SCHOLASTIC ACHIEVEMENT PARTNERS | Math Solutions FOUNDED BY MARILYN BURNS

NCTM 2014 MIDDLE SCHOOL NUMBER TALKS

Welcome Middle School Educators!

What is a Number Talk?

- 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

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Common Core Standards for Mathematical Content

The Number System, 6-8: Overview

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

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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 x 99 = (6 x 100) – (6 x 1)

Session Goals

In this session we will:

- 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

$$16 \times 35 =$$

Number Talk 16 × 35

View video clip:

https://mathsolutions.wistia.com/projects/hda5hncgd3

5.3 Multiplication:16 X 35 from Number Talks™. Helping Children Build Mental Math and Computation Strategies by Parrish, S. (2010), Sausalito: Math Solutions Publications. All rights reserved

Four Procedures and Expectations

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.

Adapted from *Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K-5* by Sherry Parrish

Number Talks as a Vehicle for Computation Strategies

- Efficiency
  - 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

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

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Number Talk Student Responses

16 × 35

Omar

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

Sarah Grace

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

Molly

16 ×35 =
8 ×70 = 560
(doubling/halving)

Jarvis

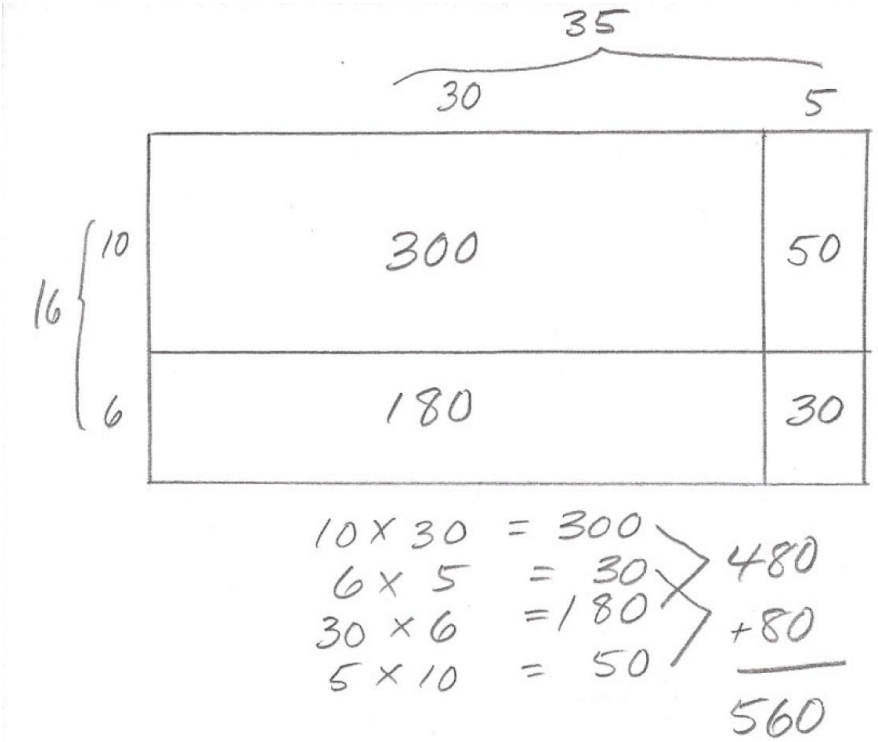
16 × 35 =
8 × 2 7 × 5
4 ×2 ×2 × 7 × 5
2×2×2×2 × 7 ×5 = 560
(prime factorization)

Key Components of Number Talks

- Classroom environment and community
- Classroom discussions
- The teacher's role
- The role of mental math
- Purposeful computation problems

16 × 35 Area Model

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



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

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Number Talks In Response to Common Errors

1. $\frac{3}{4} - \frac{1}{2}$
2. 5.40 × 0.15
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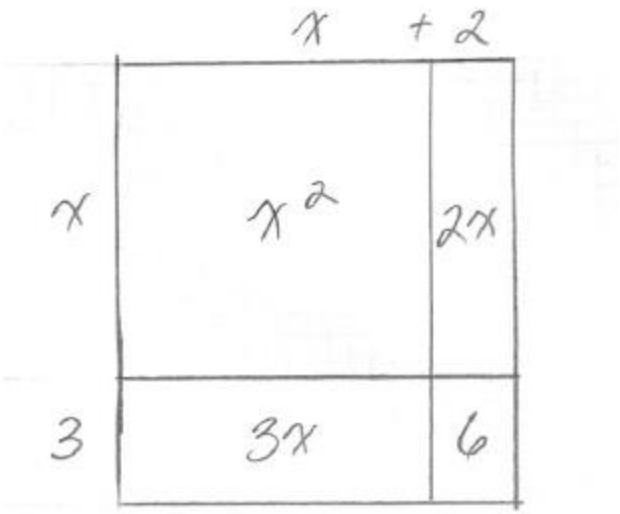
5. True or False: 6 x 99 = (6 x 100) – (6 x 1)

