

Multiplication Fact Fluency: A School-Wide Solution

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Handout:

<http://www.dnamath.com/presentations/>

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My students
don't know their
basic facts.

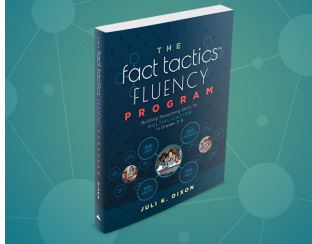
If my students just
knew their basic
facts, they would
be so much more
successful.

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Is there something
better than the
mad minute?

There's not
enough
practice.

Support all learners
with **math fact fluency**



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Goals

- Examine structures for developing fluency grounded in multiplicative reasoning.
- Make sense of the Six Fluency Tactics.
- Examine the Fact Tactics[®] Fluency Program as a school-wide solution.

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What is the current focus of fluency instruction?

```

graph TD
    A(Push to learn basic facts) --> B(Prioritize drill and kill)
    B --> C(Use timed tests)
    C --> D(Create math anxiety)
    D --> E(Struggle with quick recall)
    E --> A
        
```

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Why does this current practice miss the point?

Readiness for algebra requires “a grasp of the meaning of the basic operations of addition, subtraction, multiplication, and division. It must also include use of the commutative, associative, and distributive properties; computational facility; and the knowledge of how to apply the operations to problem solving” (NMAP, 2008, p. 17).

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How do we bring sense making to multiplication?



It starts with word problems.

Write a word problem for 6×7 .

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Consider 3×4



I have 3 elephants. Each elephant has 4 legs. How many legs are there in all?



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Now consider 4×3



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Now consider 4×3



I have 4 elephants. Each elephant has 3 legs ...

Same number of legs, really different image ...

When the focus is on sense making, the order of the factors matters.

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How do we bring sense making to multiplication?



Re-examine the word problem you wrote.

Is your word problem modeled by 6×7 or 7×6 ?

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What strategies might students use to determine the product of 6×7 if they did not know it?



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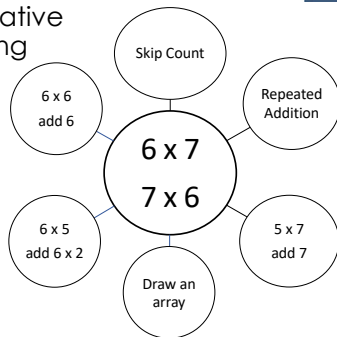
What mathematics is involved in each strategy?

- Drawing
- Counting Strategies
- Multiplicative Reasoning

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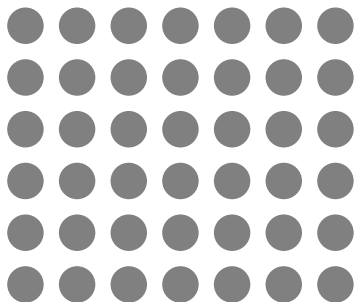
- Drawing,
- Counting Strategies, or
- Multiplicative Reasoning



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6 x 7



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7 x 6

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6 x 7 as 3 x 7 and double

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How would we represent the strategy symbolically?

3 x 7 and double

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Six Fluency Tactics

- The Grounding Tactic
- The Linking Tactic
- The Strategic Repetition Tactic
- The Review Tactic
- The Assessment Tactic
- The Extension Tactic

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The Grounding Tactic

Students will be more likely to make sense of their basic facts if they have already developed an understanding of the meaning of multiplication and can apply that meaning to strategies for multiplying basic facts.

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The Grounding Tactic

Where do we start?

What might be more informing is to consider where we don't start!

We do not start with one and zero facts...

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The Grounding Tactic

Where do we start?

Beyond making sense of multiplication, there are facts students need to know to make the most of Fact Tactics[®].

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The Grounding Tactic

Foundations for Fact Fluency:

- ✓ Twos
- ✓ Fives
- ✓ 3 x 3

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The Linking Tactic

The order of facts we use to build fact fluency has the power to support reasoning and sense making. It is about being Fact Tactical 😊.

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The Linking Tactic

How many facts are we talking about anyway?

Twenty facts.

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The Linking Tactic

X	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

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The Linking Tactic

This progression addresses all facts in 20 weeks and provides a tactical development of fact fluency.

✓ 3 x 4	✓ 3 x 7	✓ 4 x 8	✓ 8 x 8
✓ 3 x 6	✓ 4 x 7	✓ 6 x 8	✓ 4 x 9
✓ 4 x 4	✓ 6 x 7	✓ 7 x 8	✓ 7 x 9
✓ 4 x 6	✓ 7 x 7	✓ 3 x 9	✓ 8 x 9
✓ 6 x 6	✓ 3 x 8	✓ 6 x 9	✓ 9 x 9

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4 x 6

6 x 4

How might students derive this fact as they develop fact fluency? Create a sample web to support your thinking.

