

Break the Cycle of Failure

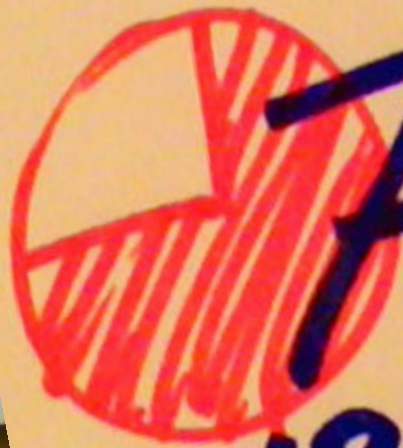
Save Struggling Students
with Math Intervention

NCTM Indianapolis Conference 2014

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$$9 + .5 = 1.4$$



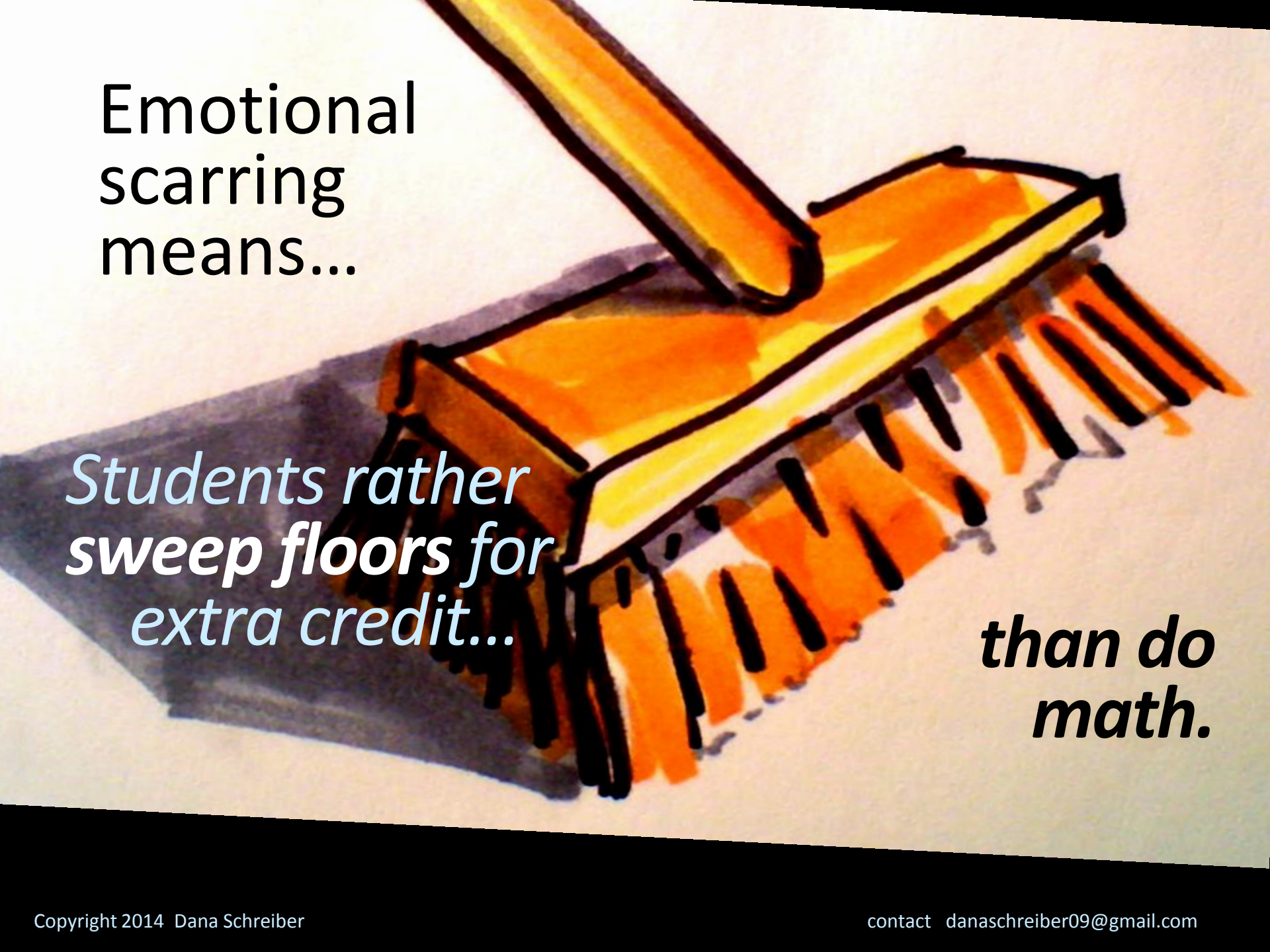
75%
WRONG

$$\frac{1}{2} + \frac{2}{3} = \frac{3}{5}$$

 68 %
WRONG

Painful Scars

By 8th grade,
for 20% or more urban kids,
math is a fact of failure



Emotional
scarring
means...

*Students rather
sweep floors for
extra credit...*

***than do
math.***

I'm Outta Here...

...continues into high school

one out of four
dropout nationwide.

#1

What is
Math Intervention?

Intensive

Targeted

Universal

few

some

most

**Math
Intervention**

**Regular
Classroom**

Current RTI Process

- *Universal Assessment of All Students*
- *Data Analysis & Cut-Offs*
- *Diagnostics & Grouping*
- *Intervention*
- *Progress Monitoring for Growth Rate*
- *Decision Making (6 - 20 week review)*

Possible RTI Lesson Format

- 5 min. Warm-up
- 10 min. Explicit Instruction
- 10 min. Practice
(guided/independent)
- 5 min. Closure

Plus optional online software for 15 min. *(progress monitoring, summarizing, & journal)*

Time to Tune Up

* INDIVIDUAL
DIAGNOSIS

Headlights
PLACE VALUE

SMART
CAR

**Target Key
skills**

Tires
FRACTIONS

Muffler
DECIMALS

Brakes
MULTIPLICATION

#2

A holistic approach

- Social & Cognitive psychology
- Neuroscience
- Conceptual Mathematics

Plus Empowerment

- Growth Mindset
- Emotional Intelligence
- Step-by-Step Success

For example...

