

# NWMC 2014 OCTOBER 10, 2014

# NUMBER TALKS IN THE MIDDLE SCHOOL MATH CLASSROOM

Welcome Middle School Educators!

# Standards for Mathematical Practice

- 1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics.

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- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for and make use of structure.
- 8. Look for and express regularity in repeated reasoning.

# What is a Number Talk?

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- Number talks can be best described as classroom conversations around purposely crafted computation problems that are solved mentally.
- The problems in a number talk are designed to elicit specific strategies that focus on number relationships and number theory...
- By sharing and defending their solutions and strategies, students have the opportunity to collectively reason about numbers while building connections to key conceptual ideas in mathematics.

From Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K-5 by Sherry Parrish, page xviii

# Common Core Standards for Mathematical Content

#### The Number System, 6-8: Overview

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In Grades 6–8, students build on two important conceptions which have developed throughout K–5, in order to understand the rational numbers as a number system.

The first is the representation of whole numbers and fractions as points on the number line,

and the second is a firm understanding of the properties of operations on whole numbers and fractions.

— Progressions for the Common Core State Standards in Mathematics, Number Sense, 6-8, www.commoncoretools.wordpress.com

# Why "Middle School" Number Talks?

#### **Examining Common Errors:**

- 1.  $\frac{3}{4} \frac{1}{2}$
- **2.** 5.40 × 0.15

- 3. -3 + -6
- 4. (x + 2)(x + 3)
- 5. True or False:  $6 \times 99 = (6 \times 100) (6 \times 1)$ True or False:  $99 \times 6 = (100 \times 6) - (1 \times 6)$

# **Session Goals**

#### In this session we will:

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- Use models and tools that support student understandings and proficiencies called for in the Common Core State Standards
- Recognize and support students' understandings of the mathematical properties
- Share strategies in ways that emphasize the important mathematical ideas that are inherent in the strategies



# Number Talk: Compute the Answer Mentally

## 16 × 35 =

# Four Procedures and Expectations

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- 1. Establish Number Talks as part of your math class routine.
- 2. Provide appropriate wait time for most students to access the problem.
- 3. Accept, respect, and consider all answers.
- 4. Encourage student communication.

# Number Talks as a Vehicle for Computation Strategies

• Efficiency

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- the ability to choose an appropriate, expedient strategy
- Flexibility
  - the ability to use number relationships with ease in computation
- Accuracy
  - the ability to produce an accurate answer

## **Number Talk Student Responses**

Omar	16	×	25
16 × 35 =	10		55
10 x 30 = 300			
6 x 5 = 30			
30 x 6 = 180			
$5 \times 10 = 50$			
300 + 180 + 30	+ 50=	•	
480 + 80 =	= 560		
(partial products	5)		Jarvis
			16
			8 × 2
16 × 35 =			4 × 2 ×
8 × 70 = 560			 2x2 x 2x
(doubling/halving	)		
· · · ·	-		(prime ta

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Sarah Grace 16 × 35 = 20 × 35 = 700 35 × 4 = 140 700 - 140 = 560 (friendly number)

Jarvis 16 × 35 = 8 × 2 7 × 5 4 × 2 ×2 × 7 × 5 2×2 × 2×2 × 7 × 5 = 560 (prime factorization)

# **Key Components of Number Talks**

- Classroom environment and community
- Classroom discussions
- The teacher's role

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- The role of mental math
- Purposeful computation problems

#### 16 × 35 Area Model

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35 Omar 30 5 16 ×35 = +  $10 \times 30 = 300$  $6 \times 5 = 30$ 10 300 50 16 30 x 6 = 180 + $5 \times 10 = 50$ 180 30 6 300 + 180 + 30 + 50= 480 + 80 = 560 = 300 10×30 (partial products)  $6 \times 5 = 30$  $30 \times 6 = 180$ 5×10 560

$$16 \times 35 = (10 + 6) \times (30 + 5)$$
  
= (10 × 30) + (6 × 5) + (30 × 6) + (5 × 10) = 560

# Single Digit x Single Digit Arrays

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# **Concrete Model of 6 x 13**

6

#### 10 + 3



## **Representational Model**

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## **Abstract Model**





## Compute 3 x 14

#### • Chrissy, Grade 4



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# Number Talks In Response to Common Errors

1.  $\frac{3}{4} - \frac{1}{2}$ 

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- **2.** 5.40 × 0.15
- 3. -3 + -6
- 4. (x + 2)(x + 3)

5. True or False:  $6 \times 99 = (6 \times 100) - (6 \times 1)$ 

# Using Partial Products Model to Solve (x + 2)(x + 3)



# Number Talk: Compute the answer mentally

1. 3(x + 5)

- 2. (x + 3)x
- 3. (x + 3)(x + 5)

# Number Talks In Response to Common Errors

1.  $\frac{3}{4} - \frac{1}{2}$ 

- **2**. 5.40 × 0.15
  - 3. -3 + -6
  - 4. (x + 2)(x + 3)
  - 5. True or False:  $6 \times 99 = (6 \times 100) (6 \times 1)$

