Grade Level/Course: Grades 3-6

Lesson/Unit Plan Name: Multiplication Facts Made Easy

Rationale/Lesson Abstract: Teachers can eliminate the stress associated with developing fluency with multiplication facts. Students can learn to fluently multiply facts within 100, and gain familiarity with factors and multiples by the use of strategies and games in this lesson. By lowering the affective filter students will have a positive mindset and believe "I CAN MULTIPLY! YES I CAN!" Traditionally, students have been told to memorize the basic facts, yet they are often not taught how to memorize. Repeating facts over and over again does not necessarily lead to fluency. Multiple methods for representing multiplication, e.g., through bar models, open number lines, and area models, provide a foundation for students to develop fluency with multiplication. In combination with the use of multiple methods and representations, students can improve their fluency by using the games in this lesson.

Timeframe: Multiple Days

Common Core Standard(s):

3.OA.1 Interpret products of whole numbers, e.g., Interpret 5x7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5x7.*
3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

4.OA.4 Find all factor pairs for whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.

5.OA.2.1 Express a whole number in the range 2-50 as a product of its prime factors. For example, find the prime factors of 24 and express 24 as 2 x 2 x 2 x 3. CA

6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a com- mon factor as a multiple of a sum of two whole numbers with no common factor. For example, express 36 + 8 as 4 (9 + 2).

Instructional Resources/Materials:

- Multiplication Made Easy Chart
- Multiplication Tables
- Multiplication Strategies Chart
- Multiplication Drills Sheet
- Multiplication Flash cards
- Hundreds Chart (mainly for 3rd grade)
- My Multiplication Book page (mainly for 3rd grade)
- Variety of Multiplication Games

Materials: Dice, playing cards, crayons or colored pencils, and material noted in each game

Activity/Lesson:

Activity 1: Reduce Anxiety

Here is a strategy to reduce students' anxiety about learning the multiplication facts. It appears that there are 120 facts to memorize from 0 to 11, but there are far fewer once the multiplication table is analyzed. Use the charts on the following page, with these instructions to students. A sample of student work is provided on the page following the charts.

- "If you eliminate the easy 0s, 1s, 10s and 11s in the first table there will be fewer facts to memorize. Draw a line through each column and row because those you know."

- "If you eliminate the 5s and 2s in the second table, which also seem easy, you will have 28 less facts to do. Draw a line through each column and row because here are more facts that you know."

- "Now in table number three you will circle the square numbers, such as three 3s and 6s but study them all even if there are only 6 square facts to memorize."

- "That leaves only 30 facts to memorize. With the commutative property we have duplicates like 3X4 and 4X3; so we can cut 30 in half, eliminating 15 more. Now in table number four you will circle one fact and put a check on its duplicate."

- "On the back of the multiplication table page write these 15 facts. How amazing, there aren't many left to memorize! Practice all facts through games and play and you will know your multiplication facts in a matter of days. Hooray!!"

4×3 6×3 7×3 8×3 9×3 6×4 7×4 8×4

9×4 7×6 8×6 9×6 8×7 9×7 9×8

x/÷	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

x/÷	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

x/÷	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
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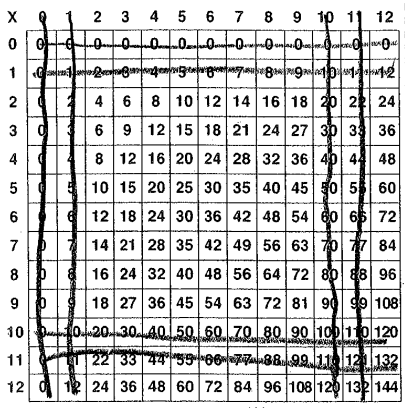
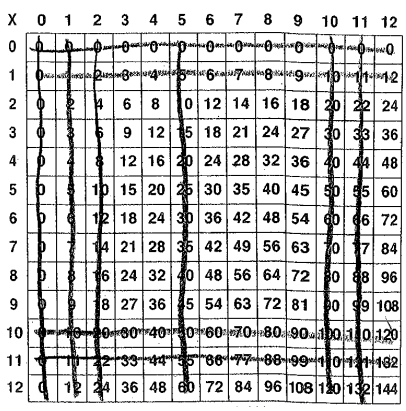
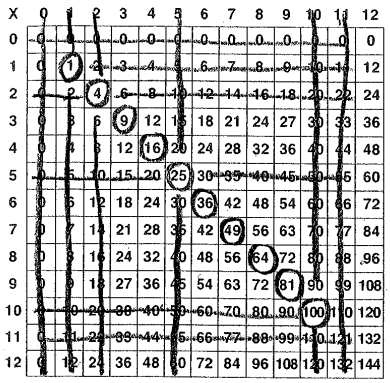
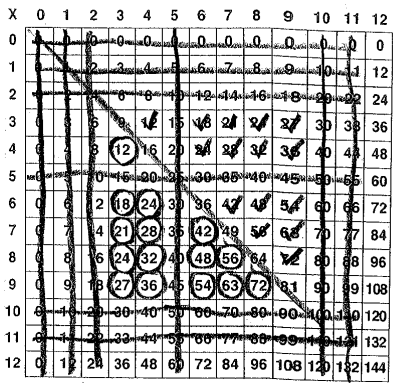
x/÷	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144