GROWTH MINDSET

VS.

FIXED MINDSET

(Dweck, 2007)

“It’s not just whether or not
you think you have the ability
that matters. . . .”

- “In fact, what seems to be most important is whether or not you **think you can get the ability.**”

- Heidi Halvorson, 2011

High Achievement

**I take on more
higher challenges**

**I use new concepts
& processes**

**I persist, feel stronger,
try harder**

**My efforts get
better results**

**I can improve
& learn**

Low Achievement

Growth Mindset Sequence

Hope & Possibilities

This is easy *Mastery*

I could've had a 90

I can remember

I am getting better

I can do it

I can improve

Maybe *I can figure it out*

I'm stupid

I'm Outta Here!

Hopeless & Impossible

Can you imagine what a
growth mindset looks like
in the classroom?

High expectations
(different than standards)

Risk-Tolerant Environment

High confidence in growth

Frame as opportunity to stretch

Mistakes are expected & valuable

Progressive improvement is our goal

Lets do something *new*



What?!- New?

Supplies and Tools

- ✓ DRAWING PAPER
- ✓ VINE CHARCOAL
- ✓ KNEAD ERASER
- ✓ STUMP

**Draw one or more
of the still life objects
on the table.**

What are you feeling?

What are you thinking?

**If you aren't an artist...
does this task
feel intimidating?**

Did you avoid?

What is that about?

We must address Emotional Intelligence

*Struggling math students are often
emotionally hijacked and often
feel the following...*

(Limbic System)



Hopeless



Hopeless

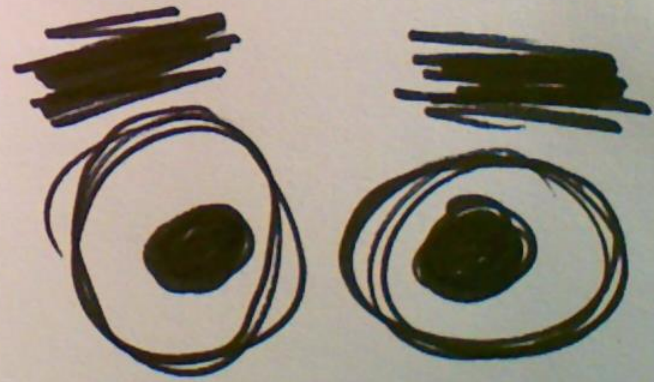


Fear

Anger



Fear



Hopeless



Avoidance



Anger



Fear



Hopeless



"I'm
Stupid"

~

Big Ouch!!



Little Ouch!

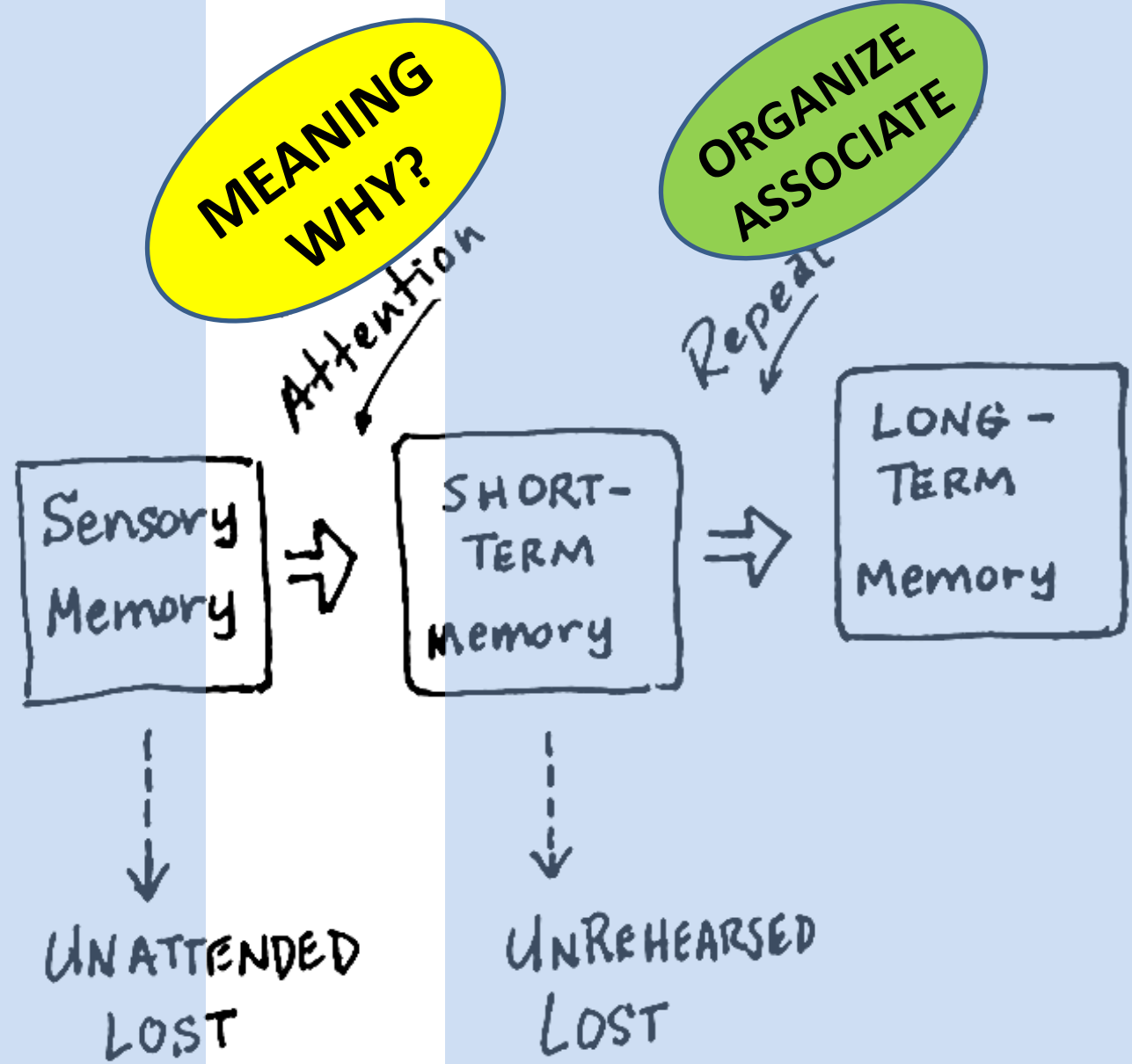
How can we help
8th grade students
remember
5th grade math?

