

Multiplication Fact Fluency: A School-Wide Solution

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Handout:

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

My students don't know their basic facts.

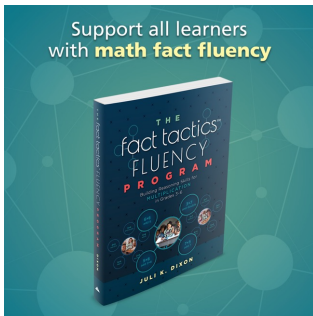
If my students just knew their basic facts, they would be so much more successful.

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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 fact 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 --> A
      E((Struggle with quick recall)) --> A
      E --> B
  
```

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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 .

Consider 3×4

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



Now consider 4×3

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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Label each strategy as:
 • Drawing,
 • Counting Strategies, or
 • Multiplicative Reasoning

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Developing Multiplicative Reasoning

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6 x 7

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Developing Multiplicative Reasoning

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$6 \times 7 = 7 + 7 + 7 + 7 + 7 + 7$

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Developing Multiplicative Reasoning

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Developing Multiplicative Reasoning

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$6 \times 7 = (6 \times 5) + (6 \times 2)$

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How would we get to the strategies symbolically?

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$6 \times 7 = (6 \times 5) + (6 \times 2)$

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What does this mean?

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$6 \times 7 = (6 \times 6) + 6$

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Now you try. Show the symbolic pathway for this strategy.

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$6 \times 7 = (6 \times 6) + 6$

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Developing Multiplicative Reasoning

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$6 \times 7 = (5 \times 7) + 7$

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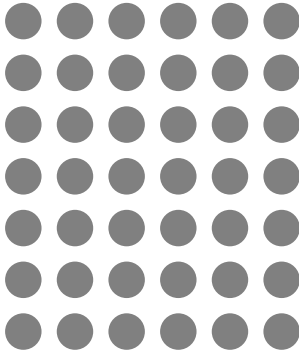
Show the symbolic pathway for this strategy.

$6 \times 7 = (5 \times 7) + 7$

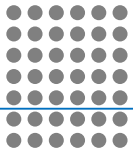
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What if a student uses a property based on 7×6 ?

7×6

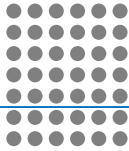


How can you get from 6×7 to this strategy symbolically and what properties of operations will you use?



$$6 \times 7 = (5 \times 6) + (1 \times 6)$$

How can you get from 6×7 to this strategy symbolically and what properties of operations will you use?



$$\begin{aligned} 6 \times 7 &= 7 \times 6 \leftarrow \text{commutative property of multiplication} \\ &= (5 + 2) \times 6 \\ &= (5 \times 6) + (2 \times 6) \leftarrow \text{distributive property of multiplication over addition} \end{aligned}$$

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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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Six Fluency Tactics



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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 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.

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

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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The Linking Tactic

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

How is this focus fact connected to the one you just explored?

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The Linking Tactic

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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The Strategic Repetition Tactic

Examine the Fact Tactics™ Web for 6×7 and the partner fact 7×6 . Choose your favorite strategy and record it on the Fact Tactics™ Card.

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The Strategic Repetition Tactic

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The Strategic Repetition Tactic

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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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The Assessment Tactic

Each week, students are given five facts at a time as mini assessments. Time constraints should not be emphasized. 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 assessment scheduled for week 8 when the focus fact is 6×7 . What do you notice about the quiz? How might the results of this quiz support a formative assessment process?

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The Assessment Tactic

Week Eight 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. $2 \times 7 =$ _____	<input type="checkbox"/>	
2. $6 \times 7 =$ _____	<input type="checkbox"/>	
3. $4 \times 7 =$ _____	<input type="checkbox"/>	
4. $7 \times 6 =$ _____	<input type="checkbox"/>	
5. $3 \times 3 =$ _____	<input type="checkbox"/>	

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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 36

How might you determine this product using mental computation?

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A School-Wide Solution

- Set a schedule for the twenty-week program.
- Introduce a new focus fact each Monday.
- Begin each Tuesday-Friday with a Fact Tactics strategy.
- Include all school personnel in professional development.

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