These are the facts I must memorize!!

4×3	6×3	7×3	8×3
9×3	6×4	7×4	8×4
9×4	7×6	8×6	9×6
8×7	9×7	9×8	

This activity is a modified version of an activity in Nimble with Numbers (Childs, et al).

Additional notes for Reducing Anxiety:

The first goal is to lower anxiety of learning multiplication facts by using the charts on the previous page. Students don't have to memorize 120 facts of 0 through 11. They really only have to "memorize" 15 facts, and can use other strategies and multiple methods.

As you review the "Multiplication Made Easy" chart with students, have them look at 0s, 1s, and 10s first and remind them that they learned this in 2nd grade. Have them draw lines through these facts horizontally and vertically on a multiplication table. Discuss the easy 11s and they can eliminate that fact too. Have them draw lines vertically and horizontally through 11s on the multiplication table too.

Follow instructions for each fact or group of facts on the "Multiplication Made Easy" chart and have students continue to eliminate the facts they already know or should know. When students get to square numbers have them circle all square numbers on a new multiplication table (see example). Square numbers, like 3 threes and 6 sixes, may be facts that especially 3rd graders may not know yet but continue through the chart and have them add the square numbers later. Knowing square numbers eliminates 6 more facts and now there are 30 facts to learn instead of 120. Use this moment to review the commutative property of multiplication because 4 x 3 has the same answer as 3 x 4. Using the fourth multiplication table (see example) have students circle the answer for 3 x 4 which is 12 and put a check on the answer for 4 x 3 which is the other 12. Now 30 multiplication facts, because of the commutative property of multiplication, has eliminated 15 more facts, which leaves only 15 to learn.

Learning 15 facts sounds a lot easier than learning 120 facts and something all students believe they can do. Now that anxiety is lower, students are open to hear about strategies they can use to help develop fluency with multiplication facts and games they can play to lock in the memory of facts in a fun way.

Activity 2: Things that Come In Groups (3rd Grade)

List and show pictures of things that comes in groups of 2 (e.g., glasses, ears, pairs of shoes), 3's (e.g., sides of a triangle, wheels on a tricycle), 4's (sides on a triangle, wheels on a car), 5's (sides on a pentagon, fingers on one hand), and continue with 6's, 7's, 8's, 9's, 10's, and 11's.

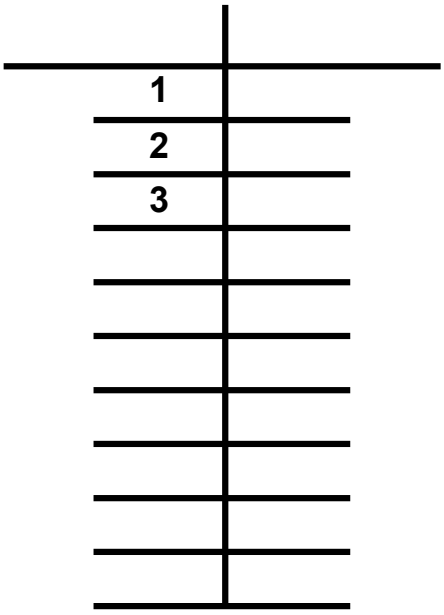
Activity 3: My Multiplication Book (3rd Grade)