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



$x^2 + 2x + 3x + 6$

$= x^2 + 5x + 6$

Number Talk:
Compute the answer mentally

1. $3(x + 5)$
2. $(x + 3)x$
3. $(x + 3)(x + 5)$

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"Estimation Task" Number Talk

1. 2376 ÷ 0.98
2. 32% of 647
3. 5.08 × 2.4

“Are These Answers Reasonable?” Number Talk

1. $\frac{8{,}638}{7} = 123.4$
2. $\frac{696}{8} = 5{,}568$
3. $\frac{2{,}961}{6} = 49.35$

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

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Strategies for Fraction Addition

$$\overbrace{\frac{3}{4}}^{} + \overbrace{\frac{3}{4}}^{}$$

$$= \frac{1}{2} + \frac{1}{4} + \frac{1}{2} + \frac{1}{4}$$

Decomposition of Fractions

$$= \frac{1}{2} + \frac{1}{2} + \frac{1}{4} + \frac{1}{4}$$

Commutative Property

$$= \underbrace{1}_{} + \underbrace{\frac{2}{4}}_{} = 1\frac{1}{2}$$

Associative Property

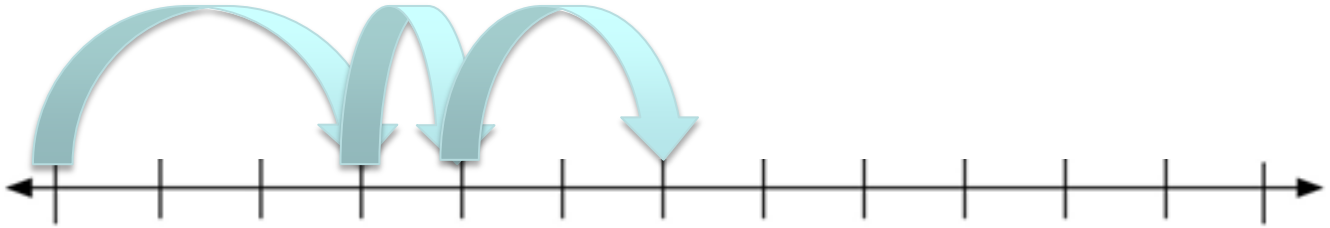
Recomposition

From *Beyond Invert and Multiply* by Julie McNamara “Coming Soon”

Model for Fraction Addition

$$\frac{3}{4} + \frac{3}{4} =$$

$$\frac{3}{4} + \frac{1}{4} + \frac{1}{2} = 1\frac{1}{2}$$



$\frac{0}{4}$ $\frac{1}{4}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{5}{4}$ $\frac{6}{4}$ $\frac{7}{4}$ $\frac{8}{4}$

0 1 $1\frac{1}{2}$

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Number Talks: Fraction Addition

1. $\frac{7}{8} + \frac{1}{2} =$
2. $\frac{3}{4} + \frac{5}{16} =$
3. $2\frac{3}{8} + 3\frac{3}{4} =$