Try adding
“meaning”

What is “Meaning” to our brain?

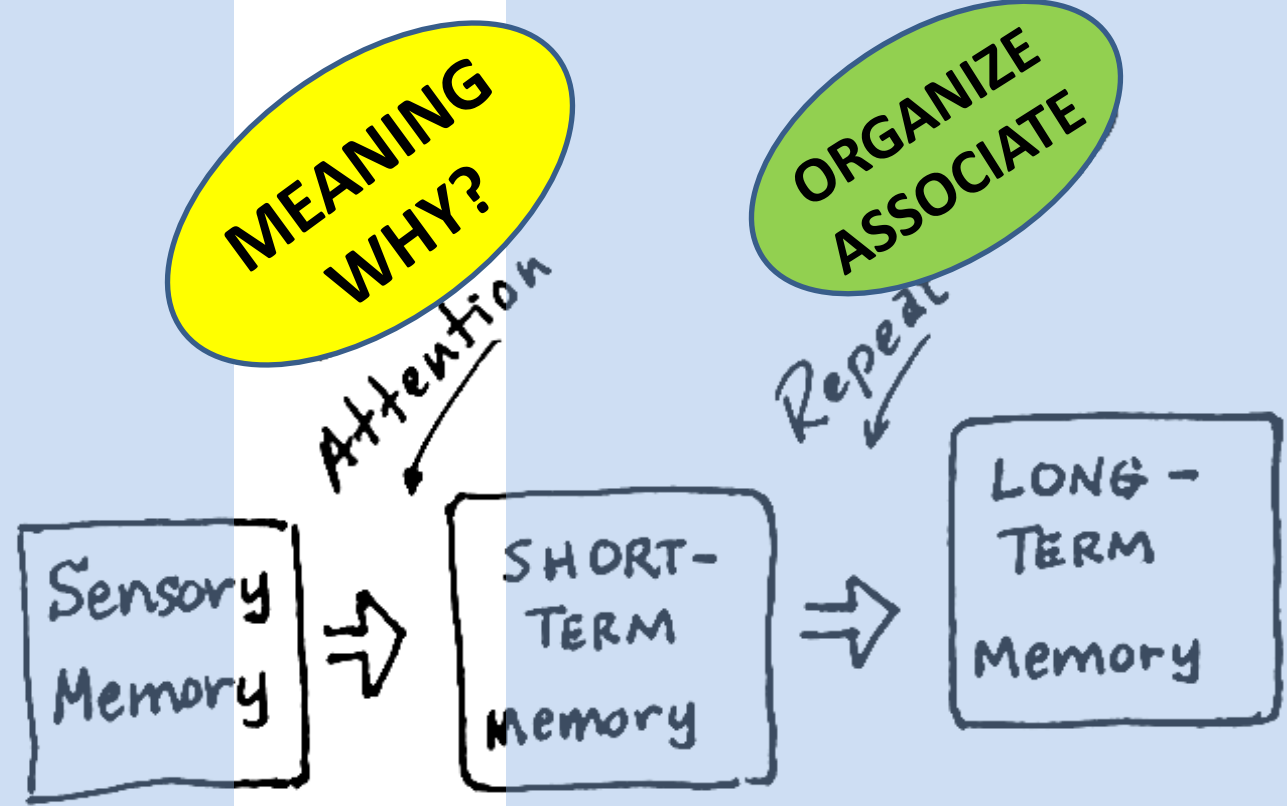
- Why?
- Value?
- Feelings?

Sight
Smell
Hearing
Taste
Touch



(Atkinson & Shiffrin, 1968)