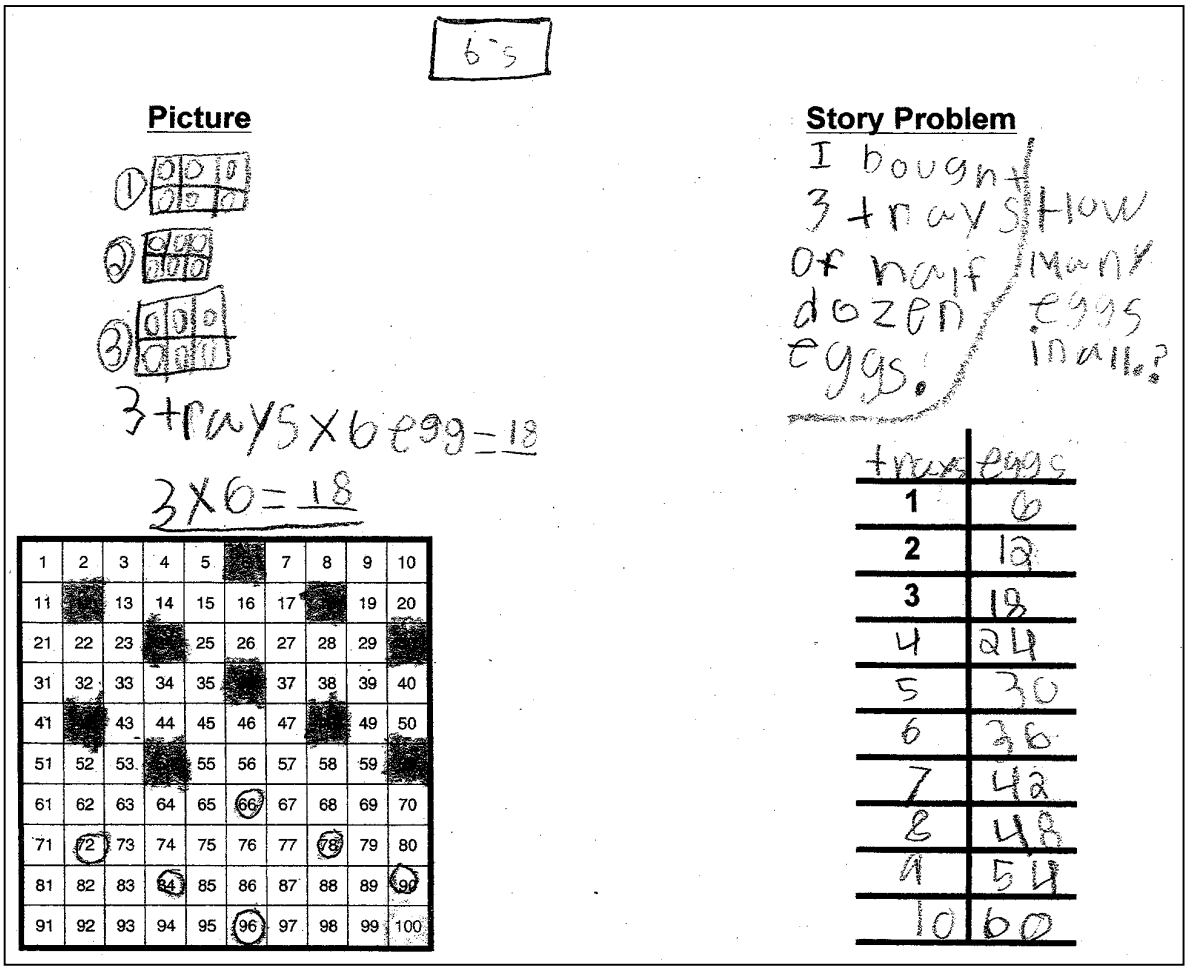
Begin pages of "My Multiplication Book" (see sample worksheet on page 6 and student work sample on page 7), to include a picture, story, skip counting on the hundreds chart, and completing the t-table with counting by multiples of the given number. Use the worksheet to make separate pages for 2s through 10s.

