

Building Multiplication Fluency through Properties & Strategies

Improving Fact Fluency

Robyn Tedesco
Math Coach & Specialist

Rose Okai
Math Coach

<http://bit.ly/BuildMultiplicationFluency>

Learning Targets

Today we will:

- Define fluency
- Identify & understand the properties of multiplication
- Explore the Karate Belt system
- Discuss multiplication strategies

Reflect

When you think about or remember learning your multiplication tables as a student, what feelings does it invoke?

Grade 3 Standard

Multiply and divide within 100.

CCSS.MATH.CONTENT.3.OA.C.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

Grade 3 Standard

Understand properties of multiplication and the relationship between multiplication & division.
CCSS.MATH.CONTENT.3.OA.B.5

Apply properties of operations as strategies to multiply and divide.

Defining Fluency

- **Strategies**
 - Doubling, halving, adding/ subtracting a group, break apart
- **Accuracy**
 - Getting the correct answer
- **Flexibility**
 - More than 1 path to the answer
- **Automaticity**
 - Recall without having to think about it
 - Rule of thumb 3-4 seconds

Exploring Properties of Multiplication

Multiplication Property of Zero

States:

If you multiply a number by zero, the product will be zero.

$$4 \times 0 = 0 \times 4$$

Identity Property of Multiplication

States:

Any number multiplied by 1, gives the same result as the number itself. It is also called the Identity Property of Multiplication, because the identity of the number remains the same.

$$5 \times 1 = 5$$

Commutative Property of Multiplication

States:

The order in which we multiply numbers does not change the product. This property essentially allows for memorization of half the facts. $6 \times 8 = 8 \times 6$

Associative Property of Multiplication

States:

That when performing a multiplication problem with more than two numbers, it does not matter which numbers you multiply first.

$$(3 \times 4) \times 5 = 3 \times (4 \times 5)$$

Distributive Property of Multiplication over Addition

States:

That when a factor is multiplied by the sum of two terms, it is essential to multiply each of the two numbers by the factor, and finally perform the addition operation.

$$(8 \times 5) = (4 \times 5) + (4 \times 5)$$

Karate Belt System

Multiplication Karate Belt System

Multiplication Belts

Level	Focus Facts	Focus Strategies
1	0, 1	<ul style="list-style-type: none"> - (0) Zero times any number is always zero - (0) I have zero groups or zero in each group - (1) One times any number is the other number - (1) One group, so it has to have the other number in it
2	2	<ul style="list-style-type: none"> - (2) 2 times any number is double the other number <ul style="list-style-type: none"> - $2 \times 3 = 3 + 3$
3	10, 5	<ul style="list-style-type: none"> - (10) 10 groups of a number, so I have that many tens - (10) 10 times any number is the other number with a zero at the end - (5) Start with groups of 10 then split it in half <ul style="list-style-type: none"> - $4 \times 5 = (4 \times 10) / 2$ - (5) Skip count 5s
4	4, 8	<ul style="list-style-type: none"> - (4) Double the 2 times table <ul style="list-style-type: none"> - $4 \times 3 = (2 \times 3) \times 2$ - (4) Break apart 4 into smaller groups, 2 groups of 2 <ul style="list-style-type: none"> - $4 \times 3 = (2 \times 3) + (2 \times 3)$ - (8) Break apart 8 into smaller groups, 2 groups of 4 <ul style="list-style-type: none"> - $8 \times 4 = (4 \times 4) + (4 \times 4) = 16 + 16$
5	3,6,9	<ul style="list-style-type: none"> - (3) Break apart 3 into smaller groups, a group of 2 and a group of 1 <ul style="list-style-type: none"> - $3 \times 6 = (2 \times 6) + (1 \times 6)$ - (6) Break apart 6 into smaller groups, 2 groups of 3 <ul style="list-style-type: none"> - $6 \times 4 = (3 \times 4) + (3 \times 4) = 12 + 12$ - (9) Start with ten groups and take away one group <ul style="list-style-type: none"> - $6 \times 9 = (6 \times 10) - 6$ - (9) Break apart the 9 into smaller groups, a group of 3 and a group of 6 <ul style="list-style-type: none"> - $9 \times 4 = (3 \times 4) + (6 \times 4) = 12 + 24$
6	7, Squares	<ul style="list-style-type: none"> - (7) Break apart 7 into smaller groups, a group of 5 and a group of 2 <ul style="list-style-type: none"> - $7 \times 3 = (5 \times 3) + (2 \times 3) = 15 + 6$ - Squares are the individual number times itself <ul style="list-style-type: none"> - $5^2 = 5 \times 5$
7	Summative	<ul style="list-style-type: none"> - Master levels 1-6