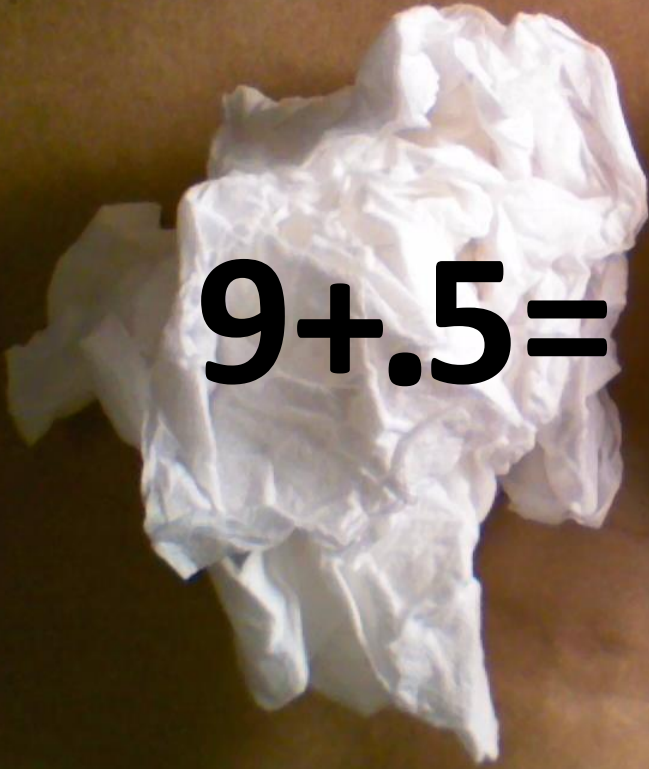
Sight
Smell
Hearing
Taste
Touch



UNATTENDED
LOST

Meaning enhances
attention

(Atkinson & Shiffrin, 1968)



$9+.5=$



$\$9+.5=\9.50

Decisions about meaning are very **quick**
we attend to **meaningful** things first.

How can we
reduce anxiety
and **validate** our kids?



Mistakkes honored

(and used as a diagnostic tool)

What does some
of the neuroscience
tell us?

Chemistry

Success triggers **dopamine**.

Dopamine is addictive
and helps memory.

Chemistry

Stress triggers **cortisol**

Cortisol interferes
with memory.

#3

What does effective
Progress Monitoring
look like?

One example of Progress Monitoring

Feedback and Progress
Monitoring in a
one-sheet format

Completed Feedback and Monitoring sheet showing quiz scores reaching goal of 3 quizzes scoring 70% or greater

I need 3 scores > 70% in each of the following areas

DONE

- Integers
- Fractions
- Decimals
- Multiplication
- Place Value

	1st Score	Date	2nd Score	Date
	80	6/15		
	87	6/15		
	73	6/13		
	67	6/13		
Goal	40			

F4	NQKU2608	Fraction 8	50	6/13		
F5	BVKH8748	Fraction 8	30	6/13		
F6	LEJE0091	Fraction 8	40	6/15		
F7	LWUX8034	Fraction 3	50	6/15		
F8	XGEB8712	Fraction 3	40	6/13		
F9	HEYB2744	Fraction 1	40	5/31	90	6/19
F10			20	6/1	40	6/13
F11			20	5/25	60	6/18

Starting Point: 70

D9	AVAS0395	Decimal 8				
D8	PTOG8879	Decimal 8				

Percentage	[Edit]	60%
Points		6/10
Completed		10
Unanswered		0
Right		6
Wrong		4
Time		5:21
Seconds per problem		32.10

Individual quiz
data for a 10
minute decimal
online quiz

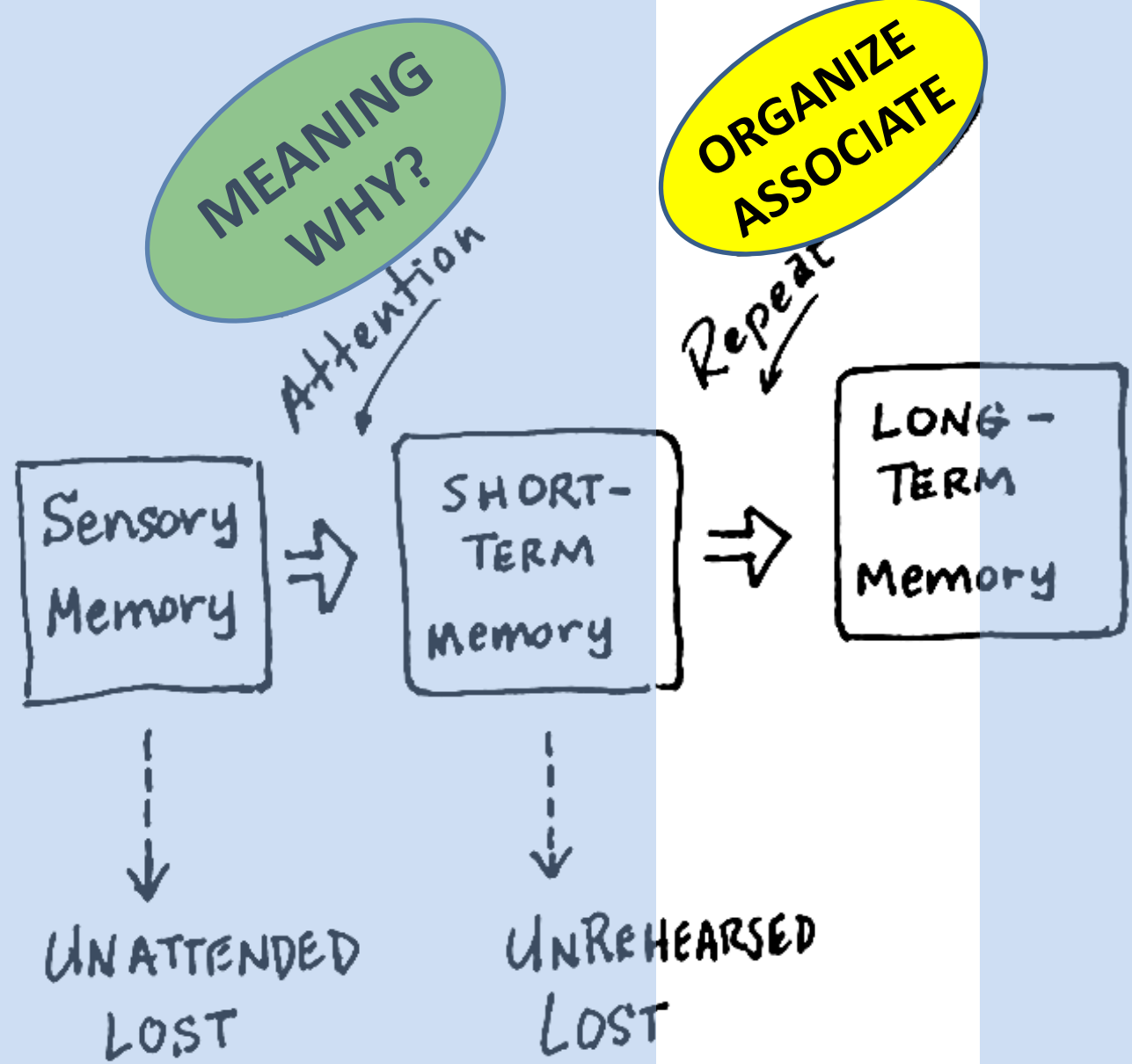
5:21 used of allotted 10 minutes
suggests rushing and not attending
to precision