Picture

Story Problem

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100





Activity 4: Sixty Second Sweep

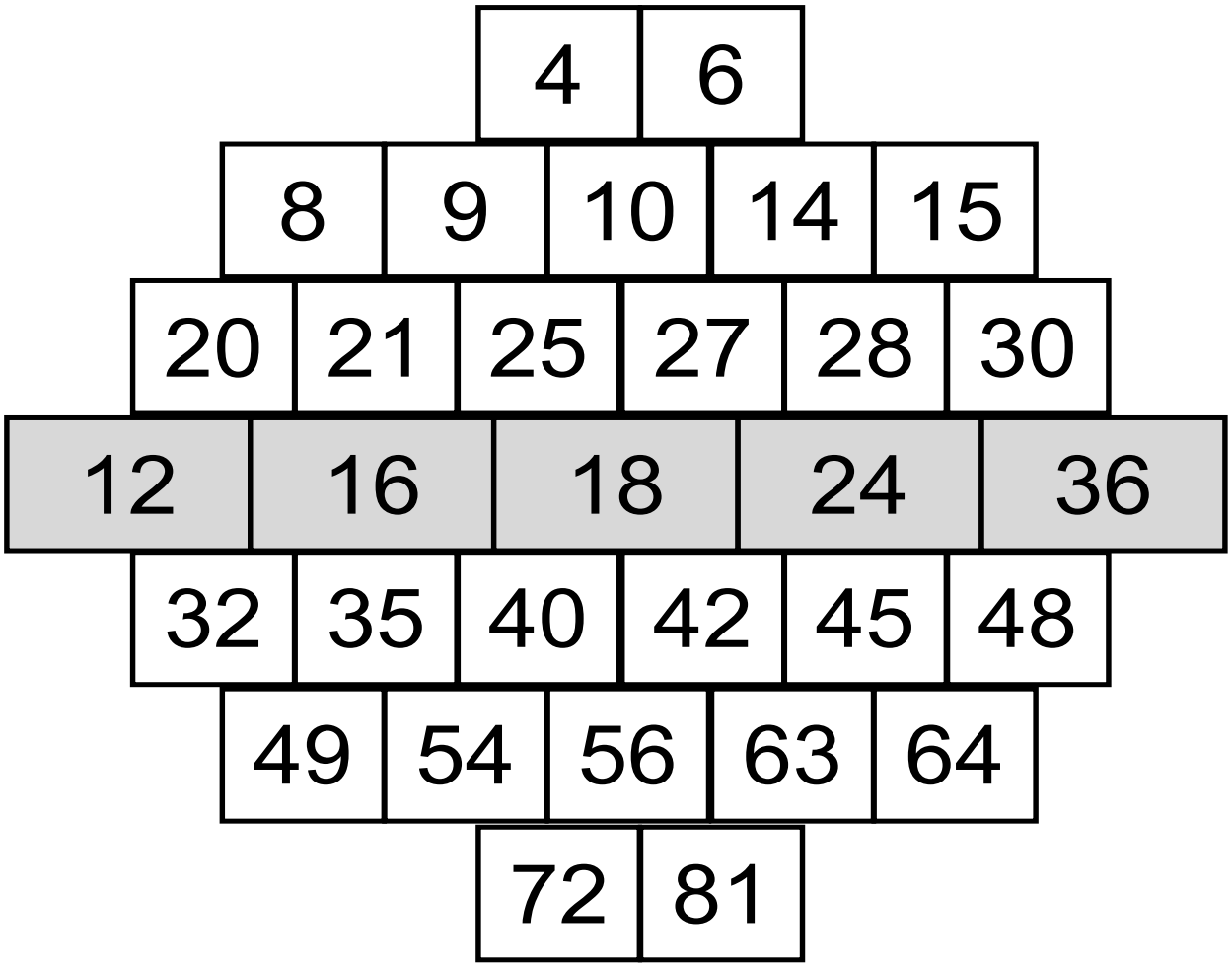
This activity, with the worksheet on the page 8, provides practice in developing fluency with factoring. Students can develop fluency in not only knowing multiplication facts (i.e., the answer to a multiplication problem) but also they can develop fluency by quickly stating the factors that can be multiplied to result in a given number, such as those numbers shown on the chart on the next page. Being able to quickly factor provides a basis for future learning in fractions, algebra, and other areas of mathematics.

Activity 5: Multiplication Top It

This activity, with the instructions on page 9, provides a fun and low-stress game to practice developing fluency with multiplication.

SIXTY SECOND SWEEP

This activity gives practice in quickly finding sets of factors for all the numbers because the goal is to sweep through the multiplication facts in sixty seconds. Only use digits 2 through 9 as factors. Say one set of factors for each number in the white squares and say two sets of factors for each number in the shaded rectangles. Graph your results to record your growth in mastering this task.



This activity is a modified version of a similar activity in ComMuniCator (Hammond).

