Mental Math Across the Grades

Keynote
for
Driving your Math Class: It's Worth the Trip

Analogy

Transportation	Calculation

What is Mental Math?

- Think Pair Share
- Definitions from the Web
- Definitions from Manitoba Curricula
- Thoughts from Students

What is Mental Math?

Definitions from Web:

Students who practice **mental math** make calculations in their minds without the guidance of pencil and paper, calculators or other aids. **Mental math** is often used as a way to calculate and estimate quickly, using **math** facts that a student has committed to memory, such as multiplication, division or doubles facts. (from https://www.verywell.com/what-is-mental-math-620915)

Mental math is doing math in your head with out Pencil, Paper or a Calculator. Students with good Number Sense are usually good at mental math.

http://www.mathatube.com/glo-mental-math.html

What is Mental Math?

Manitoba Curriculum Description

Mental mathematics and estimation is a combination of cognitive strategies that enhances flexible thinking and number sense. It is calculating mentally without the use of external memory aids. It improves computational fluency by developing efficiency, accuracy, and flexibility. (p.12 K - 8 Framework)

What is Mental Math?

MENTAL MATH AND ESTIMATION The student uses math knowledge and number facts to calculate mentally or estimate within each strand (number, patterns and relations, shape and space, statistics and probability). Students apply mental math strategies with efficiency, accuracy, and flexibility. They are able to make reasonable estimates of values or quantities using benchmarks and referents.

(Curriculum Essentials Description)

What is Mental Math?

Student Answers

- Most popular responses: math done in your head.
- Some interesting perspectives:
  - Math that you are confident enough to apply in your mind without writing the methods that used down on paper.
  - knowing your basics
  - If you can answer a simple multiplication question such as 17x7 in your brain without doing the math, you have accomplished mental math.
  - math that is done in the mind, quickly and efficiently
  - Warming up your head to do math
  - To do math instantly, without the effort put into operations and procesess

What is Mental Math?

- Some interesting perspectives (cont.):
  - Mental math to me means doing simple calculations in your head. It is not something I think is terribly important in math because I believe math is a lot more about understanding topics and knowing how to approach problems than how fast you can do calculations in your head.
  - To be able to do this I believe you have to be very familiar with the topics and it comes from extra practices.
  - Math that you understand so well that you don't need to write anything down to do calculations/find the answer
  - For me, it isn't just doing arithmetic. I guess whatever math you're able to do in your head, even if it's the logical reasoning and explanation, is mental math.
  - Since mental math means to do arithmetic in my head without pens and paper, it implies memorization of equations, lots of practice, and flexibility of thinking to me.

Main Take-Aways

- Flexibility

- Increasing Tool Box Contents Slowly

"Number sense cannot be taught.

It can only be developed."

- Wayne Watt

Progressions
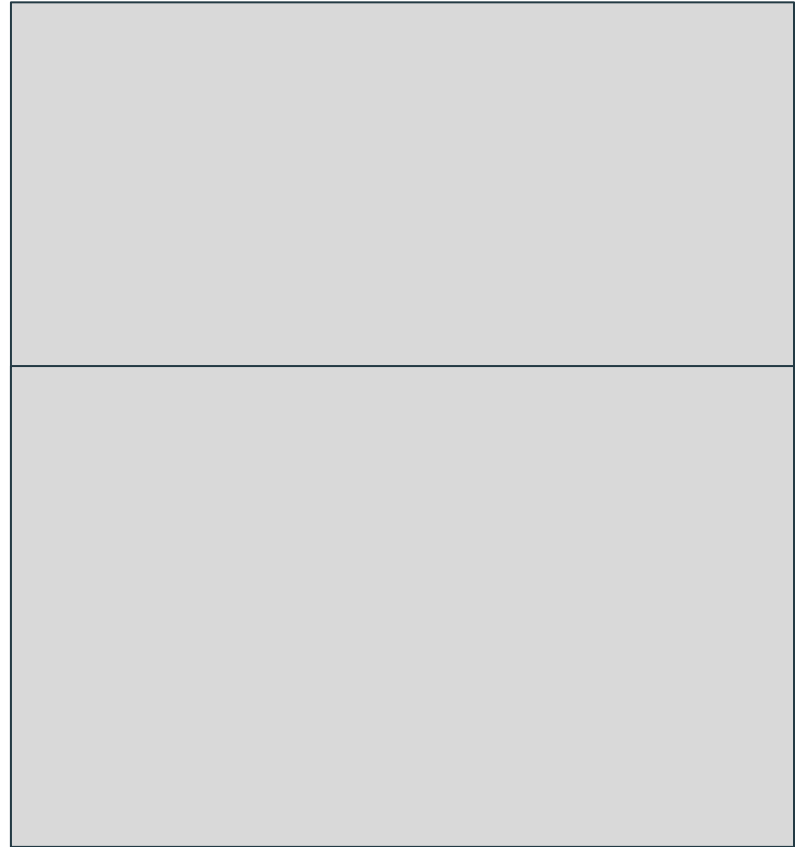
Graham Fletcher - [Progression Videos](#)