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The Linking Tactic

3 x 6

and double

4 x 6

add 2 x 6

6 x 6

5 x 6

add 6

Notice how previous facts are used to derive the new focus fact. This is linking.

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The Linking Tactic

Diagram illustrating the Linking Tactic for the 4x6 and 6x4 facts. The central focus is 4x6 and 6x4. Surrounding it are related facts and the operations used to derive them:

- 3x4 and double (leads to 4x6)
- 4x4 add 2x4 (leads to 4x6)
- 3x6 add 6 (leads to 4x6)
- 5x6 Subtract 6 (leads to 4x6)
- 5x4 add 4 (leads to 4x6)
- 3x6 and double (leads to 6x6)
- 4x6 add 2x6 (leads to 6x6)
- 5x6 add 6 (leads to 6x6)

Notice how previous facts are used to derive the new focus fact. This is linking.

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The Strategic Repetition Tactic

Students should be provided many opportunities to verbalize *both* their strategies and the product. As students verbalize their strategies, they will approach automaticity with the focus and partner facts.

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Examine the Fact Tactics® Web for 6×7 and the partner fact 7×6 .

Choose one of these strategies.

Write your strategy in your notes.

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The Strategic Repetition Tactic

With the program, the fact would be on one side of a card and the student's chosen strategy on the other.

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Some ideas for strategic repetition:

1. Find someone with the same strategy as you and discuss why you chose that strategy.
2. Find someone with a different strategy and discuss how the strategies are the same and how they are different.

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The Review Tactic

Practice in the form of review is crucial for developing long term fact fluency. Review is strategic when it is connected to fact strategies.

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6 x 7
or
7 x 6
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4 x 7
or
7 x 4
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3 x 7
or
7 x 3
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6 x 6
#FactTactics™

4 x 4
#FactTactics™

4 x 6
or
6 x 4
#FactTactics™

3 x 6
or
6 x 3
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3 x 4
or
4 x 3
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5 x 6 = 30
Add 2 x 6 = 12
Product: 42

2 x 9 = 18
Add double
Product: 28

4 x 3 = 12
Add 3 x 3 = 9
Product: 21

4 x 6 = 24
Add 2 x 6 = 12
Product: 36

3 x 4 = 12
Add 4
Product: 16

5 x 4 = 20
add 4 to get 24
Product: 24

2 x 6 = 12
add 6
Product: 18

3 x 3 = 9
add 3
Product: 12

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The Assessment Tactic

Timed tests are not encouraged. Instead, students are given five facts per week as mini assessments. On the assessment, students indicate the product of each fact and state if they “just knew it” or provide the Fact Tactics strategy they used.

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The Assessment Tactic

Examine the mini assessments for weeks 3 and 4 when the focus facts are 4×4 and 4×6 . What do you notice?

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The Assessment Tactic

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

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✓ 4 x 4

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The Assessment Tactic

Week Three Assessment: Record the product of each fact. Indicate if you just knew it by checking the box, or describe the Fact Tactics™ strategy you used to determine it.

	I just knew it!	I used the Fact Tactics strategy of...
1. 4 x 4 =	☐	
2. 6 x 3 =	☐	
3. 2 x 4 =	☐	
4. 3 x 6 =	☐	
5. 3 x 4 =	☐	

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✓ 4 x 6

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The Assessment Tactic

Week Four Assessment: Record the product of each fact. Indicate if you just knew it by checking the box, or describe the Fact Tactics™ strategy you used to determine it.

	I just knew it!	I used the Fact Tactics strategy of...
1. 6 x 4 =	☐	
2. 3 x 6 =	☐	
3. 2 x 4 =	☐	
4. 2 x 6 =	☐	
5. 3 x 4 =	☐	

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The Extension Tactic

Students who already “know” their basic facts, reason and connect concepts to procedures through extension tasks. These more complicated problems are solved by applying the same properties that are emphasized with the Fact Tactics Webs.

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The Extension Tactic: Supporting Students who Need More

4 x 6

Consider students who already know the product of this fact without using a strategy.

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The Extension Tactic: Supporting Students who Need More

4 x 36

How might you determine this product using mental computation?

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In what ways is this practice supporting algebra readiness?



Readiness for algebra requires “a grasp of the meaning of the basic operations of addition, subtraction, multiplication, and division. It must also include use of the commutative, associative, and distributive properties; computational facility; and the knowledge of how to apply the operations to problem solving” (NMAP, 2008, p. 17).

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A School-Wide Solution



- Set a schedule for the twenty-week program and make sure all school personnel are informed.
- Introduce a new focus fact each Monday.
- Begin each Tuesday-Friday with a Fact Tactics strategy.
- Review past facts.
- Implement a process for data monitoring.

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Goals



- Examine structures for developing fluency grounded in multiplicative reasoning.
- Make sense of the Six Fluency Tactics.
- Examine the Fact Tactics® Fluency Program as a school-wide solution.

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