Fraction Division Models

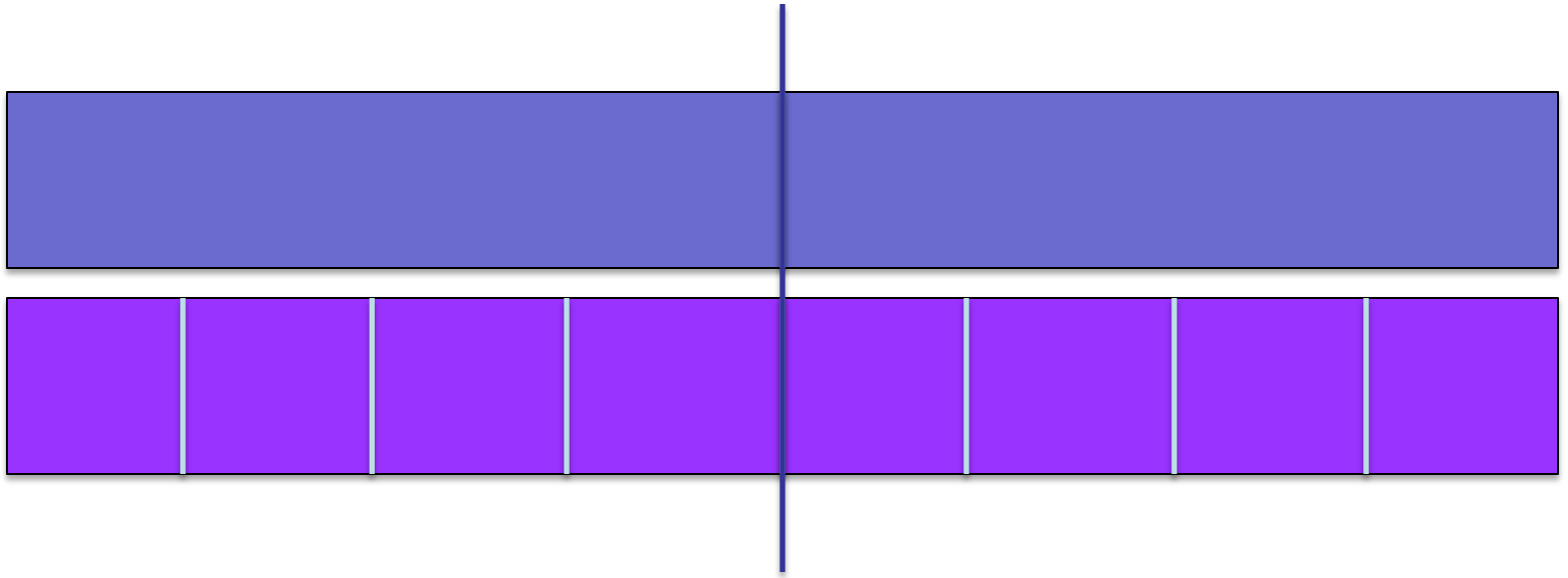
1. Fraction Strips
2. Fractions on a Number Line

1. Fraction Strips Model

Connecting Fraction Division to Whole Number Division:

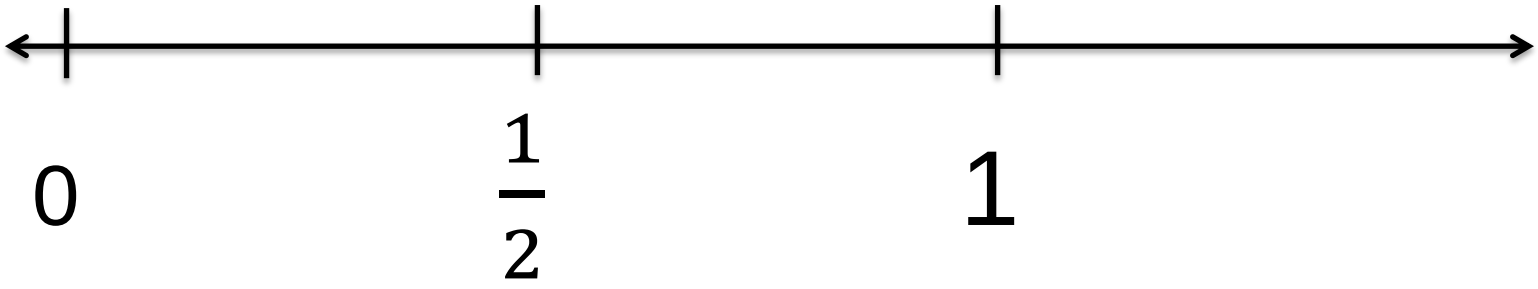
$6 \div 2$ =(how many 2s are in 6?)