Incorrect Answers

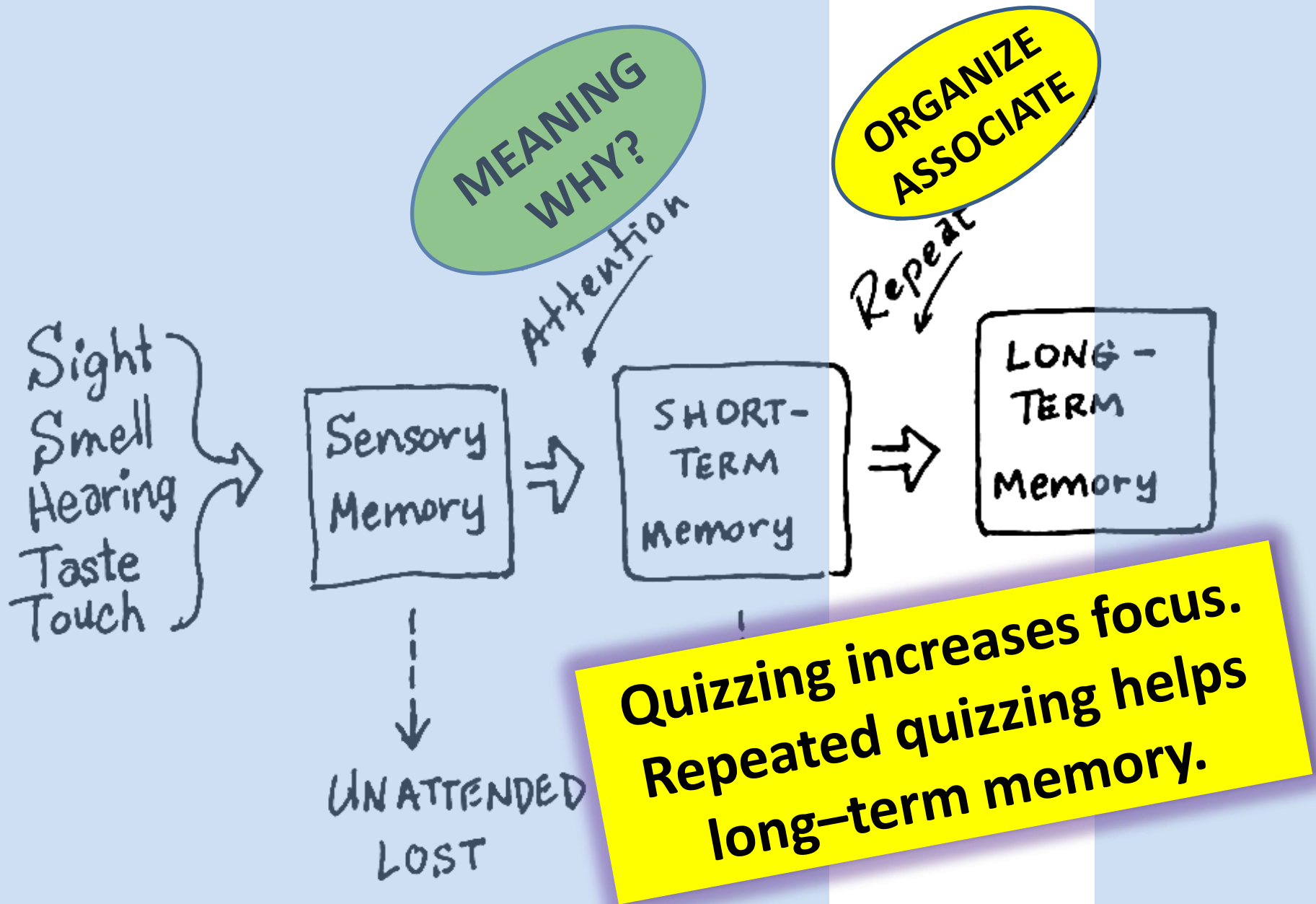
1. $0.9 \div 0.3 = 3$ (0.33)
5. $8.01 - 6.79 = 1.22$ (2.22)
6. $7.8 - 1.74 = 6.06$ (6.14)
9. $6.65 + 10 = 16.65$ (6.75)

() is student's incorrect answer

Sight
Smell
Hearing
Taste
Touch



(Atkinson & Shiffrin, 1968)



(Atkinson & Shiffrin, 1968)

MEL SnapShot Data

ThatQuiz Data

TQ Score Summary

% Percent of Students

SRBI Goal: 3 Quizzes @ 70%+ Score

1 or more > 70%+ Score

P R M D F I

	P	R	M	D	F	I
3	98	54	100	77	63	52
1	98	67	100	90	69	52

Semester summary showing % of students reaching goal in all categories

Key

Grade

	Place Value	Rounding	Multiplication	Decimals	Fractions	Integers
7	3		3	3	3	
7	3	1	3	3	3	3
8	3	3	3	3	3	3
3						