# "Estimation Task" Number Talk Please solve mentally then record each answer using paper and pencil:

1. 2376 ÷ 0.98

- 2. 32% of 647
- 3. 5.08 × 2.4

# "Are These Answers Reasonable?" Number Talk

1. 8,638/7 = 123.4

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- **2.** 696/8 = 5,568
- **3.** 2,961/6 = 49.35

(from *Good Questions for Math Teaching,* by Lainie Schuster and Nancy Anderson p. 39)



#### https://www.mathreasoninginventory.com

#### ...or search on-line for: "Math Reasoning Inventory"

# Number Talks In Response to Common Errors



# Strategies for Fraction Addition

3/4 From *Beyond Invert and Multiply* by Julie McNamara "Coming Soon" + 3/4

$$= 1/2 + 1/4 + 1/2 + 1/4$$

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Decomposition

of Fractions

$$= 1/2 + 1/2 + 1/4 + 1/4$$

Commutative

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$$=$$
 1 + 2/4 = 11/2

Associative Property Recomposition

## **Model for Fraction Addition**





0 1 11/2

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# Number Talks: Fraction Addition

1. 7/8 + 1/2 =

- 2. 3/4 + 5/16 =
- **3.** 23/8 + 33/4 =

# **Fraction Division Models**

**1.** Fraction Strips

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2. Fractions on a Number Line

# **1. Fraction Strips Model**

Connecting Fraction Division to Whole Number Division:

6÷2 =(how many 2s are in 6?)

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 $1/2 \div 1/8 = (\text{How many } 1/8 \text{ s are in } 1/2 ?)$ 



## 2. Number Line Model

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 $1/2 \div 1/8 = (\text{How many } 1/8 \text{ s are in } 1/2 ?)$ 



## 2. Number Line Model

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1/2 ÷ 1/8 = (How many 1/8 s are in 1/2?) 1 2 3 4



# Number Talks: Dividing Fractions by Fractions

1.  $1/2 \div 3/8 =$ 

- 2.  $1/2 \div 1/3 =$
- **3**. 16/8 ÷ 1/4 =
- 4.  $23/4 \div 1/8 =$

# Number Talks In Response to Common Errors

1.  $\frac{3}{4} - \frac{1}{2}$ 

- **2.** 5.40 × 0.15
- 3. -3 + -6
- 4. (x + 2)(x + 3)
- 5. True or False: (6 x 100) (6 x 1)

# Strategies for Adding and Subtracting Integers

# "Students understand 5 – 3 as the missing addend in

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#### On the number lines, ..."

http://commoncoretools.me/wp-content/uploads/2013/07/ ccssm\_progression\_NS+Number\_2013-07-09.pdf, pages 9-10

#### **Strategies for Adding and Subtracting Integers**

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"On the number lines, [3 + ? = 5] is represented as the distance from 3 to 5 or direction on the number line by saying how you get from 3 from 5; by going two units to the right."



http://commoncoretools.me/wp-content/uploads/2013/07/ ccssm\_progression\_NS+Number\_2013-07-09.pdf, pages 9-10 Strategies for Adding and Subtracting Integers (-5) - (-3) = How to write as a missing addend?

(-3) + ? = (-5)

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Using a number line,

how do you get from -3 to -5?

Since -5 is two units to the left of -3 on the number line, the missing addend is -2.



http://commoncoretools.me/wp-content/uploads/2013/07/ccssm\_progression\_NS +Number\_2013-07-09.pdf, page10



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3. 
$$5 - (-2)$$

# Why "Middle School" Number Talks? Examining Common Errors:

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## "True or False?" Number Talks

#### 1. 5 X 1/9 = 4 x 1/9 + 1/9

#### 2. 1/2(1 + 1/3) = 1/2 + 1/3



## **True or False?**

#### 3. $6 \times 1/3 = 1/6 + 1/6 + 1/6$

#### 4. $9 \times 5/6 = (6 \times 5/6) + (3 \times 5/6)$

## "True or False?" Number Talk

5. 
$$3 \times -7 = (-7) + (-7) + (-7)$$

6. 
$$-8 \times 6 = (-8 \times 5) + 6$$

7. 
$$9 \times -7 = 10 \times -7 + 7$$

8. 
$$-9 - 6 = -9 - (-6)$$

# **Session Goals**

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- Recognize and support students' understandings of the mathematical properties
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# What is a Number Talk?

*Number Talks* are a valuable classroom *routine* for:

- making sense of mathematics
- developing efficient computation strategies
- communicating reasoning
- and proving solutions

# **Number Relationships**

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"When we ask students questions about relationships, properties, and procedures associated with number concepts, we help our students make important mathematical connections between numbers and their representations."

> From *Good Questions for Math Teaching* by Lainie Schuster and Nancy Canavan Anderson, page 17



## **Final Reflection**

# What impact might *Middle School Number Talks* have in *your* math classroom?



# **Thank You!**

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