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



2. Number Line Model

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



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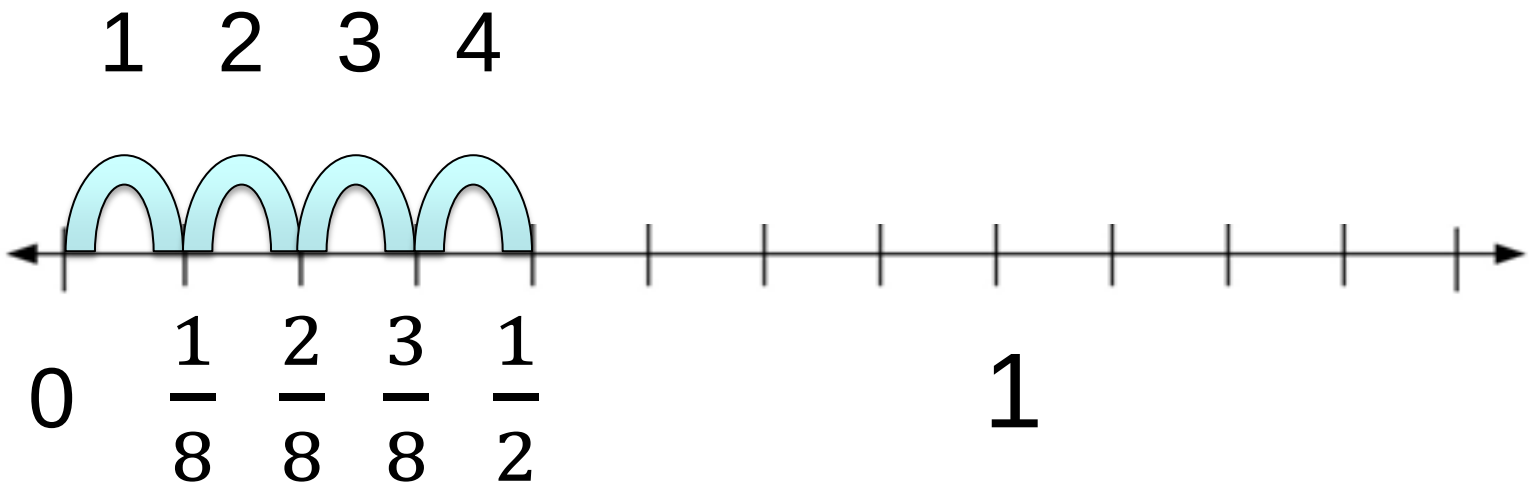

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Number Talks: Dividing Fractions by Fractions

1. $\frac{1}{2} \div \frac{3}{8} =$
2. $\frac{1}{2} \div \frac{1}{3} =$

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Number Talks: Dividing Fractions by Fractions

1. $1\frac{6}{8} \div \frac{1}{4} =$
2. $2\frac{3}{4} \div \frac{1}{8} =$

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Strategies for Adding and Subtracting Integers

- Students understand 5 – 3 as the missing addend in

  3 + ? = 5…

Integer chips (whether chips are used or not, Standards require that students eventually understand location and addition of rational numbers on the number line)…

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

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Strategies for Adding and Subtracting Integers

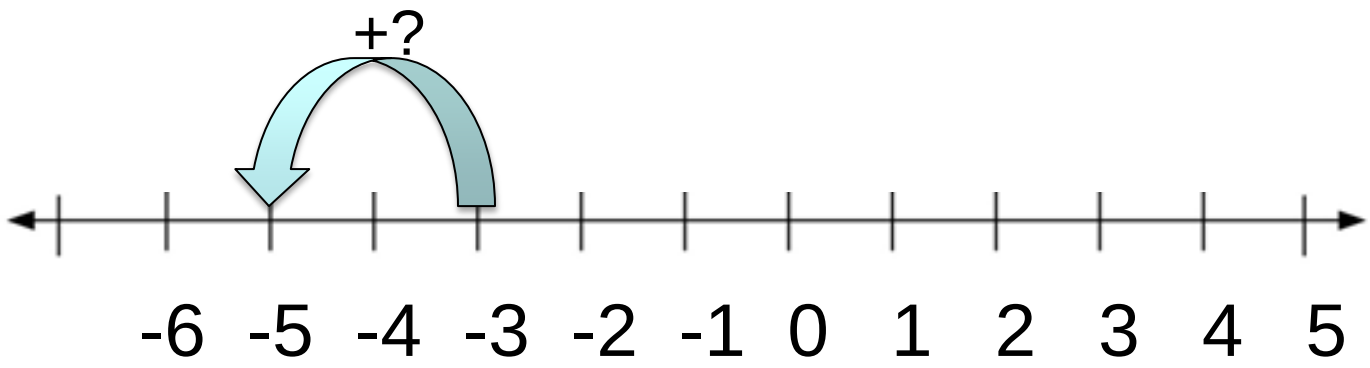
(-5) – (-3) = How to write as a missing addend?