Starting Point

Quizzing score pattern reveals a learning S-curve

F9	UGYB2792	Fraction 7	
F8	NQKU2609	Fraction 8	
F7	BVKH8748	Fraction 5	100 ● 6/13 ✓
F6	LEJE0091	Fraction 4	80 ● 6/13 ✓
F5	BEYT9814	Fraction 3	70 ● 6/13 ✓
F4	LWUX8034	Fraction 2	50 ● 6/13 ✓
F3	XGEB6712	Fraction 1	60 ● 6/13 ✓
F2	HEYB2744	Fraction Pretest	30



Starting Point

F9	TXKC8215	Fraction 9	
F8	UGYB2792	Fraction 8	
		Fraction 7	

"I could'a had a 90%"



"I could'a had a 90%"



"Mr. Schreiber,
Can I take
another Quiz?"

#4

Lesson Plans?

Lesson Plans Include...

Three Conceptual Stages

1. Concrete
2. Representational
3. Abstract

Concrete

The “doing” stage uses
concrete objects to
model problems.

*Manipulatives: chips, pennies, blocks,
cut out paper, fraction bars/rods...*

Representational

The “seeing” stage uses visual representations of the objects to model problems.

*Pictures, hash marks, diagrams, drawings
Uses paper, whiteboards, cards,
sticky notes, etc.*

Abstract

The “symbolic” stage uses abstract symbols to model problems.

“Naked” numbers and symbols and symbolic mental math.

“Students who use manipulatives
in their mathematics classes
usually outperform those
who do not. . .”

“...This benefit holds across grade level, ability level, and topic, given that use of a manipulative **"makes sense"** for that topic.”

- *Douglas Clements, 1999*

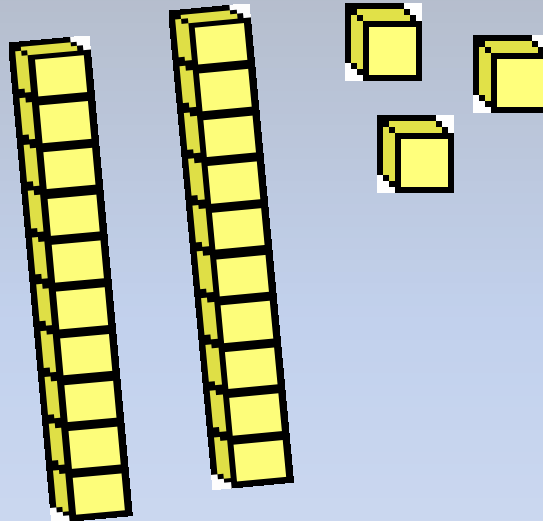
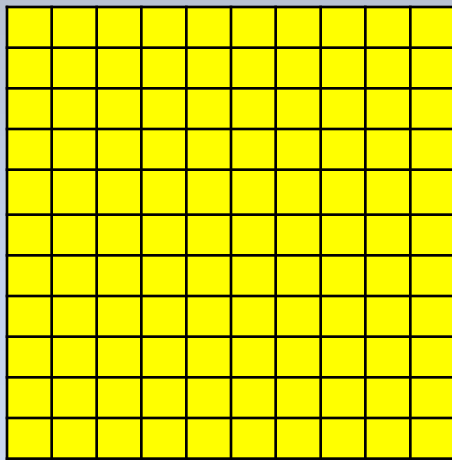
Subtraction Magic



$$\begin{array}{r} 1 \quad \cancel{2} \quad \cancel{3} \\ - 7 \quad 5 \\ \hline 4 \quad 8 \end{array}$$

An Example of Representing Subtraction

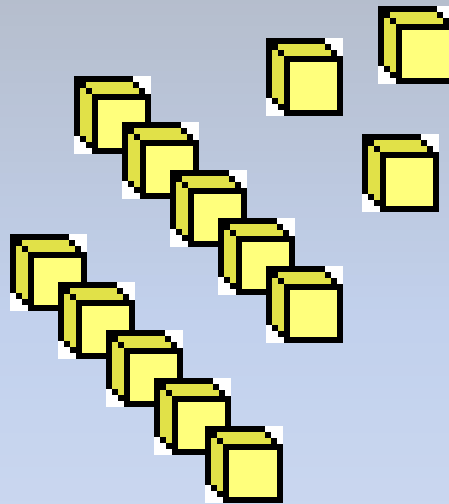
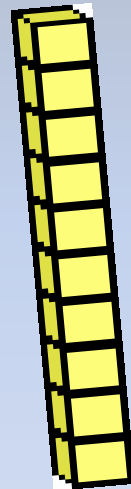
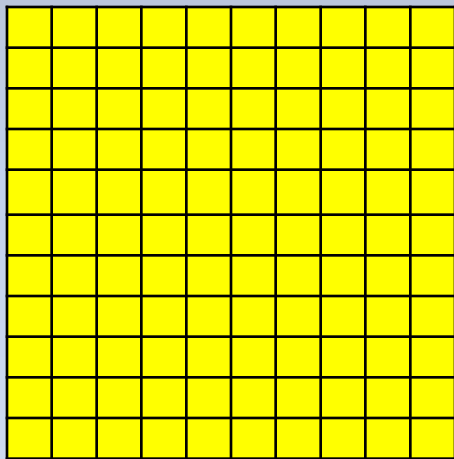
Before Borrowing



