- develop fluency in multiplying whole numbers

Visual Arts

[NA-VA.K-4.2](#) USING KNOWLEDGE OF STRUCTURES AND FUNCTIONS

- Students use visual structures and functions of art to communicate ideas

[NA-VA.K-4.3](#) CHOOSING AND EVALUATING A RANGE OF SUBJECT MATTER, SYMBOLS, AND IDEAS

- Students select and use subject matter, symbols, and ideas to communicate meaning

[NA-VA.K-4.6](#) MAKING CONNECTIONS BETWEEN VISUAL ARTS AND OTHER DISCIPLINES

- Students identify connections between the visual arts and other disciplines in the curriculum