Manitoba Education and Training - [Glance Across the Grades](#)
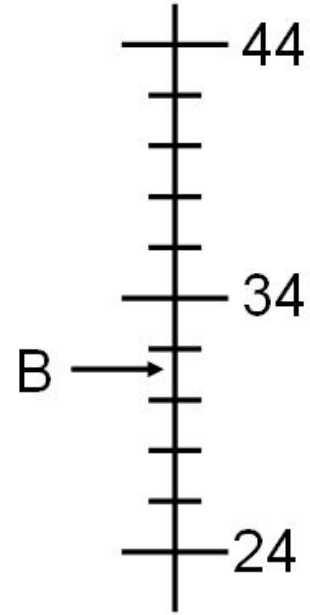
Mental Math Activities

Early Years:

Math Routines

- Calendar Math
- 100 Day
- Number of the Day
- Number Talks

Mental Math Activities

Middle Years

- Number of the Day
- Mental Math Strategies
- Number Talks
- [Developing Conceptual Understanding of Number](#)

Mental Math Activities

Senior Years

- Strategies
- Number Talks
- Number of the Day
- Mental Math Exercises to start class

Evaluate: 15^2

Evaluate: 35^2

Evaluate 105^2

Evaluate: $-\sqrt{4225}$

Write $\left(-2x^2\right)^3$ as repeated multiplication.

Looking Silly to Make Sense

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

Looking Silly to Make Sense

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Connections Among Strands

- Area for multiplication, primes, composites, factors
- Patterns for multiplication
- Shape and Space for Fractions
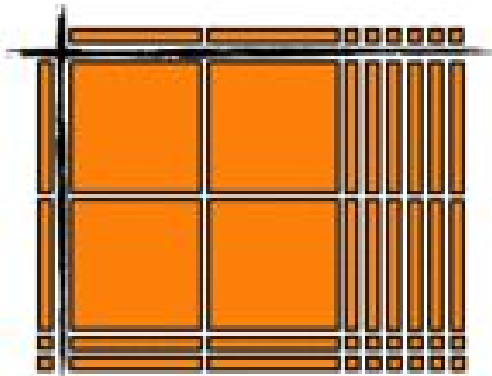- Probability and Fractions

Shape and Space Connections

Activity: Draw all rectangles with a given area.

Rectangle Activity (continued)
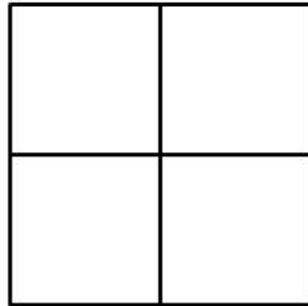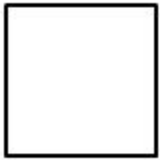
Area Model for Multiplication

Connection to Algebra

9 x 12 = ?

"9 groups of 12"

or

"5 groups of 10
plus
4 groups of 2"

	10	2
5	50	10
4	40	8
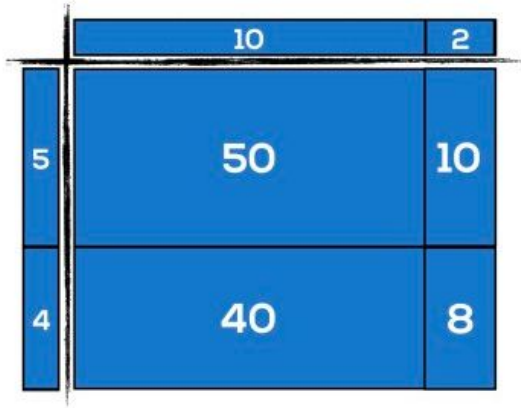
$\cdot$	x	+ 7
x	x^2	$7x$
- 5	$-5x$	-35

Looking Silly to Make Sense

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Take Aways

- Flexibility in thinking about number
- Try one new thing for 6 weeks or so until it becomes a tool in your tool box. Then try something else new.