1 2 3

-7 5

After Regrouping 10's into 1's



1

13

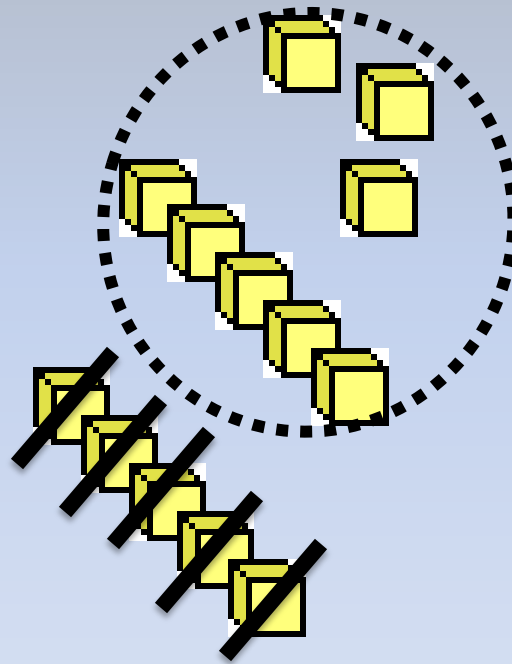
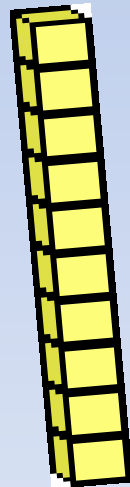
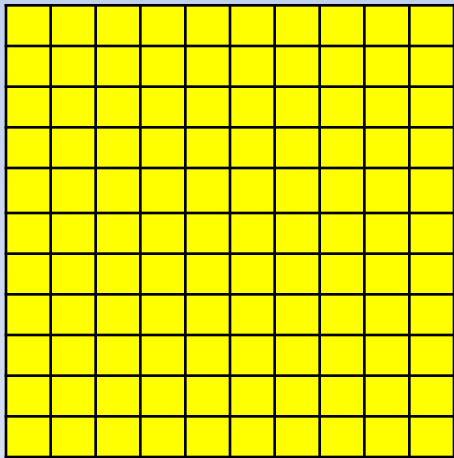
1

~~2~~

~~3~~

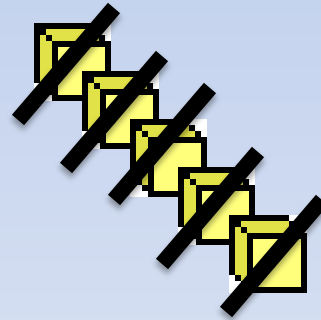
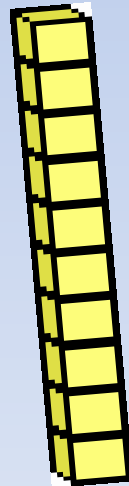
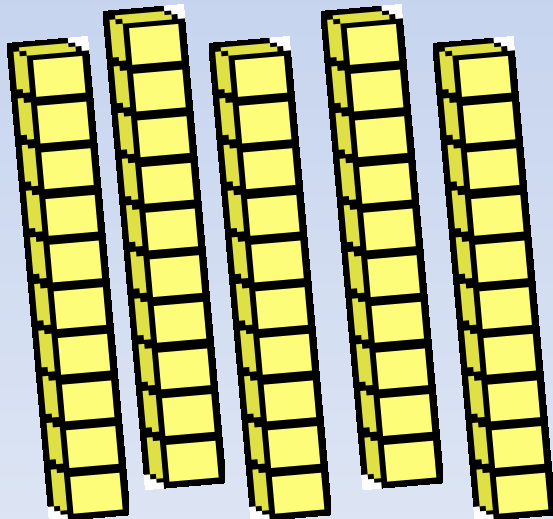
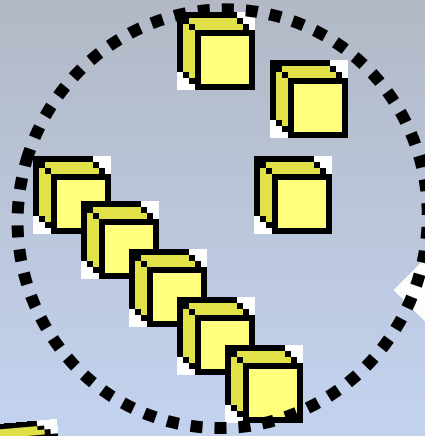
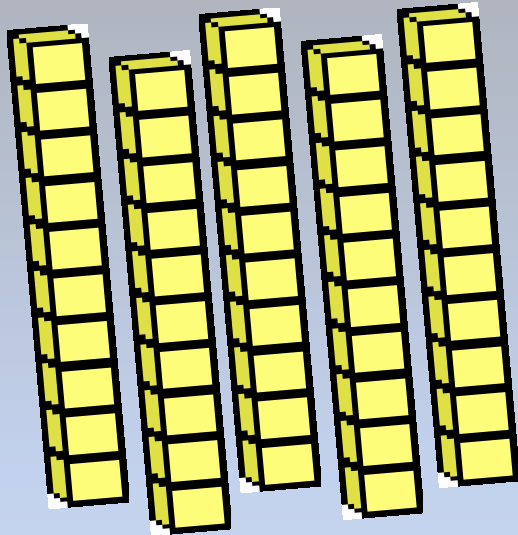
-7 5

After Subtracting the Ones



$$\begin{array}{r} \overset{\text{1}}{\cancel{1}} \overset{\text{13}}{\cancel{23}} \\ - 75 \\ \hline 8 \end{array}$$