Foundational Facts

0 & 1

- Multiplying by 0 always produces a product of 0.
- Multiplying by 1 produces a product that is the same as the non-1 factor.
- Students use context to develop solid understanding
 - I have **zero** in my group or **no** groups
 - I have **one** in each group or I have **one** group

Foundational Facts

2, 5, & 10

- Skip counting strategies from grades 1&2 support initial learning
- These foundational facts must be SOLID to improve fluency with all other facts
- No finger counting

2, 10, & 5

- Strategy for **2**
 - **Doubling**
 - Solve 2×4 by doubling 4 “think” $4 + 4$
- Strategy for **10**
 - **Place Value**
 - Solve 3×10 by thinking about 3 tens or 30
- Strategy for **5**
 - **Halving**
 - Solve 5×4 by halving 10×4 .

Derived Facts

3, 4, 6, 7, 8, 9

All other facts can be “derived” from the foundational facts.

Derived means we solve using strategies based on the facts we already know.

- Adding or subtracting a group
- Halving and doubling
- Using a square product
- Decomposing a factor

4 & 8

These facts are derived from knowing the 2 tables.

- Strategy for 4
 - **Double the Double**
 - Solve 4×6 by thinking about $(2 \times 6) + (2 \times 6)$ or doubling 12
- Strategy for 8
 - **Double - Double the Doubles Fact**
 - Solve 8×6 by thinking $2 \times 6 = 12$. 12 doubled is 24. And 24 doubled is 48

3 & 6

These facts are derived from adding a group and doubling.

- Strategy for 3
 - **Add a group to the double**
 - Solve 3×6 by thinking about $(2 \times 6) + 6$.
- Strategy for 6
 - **Double a 3 fact**
 - Solve 6×5 by thinking about $(3 \times 5) + (3 \times 5)$ or doubling 15.

9

This fact is derived from subtracting a group or breaking apart into smaller groups.

- Strategy for 9
 - **Subtract a group from 10**
 - Solve 9×6 by thinking about 10×6 . $60 - 6 = 54$
- OR
- **Breaking Apart**
- Solve 9×6 by thinking of 9 as 5 groups and 4 groups. $5 \times 6 = 30$ and $4 \times 6 = 24$.
 $30 + 24 = 54$

7

This fact is derived from breaking apart into smaller groups.

- Strategy for 7
 - **Breaking Apart**
 - Solve 7×6 by thinking of 7 as 5 groups and 2 groups. $5 \times 6 = 30$ and $2 \times 6 = 12$. $30 + 12 = 42$

Order Matters

Karate Belt System:

- was designed with Foundational Facts & Derived Facts in mind
- The order in which the facts are presented is important for the students to see the connections between factors.

Meaningful Practice with Facts

How do students practice?

- Complete & check the strategy packet
- Make personal flashcards
- Play games
- Use Technology
- Study with a Buddy

Black Belt..... Now What

- Students will need continued practice to maintain automaticity.
- Students can work on using the distributive property to learn facts beyond 10×10 .
- Students can strengthen their division facts.

Contact Information

Robyn Tedesco

Math Coach & Specialist

tedescor@norwalkps.org

<http://bit.ly/BuildMultiplicationFluency>

Rose Okai

Math Coach

okair@stratk12.org



[@rose_okai](https://twitter.com/rose_okai)