(-3) + ? = (-5)

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

Integer Number Talks

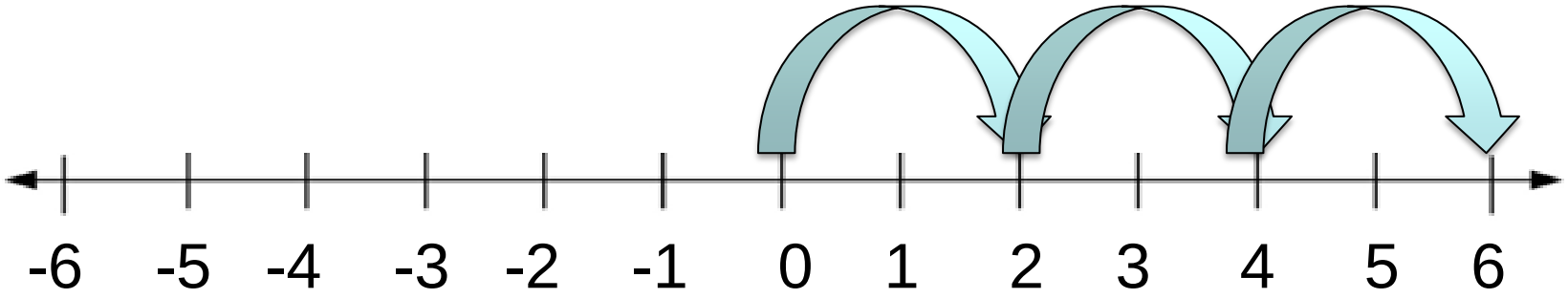
1. (-7) – (-3)

2. (-10) – (-2)

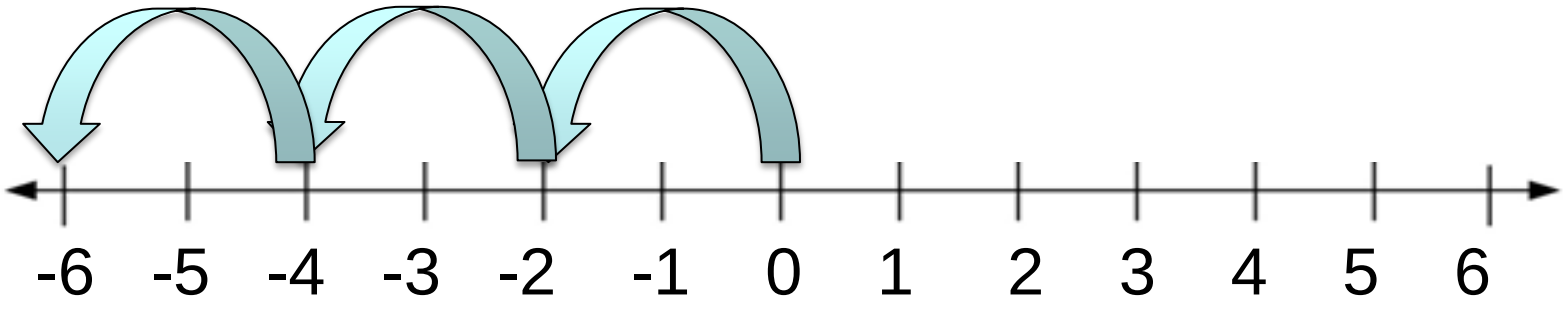
3. 5 – (-2)

Strategies for Multiplying and Dividing Integers

Multiplying 3 x 2 is the same as 3 sets of 2 or 2 + 2 + 2 = 6 or 3 jumps to the right on the number line.



Multiplying 3 x (-2) is the same as 3 sets of -2 or (-2) + (-2) + (-2) = -6 or 3 jumps to the left on the number line.



Strategies for Multiplying and Dividing Integers

Relationship of multiplication and division.

(-2) x 4 = ? is the same as ? ÷ 4 = (-2).

What about -2 x -3?

This is saying I have -3 sets of -2, or -(-2)-(-2)-(-2), which is 6.

Or we could use the relationship between multiplication and division ? ÷ (-3) = (-2)

Integer Multiplication/Division Number Talk

1. 4 x -2

2. (-16) ÷ (-2)

3. -3 x 5

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"True or False?" Number Talks

1. $5 \times \frac{1}{9} = 4 \times \frac{1}{9} + \frac{1}{9}$

2. $\frac{1}{2}\left(1 + \frac{1}{3}\right) = \frac{1}{2} + \frac{1}{3}$

True or False?

3. $6 \times \frac{1}{3} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$

4. $9 \times \frac{5}{6} = \left(6 \times \frac{5}{6}\right) + \left(3 \times \frac{5}{6}\right)$

"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

In this session we will:

- 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

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

"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

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Talk Moves: Building Place Value Understanding

42×17

42×1.7

$42 \times .17$

4.2×17

$4.2 \times .17$

Final Reflection

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

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Thank You

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