MULTIPLICATION TOP IT

Material:

1 deck of playing cards, Ace to 10 (Ace=1)

Directions:

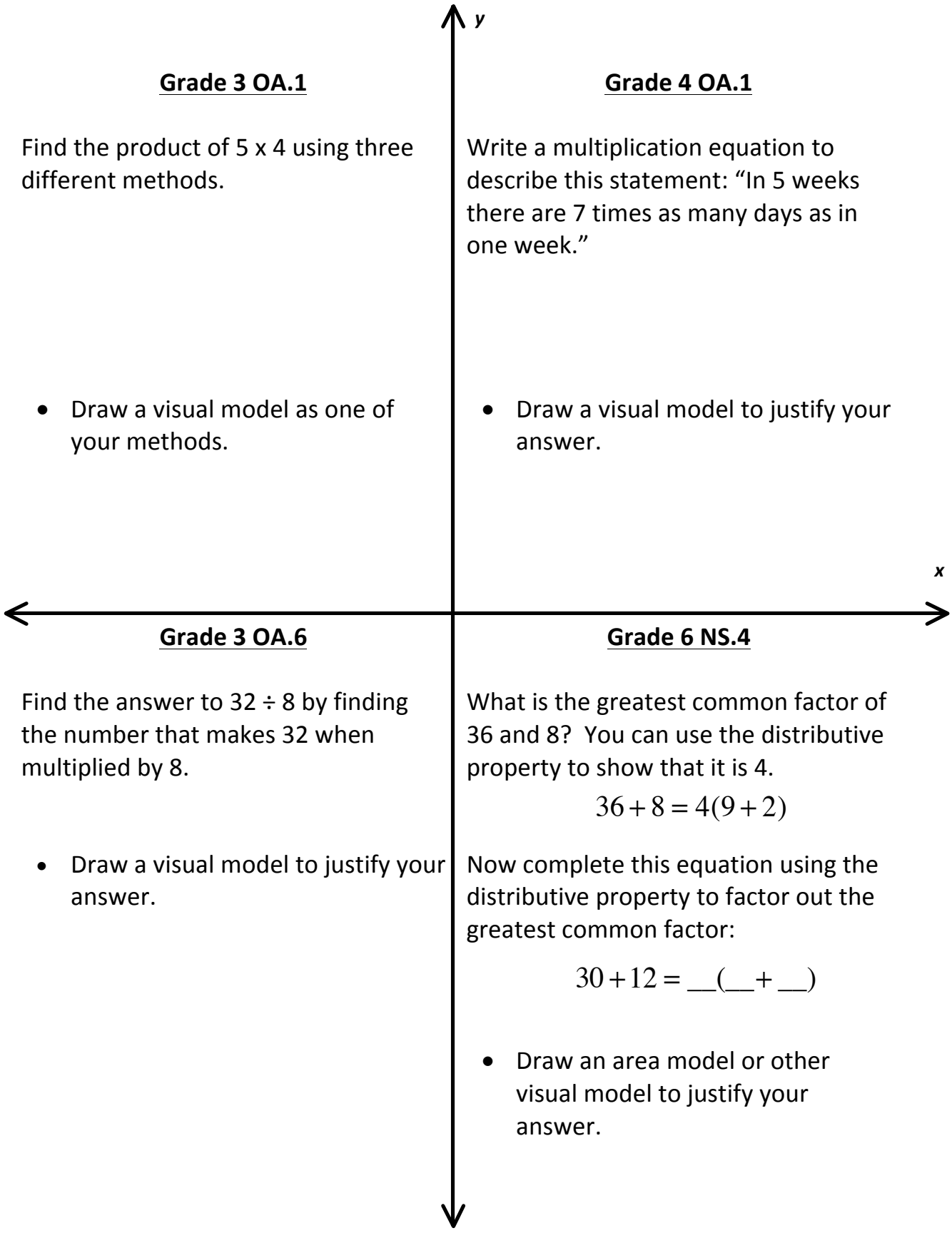
1. **One player shuffles the cards and places the deck number side down on the table.**
2. **Each player turns over 2 cards and calls the product of the numbers. (if the player doesn't know the product he/she can use the multiplication table to find the answer to the fact)**
3. **The player with the highest product wins the round and takes all the cards.**
4. **In case of a tie each player turns over 2 more cards and the player with the greatest product takes all cards from both plays.**
5. **Play ends when not enough cards are left for each player to have another turn.**

THE PLAYER WITH THE MOST CARDS WINS!