After Regrouping 100's into 10's



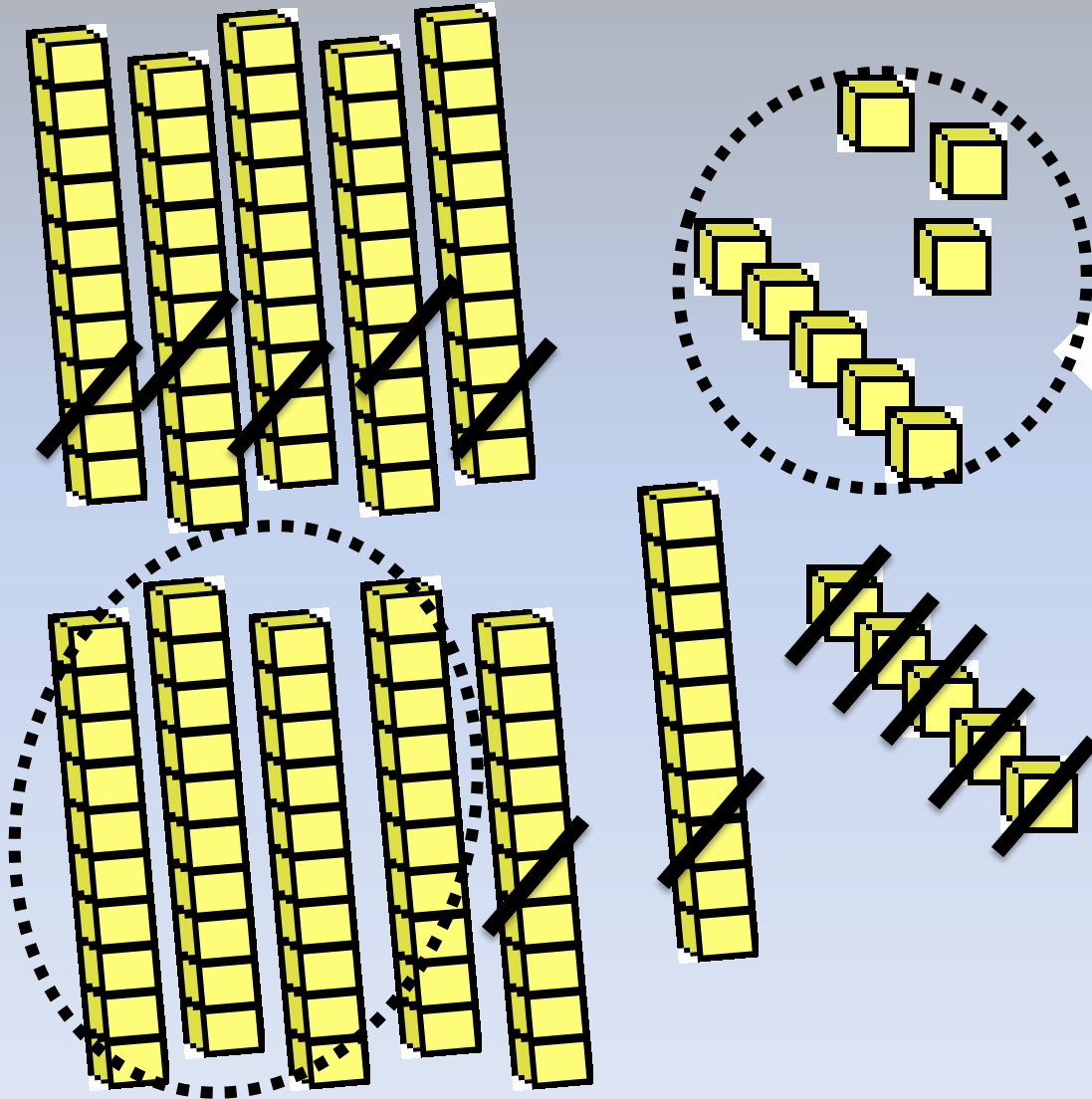
0 11 13

~~1~~ ~~2~~ ~~3~~

-7 5

8

After Subtracting 10's



$$\begin{array}{r} 011 \\ - 123 \\ \hline \end{array}$$

$$\begin{array}{r} -75 \\ \hline 48 \end{array}$$

Your Turn...

- *Use Subtraction Worksheet*
- *Build the number with the blocks and draw it on the worksheet*
- *Show each step of regrouping and renaming as you subtract*
- *Make sure that the representations and the numbers match!*

Subtract using Base 10 Blocks – Draw each step along the way.

MAKE SURE THE NUMBERS AND THE REPRESENTATION MATCH!

$$\begin{array}{r} 143 \\ - 56 \\ \hline \end{array}$$

BUILD AND DRAW YOUR STARTING NUMBER:

NOW SHOW EACH STEP YOU TAKE

Embedded Skills?

- Understanding subtraction
- Basic Facts
- Place Value Understandings
- Regrouping for more than 10

(Base 10 system)

Division... The next Pitfall

Here is a fun game to help students learn the algorithm of long division using manipulatives

LeftOvers Game

- 1. Choose a cup of pennies – count & record the amount**
- 2. Roll the number cube – record the number**
- 3. Predict if you will have leftovers - or not**
- 4. Make groups of the number shown on the number cube**
- 5. Fill in your score worksheet – write how many groups?**
- 6. Any leftovers?**
- 7. Were you correct in your prediction?**

LeftOvers Game

Name _____

Play 9 Games

Predict Before				Now Make Groups		Score
Total Pennies	What is the Number on the Cube?	Estimate: How many Groups of number are there in the total?	Predict: Will you have leftovers? Y or N	How many groups do you actually have? Match? Y or N How many groups?	Do you have any Leftovers? Y or N	Total Points +2 pts if leftovers match +1 Bonus pt if groups match (max. 3 pts. possible)
Cup						
Cup						

Embedded Skills?

- Grouping
- Divisibility
- Remainders
- Factoring

Examples that Explain

- Connecting expanded notation to multi-digit array multiplication
- One more visual way to explain decimal multiplication
- What happens when our divisor gets smaller?

To learn more

Contact Dana Schreiber
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Thank you

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