Assessment:

- Provide students an opportunity, in a low-stress, non-publicized environment, to complete a multiplication chart as a "pre-test", after completing concept-based multiple method activities from other lessons. This is considered a "pre-test" for what students know from memory. Reasonable time should be provided.
- After the "pre-test" have students engage in the activities in this lesson.
- After the activities in this lesson, provide students an opportunity to complete a multiplication chart as a "post-test" and compare their pre and post charts to see which multiplication facts they still need to learn with fluency.
- This cycle can be repeated to provide students feedback on their improvement over time. Depending on each child's learning needs, use a variety of multiple method and fluency strategy activities to develop each child's fluency with multiplication.

Warm-Up



Grade 3 OA.1

Find the product of 5 x 4 using three different methods.

- Draw a visual model as one of your methods.

Grade 4 OA.1

Write a multiplication equation to describe this statement: "In 5 weeks there are 7 times as many days as in one week."

- Draw a visual model to justify your answer.

Grade 3 OA.6

Find the answer to 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.

- Draw a visual model to justify your answer.

Grade 6 NS.4

What is the greatest common factor of 36 and 8? You can use the distributive property to show that it is 4.

$$36 + 8 = 4(9 + 2)$$

Now complete this equation using the distributive property to factor out the greatest common factor:

$$30 + 12 = \_\_(\_\_ + \_\_)$$

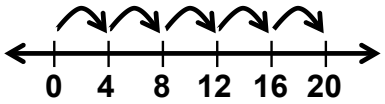
- Draw an area model or other visual model to justify your answer.

Warm-Up Debrief

Grade 3 OA.1

Find the product of 5 x 4 using three different methods.

Open Number Line:

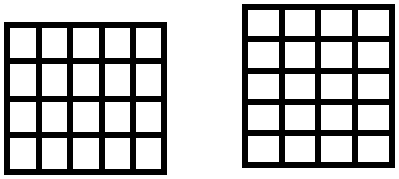


Repeated Addition: $4+4+4+4+4=20$

$5+5+5+5=20$

- Draw a visual model as one of your methods.

Area Model:

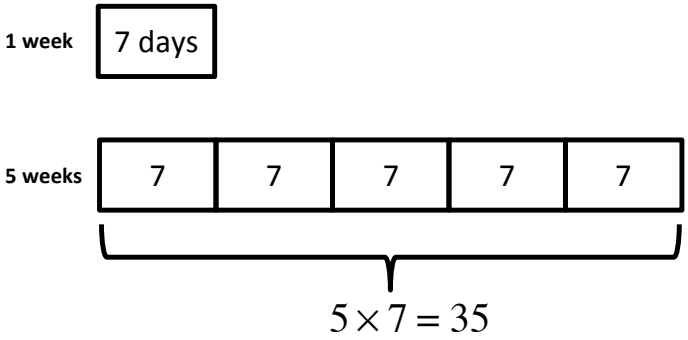


Grade 4 OA.1

Write a multiplication equation to describe this statement: "In 5 weeks there are 7 times as many days as in one week."

$$5\times 7=35$$

- Draw a visual model to justify your answer.

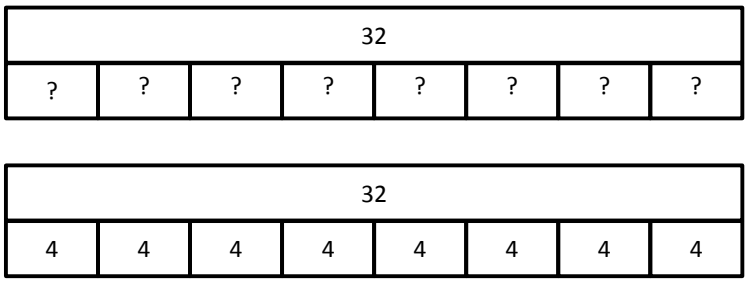


Grade 3 OA.6

Find the answer to 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.

$$8\times 4=32$$

- Draw a visual model to justify your answer.



Grade 6 NS.4

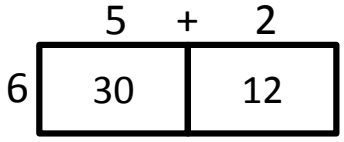
What is the greatest common factor of 36 and 8? You can use the distributive property to show that it is 4.

$$36+8=4(9+2)$$

Now complete this equation using the distributive property to factor out the greatest common factor:

$$30+12=6(5+2)$$

- Draw an area model or other visual model to justify your answer.



$$6(5+2)$$

$$=30+12$$